



# Quality of tuberculosis care at different levels of health care in Brazil in 2013

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## Suggested citation

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## ABSTRACT

**Objective.** To assess 1) the burden and socio-demographic and clinical characteristics of tuberculosis (TB) cases, and 2) the quality of TB care provided to patients who entered and remained within each health care service level (primary, secondary, or tertiary) and those who moved from one level to another, using process and results indicators.

**Methods.** This cross-sectional operational research study assessed new smear-positive pulmonary TB cases diagnosed in Brazilian state capitals in 2013 using TB program records and the TB surveillance system. Quality of care was assessed based on process and results indicators including HIV screening, TB contact screening, Directly Observed Treatment (DOT), sputum smear microscopy monitoring, and treatment outcomes.

**Results.** There were 12 977 new smear-positive TB cases reported. Of these, 7 964 (61.4%) cases were diagnosed and treated at the primary care level, 1 195 (9.2%) at the secondary level, 1 521 (11.7%) at the tertiary level, and 2 296 (17.7%) at more than one level, with 65% of the latter group moved from the tertiary level to the primary level. The proportion of cases tested for HIV was significantly higher in patients receiving care at the primary level compared to those receiving care at the secondary level (prevalence ratio (PR): 1.17; 95% confidence interval (CI): 1.07–1.28) and those attending more than one service level. Patients attending the tertiary health care level had a 122% higher PR for not doing DOT (“DOT not done”) compared to patients at the primary level (PR: 2.22; CI: 2.12–2.32). When the two levels were compared, the prevalence for an unfavorable outcome (lost to follow-up, death from TB, death with TB, transferred out, or not evaluated) was higher at the tertiary health care level.

**Conclusions.** Primary health services are successfully incorporating the management of new smear-positive TB cases. Primary health care obtained better operational indicators than secondary or tertiary levels.

## Key words

Tuberculosis; primary health care; health services; decentralization; operations research; Brazil.

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Brazil is one of the 22 high-burden countries for tuberculosis (TB), according to the World Health Organization (WHO), and notified 67 966 new TB cases (33.5 per 100 000 inhabitants) in 2014 (1, 2). The country is divided into

26 states and a Federal District. The state capitals and Federal District have 24% of the population and 40% of the TB cases. TB incidence rates in state capitals range from eight new cases per 100 000 inhabitants (in Palmas, Tocantins state) to

99 new cases per 100 000 inhabitants (in Cuiabá, Mato Grosso state) (2).

Globally, according to the Stop TB Strategy, health systems must be strengthened at the primary health care level (3), but implementation outcomes have varied, particularly in terms of the quality of the care. In the 1990s, after the consolidation of Brazil's Unified Health System (*Sistema Único de Saúde*, SUS), the Ministry of Health (MoH) created the Family Health Program (*Programa Saúde da Família*, PSF) to reorient its primary health care program and increase access to health services (4). The PSF was part of a government strategy to expand, qualify, and consolidate primary health care to improve the health of the population (5). Over the years, the PSF has grown in importance and scale and based on government strategy has replaced the traditional primary care network. Currently, 62% of the population is covered by the Family Health Strategy (*Estratégia Saúde da Família*, ESF) (6)—the main SUS strategy to improve primary health care.

Among newly diagnosed TB pulmonary cases, approximately 56% are smear-positive. Since 2004, Brazil's National Tuberculosis Program (NTP) has recommended that these cases be diagnosed and treated by primary health care services (7), and this task has been one of the priorities of the NTP in recent years. It has been challenging to reorganize the health services network and change the Brazilian population's tendency to seek TB diagnosis and treatment at referral centers (the secondary and tertiary levels) (2). In addition to their core tasks, primary health care service providers must also carry out daily health surveillance, and this includes TB activities such as active case finding, TB contact screening, and Directly Observed Treatment (DOT) (8). In 2001, 5 447 health service units reported at least one TB case. In 2013, this number increased to 13 810, but there is no information about the percentage of TB cases diagnosed and treated at the primary health care level, or the quality of services (9).

According to Maciel (2015), in Brazil, incidence and TB outcomes are the results of a causal complex model that includes individual, behavioral, social, and contextual causes, as well as those related to the programmatic/institutional vulnerability of the health system (10). Donabedian (1980) defined three types of

indicators to evaluate health care quality: structural (physical, human, material, and financial resources); process (activities carried out by health professionals, and patients, based on an accepted standard); and results (the final care product, considering health, satisfaction, and expectations) (11). Thus, the quality of TB care can influence the incidence or TB outcome and is evaluated using process indicators such as HIV testing, TB contact screening, sputum smear microscopy monitoring during treatment, DOT, and a result indicator such as treatment outcome.

As progress is made toward decentralization of TB health services, more TB patients are receiving care at the primary level. For example, studies show that in Vitória, in Espírito Santo state, and Ribeirão Preto, in São Paulo state, two cities with high ESF coverage, 38% and 66% of TB patients received their initial care from primary health services. However, all patients had to be referred to secondary- and tertiary-level care for the TB diagnosis (12, 13). The fact that primary health care services do not always provide TB diagnosis and treatment, along with their limited hours of service (compared to secondary and tertiary care), might explain why a large proportion of Brazilian patients still do not consider primary care their "entry point" to the health system (12, 13). Thus far, TB health service decentralization has not resulted in satisfactory access to TB diagnosis (14).

