

# Effectiveness in the diagnosis of tuberculosis in Foz do Iguaçu, the triple-border area of Brazil, Paraguay and Argentina\*

EFETIVIDADE NO DIAGNÓSTICO DA TUBERCULOSE EM FOZ DO IGUAÇU, TRÍPLICE FRONTEIRA BRASIL, PARAGUAI E ARGENTINA

EFFECTIVIDAD EN EL DIAGNÓSTICO DE LA TUBERCULOSIS EN FOZ DE IGUAZÚ, TRIPLE FRONTERA BRASIL, PARAGUAY Y ARGENTINA

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## ABSTRACT

This study sought to assess the effectiveness of health services in the diagnosis of tuberculosis in Foz do Iguaçu-PR, the triple border region of Brazil, Paraguay, and Argentina. In this epidemiologic, cross-sectional study, 101 persons with tuberculosis were interviewed in 2009 by using an instrument based on the *Primary Care Assessment Tool*. The analysis was based on proportions and respective 95% confidence intervals (95%) and means. Emergency units (37%) and primary health care units (26%) were the most sought units. Access to medical consultation on the same day reached 70%, but tuberculosis was suspected in less than 47% of patients; bacilloscopy was conducted in 50% of patients. We conclude that although these services provide rapid care, they do not determine the true diagnosis and lead the patient to seek specialized services. Specialty services are more effective in establishing the correct diagnosis. In the triple border region, seeking care at a primary health care unit led to extra time and more returns to the hospital for a tuberculosis diagnosis.

## DESCRIPTORS

Tuberculosis  
Diagnosis  
Effectiveness  
Evaluation of Health Services  
Primary Health Care  
Border health

## RESUMO

Objetivou-se avaliar a efetividade dos serviços de saúde no diagnóstico da tuberculose em Foz do Iguaçu-PR. Realizou-se uma pesquisa avaliativa, com desenho epidemiológico transversal. Foram entrevistados 101 doentes de tuberculose em 2009, utilizando um instrumento baseado no *Primary Care Assessment Tool*. A análise ocorreu a partir de proporções e respectivos intervalos de confiança (95%) e mediana. O Pronto Atendimento (37%) e a Atenção Básica à Saúde (ABS) (36%) foram os locais mais buscados. O acesso à consulta no mesmo dia alcançou 70%, mas a suspeição da doença foi menor que 47%; a baciloscopia realizada em 50% dos doentes. Concluiu-se que apesar desses serviços atenderem rapidamente, isso não determinou alcance do diagnóstico, levando o doente a procurar os serviços especializados, mais efetivos na descoberta dos casos. A busca pela ABS gerou maior tempo e maior número de retornos para o diagnóstico da tuberculose na tríplice fronteira.

## DESCRITORES

Tuberculose  
Diagnóstico  
Efetividade  
Avaliação de Serviços de Saúde  
Atenção Primária à Saúde  
Saúde na fronteira

## RESUMEN

Este estudio tuvo como objetivo evaluar la efectividad de los servicios de salud en el diagnóstico de la tuberculosis en Foz de Iguazú - Paraná. Se realizó una investigación evaluativa con un diseño epidemiológico transversal. Fueron entrevistados 101 pacientes con tuberculosis en el 2009, utilizando un instrumento basado en la *Herramienta de Evaluación de la Atención Primaria*. El análisis se produjo a partir de proporciones y los respectivos intervalos de confianza (95%) y la mediana. La atención de emergencia (37%) y la Atención Primaria de Salud (ABS) (36%) fueron los locales más buscados. El acceso a la consulta en el mismo día llegó a 70%, pero la sospecha de la enfermedad fue menor que 47%; baciloscopia fue realizada en el 50% de los pacientes. Se concluyó que, si bien estos servicios atienden rápidamente, eso no determinó el alcance del diagnóstico, llevando al paciente a buscar los Servicios Especializados más efectivos en la detección de los casos. La búsqueda de la ABS generó mayor tiempo y número de retornos para el diagnóstico de la tuberculosis en la triple frontera.

## DESCRITORES

Tuberculosis  
Diagnóstico  
Efectividad  
Evaluación de Servicios de Salud  
Atención Primaria de Salud  
Salud fronteriza

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## INTRODUCTION

The World Health Organization (WHO) states that in 2010, about 8.8 million of new cases of tuberculosis (TB) were registered worldwide. Of these, 57% had sputum samples with positive bacilloscopy results; 800,000 of these samples showed extrapulmonary tuberculosis. The incidence of TB in Brazil is 37.6 cases per 100,000 habitants, and currently the country has the 22nd highest load of TB in the world<sup>(1)</sup>.

