TUBERCULOSIS in the Russian Federation 2009

An analytical review of the TB statistical indicators used in the Russian Federation

TUBERCULOSIS
IN THE RUSSIAN FEDERATION
2009

An analytical review
of the statistical indicators
used in the Russian Federation

Moscow
2010

УДК 616-002.5-312.6(047)
ББК 55.4
Т81

Т81 **Tuberculosis In The Russian Federation, 2009. An analytical review of the TB statistical indicators used in the Russian Federation.** – Moscow, 2011. – 208 p.

This analytical review is a joint publication prepared by the Ministry of Health and Social Development of the Russian Federation, the Federal Research Institute for Health Care Organization and Information, the Research Institute of Phthisiopulmonology, I.M.Sechenov First Moscow State Medical University, the Central Tuberculosis Research Institute, the Saint-Petersburg Research Institute of Phthisiopulmonology, the Federal Penitentiary Service, and the Federal Service for External Quality Control of Clinical Laboratory Research, with participation of the World Health Organization Office in the Russian Federation.

The analytical review continues the series of publications issued in 2007–2009.

The review contains analysis of indicators calculated based on national and sectoral service reports; the significance of these indicators for assessment of the epidemiological situation of TB and the quality of TB control activities in the Russian Federation in 2007–2009 are discussed, along with the trends in these indicators in the last 10–15 years. The analysis is presented with due account of the international definitions and approaches used in medical and epidemiological statistical data processing.

Particular importance is attached to the methods of application and interpretation of indicators used both in the Russian Federation and internationally for assessment of effectiveness of TB control activities, and to the comparison of the situation of TB in the Russian Federation, in other countries, and in the WHO European Region.

ББК 55.4

This analytical review has been developed by

Ministry of Health and Social Development of the Russian Federation
Kirvonos O.V., Mikhailova L.A., Skachkova E.I., Kormacheva E.A. – Department of Health Care Management and Health System Development; Yablonsky P.K., Chief Specialist-Phthisiatrician, MoH&SD, Director, St-PRIPP; Mikhailova Y.V., Deputy Director, FPHI

Federal Research Institute for Health Care Organization and Information
Son I.M., Sterlikov S.A.

Research Institute of Phthisiopulmonology, I.M.Sechenov First Moscow State Medical University
Perelman M.I., Bogorodskaya E.M., Frolova O.P., Shilova M.V., Popov S.A., Aksenova V.A.

Moscow City Research and Practical Centre for TB Control
Borisov S.E.

Central TB Research Institute Russian Medical Academy of Science
Punga V.V.

Saint-Petersburg Research Institute of Phthisiopulmonology
Galkin V.B., Mushkin A.Yu.

Federal Penitentiary Service of the Russian Federation
Baryshev S.N., Odintsov V.E., Safonova S.G.

World Health Organization
Belilovsky E.M., Danilova I.D., Pashkevich D.D., Yurasova E.D.

Federal Service for External Quality Assessment of Clinical Laboratory Tests
Malakhov V.N., Shulgina M.V., Zaikin E.V.

The contributors express gratitude to the following specialists for assistance in the preparation of this review:
Nechaeva O.B., Ogryzko E.V., Dudina A.G., Disu A., Testov V.V.,
Ilyitskaya L.S., Ponomareva E.G., W. van Gemert, Afanasiev N.Yu.

Translated in English by V. Zavolsky with editing of E. Belilovsky

The Review has been prepared with the technical and financial support of the WHO Country Office in the Russian Federation