Knowledge about the quality of TB care at each health service level and the factors that may affect it can help the NTP define needs and priorities. The objectives of this study were to assess 1) the burden and socio-demographic and clinical characteristics of new smear-positive TB cases, and 2) the quality of TB care provided to patients who entered and remained in each health care service level (primary, secondary, and tertiary) and to those who moved from one level to another, using process and result indicators.

## MATERIALS AND METHODS

### Design

This research was a cross-sectional study of new smear-positive pulmonary TB cases diagnosed in 26 Brazilian state capitals and the Federal District in 2013.

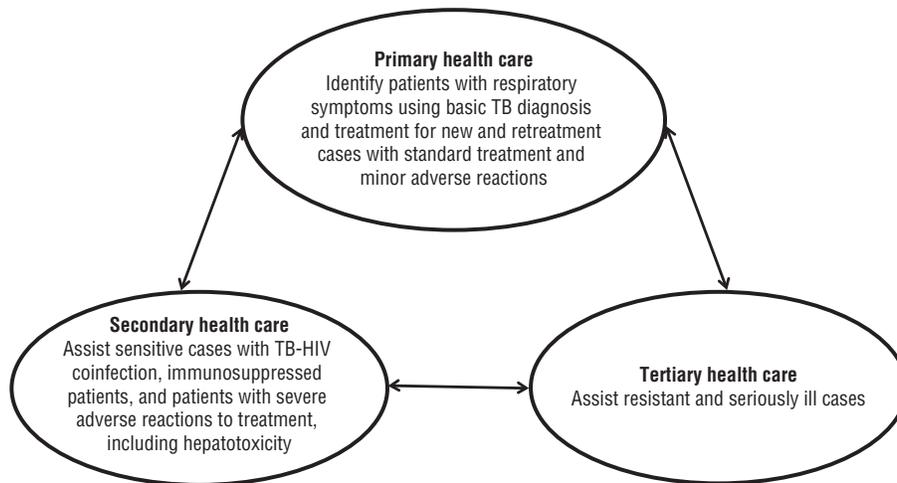
## Setting

Brazil is a Latin American country with a population of 201 062 789, the fifth-largest in the world (15). The government provides universal access to health and services, including TB diagnosis and treatment, which are provided free of charge through the SUS. TB case finding is mainly passive, but active case finding by all three levels of health care is recommended by the NTP, along with HIV screening, for all detected TB cases. DOT is offered at least three times per week and observed mainly by health professionals or family/community members supervised by a health professional. The NTP recommends that all pulmonary cases have sputum smear microscopy performed monthly during treatment. The NTP also recommends that contact screening of index cases be a priority service, performed by primary care services (although the other two service levels also perform this activity). The goal of the MoH is to achieve at least 80% screening coverage of identified TB case contacts. Primary health care is the MoH-recommended "entry point" into the health care system for TB patients (although diagnosis and treatment can be sought at any health unit at any level). Specific, different responsibilities have been established for care of persons suspected and diagnosed with TB at the three levels of health services provision. The secondary and tertiary levels are responsible for the more complex TB cases, such as retreatment and extrapulmonary or drug-resistant cases (Figure 1). During TB treatment, patients can switch from one level of health care to another (16).

TB notification is compulsory in Brazil. The health facility that diagnoses a case of TB is responsible for sending the notification form to the first electronic information systems level, where the data are entered into the Information System for Notifiable Diseases (*Sistema de Informação de Agravos de Notificação*, SINAN), the national electronic database system.

### Study population

The study included all 26 Brazilian state capitals and the Federal District. All new smear-positive pulmonary TB cases registered in 2013 were included in the study, excluding patients in prisons and multidrug-resistant cases.

**FIGURE 1. Diagnosis and treatment services for tuberculosis (TB) patients by level of health care services, Brazil, 2015**

Source: prepared by the authors based on the study results.

### Data variables, data collection, and sources of data

The socio-demographic and clinical characteristics evaluated were city of residence, sex, age, race, alcohol intake, HIV test result, and diabetes diagnosis. Race was a self-reported variable, unlike the others analyzed.

To analyze the quality of TB care, implementation of key interventions was assessed individually: screening for HIV, sputum smear microscopy during treatment, and DOT (each classified as “done” or “not done”), and screening of contacts (reported as  $\geq 80\%$  or  $< 80\%$  of identified contacts screened) and treatment outcome (treatment success (cure and completion of treatment) or unfavorable outcome (lost to follow-up, death from TB, death with TB, transferred out, or not evaluated)). The patients were classified according to the level of health care service that notified the TB case and the level that reported the treatment result. Patients who moved from one level of health care service to another were analyzed as a separate group.

The source of the data was SINAN; in May 2015, the database was exported to Stata® software version 12 (StataCorp, College Station, Texas, United States). Because the variable that classifies cases by level of treatment was not available in SINAN, for the purposes of this study, the TB control program in each capital

classified the treatment provided as one of the three levels of care according to MoH criteria (Figure 1).

### Analysis and statistics

The objective of the first stage of the research was to describe the TB disease burden (i.e., the notification rate) by level. The objective of the second stage of the research was to conduct a statistical analysis comparing the socio-demographic and clinical characteristics of patients by level of health care received (analyzing the respective proportions using the chi-square test) and then describe and compare the quality of TB care by level (estimating the prevalence ratio (PR) and 95% confidence interval (CI)). The level of significance was set at 5%.

