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Tuberculosis incidence and cure rates, Brazil, 2000-2004

ABSTRACT

OBJECTIVE: To describe the geographical distribution of tuberculosis incidence rates based on a set of epidemiological and operational indicators from information system database.

METHODS: Data from the *Sistema de Informação de Agravos de Notificação* (Brazilian Information System for Tuberculosis Notification) were collected after removal of improper repeat records and record linkage. Tuberculosis incidence rates were estimated according to geographical unit, age group, sex, clinical manifestation and treatment schedule and standardized for population age group distribution based on 2000 Population Census.

RESULTS: In 2004, in Brazil, tuberculosis incidence rate was 41 per 100,000 inhabitants and 74,540 new cases were notified. Of these, 52.8% were pulmonary tuberculosis with positive bacilloscopy, 24.1% were under supervised treatment, 63.5% were from state capitals or metropolitan areas, and 54.9% were cured cases (complete treatment). After records with missing outcome data were excluded, cure rates were 72.4% for new cases, 47% for new HIV-positive cases, 64.9% for relapses, 64.5% for transfers in/out, and 40% for returns after default. Cure rate for new cases under supervised treatment was 77.1%. A higher proportion of records with missing outcome information was seen in recent years.

CONCLUSIONS: Different incidence rates and treatment outcomes were found in different Brazilian states. To reach the 85% cure goal for new cases and to increase cure in HIV-positive and defaults cases additional efforts are needed by the Brazilian National Tuberculosis Program, including scaling up the Directly Observed Therapy Strategy.

KEY WORDS: Tuberculosis, epidemiology. Incidence. Diseases registries. Epidemiology, descriptive. Brazil.

INTRODUCTION

Tuberculosis (TB) has historically been a public health concern worldwide. As part of the global strategy for TB morbidity and mortality reduction, the World Health Organization (WHO) established a goal of 70% detection of all new bacillary (BK) TB cases and 85% treatment success.[7] According to current WHO estimates, in Brazil, 110,000 new TB cases are reported every year, i.e., an incidence rate of 62 per 100,000 inhabitants, and Brazil ranks 15th of the 22 most affected countries.[7]

In order to achieve internationally established TB control goals it is central for the Brazilian Ministry of Health National Program for Tuberculosis Control (PNCT) to have available instruments for analysis of data collected in the epidemiological surveillance system to support evidence-based actions.

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The objective of the present study was to describe the geographical distribution of TB incidence using a set of epidemiological and operational indicators from information system database.

METHODS

For data analysis of TB incidence between 2000 and 2004 data from the *Sistema de Informação de Agravos de Notificação* (Sinan – Brazilian Information System for Tuberculosis Notification), obtained in February 2006, was used after removal of improper repeat records and record linkage.

New TB cases were defined according to Sinan guidelines.* Notification rates were estimated for TB incident cases and referred as incidence rates. Rates were estimated by geographical unit, age group, sex, TB clinical form and treatment schedule. Two different age classification were used, the first was divided into four age groups (children [0–19 years], young adults [20–39 years], adults [40–59 years]; and elderly [over 60 years]) and the second into 11 age groups (0 to 4 years; 5 to 9 years; 10 to 14 years; 15 to 19 years; 20 to 29 years; 30 to 39 years; 40 to 49 years; 50 to 59 years; 60 to 69 years; 70 to 79 years; and 80 years or more). The following geographical units were included in the study: regions, states, 36 metropolitan areas, state capitals and 315 priority municipalities defined in PNCT working program for 2004–2007. TB incidence rates were standardized for age distribution in Brazilian states according to the 2000 Population Census.

The number of cases by geographical unit was estimated based on local case notification except for estimates of incidence rate, which were based on case municipality of residence.

RESULTS

After progressively adding up the number of new TB cases and incidence rate in Brazil for 2000–2003, in 2004, it was found slight case reduction with a total of 74,540 new cases and incidence rate of 41 per 100,000 inhabitants. The observed rates are below WHO estimated rates for Brazil, i.e., 110,000 new cases per year and incidence rate of 62 per 100,000 inhabitants. New pulmonary cases and BK pulmonary cases remained relatively steady around 85.6% and 53.1%, respectively, over the study period (Table 1).