ISBN 978-5-94789-467-7

List of abbreviations

AFB	acid fast bacilli
AIDS	acquired immune deficiency syndrome
ART	antiretroviral therapy
CDL	clinical diagnostic laboratory
CF	correctional facility
CFR	Central Federal Region
ChT	chemotherapy
CI	confidence interval
CNS	central nervous system
CPT	cotrimoxazole preventive therapy
CTRI	Central Tuberculosis Research Institute, Russian Academy of Medical Sciences
Cu+	culture-positive TB case (culture-confirmed TB cases)
DFG	dispensary follow-up group (see Annex)
DR	drug resistance
DST	drug susceptibility test
EPTB	extra-pulmonary TB
EQA	external quality assurance
ERTB	extra-respiratory TB
FCTB	fibro-cavernous tuberculosis
FCTBM	Federal Centre for TB Control Monitoring in the Russian Federation (at FHCOIRI)
FEFR	Far-Eastern Federal Region
FHCOIRI	Federal Research Institute for Health Care Organization and Information
FSEQA	Federal Service of External Quality Assessment of Clinical Laboratory Tests
FSIN	Federal Service of Punishment Execution
FSSS	Federal Service of State Statistics (“Rosstat”)
FTP	Federal Target Programme
GF	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHC	General Health Care
GLC	Green Light Committee
HIV	human immunodeficiency virus
HF	health facility
IBRD	International Bank for Reconstruction and Development
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th Revision
IUATLD	International Union against Tuberculosis and Lung Diseases
MbT	mycobacterium Tuberculosis
MDR	multidrug resistance
MoH	Ministry of Health of the Russian Federation
MoH&SD	Ministry of Health and Social Development of the Russian Federation (former MoH)
MoJ	Ministry of Justice of the Russian Federation
NCFR	North-Caucasian Federal Region
NTRI	Novosibirsk TB Research Institute
NWFR	Northwestern Federal Region
PFR	Povolzhsky Federal Region
PHC	primary health care

PTB	pulmonary TB
RAMS	Russian Academy of Medical Sciences
RF	Russian Federation
RIPP	Research Institute of Phthisiopulmonology, I.M. Sechenov First Moscow State Medical University
RTB	respiratory TB
SbFR	Siberian Federal Region
SFR	Southern Federal Region
SIZO	pre-trial detention center
ss+	sputum smear positive TB cases (microscopy confirmed TB cases)
SSTM	State System of TB Monitoring
St-P RIPP	St. Petersburg Research Institute of Phthisiopulmonology
TB	Tuberculosis
UFR	Ural Federal Region
UNAIDS	The Joint United Nations Programme on HIV/AIDS
URIPP	Ural Research Institute of Phthisiopulmonology
WHO	World Health Organization
WHO RF	WHO TB Control Program in the Russian Federation

Contents

Introduction

This analytical review is a joint publication of the Ministry of Health and Social Development of the Russian Federation (MoH&SD), the Federal Research Institute for Health Care Organization and Information (FHCOIRI), the Research Institute of Phthisiopulmonology, I.M.Sechenov First Moscow State Medical University (RIPP), the Saint-Petersburg Research Institute of Phthisiopulmonology (St-PRIPP), the Central Research Tuberculosis Research Institute, Russian Academy of Medical Sciences, (CTRI) the Federal Penitentiary Service (FSIN), and the Federal Service for External Quality Assessment of Clinical Laboratory Tests (FSEQA), in collaboration with the WHO Country Office in the Russian Federation (WHO).

This review continues a series of publications issued in 2007–2009 [A1, A2, and A3]. Compared to the previous editions, in addition to analysis of 2009 statistical reports, this review contains separate sections with analysis of data on extra-pulmonary TB, TB in children and adolescents. In addition, the review provides a broader scope of information on financing of TB control activities and includes updated sections on the methods of estimation of TB indicators.

The review also presents an analysis of TB indicators based on national and sectoral statistics data, along with the use of these indicators in the assessment of the epidemiological situation of TB and TB control activities in the Russian Federation in 2006–2009. The review also examines trends in the indicators in the last 10–15 years.

Data analysis has been performed basing on the internationally accepted definitions and approaches used in processing medical and epidemiological statistical information. The review considers the WHO-approved indicators for analysis of TB epidemiological indicators and TB control effectiveness, and compares the situation of TB in the Russian Federation, other countries of the world and in the WHO European Region.

Special attention has been attributed in this review to the methodological issues related to the use and interpretation of various TB indicators used in the Russian Federation and other countries for assessment of TB control effectiveness.