### Ethics approval

The study protocol was approved by the Ethics Advisory Group of the Union Against Tuberculosis and Lung Disease (Paris) and the Brazilian Ethics Committee on Research (*Comissão Nacional de Ética em Pesquisa*, CONEP) (Brasília) based on protocols no. 70/14 and no. 1 031 822 respectively. The NTP approved the study. The researchers had permission to use information from the SINAN database without identified patient data for the purposes of the study and waived the

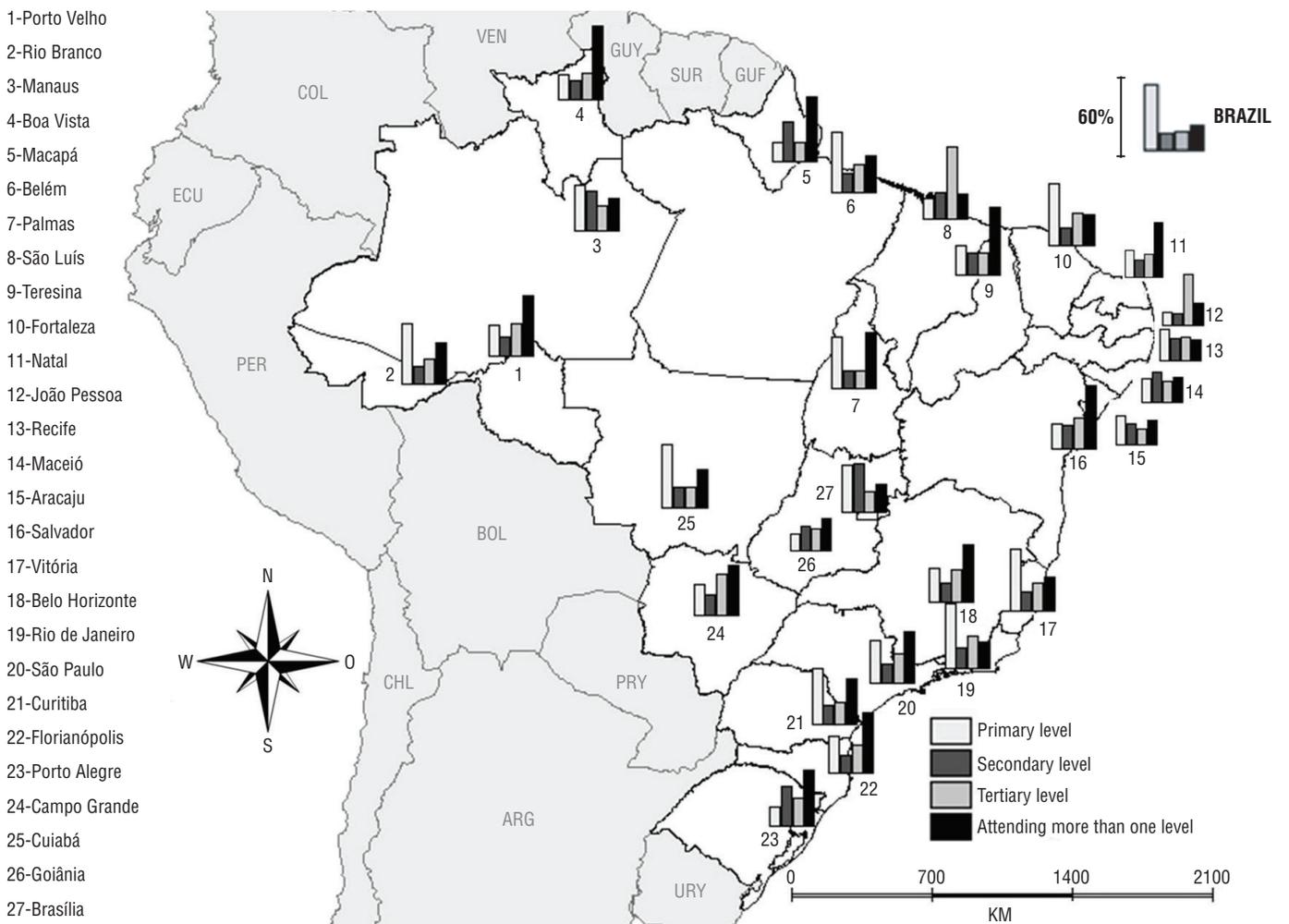
need for written informed consent from participants as the study involved only secondary data and the confidentiality of the patients’ identities was protected.

### RESULTS

In 2013, a total of 12 977 new smear-positive pulmonary TB cases were reported to SINAN from Brazilian state capitals and the Federal District. Among those patients, 7 964 (61.4%) were diagnosed and treated by primary health services, 1 196 (9.2%) by secondary health services, and 1 521 (11.7%) by tertiary health services. During the treatment period, 2 296 (17.7%) patients switched to a different health service level (Figure 2); 74% of those were diagnosed and first treated at the tertiary/secondary level and completed their treatment at the primary health care level. Only 11% were diagnosed and first treated at the primary level and completed their treatment at secondary/tertiary level.