In 2004, 75.2% of new cases were notified in 315 priority municipalities, 63.5% in capitals and other municipalities forming metropolitan areas and 43.4% exclusively in state capitals. These proportions were distinct in the Brazilian regions (Table 2).

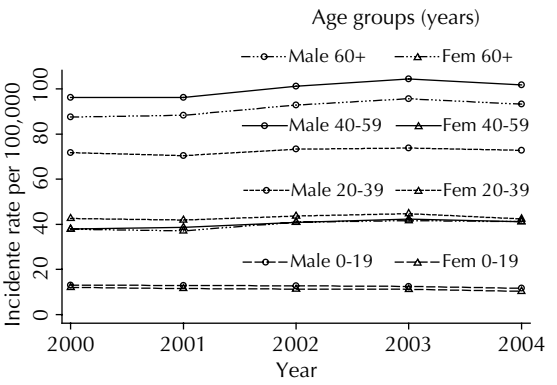

Figure. Tuberculosis incidence rates (all clinical forms) by gender and age group. Brazil. 2000–2004.

The proportion of Brazilian municipalities where not even a single TB case was notified over the study period was variable. It more remarkably decreased between 2000 and 2002 and then remained at 25%. Overall, municipalities where no TB case was notified had small populations. In 2004, 26% of them did not notify any TB case. However, only 1% had a population of 20,000 inhabitants or more. Ponta Grossa (state of Paraná), a PNCT priority municipality, was the single city with more than 100,000 people where no TB cases were notified in 2004.

Table 3 shows new cases, relapses, returns after default, transfers in/out and changes in diagnosis by year of notification. Cases in each category did not vary significantly by year of notification. More than 84% of notifications in all years were new cases, and a portion of these diagnoses were changed and no longer were TB cases throughout follow-up.

The Figure shows the annual TB incidence rate (all clinical forms) by sex and age groups. A reduction in incidence rates was seen in younger age groups in contrast to increased rates in older age groups. Although there was only slight time variation in each category, a difference could be seen. In men, incidence increased with age while in women it increased in children and young adults but remained constant in those aged 20 to 39 years or more. In 2004, incidence rates were similar in both male and female children (risk ratio=RR=1.1), increased in young adult (RR=1.7) and adult males (RR=2.4), and decreased in elderly males (RR=2.2).

With respect to clinical manifestations, in 2004, pulmonary TB was the most prevalent form in all age groups. There was 3% of mixed (pulmonary and extra-

* Ministério da Saúde. Secretaria de Vigilância em Saúde. Sistema de Informação de Agravos de Notificação. Normas e rotinas. Brasília; 2004. (Série A: Normas e Manuais Técnicos).

pulmonary) TB form; ganglionar TB among total new cases was higher up to 14 years of age; and pleural TB increased during childhood and then remained relatively steady. Bone and miliary forms were also more prevalent in children and then declined during adolescence. The proportions were similar in the remaining years studied.

When only TB cases with HIV co-infection were analyzed, more than 50% of cases had pulmonary TB in all age groups. However, when compared to total cases, HIV-infected TB cases comprised a higher proportion of extra-pulmonary cases, i.e., more than 20% in all age groups.

Table 4 shows outcome of new cases by year of notification. Cure rate was 68.8% in 2000 and 54.9% in 2004 without removing cases with missing outcome information from the analysis. New cases with missing outcome information increasingly grew over the period studied, which indicates a delay in case follow-up notification. It can also be noted that, while lower than in more recent years, in the year 2000, there were still notified new cases with missing outcome information. Therefore, after removing from the analysis notifications with missing outcome information, cure rates were 73.3% and 72.4% in 2000 and 2004, respectively.

Outcomes were different depending on case status. New BK cases with or without HIV co-infection had higher cure rates than total new cases. Cure rates of new cases with HIV co-infection, relapses and returns were lower than those found for total new cases and cure rate of returns was lower than relapses and even lower than that found in HIV-infected TB cases. Death among new HIV-infected TB cases was about three times higher than that seen in total new cases. Relapses and returns had greater missing outcome data. Defaults were about three times higher for cases previously returning after default compared to total new cases (Table 5).