Given the epidemiologic importance of TB in the country, since 1998 the National Program of Tuberculosis Control has intensified and strengthened the actions to detect and treat cases through active surveillance, control of vectors, and directly observed treatment. In addition, since 2001, actions for TB control in primary health care (PHC) have been systematized and decentralized in order to widen access to diagnosis and treatment<sup>(2)</sup>.

In the State of Paraná and municipality of Foz do Iguaçu-PR, the incidence coefficients in 2010 were 22.9 and 41.8 cases per 100,000 habitants, respectively<sup>(3)</sup>. Because this municipality shares borders with Paraguay and Argentina and other 's regions<sup>(4,5)</sup>, Foz do Iguaçu has a higher incidence of TB than in other states and the country overall<sup>(6)</sup>.

The mobility and migration of the population are the main factors that make appropriate detection of TB and treatment adherence difficult. As a result, individuals who live in border regions are more vulnerable to acquiring TB. In such regions, initiatives for cooperation between countries are important for prevention and control of many infectious diseases (including TB); such initiatives include professional training, meetings of local health councils, and the exchange and sharing of materials and equipments<sup>(7)</sup>.

However, in the triple-border region for Brazil, Paraguay, and Argentina, few resources have been devoted to the prevention and treatment of infectious diseases. On the border of Paraguay, for example, Paraguayan patients place a high demand on the *Sistema Único de Saúde* (SUS [acronym in Portuguese], or the Brazilian Public Health System), but the Brazilian government does not receive financial reimbursement for the care provided to this population. On the border of Argentina, a single vaccination schedule is used, and joint actions for epidemiologic surveillance take place<sup>(7)</sup>.

Given the prevalence of TB in Brazil and the importance of diagnosis (both to control spread of TB and identify the conditions that make a population vulnerable to the disease) in the triple-border region, studies of the effectiveness of health services for case detection are valuable for planning policies and sanitary activities in this area<sup>(8)</sup>.

Thus, the current study assessed primary health care sought by patients diagnosed with TB in Foz do Iguaçu, PR.

## METHOD

This study, designed for ex post assessment of interventions using scientific methods, analyzed theoretical bases, operational processes, and implementation of interface with constitutive context<sup>(9)</sup>. We chose the effect analysis type form attribute effectiveness<sup>(10)</sup>. A cross-sectional design, often adopted for health assessment<sup>(11)</sup>, was used, along with group comparison (primary health care services, emergency unit, and specialty services).

The study was conducted in Foz do Iguaçu-PR, which had a population of 325,137 habitants in 2009. The municipality has an ambulatory of reference for control of TB, 11 primary health units (PHUs), 16 family health unit (FHUs), and 32 family health teams, providing coverage for 38% of the population. Two emergency units and four hospitals serve the eight municipalities of 9<sup>th</sup> regional of health. These services offer health care to all municipality residents and constitute an informal option for Brazilians and persons of Brazilian descent living in the municipalities that share borders (Ciudad del Este [Paraguay] and Porto Iguazu [Argentina]), in addition to the health care services offered to citizens of Paraguay and Argentina<sup>(7)</sup>.

Despite the agreement among countries of Mercosul (Southern Common Market), there is no universal health assistance for the population of this trade bloc. However, since the health system in Brazil is free, foreigners and immigrants look for care in Foz do Iguaçu and receive selective care because of the requirement to present a Brazilian ID card, an SUS card, and proof of permanent residency in Brazil. Requests for vaccination, urgent and emergency care, treatment for bites by poisonous animals, and follow-up of institutionalized pregnant women are honored without reciprocity of neighboring countries<sup>(12)</sup>.

Given the socioeconomic profile of TB patients and the transmissibility of the pathogen, health care managers in Foz do Iguaçu-PR are advised to diagnose and treat these patients without restrictions, even though they have no legal responsibility to offer care for foreigners and Brazilians who live outside of the national territory.

The study population was composed of patients with TB receiving all forms of treatment who were registered in the database of the National Disease Surveillance Data System for the current municipality who met the following inclusion criteria: age 18 years or older, not incarcerated, and diagnosed with TB at Foz do Iguaçu-PR in 2009.