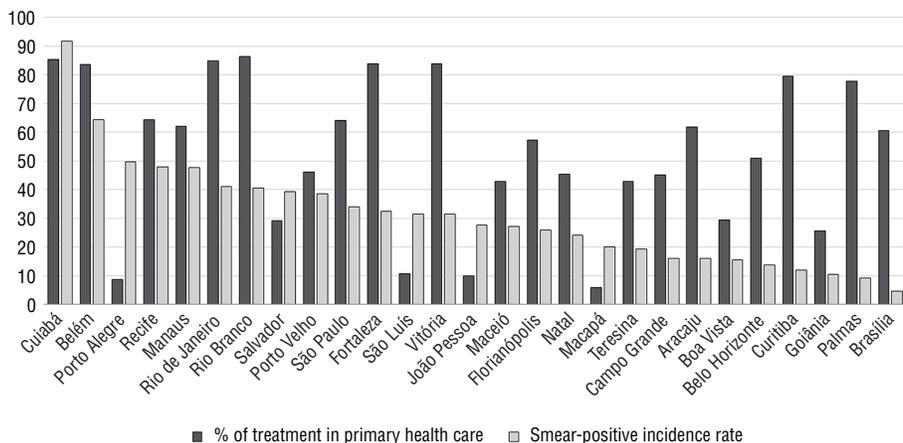
In Cuiabá, the capital of Mato Grosso state, 85.2% of cases were diagnosed and treated at the primary health care level only and the smear-positive incidence rate was 91.6 per 100 000 inhabitants—the highest in the country. In Goiânia, Goiás state, only 25.6% of cases used primary health care for diagnosis of smear-positive disease and the smear-positive incidence rate was 10.4 per 100 000 inhabitants (Figure 3).

**FIGURE 2. Distribution (%) of new smear-positive pulmonary tuberculosis cases by level of health care services attended, Brazilian state capitals and Federal District, 2013**



Source: prepared by the authors based on the study results.

**FIGURE 3. Incidence rate of new pulmonary tuberculosis patients with positive smear and proportion with case notification and report of treatment result submitted by primary health care services, Brazilian state capitals and Federal District, 2013**



Source: prepared by the authors based on the study results.

Basic socio-demographic and clinical characteristics of TB cases are shown in Table 1. Some of the patient characteristics differed significantly by level of health care. In brief, the majority of cases at all levels of care were male, with the highest proportion (1 047; 68.8%) attending the tertiary level. Most patients (50.4%) were 50 years old or older. The majority of patients' race/skin color was reported as "brown" at all levels of care. The proportion of patients with a high alcohol intake was highest in those who moved between service levels and those who attended the tertiary level (495 or 21.6% and 328 or 21.6% respectively). The proportion of HIV-positive patients was higher at the secondary level (216 or 18.1%) and tertiary level (336 or 22.1%) versus the primary level. The highest proportion of diabetes patients was

**TABLE 1. Socio-demographic and clinical characteristics of new smear-positive tuberculosis cases by level of health care services attended, Brazilian state capitals and Federal District, 2013**

Characteristic	Level of health care services attended										P
	Total		Primary		Secondary		Tertiary		More than one level		
	No.	%	No.	%	No.	%	No.	%	No.	%	
Total	12 977	100.0	7 964	61.4	1 195	9.2	1 521	11.7	2 296	17.7	
Sex											0.003
Male	8 402	64.7	5 103	64.1	748	62.5	1 047	68.8	1 504	65.5	
Female	4 573	35.2	2 860	35.9	447	37.4	474	31.2	792	34.5	
Not recorded	2	0.0	1	0.1	0	0.0	0	0.0	0	0.0	
Age group (years)											< 0.01
0–14	329	2.5	195	2.5	34	2.8	40	2.6	60	2.6	
15–49	6 752	52.0	4 123	51.8	762	63.7	789	51.9	1 078	47.0	
≥ 50	5 896	45.4	3 646	45.8	400	33.4	692	45.5	1 158	50.4	
Race/color											< 0.01
White	3 478	26.8	2 155	27.1	363	30.4	351	23.1	609	26.5	
Black	1 771	13.6	1 089	13.7	170	14.2	178	11.7	334	14.6	
Yellow	120	0.9	67	0.8	20	1.7	9	0.6	24	1.1	
Brown	6 566	50.6	3 999	50.2	602	50.3	830	54.6	1 135	49.4	
Indigenous	79	0.6	58	0.7	3	0.3	6	0.4	12	0.5	
Not recorded	963	7.4	596	7.5	38	3.2	147	9.7	182	7.9	
Level of education (years)											< 0.01
None	399	3.1	215	2.7	51	4.3	52	3.4	81	3.5	
1–4	2 123	16.4	1 303	16.4	212	17.7	219	14.4	389	16.9	
5–8	3 307	25.5	2 058	25.8	287	24.0	352	23.1	610	26.6	
9–11	3 208	24.7	2 065	25.9	319	26.7	261	17.2	563	24.5	
≥ 12	742	5.7	427	5.4	92	7.7	104	6.8	119	5.2	
Not applied	44	0.3	26	0.3	5	0.4	6	0.4	7	0.3	
Not recorded	3 154	24.3	1 870	23.5	230	19.2	527	34.7	527	23.0	
Alcohol intake											< 0.01
Yes	2 119	16.3	1 133	14.2	163	13.6	328	21.6	495	21.6	
No	9 705	74.8	6 011	75.5	954	79.8	1 069	70.3	1 671	72.8	
Not recorded	1 153	8.9	820	10.3	79	6.6	124	8.2	130	5.7	
HIV <sup>a</sup> result											< 0.01
Positive	1 052	8.1	257	3.2	216	18.1	336	22.1	243.0	10.6	
Negative	8 004	61.7	5 471	68.7	586	49.0	731	48.1	1 216.0	53.0	
Not recorded	3 921	30.2	2 236	28.1	394	33.0	454	29.8	837.0	36.5	
Diabetes											< 0.01
Yes	1 176	9.1	681	8.6	132	11.0	132	8.7	231	10.1	
No	10 537	81.2	6 382	80.1	982	82.1	1 255	82.5	1 918	83.5	
Not recorded	1 264	9.7	901	11.3	82	6.9	134	8.8	147	6.4	

**Source:** compiled by the authors based on the study results.

<sup>a</sup> HIV: human immunodeficiency virus.

found at the secondary level and in patients who moved between service levels (132 or 11.0% and 231 or 10.1% respectively) (Table 1).