Information on treatment schedule (supervised or self-administered) is still scarce nationwide. This data was missing in 30.9% of new cases, 37.9% of relapses and 36.4% of returns. Table 6 shows higher cure rates and lower default and transfer rates for new cases receiving supervised treatment. A larger number of cases with missing outcome information was seen in records where data on treatment schedule was unknown or missing; and a larger number of deaths was found in supervised compared to self-administered treatment cases. Table 6 also shows outcomes of returns after default by treatment schedule. Similarly to new cases, returns under supervised treatment showed higher cure and death rates as well as lower defaults compared to

Table 1. TB incidence and incidence rate per 100,000 inhabitants (all forms, pulmonary and BK pulmonary) per year of notification. Brazil, 2000–2004.

Year	Incidence			Rates*		
	Total new cases	New pulmonary cases		New cases	New pulmonary cases	
		N (%)	BK+ N (%)			BK+
2000	70,086	60,407 (86.2)	37,560 (53.6)	41.3	35.6	22.1
2001	70,384	60,312 (85.7)	37,260 (52.9)	40.8	35.0	21.6
2002	72,516	61,925 (85.4)	38,402 (53.0)	41.1	35.1	21.8
2003	75,416	64,412 (85.4)	40,269 (53.4)	42.1	36.0	22.5
2004	74,540	63,632 (85.4)	39,373 (52.8)	41.0	35.0	21.7

Source: Sinan
* Excluded records with missing sex, age or code of residence municipality.
BK: bacillary.

Table 2. Number and proportion of new TB cases (all forms) notified in capitals, capitals or other municipalities of metropolitan areas and priority PNCT municipalities. Brazil, 2004.

Region	Total	Priority municipality N (%)	Metropolitan area N (%)	Capital N (%)
North	6,949	5,123 (73.7)	4,224 (60.8)	3,901 (56.1)
Northeast	21,582	14,739 (68.3)	11,808 (54.7)	9,840 (45.6)
Midwest	3,162	2,047 (64.7)	1,604 (50.7)	1,517 (48.0)
Southeast	34,179	28,578 (83.6)	24,321 (71.2)	14,606 (42.7)
South	8,668	5,587 (64.5)	5,406 (62.4)	2,508 (28.9)
Brazil	74,540	56,074 (75.2)	47,363 (63.5)	32,372 (43.4)

Source: Sinan

returns under self-administered treatment. However, regardless of treatment schedule, cure was seen in about half of return cases and default was three times as high when compared to new cases.

States and regions share to the total number of cases was quite similar except in the states of Minas Gerais and Amapá, where incidence rates significantly increased over the study period. In 2004, 45.9% of new cases were notified in the Southeastern region, 29% in Northeastern, 11.6% in Southern, 9.3% in Northern and 4.2% in Midwestern region. Table 7 shows crude and standardized rates (estimated based on municipality of residence) for each state and region. In most Brazilian states there was a difference between the number of cases notified and the number of residents; for instance in the Federal District where there were 36.4% more notified cases than residents. In 2004, those states with more new cases were São Paulo, Rio de Janeiro and Bahia whereas those with higher standardized rates were Amazonas, Rio de Janeiro, and Roraima.

Nationwide, 25% of new cases did not undergo sputum bacilloscopy for diagnosis in 2004. This proportion was 27.1% in the Southeastern region, 24.9% in Southern and Northeastern regions, 22.1% in Midwestern, and 16% in Northern region. It is possible that the ratio of BK cases compared to total new cases may have been affected by the percentage of tests not performed: 53.1% nationwide, ranging from 60.7% in the Northern region to 50.1% in the Southeastern region.

The distribution of new cases according to HIV testing was different in Brazilian regions in 2004; more than 75% of cases in Northern and Northeastern region were not tested for HIV. The proportion of cases with ongoing HIV testing was high, above 10%, in all regions and as high as 26.8% in the Southeastern region. Southern and Southeastern regions shower higher percentage of cases with HIV (either positive or negative) results available, 50.5% and 40.6% respectively. While the Northern region had the lowest percentage of cases with results available (9%), it showed the highest rate of positive cases (35%). Of all cases with HIV results available, 24.2% were positive nationwide.

The distribution of new cases by treatment schedule was significantly different in all regions in 2004. Southeastern region had the lowest proportion of cases under supervised treatment (14.6%) and the highest with unknown treatment schedule (51.9%). The Mi-

Table 3. Category of TB cases notified by year of notification. Brazil, 2000–2004.