Of 112 patients receiving treatment, 2 were minors, 7 were in the prison system, and 2 declined to participate in the research. Therefore, 101 patients were interviewed. It was not possible to identify the total number of Brazilians

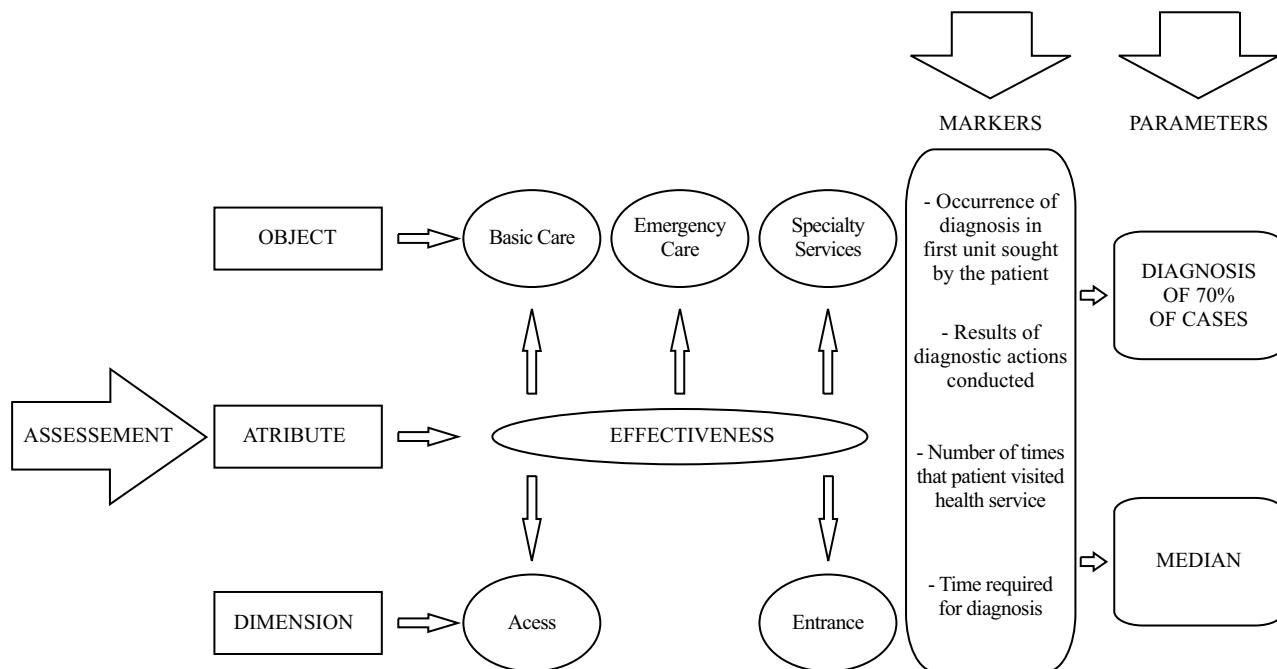
Because this municipality shares borders with Paraguay and Argentina and other 's regions, Foz do Iguaçu has a higher incidence of TB than in other states and the country overall.

living in Paraguay or Argentina who were treated for TB at Foz do Iguaçu-PR.

The data collection instrument was based on the Brazilian validated version of the Primary Care Assessment Tool<sup>(13)</sup>, which was adapted for TB care<sup>(15)</sup>. This questionnaire consisted of questions with dichotomous and multiple-choice answers that concerned sociodemographic and clinical

characteristics and were related to dimensions of health care access and role of health services in the diagnosis of TB.

Data were collected from secondary sources (medical charts) and by interviews with patients in the health service setting or at their home. Data were analyzed by using descriptive techniques. The effectiveness assessment (Figure 1) consisted of the following outcome measures:



**Figure 1** – Theoretical model to assess effectiveness of health service for diagnosis of tuberculosis in Foz do Iguaçu, PR, in 2009

1. Diagnosis at the first service sought by patients (primary health care services [PHUs and FHUs]), emergency units, and specialty services [private clinics, specialized outpatient units, hospitals, and Tuberculosis Control Program clinic).
2. Results of actions from diagnosis (construction of access indicators and entrance from proportions and respective confidence intervals [95%]), (Chart 1);

**Chart 1** – Dimension and indicators of effectiveness of actions for diagnosis of tuberculosis in Foz do Iguaçu, PR, in 2009.