In the last five years, there have been significant changed in TB control practices in Russia. RF MoH&SD Orders Nos. 109 and 50 [25, 26] were issued, which provided a solid basis for improvements in phthisiatric services and for enhancement of the regulatory framework for TB control activities in Russia. International Bank for Reconstruction and Development (IBRD) loan project "TB and AIDS Prevention, Diagnostics and Treatment" has been implemented and the Global Fund project "Promoting a Strategic Response to TB Treatment and Care for Vulnerable Populations in the Russian Federation" is now coming to the final stage of implementation.

Owing to these projects, almost all bacteriological tuberculosis laboratories and one third of CDLs participating in TB diagnosis and treatment have been upgraded. Qualification and practical skills of health workers of TB control services and primary health care (PHC) facilities were improved at training courses organized in all RF regions. In these years, the system of supervision of RF regions by the federal TB research institutes was resumed, and activities against MDR-TB and other activities took place (drugs procurement and infection control improvements, hospitals renovation, staff training), etc.

Since all major activities for TB service modernization were finalized by the end of 2008, so the main outcomes from these activities can be expected in 2009–2011.

Nevertheless, the data analysis presented in this review shows that in past two-three years certain positive results of all these efforts may be observed. For example, TB notification rates have stabilized and started to decrease both at the national level and in practically all major regions in the Russian Federation due to continuing improvements in TB case detection (including a more active use of fluorography and improvements in the detection of MbT+ patients in many regions), while TB relapses rates and the proportion of chronic TB patients have decreased and TB mortality rates have been reduced over past four years running.

The review demonstrates that stabilization of the epidemiological situation to a certain degree is due to increased efficiency of TB control service in penitentiary system (FSIN).

It should be noted however that these positive results were observed in a stable but still aggravated epidemiological situation of TB in the country. In general, the basic TB indicators still demonstrate a high TB burden. Moreover, there is a vivid variation of indicators between RF regions, which is due to unfavorable situations for TB in these regions and federal okrugs. The most affected regions with respect to the epidemiological situation for TB are the Siberian and Far-Eastern federal okrugs. Some basic indicators (such as effectiveness of TB treatment and confirmation of diagnoses with laboratory tests) are still low, whereas the current spread of MDR-TB, TB-HIV co-infected cases and the number of patients with chronic TB are high. The presence of some disconcerting prognostic indicators, such as changes for the worse in demographic and social characteristics of TB patients, may be due to unfavorable socio-economic situations in these regions, which were aggravated by the 2008 world economic crisis.

The quality and completeness of TB-related statistical data improved in a noticeable way over the past two years, which significantly increased the capacity of data analysis of TB notification rates and effectiveness of treatment. In particular, this review uses more widely information derived from the reporting forms approved by MoH&SD Order No. 50 [26]. This became possible as a result of intensive work of the Federal specialized Research Institutes and WHO RF in the supervision of developing the reporting forms and verification of data received from these forms.

Overall, the data presented in this review has confirmed the following:

- The information available in the statistical reporting forms on TB in the Russian Federation is sufficient for a general analysis of TB situation in the country.
- The indicators used to assess TB epidemiological trends are adequate to meet the analysis' objectives and, for the most part, are compatible with the internationally accepted indicators.
- Significant dispersion of indicator rates exists across the territories of the Russian Federation, which requires a differential data analysis to be performed by territory, by groups of territories and by region.
- To conduct data analysis based on advanced principles of epidemiological analysis and biostatistics, it is necessary to use data from the State System of TB Monitoring (SSTM) that is currently being developed and is to be based on territorial case-based computerized TB surveillance registers.

This publication is intended for public health authorities of the subjects of the Russian Federation, heads of medical and prophylactic institutions and PHC facilities, TB specialists and epidemiologists, and public health managers.

In preparing this review, information was used from state and sectoral statistical reporting forms, demographic and socio-economic data from the Federal Service of State Statistics of Russia (FSSS), Global Tuberculosis Control reports of WHO/IUATLD[1], SSTM data, and data from some scientific publications.

The Annex contains tables showing the main epidemiological indicators of TB control activities in Russia in 2005–2009.

[1] The Union.

Improvement of TB patient service management in the Russian Federation in the framework of the National Priority Project "Health Care"

Krivonos O.V., Mikhailova L.A., Alexeyeva G.S., Kormacheva E.A.