Category	2000 N (%)	2001 N (%)	2002 N (%)	2003 N (%)	2004 N (%)
New case	70,086 (84.6)	70,384 (86.8)	72,516 (87.6)	75,416 (89.3)	74,540 (89.9)
Relapse after cure	5,983 (7.3)	5,330 (6.6)	4,842 (5.8)	3,947 (4.7)	3,274 (4.0)
Return after default	4,679 (5.6)	2,896 (3.6)	2,303 (2.8)	1,810 (2.1)	1,525 (1.8)
Transfer in/out	838 (1.0)	698 (0.8)	1,663 (2.0)	1,667 (2.0)	2,047 (2.5)
Change in diagnosis*	1,212 (1.4)	1,287 (1.6)	1,377 (1.7)	1,565 (1.8)	1,423 (1.7)
Missing data	54 (0.1)	534 (0.6)	107 (0.1)	38 (0.1)	45 (0.1)
Total	82,852	81,129	82,808	84,443	82,854

Source: Sinan
* Change in diagnosis is one category of case outcome variable. The values were subtracted from the categories of the respective variable in database.

Table 4. Outcome of new TB cases. Brazil, 2000–2004.

Outcome status	2000 N (%)	2001 N (%)	2002 N (%)	2003 N (%)	2004 N (%)
Cure	47,676 (68.0)	47,133 (67.0)	47,782 (65.9)	49,286 (65.4)	40,887 (54.9)
Default	8,674 (12.4)	8,146 (11.6)	7,291 (10.1)	7,033 (9.3)	5,563 (7.4)
Death	4,562 (6.5)	4,254 (6.0)	4,437 (6.1)	4,651 (6.1)	4,277 (5.7)
Transfer in/out	4,158 (6.0)	4,090 (5.8)	4,601 (6.3)	5,502 (7.3)	5,640 (7.6)
MRTB*	17 (0.0)	19 (0.0)	51 (0.1)	51 (0.1)	60 (0.1)
Missing data	4,999 (7.1)	6,742 (9.6)	8,354 (11.5)	8,893 (11.8)	18,113 (24.3)
Total	70,086	70,384	72,516	75,416	74,540

Source: Sinan
* MRTB: Multiresistant tuberculosis

Table 5. TB case distribution by outcome and categories. Brazil, 2004.

Outcome status	New case N (%)	New BK pulmonary case** N (%)	New HIV case N (%)	New HIV BK pulmonary N (%)	Relapse N (%)	Return N (%)	Transfer in/out N (%)
Cure	40,887 (54.9)	35,205 (55.3)	1,849 (34.8)	637 (37.0)	2,649 (46.0)	1,750 (28.0)	1,156 (53.7)
Default	5,563 (7.4)	4,934 (7.8)	537 (10.1)	186 (10.8)	554 (9.6)	1,499 (24.0)	176 (8.2)
Death	4,277 (5.7)	3,561 (5.6)	954 (18.0)	294 (17.1)	390 (6.8)	403 (6.4)	85 (4.0)
Transfer in/out	5,640 (7.6)	4,704 (7.4)	591 (11.0)	197 (11.4)	469 (8.2)	699 (11.2)	369 (17.2)
MRTB*	60 (0.1)	55 (0.1)	3 (0.1)	1 (0.1)	23 (0.4)	21 (0.3)	6 (0.3)
Missing data	18,113 (24.3)	15,173 (23.8)	1,379 (26.0)	408 (23.6)	1,670 (29.0)	1,888 (30.1)	360 (16.6)
Total	74,540	63,632	5,313	1,723	5,755	6,260	2,152

Source: Sinan
*MRTB: Multiresistant tuberculosis
** BK: bacillary

Table 6. Outcome by treatment schedule for new TB cases and returns after default. Brazil, 2004.

