

# Actions for tuberculosis control in Brazil: evaluation of primary care

*Ações para o controle da tuberculose no Brasil: avaliação da atenção básica*

Alexandre Baumgarten<sup>I</sup> , Rafaela Soares Rech<sup>I</sup> , Patrícia Távora Bulgarelli<sup>II</sup> , Kellyn Rocca Souza<sup>III</sup> , Camila Mello dos Santos<sup>II</sup> , Karla Frichembruder<sup>IV</sup> , Juliana Balbinot Hilgert<sup>I,IV</sup> , Alexandre Fávero Bulgarelli<sup>II</sup> 

**ABSTRACT:** *Objective:* To describe and evaluate the factors associated with actions for the control of tuberculosis (TB) in primary care (PC) in the five Brazilian macroregions. *Methods:* This cross-sectional study was carried out with data from the second cycle of the National Program for Improving Access to and Quality of Primary Care. The outcome of the study was constructed based on a set of items that were considered essential for the treatment and control of tuberculosis in Primary Care Units (PCUs). Data were analyzed using the  $\chi^2$  test and Poisson regression with robust variance. *Results:* The national prevalence of the set of items to control tuberculosis was 17.22%. The Northeast (11.18%) and North (12.15%) had the worst performance. The main results indicate association with this outcome for PCUs performing educational actions for TB (PR = 1.53; 95%CI 1.45 – 1.62), those performing HIV serology (PR = 1.68; 95%CI 1.11 – 2.54), those that have a reception room (PR = 1.61; 95%CI 1.46 – 1.79) and those performing continuing education activities (PR = 1.73; 95%CI 1.54 – 1.95). *Conclusion:* The results show a weakness in the structures and in the work process of PC in relation to the control of tuberculosis in all Brazilian regions.

**Keywords:** Tuberculosis. Primary health care. Health services. Health services research.

<sup>I</sup>Graduate Program in Epidemiology, Universidade Federal do Rio Grande do Sul – Porto Alegre (RS), Brazil.

<sup>II</sup>Graduate Program in Collective Health, Universidade Federal do Rio Grande do Sul – Porto Alegre (RS), Brazil.

<sup>III</sup>School of Dentistry, Universidade Federal do Rio Grande do Sul – Porto Alegre (RS), Brazil.

<sup>IV</sup>Graduate Program in Dentistry, Universidade Federal do Rio Grande do Sul – Porto Alegre (RS), Brazil.

**Corresponding author:** Alexandre Fávero Bulgarelli. Faculdade de Odontologia da Universidade Federal do Rio Grande do Sul. Rua Ramiro Barcelos, 2492, Rio Branco, CEP: 90035-003, Porto Alegre, RS, Brazil. E-mail: alexandre.bulgarelli@ufrgs.br

**Conflict of interests:** nothing to declare – **Financial support:** National Program for Improving Access to and Quality of Primary Care (PMAQ-AB), Brazilian Ministry of Health.

**RESUMO:** *Objetivo:* Descrever e avaliar os fatores associados ao conjunto de ações para o controle da tuberculose (TB) na atenção básica (AB) nas cinco macrorregiões brasileiras. *Métodos:* Trata-se de um estudo transversal de base em serviço com dados obtidos a partir do segundo ciclo do Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica (PMAQ-AB). O desfecho foi construído a partir de um conjunto de itens que caracterizam a realização de ações para o cuidado no controle e tratamento da TB nas unidades básicas de saúde (UBSs). Os dados foram analisados por meio do teste do  $\chi^2$  e da regressão de Poisson com variância robusta. *Resultados:* A prevalência nacional do conjunto de ações para controle da TB foi de 17,22%, sendo que as macrorregiões Nordeste (11,18%) e Norte (12,15%) tiveram o pior desempenho. Os resultados principais apontam que houve associação da presença do conjunto de ações para o controle da TB com as UBSs que realizam ações educativas para TB [razão de prevalência — RP = 1,53 (intervalo de confiança de 95% — IC95% 1,45 – 1,62)], sorologia para HIV [RP = 1,68 (IC95% 1,11 – 2,54)], possuem sala de acolhimento [RP = 1,61 (IC95% 1,46 – 1,79)] e atividades de educação permanente [RP = 1,73 (IC95% 1,54 – 1,95)]. *Conclusão:* Os resultados demonstram fragilidade nas estruturas e no processo de trabalho da AB em relação ao controle da TB em todas as regiões brasileiras.