The problem of TB and TB control is a most expedient priority in the Russian Federation.

For many years, TB control in Russian has been implemented basing on scientifically substantiated methods with due account of national and international experience in the field and gaining support at all the levels of executive power including the Government of the Russian Federation and authorities in the subjects of the Russian Federation and municipalities.

State regulation of TB control activities in the country is performed basing on a set of Federal laws and RF Government ordinances – Federal Law No. 77-ФЗ of 18.06.2001 "On the Prevention of Tuberculosis Spread in the Russian Federation"; RF Government's Ordinance No. 892 of 25.12.2001; MoH&SD executive orders No. 109 of 21.03.2003 "On the Improvement of TB Control Activities in the Russian Federation" [25], and No. 50 of 13.02.2004 "On the Introduction of Registration and Reporting Documentation for TB Monitoring in the Russian Federation" [26], and others.

Presently, additional efforts are being made to improve the current legislation related to TB control issues to make it in compliance with the new demands and the changing requirements for TB control activities. With this aim in view, a system of monthly monitoring of TB control activities in the Russian Federation was introduced in 2010.

A new methodology of TB patient management and care has been implemented and standards of TB services are being developed. Consequently, a comprehensive, united and mandatory system of TB control activities is now being implemented to provide universally accessible high quality TB services.

A decrease in TB incidence rate has been registered in the country in 2009. TB mortality rates were also permanently decreasing over the last four years, which proves the effectiveness of the TB control policies aimed at the improvement of TB control and TB patient management in the country.

To reinforce the current measures for stabilization of the epidemiological situation of TB in the country, a new strategic approach within the National Priority Project in Public Health was started in 2009 following the RF Government Decision. The new strategy emphasizes the following major components:

1. Adequate financing: in the Russian Federation, the total volume of investments allocated for TB control activities increased 1,5-fold (compared with 2009) and amounted to 3,5 billion rubles[2]; in the draft Federal budget till 2013, this funding will be preserved at the same level with yearly indexing.
2. Priority is given to preventive medicine in public health for early detection, treatment and prevention of TB spread.
3. Development of new medical technologies in anti-tuberculosis therapy and introduction of surgical methods of TB treatment.
4. Provision of anti-tuberculosis facilities with modern diagnostic and treatment equipments including devices for infection control and prevention of disease spread.
5. Training of qualified health personnel capable of early detection of TB on the primary health care level, as well as highly qualified staff for specialized TB control services.
6. Improvement of effectiveness of TB patient treatment based on the introduction of TB treatment and care standards.
7. Involvement of PHC staff in the early TB detection activities and enhancement of out-patient treatment of people with TB under direct observation of medical workers.
8. Development of hospital-replacement technologies (day care facilities, home care, nursing homes, etc.).
9. Improvement of bacteriological tests quality based on the introduction of the national system of external quality assurance of laboratory tests.
10. Operational research performed in the leading specialized research institutions for the development of new methods of diagnosis and treatment of the disease and for enhancement of the existing methods.

Much attention is being paid to the timely and complete detection of TB cases among population. According to WHO data, 79% of the estimated number of TB cases with bacillary excretion were detected in Russia in recent years, which correspond to the Millennium Development Goals targets. In addition, much effort has been undertaken over recent years for detection of multi-drug resistant TB cases. If, according to WHO estimates, not more than 3% of MDR-TB cases of the total number of cases in the population are nowadays detected worldwide, the respective indicator in the Russian Federation is much higher (over 28%).

[2] About 120 mln USD – translation editor's note.

All changes in the Government's policies pertaining to TB control, calculations of funds required for TB control activities, as well as decision-making at all levels are based on the federal health statistics data.

The sustainable national system of TB monitoring, including drug-resistant cases, ensures collecting comprehensive and reliable data received through the total statistical observation.

The current system of assessment of TB patient treatment effectiveness is based on cohort analysis data, provides for the determination of treatment outcome in almost 100% of TB cases and is indicative of a high reliability of treatment effectiveness data, which is not common in all WHO European Region countries.