Desfecho	New cases N (%)				Returns after default N (%)			
	Yes	No	Unknown	Total	Yes	No	Unknown	Total
Cure	11,108 (61.9)	19,740 (58.9)	10,039 (43.5)	40,887 (54.9)	459 (31.8)	781 (30.8)	510 (22.4)	1,750 (28.0)
Default	1,227 (6.8)	2,772 (8.3)	1,564 (6.8)	5,563 (7.5)	318 (22.0)	688 (27.1)	493 (21.7)	1,499 (23.9)
Death	1,029 (5.7)	1,572 (4.7)	1,676 (7.3)	4,277 (5.7)	94 (6.5)	127 (5.0)	182 (8.0)	403 (6.4)
Transfer in/out	1,024 (5.7)	2,770 (8.3)	1,846 (8.0)	5,64 (7.6)	173 (12.0)	262 (10.3)	264 (11.6)	699 (11.2)
MRTB*	19 (0.1)	38 (0.1)	3 (0.0)	60 (0.1)	4 (0.3)	16 (0.6)	1 (0.0)	21 (0.3)
Missing data	3,553 (19.8)	6,629 (19.8)	7,931(34.4)	18,113 (24.3)	396 (27.4)	655 (26.2)	827 (36.3)	1,888 (30.2)
Total	17,960 (24.1)	33,521 (45)	23,059 (30.9)	74,540 (100)	1,444 (23.1)	2,539 (40.5)	2,277 (36.4)	6,260 (100)

Source: Sinan

dwestern region had the highest proportion of cases under supervised treatment (40.2%).

Regions differed regarding outcome of new cases. The 85% cure of new cases was not seen in any clinical form. The Southeastern region had the lowest cure rate (39.3%) possibly due to the large number of new cases with missing outcome information.

The states of Rio de Janeiro, São Paulo and Rio Grande do Norte had higher unknown or missing outcome data and thus had the lowest cure rates. The states of Acre, Roraima, Sergipe and Espírito Santo had 80% or more of cure of new cases. Roraima was the single state to reach cure rates above 85% for new cases despite the small proportion of cases with missing outcome information.

Outcomes of cases diagnosed in 2004 in metropolitan areas showed also a heterogeneous pattern for both total new cases and new BK cases. Comparison was hindered between metropolitan areas due to different proportion of cases with missing outcome information. Of all new cases, including those with missing outcome information, the metropolitan areas of Natal (RN), Vale do Aço (MG), Baixada Santista (SP) and Rio de Janeiro (RJ) had cure rates lower than 31%. In the regions of Núcleo and Expansão do Vale do Itajaí (SC), northern and northeastern Santa Catarina (SC), Vitória (ES) and Expansão de Tubarão (SC) 80% or more cure rate was found. Considering only new BK cases, including those with missing outcome information, besides the aforementioned regions, the metropolitan areas of Núcleo de Tubarão (SC) and Petrolina/Juazeiro (PE) had also cure rates of 80% or more.

Table 8 shows that all regions had higher proportion of outcome fields left blank in new cases under supervised than self-administered treatment. Of total new cases notified, cure rate of cases under supervised treatment were higher than those found for self-administered treatment cases in the Northern and Northeastern regions but were similar in Southeastern, Southern, and Midwestern regions.

DISCUSSION

The study of TB morbidity and mortality in Brazil is based on data from information health systems managed by the Brazilian Ministry of Health and, in recent years, it has undertaken efforts to improve these information systems. TB morbidity data confirm adequate coverage and quality of data from Sinan-TB allowing in-depth epidemiological analyses by geographical region comparisons. This information also supports decision making in PNCT management at country, state and local level. As a result, regional and state discrepancies and their effect in the analysis of case outcomes became evident especially in the reporting of follow-up variables.

The present study used a database from Sinan-TB after removal of improper repeat records and record linkage. It provided lower number of new and retreatment cases and higher cure rates compared to data based

Table 7. Number of new cases and crude and standardized TB incidence rates (all forms) in each region and state by year of notification. Brazil, 2000–2004.