Quality of TB care assessed in relation to level of health care is shown in Table 2. In bivariate analyses, all process and results indicators evaluated showed significantly better results at the primary health care level, except when the primary level was compared with the tertiary level for HIV screening, where both levels had a high percentage. The prevalence of the proportion of cases tested for HIV was significantly higher in patients at the primary health care level compared with the secondary level (PR: 1.17; CI: 1.07–1.28) and in patients attending more than one service level (PR: 1.30; CI: 1.22–1.38). The proportion of identified contacts screened

reported as ≥ 80% was lower in patients attending the secondary level of services (PR: 1.28; CI: 1.18–1.38) and the tertiary level (PR: 2.03; CI: 1.92–2.15) and in patients attending more than one service level (PR: 1.33; CI: 1.25–1.42) versus the primary level. Patients attending the tertiary health care level showed a 122% higher PR for “DOT not done” compared to patients at the primary health care level (PR: 2.22; CI: 2.12–2.32). When the two levels were compared, the PR for an unfavorable outcome was higher at the tertiary health care level (PR: 2.78; CI: 2.58–3.00). Sputum smear microscopy during treatment was similar for Month 2, Month 4, and Month 6 in patients attending tertiary health care and in those attending more than one service level. The prevalence of patients having sputum smear microscopy at the

secondary health level decreased over the six-month treatment period, with only 27.6% undergoing this monitoring activity in Month 6. All analyses about sputum smear microscopy screening showed better results for the primary care level compared with the other two levels (Table 2).

## DISCUSSION

The current study is one of the first in Brazil to document and evaluate the decentralization process related to TB control, mainly due to lack of data, as the TB surveillance system database does not capture this type of information. According to the study findings, primary health care service providers have begun to take responsibility for the diagnosis and treatment of new cases of pulmonary

**TABLE 2. Quality of tuberculosis (TB) care for new smear-positive TB cases by level of health care services attended, Brazilian state capitals and Federal District, 2013<sup>a</sup>**

Indicator	Total <sup>a</sup>	Level of health care services attended			
		Primary	Secondary	Tertiary	More than one level
Total	12 977 (100.0)	7 964 (61.4)	1 196 (9.2)	1 521 (11.7)	2 296 (17.7)
HIV screening					
Total	12 977 (100.0)	7 964 (100.0)	1 196 (100.0)	1 521 (100.0)	2 296 (100.0)
Not done	3 921 (30.2)	2 236 (28.1)	394 (32.9)	454 (29.9)	837 (36.5)
Done	9 056 (69.8)	5 728 (71.9)	802 (67.1)	1 067 (70.2)	1 459 (63.6)
PR <sup>b</sup> (CI <sup>c</sup> )		1	1.17 (1.07–1.28)	1.06 (0.98–1.16)	1.30 (1.22–1.38)
P			0.001	0.157	< 0.001
Identified contacts screened					
Total	8 663 (66.7)	6 198 (77.8)	735 (61.5)	453 (29.8)	1 277 (55.6)
< 80%	3 797 (29.2)	2 412 (30.3)	365 (30.5)	358 (23.5)	662 (28.8)
≥ 80%	4 866 (37.5)	3 786 (47.5)	370 (30.9)	95 (6.3)	615 (26.8)
PR (CI)		1	1.28 (1.18–1.38)	2.03 (1.92–2.15)	1.33 (1.25–1.42)
P			< 0.001	< 0.001	< 0.001
DOT <sup>d</sup>					
Total	9 625 (74.1)	5 880 (73.8)	1 076 (90.0)	1 113 (73.2)	1 556 (67.8)
Not done	4 677 (36.0)	2 114 (26.5)	709 (59.3)	888 (58.4)	966 (42.1)
Done	4 948 (38.1)	3 766 (47.3)	367 (30.7)	225 (14.8)	590 (25.7)
PR (CI)		1	1.83 (1.73–1.94)	2.22 (2.12–2.32)	1.73 (1.64–1.82)
P			< 0.001	< 0.001	< 0.001
Treatment outcome					
Total	11 753 (90.5)	7 494 (94.1)	1 141 (95.4)	1 158 (76.1)	1 960 (85.4)
Unfavorable <sup>e</sup>	2 627 (20.2)	1 341 (16.8)	272 (22.7)	577 (37.9)	437 (19.0)
Success <sup>f</sup>	9 126 (70.3)	6 153 (77.3)	869 (72.7)	581 (38.2)	1 523 (66.3)
PR (CI)		1	1.33 (1.19–1.49)	2.78 (2.58–3.00)	1.24 (1.13–1.37)
P			< 0.001	< 0.001	< 0.001
SM <sup>g</sup> control Month 2					
Total	12 977 (100.0)	7 964 (100.0)	1 196 (100.0)	1 521 (100.0)	2 296 (100.0)
Not done	7 566 (58.3)	4 219 (53.0)	681 (56.9)	1 255 (82.5)	1 411 (61.5)
Done	5 411 (41.7)	3 745 (47.0)	515 (43.1)	266 (17.5)	885 (38.5)
PR (CI)		1	1.07 (1.01–1.13)	1.56 (1.51–1.61)	1.16 (1.12–1.20)
P			0.008	< 0.001	< 0.001
SM control Month 4					
Total	12 977 (100.0)	7 964 (100.0)	1 196 (100.0)	1 521 (100.0)	2 296 (100.0)
Not done	8 701 (67.0)	4 993 (62.7)	800 (66.9)	1 337 (87.9)	1 571 (68.4)
Done	4 276 (33.0)	2 971 (37.3)	396 (33.1)	184 (12.1)	725 (31.6)
PR (CI)		1	1.07 (1.02–1.11)	1.40 (1.37–1.44)	1.09 (1.06–1.13)
P			0.003	< 0.001	< 0.001
SM control Month 6					
Total	12 977 (100.0)	7 964 (100.0)	1 196 (100.0)	1 521 (100.0)	2 296 (100.0)
Not done	8 932 (68.8)	5 085 (63.8)	866 (72.4)	1 366 (89.8)	1 615 (70.3)
Done	4 045 (31.2)	2 879 (36.2)	330 (27.6)	155 (10.2)	681 (29.7)
PR (CI)		1	1.13 (1.09–1.18)	1.41 (1.37–1.44)	1.10 (1.07–1.14)
P			< 0.001	< 0.001	< 0.001