Following the RF Ministry of Health and Social Development Executive Order No. 118 of 16.02.2007 "On the Establishment of a Working Group for Making Amendments to the RF MoH Executive Orders No. 109 of 21.03.2003 "On the improvement of TB control activities in the Russian Federation" and No. 50 of 13.02.2004 "On the Introduction of Registration and Reporting Documentation for TB Monitoring in the Russian Federation" (version of 12.03.2009), the existing registration and reporting forms for TB monitoring have been improved basing on the cohort analysis principles. New registration and reporting forms for MDR-TB monitoring have also been introduced. The amended and new registration and reporting forms will contribute to a further strengthening of the national sanitary/epidemiological surveillance system for early detection and monitoring of TB cases and treatment outcomes control for all TB patient groups.

To improve the national TB monitoring system, the RF MoH&SD Executive Order No. 61 of 05.02.2010 "On the Monitoring of Activities Pertaining to the Improvement of TB Patient Treatment and Care" that strengthened the principle of a continuous control over the entire system of TB control activities in the Russian Federation. Basing on this Executive Order, a nation-wide system of first- and second-line drugs provision was introduced in 2010 in all the subjects of the Russian Federation.

Particular attention is also attached to the inter-medical services interaction in curbing TB and HIV-infection spread in the country. An effective system has been implemented to coordinate activities between TB control facilities, the Centres for Prevention and Control of AIDS and Communicable Diseases, the Federal Penitentiary Service of the Russian Federation (FSIN), and other institutions participating in TB control activities in the country. The newly developed system of cooperative efforts has contributed to the improvement of diagnosis and treatment of patients with TB/HIV co-infection, and to the accessibility of specific therapy for different TB patient groups.

The experience gained in the Russian Federation in the organization of anti-tuberculosis and cooperative activities is now being more widely used in other WHO European Region countries. Russian experts are invited for participation in international meetings and conferences of all levels to present their views on different aspects of TB control.

To enhance coordination of non-governmental and international organizations participation in the current activities performed by the federal TB control agencies, an effective inter-departmental coordination body was established in August 1999, represented by the High Level Working Group for TB (HLWG), which includes thematic working groups in major areas of TB control. HLWG was established at the initiative of the Russian Federation Ministry of Health and the World Health Organization to create an effective mechanism for a dialogue between Russian and international partners on issues related to TB control and for developing recommendations for the improvement of strategies and tactics in combating TB in the Russian Federation. Beside MoH&SD and WHO, HLWG includes representatives from the RF Ministry of Justice, the Federal Service on Surveillance of Health Care Services (*Roszdravnadzor),* the Federal Service on Surveillance for Consumer Rights Protection and Human Well-being (*Rospotrebnadzor),* Russian Academy of Medical Sciences, and other organizations participating in the implementation of TB control programmes in the Russian Federation. The thematic groups include Russian and international specialists and external experts, who present recommendations to MoH&SD and other federal and regional authorities. HLWG also coordinates efforts of governmental and non-governmental organizations in the country and contributes to the effective dialogue with the World Health Organization.

The problem of control and prevention of TB spread is of utmost importance all over the world. The contributors to this review of analytical materials express their belief that this source of information will be used as a basis for valuable and effective interpretation of data received through monitoring activities, and – in the long run – to increasing effectiveness of TB control activities elsewhere.

Tuberculosis in the Russian Federation: Major facts and figures

This section contains major indicators of the epidemiological situation of TB in the Russian Federation in 2008–2009, along with the dynamics of these indicators over the last 10 years.

Each indicator has a reference to the corresponding section in the Review, which contains: 1) detailed information on the procedures of data collection and analysis for the indicator; 2) exhaustive analysis of the indicator indices and trends over recent years both on the national level and by federal region and subject of the Russian Federation; 3) comparison of approaches used in Russia and other countries for calculation of the indicator and comparison of the country's indicator values with corresponding data in other countries.