Region/State	2000		2004	
	Crude rate	Standardized rate*	Crude rate	Standardized rate*
North	47.1	53.8	49.7	57.5
Rondônia (RO)	37.5	41.2	35.4	40.6
Acre (AC)	57.8	70.9	44.8	53.5
Amazonas (AM)	72.8	86.4	69	83
Roraima (RR)	55.8	67.8	51.9	63.5
Pará (PA)	44.5	50.2	51.2	58.8
Amapá (AP)	9	11	37.1	46.2
Tocantins (TO)	18.2	20.8	18	20
Northeast	43.7	46.3	43.4	46
Maranhão (MA)	47.2	53.5	43.2	49.4
Piauí (PI)	35.8	38.8	35.5	38.3
Ceará (CE)	43.8	46.4	45.5	48.3
Rio Grande do Norte (RN)	39.4	40.6	37.4	38.8
Paraíba (PB)	34	35.1	31.1	32.2
Pernambuco (PE)	43.3	44.6	51	52.3
Alagoas (AL)	38.2	41.9	39	42.7
Sergipe (SE)	26.5	29	25.7	27.7
Bahia (BA)	51.2	54	47.2	49.8
Southeast	43.3	41.3	43.6	41.5
Minas Gerais (MG)	0.3	0.2	27.2	26.6
Espírito Santo (ES)	40.8	40.3	37.8	37.4
Rio de Janeiro (RJ)	90.7	85.6	79.7	74.8
São Paulo (SP)	45.8	43.4	38.2	36.1
South	31.8	30.4	32.8	31.6
Paraná (PR)	24.4	24	24.6	24.1
Santa Catarina (SC)	23.2	22.4	26.2	25.3
Rio Grande do Sul (RS)	43.2	40.9	44.1	41.7
Midwest	28.6	29.3	24.3	25.2
Mato Grosso do Sul (MS)	39.9	40.6	39.1	40
Mato Grosso (MT)	45	48.5	35.3	38.1
Goiás (GO)	20.5	21	16.7	17
Federal District (DF)	17.1	17.4	14.8	16
Brazil	41.3	41.2	41.6	41.5

* Direct standardization by age in Brazil according to 2000 Population Census.

Table 8. Outcome of new TB cases by treatment schedule and regions. Brazil, 2004.

Outcome		Cure	Default	Death	Transfer in/out	MRTB*	Missing data	Total
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N
Supervised treatment	North	1,723 (70.2)	215 (8.8)	150 (6.1)	159 (6.5)	2 (0.1)	204 (8.3)	2,453
	Northeast	5,030 (70.2)	524 (7.3)	363 (5.1)	400 (5.6)	10 (0.1)	841 (11.7)	7,168
	Southeast	2,025 (40.5)	244 (4.9)	229 (4.5)	225 (4.5)	1 (0.0)	2,279 (45.6)	5,003
	South	1,437 (69.6)	150 (7.3)	189 (9.1)	141 (6.8)	0 (0.0)	149 (7.2)	2,066
	Midwest	893 (70.3)	94 (7.4)	98 (7.7)	99 (7.8)	6 (0.5)	80 (6.3)	1,270
	Brazil	11,108 (61.9)	1,227 (6.8)	1,029 (5.7)	1,024 (5.7)	19 (0.1)	3,553 (19.8)	17,960
Self-administered treatment	North	2,477 (65.3)	331 (8.7)	175 (4.6)	682 (18.0)	6 (0.2)	122 (3.2)	3,793
	Northeast	7,103 (66.7)	939 (8.8)	461 (4.3)	1,123 (10.6)	18 (0.2)	1,003 (9.4)	10,647
	Southeast	4,686 (40.9)	817 (7.1)	336 (2.9)	486 (4.3)	6 (0.1)	5,120 (44.7)	11,451
	South	4,358 (72.1)	528 (8.7)	486 (8.0)	350 (5.9)	8 (0.1)	316 (5.2)	6,046
	Midwest	1,116 (70.5)	157 (9.9)	114 (7.2)	129 (8.1)	0 (0.0)	68 (4.3)	1,584
	Brazil	19,740 (58.9)	2,772 (8.3)	1,572 (4.6)	2,770 (8.3)	38 (0.1)	6,629 (19.8)	33,521

*MRTB: Multiresistant tuberculosis

on crude information. The analysis report of record linkage/removal from Sinan-TB database is described elsewhere.[1] Whether or not to approve incidence rates obtained after record linkage/removal process from Sinan-TB database is under discussion in the Ministry of Health. Its approval basically relies on the quality (no improper repeat records) of database routinely sent by municipalities to the central level.