*Palavras-chave:* Tuberculose. Atenção básica. Serviços de saúde. Avaliação de serviços de saúde.

## INTRODUCTION

Tuberculosis (TB) is an infectious disease and one of the main public health problems in the world, causing morbidity and mortality, especially in developing countries<sup>1,2</sup>. Its incidence is associated with social inequalities, aging, and inequity in access to and monitoring by health services<sup>3-5</sup>. Because it is a disease of prolonged course and treatment, it is quite sensitive to the organization of care in the health care network.

It is estimated that 50 million people worldwide are infected without developing the disease, and that there is an annual increase of more than 1 million individuals. By 2020, the forecast is 1 billion people infected worldwide, of whom 200 million will get sick and 35 million will die<sup>6</sup>. Currently, Brazil is ranked 20<sup>th</sup> among the 30 countries responsible for 84% of the total TB cases worldwide<sup>7</sup>. The capitals account for 23,116 (36.00%) of the new cases in the country, with the North Region having the highest incidence rate (37.4/100,000 inhabitants)<sup>7</sup>. TB is the ninth cause of hospitalization for infectious diseases and, consequently, actions to control the disease rank seventh in expenditures with hospitalization in the Unified Health System (SUS)<sup>3</sup>. Epidemiological data point to the need for research, investments, and reorientation of clinical management to achieve effective results in TB control<sup>8</sup>.

In this context, national studies evaluating the structure of primary care (PC) services and the care process for follow-up and monitoring of the indicators associated with disease control are essential. The monitoring of a set of items for TB control may guide actions to improve the quality of health care for users and the organization of SUS care networks.

Through an evaluation survey at the national level, the National Program for Improving Access to and Quality of Primary Care (PMAQ-AB) is an important tool in allowing a systematic analysis of the Brazilian PC reality<sup>9</sup>. The program brings up important issues that surround the structure, process, and results of health care in PC. Thus, the present study brings up important issues raised by the PMAQ-AB for the control of TB.

Thus, the objective of this study was to describe and evaluate the factors associated to the actions to control TB in PC in the five Brazilian macroregions.

## METHODS

This is a baseline cross-sectional study in service, with data from the second cycle of PMAQ-AB. Data collection was performed in 17,202 primary care units (PCUs) between March and December 2014 in all Brazilian states. All PC teams were able to join PMAQ-AB voluntarily.

This is a national study carried out in a multicentric fashion and integrated by several teaching and research institutions. The interviewers who performed the data collection were duly trained in specific workshops and followed the instructional manual for field work<sup>10</sup>. The variables included in this study were those that make up Module II of the External Evaluation Instrument. This tool contains questions that assess the TB care offered by PC teams<sup>10,11</sup>. Interviews were carried out with the PC team's reference professional, as well as at-site verification, in the PCUs, of the documents proving the information presented.

The outcome was based on a set of items that characterize the implementation of actions for the care, control, and treatment of TB in Brazil. The items related to the PCU that made up the outcome were:

1. having protocols for sputum smear test;
2. having protocols for chest radiography test;
3. collecting material for laboratory tests;
4. follow-up of directly observed treatment (DOT);
5. having a protocol with therapeutic guidelines for TB;
6. conducting an active search for DOT absentees.

The positive outcome requires the presence of all six items. The construction of the outcome considered the availability of the data collected in the PMAQ-AB and the items present in the global protocols, national technical manuals, and scientific evidence<sup>12-14</sup>. This best set of measures was the outcome under study.

The explanatory variables were: having basic pharmacy drugs; allowing serology testing for HIV; conducting educational actions for TB; owning a reception room; promoting ongoing education for team members; carrying out health planning and actions; performing

monitoring and analysis of health indicators; holding team meetings; having therapeutic projects; and signaling disease groups.

Data were analyzed in SPSS software v.21 (Chicago: SPSS Inc). Absolute and relative frequency analyzes were performed, as well as the  $\chi^2$  test. Adjusted prevalence ratios were estimated using Poisson regression with robust variance. All variables associated with the outcome in the initial bivariate analysis, with p value < 0.10, were included in the multivariate model. The value for rejection of the null hypothesis was  $p \leq 0.05$ .