Attributes	Dimensions	Indicators	Calculation
Effectiveness of health services for diagnosis of TB	Access	Proportion of patients who had same-day consultation (PCD)	$PCD = \frac{\text{number of patients who had a consultation at the same day}}{\text{Total of patients who sought health service}} \times 100$
		Proportion of patients with suspicion of TB reported by nurse at the first consultation (PSP)	$PSP = \frac{\text{number of patients with suspicion of TB in the first consultation}}{\text{Total patients who sought health service}} \times 100$
	Entrance	Proportion of patients with requested sputum examination (PES)	$PES = \frac{\text{number of patients with requested sputum sample}}{\text{Total patients who sought health service}} \times 100$
		Proportion of patients with requested radiography (PRS)	$PRS = \frac{\text{number of patients with requested radiography}}{\text{Total patients who sought health service}} \times 100$
		Proportion of referrals to other health services for medical consultation (PEC)	$PEC = \frac{\text{number of patients with request for medical consultation}}{\text{Total patients who sought health service}} \times 100$
		Proportion of referrals to other health services to perform sputum examination (PEE)	$PEE = \frac{\text{number of patients who were referred for sputum examination}}{\text{Total patients who sought health service}} \times 100$
		Proportion of referrals to other health services for radiography (PER)	$PER = \frac{\text{number of patients who were referred for radiography}}{\text{Total patients who sought health service}} \times 100$

3. Number of times that the patients returned to the health service facility and;
4. Time required for the diagnosis (days).

To formulate the value judgment on the first and second measures, we used parameters for case detection  $\geq 70\%$  recommended by the World Health Organization<sup>(1)</sup>. For the third and fourth measures, the respective means were used (Figure 1).

The project was approved by the Ethical Committee of Universidade Estadual do Oeste do Paraná – Unioeste,

according to the protocol 235/2010. Participants were interviewed after they signed the informed consent form, according to resolution 196/96 of the National Health Committee.

## RESULTS

The health services patients most frequently sought as their first option by were emergency units (37%) and PHUs (36%); however, the proportions of patients with TB who received that diagnosis at these services were 18.9% and 25.0%, respectively. Specialty services diagnosed TB in 96.3% of patients (Table 1).

**Table 1** – Distribution of patients with tuberculosis according to location of diagnosis and first health service sought in Foz do Iguaçu, PR, in 2009.

Location of Diagnosis	First Health Service Sought by Patients						
	Primary Health Care		Specialty Services		Emergency care		Total
	n	%	N	%	n	%	n
Primary health care	9	25.0	0	0	1	2.7	10
Specialty services	22	61.1	26	96.3	29	78.4	77
Emergency care	5	13.9	1	3.7	7	18.9	13
<b>Total</b>	<b>36</b>	<b>100</b>	<b>27</b>	<b>100</b>	<b>37</b>	<b>100</b>	<b>100</b>

Note: One patient was excluded because he did not remember the first service he sought.

With regard to effectiveness (Table 2), we observed the following: The proportion of patients attended to on the first day was greater than 70% for all types of services; the proportion of patients in whom TB was suspected at the first health service was less than 47%; sputum examination was requested for roughly 50% of patients; the emergency unit was the service that more requested radiographs; and all types of

services referred patients for consultations and bacilloscopy of sputum in other units. The PHU was the service that referred more patients for radiography in other health units.

Patients who chose a PHU as their first health service for diagnosis of TB had the most returns to the hospital (5) and longer time (15 days) to diagnosis (Table 3).

**Table 2** – Indicators of effectiveness at the first health service sought by patients for diagnosis of tuberculosis in Foz do Iguaçu, PR, in 2009.

Indicators of Effectiveness of Health Service in the Diagnosis of TB	First Health Service Sought by Patient		
	Primary Health Unit n=36	Emergency Care n=37	Specialty Services n=28
	% [95% CI]	% [95% CI]	% [95% CI]
Proportion of patients who had consultation on first day	81 [68-93]	73 [59-87]	86 [73-99]
Proportion of patients with suspicion of TB at first consultation reported by the health professional	31 [16-46]	32 [17-48]	46 [28-65]
Proportion of patients with requested sputum examination	47 [31-64]	49 [33-65]	50 [31-69]
Proportion of patients with requested radiography	22 [1-36]	30 [15-44]	14 [0-27]
Proportion of referrals to other health service units for medical consultation	61 [45-77]	62 [47-78]	54 [35-72]
Proportion of referrals to other health service units to perform sputum examination	36 [20-52]	49 [33-65]	43 [25-61]
Proportion of referrals to other health service unit to perform radiography	75 [61-89]	41 [25-56]	50 [31-69]

Note: statistical significance 5%

**Table 3** – Number of times that patient sought health service and time to diagnosis of tuberculosis between first visit and diagnosis of tuberculosis in Foz do Iguaçu, PR, in 2009.