Increased number of new cases notified in the period 2000–2003 can be partially explained by increased TB notifications in Sinan. This is evidenced not only by increased number of new cases notified in Minas Gerais but also by a reduction in the ratio and population size of municipalities where no cases were notified during the period studied. The fact that a minority of large-size municipalities did not have any case notification can be suggestive of large – yet in small number – areas of underreporting. This hypothesis needs further investigation in field studies, follow-up of new cases in the next years and result analysis of other database linkage studies.[5] In addition, there is a need for studies to explore spatial distribution of TB cases notified in a municipality to locally detect potential areas of underreporting.[6] These studies are needed given the discrepancy in the rate found in the present study and WHO estimated rate (41 and 62 per 100,000 inhabitants, respectively).[7] Brazilian Ministry of Health is required to ascertain consistence and quality stability of data from Sinan-TB regarding coverage, inexistence of improper repeat records and data consistence in order to properly request for a review of WHO estimates on TB incidence rate in Brazil.

The period studied did not allow to evidence a reduction of TB transmission in Brazil. However, the slightly increasing number of new TB cases in younger age groups can be regarded as an indirect evidence of reduced transmission.[2] This reduction is aligned with the trend seen in aggregate data, which have been collected and analyzed by state health departments since pre-Sinan implementation. In order to describe the historical trend of TB morbidity in Brazil it is required a comparison of recent data with data from 1980s and 1990s published by the Brazilian Ministry of Health Surveillance Department.[3,4]

Moreover, it can be noted that 2004 data follows the same trends seen over the last two decades: clustering of TB cases in capitals, metropolitan areas and PNCT priority municipalities, mostly in the states of São Paulo and Rio de Janeiro; high incidence rates in Rio de Janeiro and Amazon states; prevalence of pulmonary forms especially in more advanced age groups; and high prevalence of TB-AIDS comorbidity especially in the Southeastern region.[3,4,*] The study sought to stress differences in the proportions of each outcome category when cases with missing outcome information were included or not. These differences were even more remarkable when results were broke down by states. Cases with missing outcome information are likely to have more defaults and transfers than cures. Thus, to prevent bias while generalizing cases with proper outcome record as representative of total cases, it is key to epidemiologically ascertain there are no differences between cases with and without missing information.

* Ministério da Saúde. Secretaria de Vigilância em Saúde. Saúde Brasil 2005 - Uma análise da situação de saúde. Brasília; 2005.

Low cure rates of HIV-infected cases and returns after default indicate the need for public policies specifically targeting these populations. Directly Observed Treatment Strategy (DOTS) was implemented in Brazil by the end of 1990s and this strategy has sought to bridge this gap, yet inconsistently and primarily, in many Brazilian municipalities.[7] Data on DOTS coverage are inconsistently collected and sometimes are simply approximate estimates reported by local PNCT teams. The methodological approach usually applied for estimating DOTS coverage in Brazil reports the number of health units with at least one case under supervised treatment.[7] Furthermore, the only supervised treatment variable from Sinan-TB database has almost one-third of missing information and requires to be validated for inclusion in epidemiological studies. This variable reporting has become mandatory only by the end of 2004 in Sinan-TB version 6.0 but there is still the option "unknown supervised treatment," which means non-reporting.

There may have been pre-selection of cases referred to supervised treatment. This is probably due to the fact that health units in Brazil do not have available providers generally trained for supervised treatment and/or they are not available in sufficient number to meet the needs. Outcome must be carefully interpreted for new cases and returns under supervised or self-administered treatment and study authors chose to present these data to establish parameters for further comparisons.

Missing information hinders description of TB-AIDS cases as well. The study data reveal heterogeneity of comorbidity cases in the different regions but the proportion of cases with no or "ongoing" HIV testing in the Northern, Northeastern, and Midwestern regions prevents actual comparisons and hinders the analysis on current status of this comorbidity in Brazil. Linkage studies of Sinan-TB database could bridge this gap.

Of all Brazilian states, Roraima was the single one to achieve the goal of 85% cure for new BK cases established by WHO,[5] despite missing outcome information in some cases. Even in a small universe of cases, cure rate achieved in this state is remarkable within the Brazilian national system. Other states and some highly populated metropolitan areas were also able to attain or come close to this goal, indicating that the small number of cases is not a determinant for this achievement.

In conclusion, wide differences were found between states regarding incidence and outcome. In order to achieve the cure goal for new BK cases and increase cure rates of HIV-infected cases and returns additional efforts are required by PNCT. They include surveillance of cases aiming at increasing records with outcome information and timely reporting as well as scaling up directly supervised therapy strategy.

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Note: See the Letter to the Editor in this Supplement.