**Source:** prepared by the authors based on the study results.

<sup>a</sup> Number (%) except where indicated otherwise.

<sup>b</sup> PR: prevalence ratio.

<sup>c</sup> CI: 95% confidence interval.

<sup>d</sup> DOT: Directly Observed Treatment.

<sup>e</sup> Lost to follow-up, death from TB, death with TB, transferred out, or not evaluated.

<sup>f</sup> Cure and completion of treatment.

<sup>g</sup> SM: sputum smear.

smear-positive TB, with more than 60% of patients now managed at this level of care. Furthermore, a significant proportion of patients who started their TB treatment at the tertiary level switched to the primary level to complete it. In general, the process and results indicators used to assess quality of TB care were better for patients who remained at the primary health care level throughout their treatment versus other levels. The low

percentage of cases transferred from the primary level to other levels to complete their treatment suggests a large majority of new smear-positive pulmonary cases can be treated at the primary level and are not complex enough to require treatment at the secondary or tertiary level.

The better results observed in this study for patients attended by primary health care versus other levels of health care were expected because secondary

and tertiary hospitals are designed to attend patients with complex health care issues. Although it is often believed that each level of health care services follows a pattern similar to that of the staff, some features of primary care services may help explain why it achieves better results. First, primary health services are closer to patients' homes and this allows treatment to be better monitored, DOT to be performed, sputum specimens to be

more easily submitted to health care facilities, and the logistics of contact tracing to be more easily implemented. Furthermore, health workers at the primary health care level are more familiar with the community and the social circumstances of patients, making it easier to support patients for the duration of TB treatment. Because of these advantageous features, secondary and tertiary levels often receive support from the primary level in carrying out joint activities for their patients.

The results of this study indicate good performance for HIV testing at the primary health care level. Although research done by the National Program for Improving Access and Quality of Primary Care (*Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica*, PMAQ) showed that the rapid test to detect HIV may not be available in many primary health care services (17), other tests, such as enzyme-linked immunosorbent assay (ELISA), are also offered by SUS and may be available for TB patients. Additional research to gain a better understanding of how this might be achieved would be worthwhile.

Many published studies from around the world have concluded that decentralized models of assistance are associated with better patient access and quality of care. For example, a higher cure rate and a lower rate of loss to follow-up were noted in primary health care facilities in Sudan, possibly reflecting better conditions for DOT and follow-up (18). A study performed in the Metropolitan Area of Buenos Aires, Argentina, concluded that decentralization of treatment to primary health care centers and social protection measures for patients should be considered priorities for disease control strategies in order to lessen the impact of structural barriers on adherence to treatment (19). In Brazil, one study conducted in three Brazilian northeast state capitals concluded that decentralization of primary health care can help improve access to health services (12). Another study in a metropolitan city of Brazil concluded that the ESF units provided better access to TB diagnosis compared to reference ambulatory units (20). However, better performance is not always observed. One study performed in a Brazilian capital city showed important gaps in accessibility to diagnosis of TB

at all levels of care that seemed to be related to operational and logistic difficulties related to the organization and provision of health care at different care levels (12).

While decentralization and the increased access to services it provides are, of course, patients' preference, the health system must ensure that all logistics and system components comprised by that process are properly managed, including human resources, uninterrupted drug supplies, functioning laboratory systems, and reliable and regular transport (21). Community wishes and beliefs are also important, and health services should work with and for localities and patients within them to achieve programmatic targets.

### Strengths and limitations

The nationwide coverage of this study, its adherence to STROBE (STrengthening the Reporting of OBservational Studies in Epidemiology) guidelines, and the large number of TB patients included were its strengths (22). Limitations included the general challenges involved in the use of routinely collected data and the quality of the secondary surveillance data. The fact that the classification of health care services by level was done by local health workers was also a limitation, but given how well the latter group knows the health system, they were most likely accurate in their decision-making. The information collected for the two proxy quality indicators analyzed with less than 80% of completeness (contacts screened and DOT coverage) may have been biased because the proportion of missing data varied across the three care levels evaluated. Moreover, in the analysis of the quality indicators, patients' individual characteristics, such as sex or age, were not controlled, which may have skewed the results, especially for the outcome indicator, given that patient type varied by level of care. Results for the outcome indicator might also have been skewed by the lack of controls for other patient characteristics such as diabetes, alcoholism, HIV, illicit drug use, and adverse reactions during treatment. The fact that the study results correspond to TB care in Brazilian capitals only (smaller municipalities were not evaluated) was another study limitation, although 50% of TB cases occur in Brazilian capitals.