First Health Service Sought	Number of Times That Patients Sought Health Service		
	Mean	1 <sup>st</sup> Quartile	3 <sup>rd</sup> Quartile
PHC (n=36)	3	2	5
Emergency care (n=37)	2	1	4
Specialty service (n=28)	2	1	4
All (n=101)	3	2	4

First Health Service Sought	Time for diagnosis (days)		
	Mean	1 <sup>st</sup> Quartile	3 <sup>rd</sup> Quartile
PHC (n=36)	15	7.5	35
Emergency care (n=37)	10	3.0	30
Specialty service (n=27)*	7	4.0	30
All (n=100)	15	5.0	30

\* One patient was excluded because he did not remember the number of days needed for diagnosis.

## DISCUSSION

Several studies have assessed patient health-seeking behavior. Even with the existence of a national policy that incentivizes the use of PHUs as the preferable location for first contact, this venue is not a priority for health care service. Urgency/emergency services continue to be the principal point of entry<sup>(16)</sup>; PHUs are responsible for 30% of all health care provided.

At the South Arch border (2,200 km long), the demand for Brazilian health services by Paraguayans, Argentines, and Brazilians immigrants takes place at PHUs (23.82%), followed by emergency units (21.8%). In relation to foreigners living in the South Arch area, the municipality of Foz do Iguaçu assists 28.2% of all patients<sup>(12)</sup>.

This study shows a heterogeneous distribution of PHC in all sanitary districts of Foz do Iguaçu. However, 36.6% of people suspected of having TB sought care in an emergency unit. This choice could be due to organizational characteristics of this modality of service, including wide access that can accommodate working hours, assistance in response to spontaneous demand, immediate availability of medical consultations, feasibility for performing exams, access to hospital admission, and restricted hours of PHUs<sup>(17)</sup>.

We found that 26.7% of patients were directly referred for secondary services, which are specialized in attempt for diagnosis. The access to specialty services, which benefit from organizational structures (inputs), specialized teams, technological density (access to radiography and laboratory exams), and organized working processes, seems to have been the differential that led to a diagnosis in 96.3% of patients who had sought secondary services as their first option; this indicates a more effective service. Hence, we verified that the type of unit sought and the forms of service organization are important for prompt diagnosis<sup>(17)</sup>.

Three types of health services achieved the measure *proportion of patients who had consultation on the same day*. However, obtaining a consultation on the same day did not guarantee access for diagnosis at the first service sought. This situation was also verified in Malaysia<sup>(18)</sup>, probably because the health care professionals were not prepared to investigate and diagnose, mainly in PHC<sup>(19)</sup>. This finding explains the patient's need to seek other health services in order to be diagnosed.

Studies show that during the first consultation, when cough, fever, and dyspnea are seen, the main hypotheses for diagnosis were pneumonia, allergy, chronic obstructive pulmonary disease, and, lastly, TB. This finding indicates health care professionals' insufficient experience with TB diagnosis<sup>(20)</sup>.

Concerning the measure *request of sputum examination*, the health service had unsatisfactory results: detection of only 70% of cases<sup>(1)</sup>. All health units had autonomy to request bacilloscopy with laboratory safeguard.

The low rate of requests for bacilloscopy is due to lack of suspicion for TB at the patient's first visit; this, in turn, compromises the diagnosis. This barrier to bacilloscopy was also identified in Thailand<sup>(18)</sup> and in a study conduct in Bayeux, Brazil<sup>(21)</sup>.

All units had unsatisfactory performance for the measure *request for radiography*, even when radiology equipment was available at the referral centers. A cross-sectional study in Malaysia also showed a deficit in requests for exams at first consultation<sup>(18)</sup>.

The organizational improvement of care depends on the qualifications of health care workers, implementation of referral systems, and guaranteed access to essential exams for diagnosis<sup>(19,22)</sup>.

The results for the measures *referral to another service for medical visit* and *performing sputum exam and radiography* show that these are part of routine practice in PHUs

and emergency units in Foz do Iguaçu-PR. A similar situation is found in Ribeirão Preto-SP<sup>(23)</sup>.

PHC must be organized to make TB diagnosis a priority<sup>(24)</sup>. Thus, a challenge to be faced is the organization of communication flow so that care levels and diagnostic support; in addition incorporation of reference and against-reference system, so that ensuring a networking

Referrals to exams in other health services allows hypotheses about the existence of deficiencies in the structure of services<sup>(23)</sup> or lack of organization of the local system for health care regarding TB.