This study was submitted to the analysis of the Research Ethics Committee of Universidade Federal do Rio Grande do Sul (Protocol No. 21904) and approved for being ethically and methodologically appropriate, in accordance with Resolution 196/96 and supplementary resolutions of the Brazilian National Health Council (CNS), in force in the period of its elaboration.

## RESULTS

The national prevalence of the set of actions to control TB was 17.22% (Table 1). The number of teams follows the proportion of the most populous macroregions in Brazil, with units evaluated distributed as follows: North — 1,045 (6.07%); Northeast — 5,559 (32.31%); Midwest — 1,109 (6.44%); South — 2,919 (16.96%); and Southeast — 6,570 (38.19%). The worst performing macroregions were Northeast (11.18%) and North (12.15%), and the best performing macroregion was Southeast (23.60%).

The items that make up the outcome are presented in Table 2. Most PC teams had protocols for sputum smear and chest tests. However, there is an important lack of material collection for laboratory tests in all regions. The collection of materials for laboratory tests is not performed in 62.07% of the PCUs in the Northeast Region, a large difference if compared to the 32.73% of the teams that do not carry out this practice in the Southeast Region. The Midwest macroregion has the largest number of teams with

Table 1. Presence of the set of items that characterize the accomplishment of actions for the control of tuberculosis, stratified by macroregion (n = 17,202). Brazil, 2014.

	Partial presence of items/partial accomplishment of actions	Total presence of items/total accomplishment of actions	Total
North	918 (87.84%)	127 (12.15%)	1,045
Northeast	4,937 (88.81%)	622 (11.18%)	5,559*
Midwest	950 (85.66%)	159 (14.33%)	1,109
South	2,415 (82.73%)	504 (17.26%)	2,919*
Southeast	5,019 (76.39%)	1,551 (23.60%)	6,570*
Brazil	14,239 (82.77%)	2,963 (17.22%)	17,202*

\* $\chi^2 = 0.001$ .

no protocol for therapeutic guidelines for TB (40.31%). On the other hand, the South Region presented the worst results (47.04%) for teams that do not follow up and search for DOT absentees.

Figure 1 presents the final multivariate model, which reports characteristics of the PCUs with positive prevalence of the outcome. Positive association was found in PCUs that: have basic pharmacy drugs [prevalence ratio — PR = 1.09; 95% confidence interval — 95%CI (1.03 – 1.16)]; perform HIV serological testing [PR = 1.68; 95%CI (1.11 – 2.54)]; promote educational actions for TB [PR = 1.53; 95%CI (1.45 – 1.62)]; have a reception room [PR = 1.61; 95%CI (1.46 – 1.79)]; carry out permanent education activities [PR = 1.73; 95%CI (1.54 – 1.95)]; perform health planning actions [(PR = 1.32; 95%CI (1.17 – 1.50)]; monitor health indicators [(PR = 1.19; 95%CI (1.08 – 1.31)]; and have therapeutic projects for TB treatment [(PR = 1.57; 95%CI (1.48 – 1.66)]. The model was tested by the deviance test and adjusted ( $p = 0.663$ ).

Table 2. Actions for the control of tuberculosis in primary care. Brazil, 2014.