### Recommendations

These study findings could be used by the NTP to strengthen the TB health care services network and serve as evidence of the importance and necessity of structuring primary health care to receive, diagnose, and treat TB patients. The findings could also help elucidate and guide policy on the issue of TB patients wanting to switch from one level of care to another while being treated, providing evidence that those who were referred to primary health care after being diagnosed at the tertiary or secondary level did not have the same quality of care or outcome indicators as those who remained in primary health care throughout the course of treatment. The reasons for this are not clear and require further study.

### Conclusions

This study shows that 1) primary health care in Brazil is already serving more than half of all patients with newly diagnosed TB; 2) about 20% of the patients are attended by secondary- or tertiary-level services; and 3) about 20% of the patients move between levels, mainly from tertiary to primary care. Based on a number of quality indicators, performance is better at the primary level than at the secondary or tertiary level. The decentralization of care of new smear-positive pulmonary TB cases is an ongoing process in Brazil, as shown in the data on the percentage of cases still diagnosed and treated at the secondary and tertiary levels and those diagnosed at those two levels but transferred to continue treatment at the primary level. The study results support the need for the Brazilian government to prioritize the continued decentralization of care, from diagnosis to the completion of treatment. Future studies with more complex analysis are necessary to provide further evidence of the need to continue the scale-up of primary health care for TB control in Brazil.

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## REFERENCES

- World Health Organization. Global tuberculosis report 2014. Geneva: WHO; 2014. Available from: [http://apps.who.int/iris/bitstream/10665/137094/1/9789241564809\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/137094/1/9789241564809_eng.pdf)
- Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Vigilância das Doenças Transmissíveis, Programa Nacional de Controle da Tuberculose (BR). Detectar, tratar e curar: desafios e estratégias brasileiras frente à tuberculose. Boletim Epidemiológico. 2015;46(9). Available from: <http://portal-saude.saude.gov.br/images/pdf/2015/marco/27/2015-007---BE-Tuberculose---para-substitui---o-no-site.pdf>
- World Health Organization. The Stop TB Strategy—building on and enhancing DOTS to meet the TB-related Millennium Development Goals. Geneva: WHO; 2006. Available from: <http://apps.who.int/iris/handle/10665/69241>
- Ministério da Saúde (BR). Saúde da Família: uma estratégia para a reorganização do modelo assistencial. Brasília: MS; 1997. Available from: [http://bvsms.saude.gov.br/bvs/publicacoes/cd09\\_16.pdf](http://bvsms.saude.gov.br/bvs/publicacoes/cd09_16.pdf)
- Figueiredo EN. A Estratégia Saúde da Família na Atenção Básica do SUS. São Paulo: Universidade Aberta do SUS / Universidade Federal de São Paulo; 2015. Available from: [http://www.unasus.unifesp.br/biblioteca\\_virtual/esf/2/unidades\\_conteudos/unidade05/unidade05.pdf](http://www.unasus.unifesp.br/biblioteca_virtual/esf/2/unidades_conteudos/unidade05/unidade05.pdf)
- Ministério da Saúde (BR). Departamento de Atenção Básica (DAB) [Internet]. Brasília: MS; c2012. Available from: <http://dab.saude.gov.br/portaldab/dab.php> Accessed on 17 July 2015.
- Figueiredo TMRM, Villa TCS, Scatena LM, Gonzáles RIC, Ruffino-Netto A, Nogueira JA, et al. Desempenho da atenção básica no controle da tuberculose. Rev Saude Publica. 2009;43(5):825–31.
- Ministério da Saúde (BR). Cadernos de atenção básica—vigilância em saúde. Série A. Normas e manuais técnicos. Cadernos de Atenção Básica - n.º 21. Brasília: MS; 2007. Available from: [http://bvsms.saude.gov.br/bvs/publicacoes/cadernos\\_atencao\\_basica\\_vigilancia\\_saude.pdf](http://bvsms.saude.gov.br/bvs/publicacoes/cadernos_atencao_basica_vigilancia_saude.pdf)
- Ministério da Saúde (BR). Programa Nacional de Controle da Tuberculose. Brasília: MS; 2015. Available from: <https://drive.google.com/file/d/0B0CE-2wqdEaR-cEdQTVo3V1FKOGM/view>
- Maciel EL, Reis-Santos B. Determinants of tuberculosis in Brazil: from conceptual framework to practical application. Rev Panam Salud Publica. 2015;38(1):28–34.
- Donabedian A. Explorations in quality assessment and monitoring. Vol. 1. The definition of quality and approaches to its assessment. Ann Arbor, MI: Health Administration Press; 1980.
- Loureiro RB, Villa TCS, Ruffino-Netto A, Peres RL, Braga JU, Zandonade E, et al. Acesso ao diagnóstico da tuberculose em serviços de saúde do município de Vitória ES Brasil. Cienc Saude Coletiva. 2014;19(4):1233–44.
- de Oliveira MF, Arcêncio RA, Ruffino-Netto A, Scatena LM, Palha PF, Villa TCS. A porta de entrada para o diagnóstico da tuberculose no Sistema de Saúde de Ribeirão Preto/SP. Rev Esc Enferm. USP. 2011;45(4):898–904.
- Scatena LM, Villa TCS, Ruffino-Netto A, Kritski AL, Figueiredo TMRM, Vendramini SHF. Dificuldades de acesso a serviços de saúde para diagnóstico de tuberculose em municípios do Brasil. Rev Saude Publica. 2009;43(3):389–97.
- Instituto Brasileiro de Geografia e Estatística (BR). Instituto Brasileiro de Geografia e Estatística [homepage]. Brasília: IBGE; c2015. Available from: <http://www.ibge.gov.br/apps/populacao/projecao/> Accessed on 17 July 2015.
- Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Vigilância Epidemiológica, Programa Nacional de Controle da Tuberculose (BR). Manual de recomendações para o controle da tuberculose no Brasil. 1st ed. Série A: manuais e normas técnicas. Brasília: MS; 2011. 284 pp.
- Ministério da Saúde (BR). Programa Nacional de Melhoria da Qualidade do Acesso e da Qualidade na Atenção Básica – PMAQ. V Fórum Nacional de Gestão da Atenção Básica. Brasília: MS; 2015. Available from: [https://cursos.atencao\\_basica.org.br/sites/default/files/dirceu\\_klitzke\\_-\\_pmaq\\_0.pdf](https://cursos.atencao_basica.org.br/sites/default/files/dirceu_klitzke_-_pmaq_0.pdf)
- El-Sony AI, Mustafa SA, Khamis AH, Enarson DA, Baraka OZ, Bjune G. The effect of decentralisation on tuberculosis services in three states of Sudan. Int J Tuberc Lung Dis. 2003;7(5):445–50.
- Herrero MB, Ramos S, Arrossi S. Determinants of non adherence to tuberculosis treatment in Argentina: barriers related to access to treatment. Rev Bras Epidemiol. 2015;18(2):287–98.
- Motta MC, Villa TC, Golub J, Kritski AL, Ruffino-Netto A, Silva DF, et al. Access to tuberculosis diagnosis in Itaboraí City, Rio de Janeiro, Brazil: the patient's point of view. Int J Tuberc Lung Dis. 2009;13(9):1137–41.
- Edgington ME. Tuberculosis: our problem [editorial]. HST Update. 1997;23:1. Available from: <http://www.healthlink.org.za/uploads/files/upd23.pdf>
- von Elm E, Altman DG, Eggers M, Pocock SJ, Gotsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Bull World Health Organ. 2007;85(11):867–72.