The PHUs were more effective for the measure *referral to other service for radiography*, particularly because this exam is available only in municipality-level radiology units. This study shows the need for referral of patients to conduct exams when necessary<sup>(22)</sup>.

The stimulus policy of offering of PHC access, based on family health strategy, increases the demand for specialty services; the Ministry of Health recognizes this and has stated the need for specialty support<sup>(25)</sup>. The SUS is obligated to guarantee continuity of care in PHUs, outpatient units, and specialty services and to promote the connection of PHUs with services to support diagnosis<sup>(22)</sup>.

Patients who sought the PHU for the first consultation had to return to unit a mean of three times until the diagnosis was made. Despite the repetitive presence of the patient at the health service unit, it is possible for the condition to remain undiagnosed because this process depends on the training of the team to suspect the disease<sup>(19)</sup>. In addition, in PHC several factors influence resolution<sup>(23)</sup>: one of these is the difficulty in characterizing disease episodes, the wide volume of badly defined symptoms, and diversity of chronic conditions faced in distinct locations.

On the other hand, specialty services had shorter mean time spent for diagnosis (7 days), perhaps because of the high technological density for diagnosis and treatment of the disease.

In other countries, there is no standard amount of time needed for diagnosis<sup>(17,18,20)</sup>. It is possible that differences result from the manner in which the health system is organized, training and salary of health professionals, access to programs for TB control, and economic and sociocultural differences<sup>(20)</sup>.

This scenario shows the need to reflect on how organization of health services for diagnosis of TB affects achievement of desired results. The ability to adjust care, such as using care networks, in order to strengthen the diagnosis and treatment of chronic conditions may be key for organization of health services<sup>(22,26)</sup>.

In border regions, the organization of health services is an even greater and urgent challenge because of the ambiguities between volume of financing resources available and exclusions from health care due to socioeconomic

factors and the difficulties in integrating care between local health systems and neighboring countries<sup>(7)</sup>.

In the context of the Mercosul bloc, partnerships are linked to the protection of health; however, these partnerships are not realized because of the weakness of health services in the membership countries. However, it is well known that multilateral agreements should preview the interaction between commercial and sanitary perspective to strength expected intersectional results<sup>(12,27)</sup>.

A model of consolidated transnational cooperation can be seen in the border region shared by Portugal and Spain. Health care is financed with European Union funds, and the objective is to balance and protect the health of users in such spaces<sup>(28)</sup>. In such cases, the public managers involved agreed to share responsibilities and made structural adjustments to rationalize interventions and expenses in care networks, but did not enter into agreements that obligated the adoption of health system models by involved countries.

The case of Portugal and Spain shows consensus in public health, such as the organization of an information system related to service delivery, norms of compensation, and formal agreements to guarantee health care access of specific groups<sup>(29)</sup>.

In the borders shared by Brazil, Paraguay, and Argentina, the notable asymmetry in care highlights the differences in health system organization. In Brazil, for example, the health system is universal, free, and decentralized, whereas in the neighboring countries, the health system is centralized and involves coinsurance. In addition, inequalities are seen more often in the Paraguayan population that sought care in Brazil and in Argentina because of the scarcity of sanitary resources in these countries and lack of financial resources to access health care. In addition, there is the presence of *brasiguaios* (Brazilians immigrants and their children who were born in Paraguay), who are not eligible for health care in Paraguay<sup>(12,29-30)</sup>.

This problem occurs because a bilateral cooperative agreement has not been reached. Therefore, Brazilian municipalities can block health care access for these population, which affects the quality of life for socioeconomically vulnerable individuals; this also reduces their opportunity to obtain an accurate diagnosis in border areas with a high rate of TB transmission<sup>(6,30)</sup>.

Study limitations include the possibility of biases because it relied on patients' ability to remember locations for and number of consultations (method of the study); in addition, it did not include some information on foreign patients who did not reside in Foz do Iguaçu-PR.

## CONCLUSION

Type of service sought and manner of care organization determine the opportune diagnosis of TB. In Foz do Iguaçu, specialty services were more effective for diagnosis of TB because of the shorter time to diagnosis and fewer return visits to the health care unit. These findings show

that specialty level and technologic density were decisive elements in diagnosis elucidation.

We recommend the creation of management mechanisms to set in place structural, complementary resources

for health professionals from PHUs and emergency units, particularly to amplify the resolution ability. We also suggest that further studies assess the effectiveness of diagnostic services for TB, especially in border regions shared by countries.

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