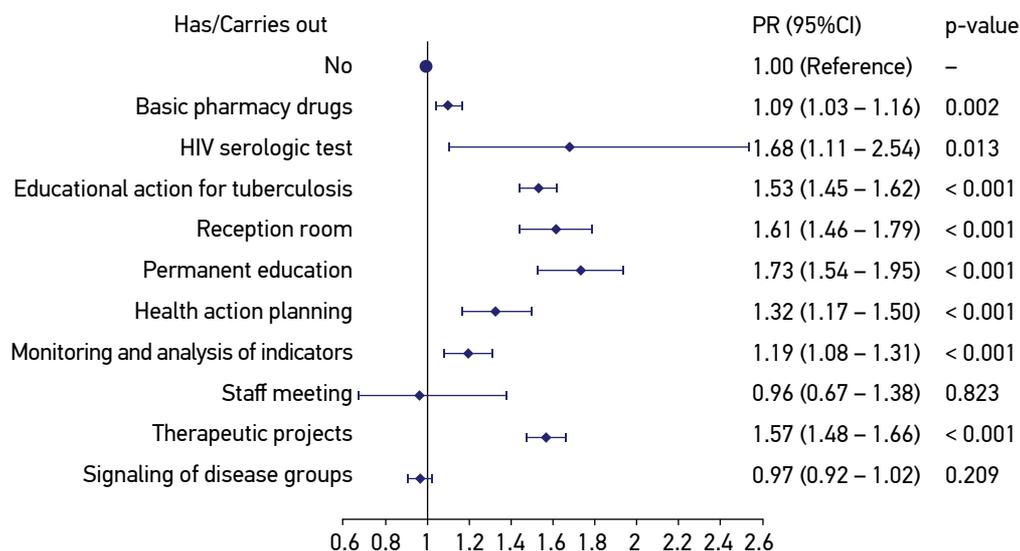
Actions carried out by the primary care team		North n (%)	Northeast n (%)	Midwest n (%)	South n (%)	Southeast n (%)	p-value
Protocols for sputum smear test	Yes	1,014 (97.03)	5,426 (97.60)	1,084 (97.74)	2,835 (97.12)	6,439 (98.00)	0.061
	No	31 (2.97)	133 (2.40)	25 (2.26)	84 (2.88)	131 (2.00)	
Protocols for chest radiography test	Yes	980 (93.77)	5,327 (95.82)	1,048 (94.49)	2,796 (95.78)	6,308 (96.01)	0.005
	No	65 (6.23)	232 (4.18)	61 (5.51)	123 (4.22)	262 (3.99)	
Collecting material for laboratory tests	Yes	547 (52.44)	2,103 (37.93)	659 (59.69)	1,338 (45.86)	4,416 (67.27)	< 0.001
	No	498 (47.56)	3,456 (62.07)	450 (40.31)	1,581 (54.14)	2,154 (32.73)	
Follow-up of directly observed treatment	Yes	750 (71.77)	3,379 (60.78)	745 (67.17)	1,655 (56.69)	3,948 (60.09)	< 0.001
	No	295 (28.23)	2,180 (39.22)	364 (32.83)	1,264 (43.31)	2,622 (39.91)	
Protocol with therapeutic guidelines for tuberculosis	Yes	730 (69.85)	3,701 (66.57)	662 (59.69)	1,916 (65.63)	5,128 (78.05)	< 0.001
	No	315 (30.15)	1,858 (33.43)	447 (40.31)	1,003 (34.37)	1,442 (21.95)	
Conducting an active search of directly observed treatment absentees	Yes	703 (67.27)	3,086 (55.51)	711 (64.11)	1,546 (52.96)	3,708 (56.43)	< 0.001
	No	342 (32.73)	2,473 (44.49)	398 (35.89)	1,373 (47.04)	2,862 (43.57)	

## DISCUSSION

This study points to important results for the control of TB in PC, indicating that more than 80% of Brazilian PCUs evaluated do not have all of the items that make up the set of actions for the disease's care and control. It is known that in Brazil there are still barriers for the structuring of PCUs that hinder TB control<sup>9</sup>. The analysis of the performance of PC in TB control is complex, as it involves several dimensions of access. Since PC is the preferred entry point of SUS, it is expected to provide greater access to consultations and diagnosis for TB.

Studies indicate that PCs performance for TB control is below expectations. Some of the aspects associated to the low performance are: high turnover and lack of compliance with the schedule by PC professionals; delay in care; use of other forms of admittance; and increased diagnostic capacity at specialized points in the network<sup>15-17</sup>. The poor results of the items listed to characterize TB control actions in the present study confirm this scenario. In addition, there is a high frequency of access to care protocols, which does not match the frequency of diagnostic or follow-up actions of the user of treatment services.

The present study demonstrated the fragility with which the actions to control TB occur in Brazil. The lack of items in the infrastructure of PCUs, as well as procedural care measures adopted by the PC teams, explains the poor performance against the outcome.



PR: prevalence ratio; 95%CI: 95% confidence interval.

Figure 1. Presence of total items in relation to the outcome in the control of tuberculosis (n = 17,202). Poisson regression with robust variance. Prevalence ratio adjusted with 95% confidence intervals. Brazil, 2014.