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**RESUMEN****Calidad de la asistencia de la tuberculosis en los diferentes niveles de atención de salud del Brasil en el 2013**

**Objetivo.** Evaluar 1) la carga de morbilidad por tuberculosis y las características sociodemográficas y clínicas de los pacientes y 2) la calidad de la atención de la tuberculosis que se presta a los pacientes que acuden y permanecen en cada nivel de los servicios de salud (primario, secundario o terciario) y a los pacientes que se transfirieron a otro nivel, mediante el análisis de los indicadores de funcionamiento de los procesos y los indicadores de resultados.

**Métodos.** En el presente estudio transversal de investigación operativa se analizaron los casos nuevos de tuberculosis pulmonar con baciloscopia positiva que se diagnosticaron en las capitales estatales del Brasil en el 2013, a partir de los registros del programa contra la tuberculosis y los datos del sistema de vigilancia de la enfermedad. Se evaluó la calidad de la atención en función de los indicadores de funcionamiento y los indicadores de resultados como la detección sistemática de la infección por el virus de la inmunodeficiencia humana (VIH), el tamizaje de los contactos de casos de tuberculosis, el tratamiento estrictamente supervisado (conocido como DOT, por su sigla en inglés), la supervisión de la baciloscopia del esputo y los desenlaces terapéuticos.

**Resultados.** Se notificaron 12 977 casos nuevos de tuberculosis con baciloscopia positiva. De los casos notificados, 7 964 (61,4%) se diagnosticaron y recibieron tratamiento en el nivel de atención primaria, 1 195 (9,2%) en el nivel secundario, 1 521 (11,7%) en el nivel terciario y 2 296 pacientes (17,7%) recibieron asistencia en servicios de varios niveles de atención; de este último grupo, el 65% pasó del nivel terciario al nivel primario de atención. La proporción de casos en los cuales se practicó la detección de la infección por el VIH fue significativamente mayor en los pacientes que acudieron al nivel primario de atención, al compararlos con los que recibieron atención en el nivel secundario (razón de prevalencia, [RP]: 1,17; intervalo de confianza [IC] de 95%: de 1,07 a 1,28) y los pacientes tratados en servicios de varios niveles de atención. En los pacientes que acudieron al nivel terciario de atención de salud, la razón de prevalencia de no seguir el DOT fue 122% más alta que en los pacientes atendidos en el nivel primario (RP: 2,22; IC de 95%: de 2,12 a 2,32). Cuando se compararon ambos niveles, la prevalencia de un resultado desfavorable (pérdida durante el seguimiento, defunción por tuberculosis, defunción con tuberculosis, transferido a otro centro o no evaluado) fue más alta en el nivel terciario de atención sanitaria.

**Conclusiones.** Los servicios de atención primaria de salud han incorporado de manera eficaz el tratamiento de los casos nuevos de tuberculosis con baciloscopia positiva. Los indicadores operativos de la atención primaria de salud fueron mejores que los indicadores de la atención de nivel secundario o terciario.

**Palabras clave**

Tuberculosis; atención primaria de salud; servicios de salud; descentralización; investigación operativa; Brasil.