Section	Indicator, short description		**2008**	**2009**
TB NOTIFICATION RATE				
2	**TB notification rate**		85.1 per 100K	82.6 per 100K
	Total number of new TB cases		120,835	117,227
	After increase to 90.7 per 100K (2000), when the number of new TB cases reached 130,657 with stabilization on the level of 83–85 cases per 100K, TB notification rate decreased in 2009 to the lowest level in the last 10 years (82.6), which is lower the 1999 level (85.2). The notification rate decrease was registered in all the federal regions (FR), with the exception of the FEFR, where the indicator was still growing since 2006. TB notification rate in the FR located in the East of the country is almost 2.5 times higher than that in the Western federal regions: 60–63 per 100K in CFR and NWFR compared with 130–148 in SFR and FEFR, respectively			
2.1	**TB notification rate among permanent resident population**[3]		69.0 per 100K	66.8 per 100K
	Total number of new TB cases among permanent resident population		103,834	100,938
	After a steady growth (1999 – 60.0; 2002 – 66.9, or over 120,000 new TB cases), there was a 3.2% decrease in 2009 (to 66.8 per 100K)			
2.9	**TB incidence according to WHO estimate** (new TB cases and ss+ TB relapses cases)		110.0 per 100K	
	WHO estimate of number of TB cases (new TB cases and ss+ TB relapses)		150,000	
	Case detection rates (proportion of notified TB cases in relation to estimated new TB cases	85% of the estimated number of new TB cases 73% of the estimated number of new sputum smear positive (ss+) TB cases (microscopy confirmed TB cases)		
	Basing on the WHO estimates of new TB cases, Russia is on the list of 22 countries with high burden of TB and accounts for a 2% share of new TB patients in these countries. According to current estimates, Russia accounts for 1.6% of all new TB cases worldwide and 35% of new cases in the WHO European Region. At the same time, RF TB control services register 2.2% of all new TB cases notified worldwide and 38.1% of all new TB cases notified in the WHO European Region			
2.5	**Laboratory confirmation of TB cases**	SS+	33.0%	33.6%
		Cu+	40.9%	41.8%
	The recommended levels of laboratory confirmed cases: 50% for microscopy confirmed (ss+) and 70–75% of culture confirmed (Cu+) cases have not yet been attained			

[3] According to MoH&SD reports, data from the penitentiary system (MoJ TB reports) is not included – note of the translation editor.

11	**External quality assurance (EQA) of laboratory tests** **Microscopy by Ziehl–Neelsen method** Proportion of federal regions whose laboratories showed satisfactory EQA results (2009)		
	Susceptibility – for regional anti-tuberculosis facilities	86–92%	80–93%
	for public health facilities (PHC)	40–47%	46–50%
	Specificity – for regional anti-tuberculosis facilities	90%	91%
	for public health facilities (PHC)	52%	53%
	Culture examination Proportion of regional anti-tuberculosis facilities whose laboratories showed satisfactory EQA results		
	Susceptibility	76–87%	80–86%
	Specificity	63%	55%
5	**TB notification rate in children (0–14 years)**	15.3 per 100K	14.7 per 100K
	With relatively stable indicators in 2002–2007 (16.2–16.7), there was a 10% decrease in TB notification rates among children in 2008–2009		
6	**Extra-pulmonary (extra-respiratory) TB notification rate**	2,7 per 100K	2,6 per 100K
	A slow year-by-year decrease of notification rates from 10.2% in 1992 to 3.2% among new TB cases detected in 2009		
2.6	**TB notification rates among people in contact with MbT+ TB patients (all age groups)**	774.1 Per 100,000 contacts	777.5 Per 100,000 contacts
2.7	**Population coverage with active detection of TB cases**		
	Population coverage with all forms of active detection	58.3%	61.3%
	Population coverage with screening by chest radiography[4]	50.3%	52.7%