This result helps to understand why the country keeps figuring among those responsible for the high prevalence of TB.

Among the factors in which no association was found with the outcome were team meetings and the signaling of diseases (Figure 1), which is possibly explained by the high turnover of professionals in PC<sup>13</sup>. Moreover, the mere presence of such factors does not guarantee an effective control of TB. In order for team meetings to be associated with TB control, it is believed that they need to act as effective spaces for discussion and planning. Similarly, signaling diseases is an important step, but if there are no staff meetings with effective planning to address the need for TB care, the activity will serve no purpose. To further elucidate this result, further studies are suggested.

The positive association with the organizational aspects of the service indicates that efforts and investments in infrastructure and work process of PCUs can help to reverse the framework pointed out in this study. In a way, the results presented point out important characteristics of PCUs in the Brazilian macroregions that allow the service and the users to take actions to control TB. In this context, this is the first study carried out at the national level that seeks to understand structural and procedural aspects for TB control in PC.

Of the explanatory variables associated with the outcome, the importance of health education actions for TB and the performance of HIV serological tests are highlighted. Due to the high incidence rate of HIV/TB coinfection in Brazil, serological testing for HIV is a necessary item for the control of morbidity and mortality due to TB, especially in regions of greater vulnerability<sup>10,18</sup>. In addition to these actions, having a reception room and promoting permanent education activities for professionals constitute other differentials, presented in the literature as essential factors for the control of the disease<sup>13,19-21</sup>. Specific programmatic actions are effective for TB control<sup>22</sup> and may arise as a result of continuing education.

All macroregions lacked items for TB control actions. This fact points to the need for efforts in infrastructure and in the care process for TB control throughout Brazil. Factors such as situations of social vulnerability, low *per capita* income, difficulties in access and problems in the infrastructure of primary care services may reflect such results<sup>23,24</sup>. It is important to emphasize that, based on these results, investments should prioritize actions to improve PC and the living conditions of those who are most vulnerable to TB.

The present study corroborates the need for decentralization and horizontalization of TB surveillance, prevention and control actions within the scope of structures offered in PCUs, as well as within the Family Health Strategy (ESF) and the Community Health Agents Program (PACS)<sup>18,25</sup>. However, this process does not take place homogeneously in all of the country's regions due to problems with structural resources and the lack of articulation between services.

Even with the generally low prevalence of the presence of all items of the outcome in Brazil, the study points out that certain issues involving the structure of PC were fundamental for TB control. The presence of medications, tests, therapeutic protocols and adequate physical spaces for reception is essential to implement the set of actions that will allow

the effective control of the disease. Offering medication, conducting HIV tests and following specific protocols for the treatment of TB are actions that happen more effectively in PC<sup>14,26</sup>. The presence of a well-ventilated nursing consultation room and the accomplishment of reception by the team are elements of the PCU structure and of the care process that improve the quality of TB control<sup>27</sup>.

In addressing issues related to the care process, the study pointed out that variables such as “educational actions”, “continuing education”, “action planning”, and “indicator monitoring and analysis” are important for TB control to be effective. In this context, the permanent education of professionals is fundamental, as it enables them to control TB in their work space.

The World Health Organization (WHO) states that the problem in TB control is in the way that health services are organized to detect and treat cases<sup>28</sup>. Thus, the implementation of a permanent education program in health services implies the initiation of new forms of coordinating care, redefining roles, responsibilities and action strategies. Thus, good care, registration, notification and follow-up of patients with the disease, as well as the joint construction of therapeutic projects and intervention strategies, are reflections of the permanent education that strengthen the work in healthcare networks<sup>29,30</sup>. Still on the matter of the care process, the study highlights the importance of promoting educational actions for TB in PC, corroborating the literature findings<sup>20-22</sup>.

Among the limitations of the study, it is pointed out that only six items for TB control were evaluated. In the proposed construction of the outcome studied, it was not possible to include all the necessary items to fill the gaps of effective control of TB in PC in Brazil. However, it is believed that this set of items studied is closer to a good understanding of issues such as process and structure for said control. Another limitation is the cross-sectional design, which did not allow affirmation of causality. In addition, it is worth considering that, because it is a multicentered study, several teams performed the data collection. However, training of all evaluators was carried out in a standardized way, and there was at-site confirmation of the structure and process items. It should be emphasized that the information comes from the health teams that joined the PMAQ-AB and, therefore, there is no probabilistic sampling for the teams.

## CONCLUSION

Although there are macroregional differences, the absence of the set of items for TB control points to a precarious situation throughout Brazil. The results demonstrate the fragility of PC structures and work process in relation to TB control in all Brazilian regions. Ongoing efforts and investments should be made to improve the health of the population. In this sense, the monitoring and evaluation of the PCUs can contribute to guiding these efforts, with the ultimate goal of reducing TB morbidity and mortality in the country.

## REFERENCES

1. Lawn SD, Zumla AI. Tuberculosis. *Lancet* 2011; 378(9785): 57-72.
2. World Health Organization. Global tuberculosis report. Geneva: WHO; 2014. (Global Report Series, Surveillance, Planning, Financing).
3. Souza MVN, Vasconcelos TRA. Fármacos no combate à tuberculose: passado, presente e futuro. *Quím Nova* 2005; 28(4): 678-82.
4. Ruffino-Netto A. Tuberculose: a calamidade negligenciada. *Rev Soc Bras Med Trop* 2002; 35(1): 51-8.
5. Brunello MEF, Chiaravalloti Neto F, Arcêncio RA, Andrade RLP, Magnabosco GT, Villa TCS. Áreas de vulnerabilidade para coinfeção HIV-AIDS/TB em Ribeirão Preto, SP. *Rev Saúde Pública* 2011; 45(3): 556-63.
6. World Health Organization. Global tuberculosis report. Geneva: WHO; 2015 (Nonserial Publication).
7. World Health Organization. Global tuberculosis report. Geneva: WHO; 2016 (Nonserial Publication).
8. Rocha GSS, Lima MG, Moreira JL, Ribeiro KC, Ceccato MGB, Carvalho WS, et al. Conhecimento dos agentes comunitários de saúde sobre a tuberculose, suas medidas de controle e tratamento diretamente observado. *Cad Saúde Pública* 2015; 31(7): 1483-96.
9. Clementino FS, Marcolino EC, Gomes LB, Guerreiro JV, Miranda FAN. Ações de controle da tuberculose: análise a partir do programa de melhoria do acesso e da qualidade da atenção básica. *Texto Contexto Enferm* 2016; 25(4): e4660015.
10. Brasil. Ministério da Saúde. Instrumento de avaliação externa do PMAQ. Brasília: Ministério da Saúde; 2013.
11. Pinto HA, Sousa ANA, Ferla AA. O Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica: várias faces de uma política inovadora. *Saúde em Debate* 2014; 38: 358-72.
12. Brasil. Ministério da Saúde. Secretaria de Políticas à Saúde. Departamento de Atenção Básica. Caderno de Atenção Básica: Manual Técnico para o Controle da Tuberculose. Brasília: Ministério da Saúde; 2002.
13. Lopes LMG, Vieira NF, Lana FCF. Análise dos atributos da atenção primária à saúde na atenção à tuberculose no Brasil: uma revisão integrativa. *Rev Enferm Cent-Oeste Min* 2015; 5(2): 1684-703.
14. Bartholomay P, Pelissari DM, de Araujo, WN, Yadon ZE, Heldal E. Quality of tuberculosis care at different levels of health care in Brazil in 2013. *Rev Panam Salud Publica* 2016; 39(1): 3-11.
15. Scatena LM, Villa TCS, Netto AR, Kritski AL, Figueiredo TMRM, Vendramini SHF, et al. Dificuldades de acesso a serviços de saúde para diagnóstico de tuberculose em municípios do Brasil. *Rev Saúde Pública* 2009; 43(3): 389-97.
16. Ponce MAZ, Wysocki AD, Scatolin BE, Andrade RLP, Arakawa T, Netto AR, et al. Diagnóstico da tuberculose: desempenho do primeiro serviço de saúde procurado em São José do Rio Preto, São Paulo, Brasil. *Cad Saúde Pública* 2013; 29(5): 945-54.
17. Loureiro RB, Villa TCS, Netto AR, Peres RL, Braga JU, Zandonade E, et al. Acesso ao diagnóstico da tuberculose em serviços de saúde do município de Vitória, ES, Brasil. *Ciênc Saúde Coletiva* 2014; 19(4): 1233-44.
18. Santos CB, Hino P, Villa TCS, Muniz JN. Indicadores epidemiológicos e de impacto da tuberculose para Ribeirão Preto no período de 1990 a 2000. *Bol Pneumol Sanit* 2002; 10(1): 31-40.
19. Vendramini SHF, Villa TCS, Palha PF, Monroe AA. Tratamento supervisionado no controle da tuberculose em uma unidade de saúde de Ribeirão Preto: a percepção do doente. *Bol Pneumol Sanit* 2002; 10(1): 5-12.
20. Barrêto AJR, Sá LD, Nogueira JA, Palha PF, Pinheiro PGOD, Farias NMP, et al. Organização dos serviços de saúde e a gestão do cuidado à tuberculose. *Ciênc Saúde Coletiva* 2012; 17(7): 1875-84.
21. Ait-Khaled, Alarcón E, Armengol R, Bissell K, Boillot F, Caminro JA, et al. The Union Guide for TB. Management of tuberculosis: a guide essentials of good practice. 6ª ed. Paris: International Union Against Tuberculosis and Lung Disease; 2010.
22. Souza CF de, Ben AJ, Schneider SMB, Nascimento BP, Neumann CR, Oliveira FJAQD. A importância das ações programáticas de saúde no controle da tuberculose: experiência de um serviço de atenção primária à saúde em Porto Alegre, Rio Grande do Sul, Brasil. *Clin Biomed Res* 2014; 34(2): 175-83.
23. Barbosa IR, Pereira LMS, Medeiros PFDM, Valentim RDS, Brito JMD, Costa IDCC. Análise da distribuição espacial da tuberculose na região Nordeste do Brasil, 2005-2010. *Epidemiol Serv Saúde* 2013; 22(4): 687-95.
24. Yamamura M, Santos Neto M, Freitas IM, Rodrigues LBB, Popolin MP, et al. Tuberculose e iniquidade social em saúde: uma análise ecológica utilizando técnicas estatísticas multivariadas, São Paulo, Brasil. *Rev Panam Salud Publica* 2014; 35(4): 270-7.
25. Prado Junior JC, Virgilio CT, Medronho RA. Comparação da proporção de cura por tuberculose segundo cobertura e tempo de implantação de Saúde da Família e fatores socioeconômicos e demográficos no município do Rio de Janeiro. *Ciênc Saúde Coletiva* 2016; 21(5): 1491-8.