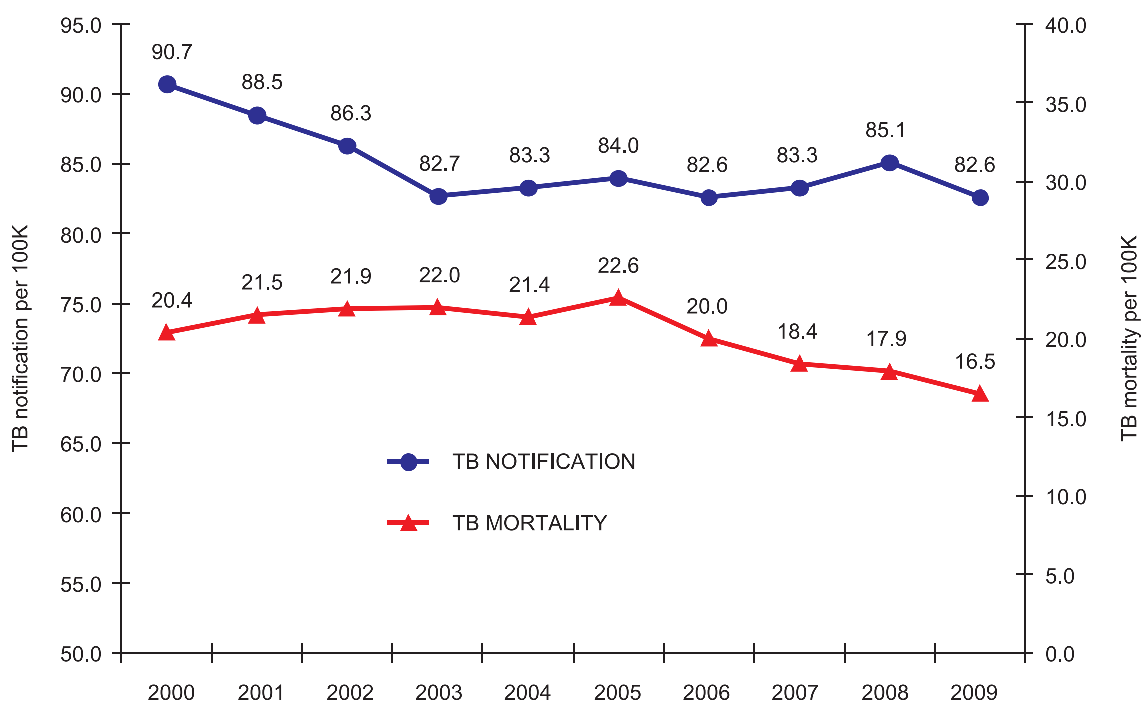


Fig. 1. TB notification and TB mortality rates in the Russian Federation

[4] Mass miniature radiography, or a photofluorography technique for mass screening for tuberculosis using a miniature photograph of the screen of a x-ray fluoroscopy of the thorax – note of the translation editor.

Section	Indicator, short description	**2008**	**2009**
TB RELAPSES			
2.8	**TB relapse rate in permanent resident population**	9.2 per 100K	9.2 per 100K
	Number of TB relapse cases in permanent resident population	13, 046	13,059
	Relapses constitute 12% of all notified TB cases. In 2008–2009, there was a slight growth of the number of relapse TB cases compared with corresponding indicators for 2006–2007 (9.2–9.0 per 100K), mainly due to “late relapses” (former TB patients taken off the follow-up register)		
TB MORTALITY RATE			
3	**TB mortality**	17.9 per 100K	16.5 per 100K
	Number of people who died of TB	25,388	23,363
	Over the last 4 years, this indicator decreased by almost 1/3 (by 27% compared with the 2005 rate at 22.6 cases per 100K). According to WHO assessment, RF has a well-developed system of vital statistics and registration that covers 99% of deaths		
	Relation of TB patients who died within one year after TB case registration to the number of new TB cases	4.1%	3.8%
	After the 5.1% rate registered in 2005, this indicator has been permanently decreasing		
	Proportion of TB cases postmortem diagnosed among new TB cases	1.8%	1.8%
	After the 2.8% rate registered in 2005, this indicator has been permanently decreasing until 2008		
TB PREVALENCE RATE			
4	**TB prevalence**	190.5 per 100K	185.1 per 100K
	Number of registered TB patients	270,544	262,718
	Prevalence of MbT+ cases (confirmed by laboratory methods)	79.5 per 100K	77.2 per 100K
	The indicators of overall TB prevalence and MbT+ TB prevalence have been decreasing in the past 10 years, the latter has decreased by 10% since 2005 (from 85.6 per 100K)		