26. Figueiredo TMRM, Villa TCS, Scatena LM, Cardozo Gonzáles RI, Ruffino-Netto A, Nogueira JA, et al. Desempenho da atenção básica no controle da tuberculose. *Rev Saúde Pública* 2009; 43(5): 825-31.
27. Araujo MRS, Silva HP, Silva AKLS. Avaliação situacional de biossegurança em tuberculose em Unidades Básicas de Saúde na Amazônia. *Rev Bras Saúde Ocup* 2016; 41: e21.
28. World Health Organization. What is dots? A guide to understanding the recommended TB control strategy known as DOTS. Geneva: WHO; 1999. (WHO/CDS/CPS/TB/99).
29. Santos NP, Lírio M, Passos LAR, Dias JP, Kritski AL, Galvão-Castro B, et al. Completude das fichas de notificações de tuberculose em cinco capitais do Brasil com elevada incidência da doença. *J Bras Pneumol* 2013; 39(2): 221-5.
30. Santa Cruz ML, Franco L, Carvalho JW, Silva FBD, Beteli VC, Lima MFD, et al. Reunião de equipe: uma reflexão sobre sua importância enquanto estratégia diferencial na gestão coletiva no Programa de Saúde da Família (PSF). *Psicol Rev* 2008; 17(1/2): 161-83.

Received on: 02/09/2017

Final version presented on: 07/11/2017

Accepted on: 08/14/2017

**Authors' contributions:** AF Bulgarelli, A Baumgarten and JB Hilgert participated in the study's idealization, conception and design, data analysis and interpretation, final drafting and critical review of the article. RS Rech and KR Souza participated in data analysis and drafting of the article, PT Bulgarelli, CM Santos and K Frichebruder participated in data analysis and interpretation and drafting and critical review of the article.