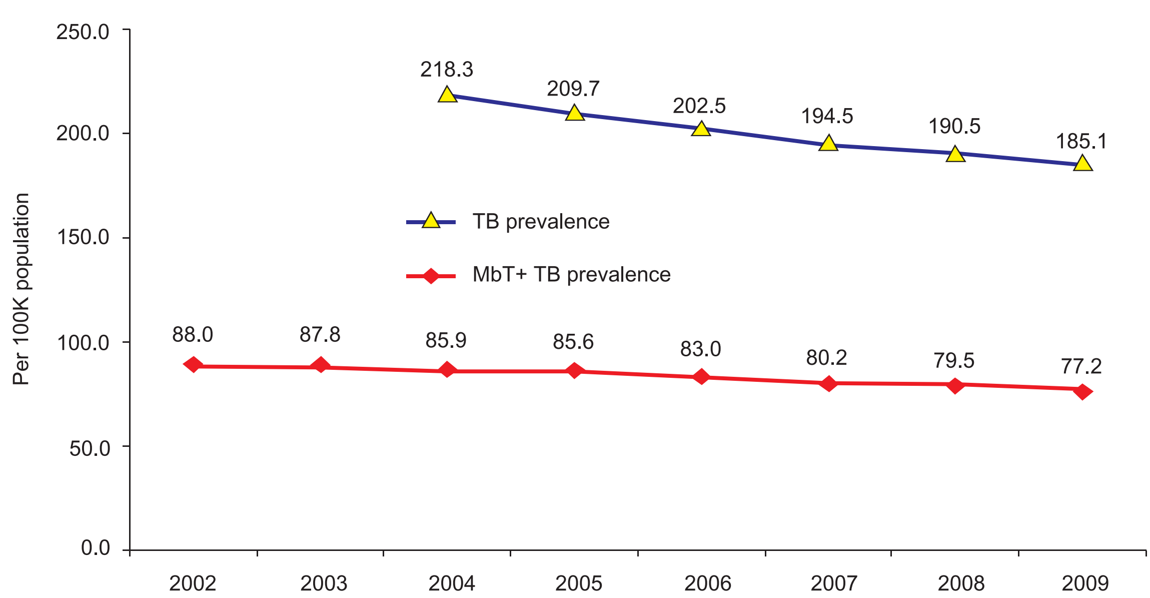


Fig. 2. TB prevalence indicators

Section	Indicator, short description	**2008**	**2009**
MULTI-DRUG RESISTANT TB (MDR-TB)			
10	**MDR-TB among new TB cases,** including FSIN data[5]	14.0%	15.8%
	Number of MDR-TB cases registered before treatment among new TB cases, including FSIN	5,274	5,816
	MDR-TB cases among new TB cases, permanent resident population only	13.6%	15.4%
	Number of MDR-TB cases registered before treatment among new TB cases, permanent resident population only	4,752	5,260
	Number of MDR-TB patients registered by the end of the year, permanent resident population only Including FSIN data	26,448 33,249	29,031 36,848
	MDR-TB prevalence in permanent resident population	18.6 per 100K	20.5 per 100K
	The Russian Federation has a relatively high MDR-TB rate with a trend to its annual growth due to both increased number of such cases and improved diagnosis and registration. Russia is on the list of 27 countries with a priority for improvement of diagnosis and management of MDR-TB cases		
11	**External quality assurance of laboratory investigations:** Proportion of laboratories at regional TB dispensaries with at least 95% of EQA matching results of drug susceptibility tests for rifampicin and isoniazid	42.2%	67.3%
10.4	**WHO estimated number of MDR-TB patients** among new TB cases among all TB cases	26,000 38,000	
	Registration of MDR-TB cases (surveillance system performance quality): according to WHO estimates, 20% of all MDR-TB cases among new TB cases are registered in the Russian Federation compared with the average 3% of such cases registered worldwide		
	The Russian Federation in the WHO Global Reports on MDR-TB (according to the accuracy and representativeness criteria)	2008 4 subjects of the RF	2009 20 subjects of the RF and the whole country

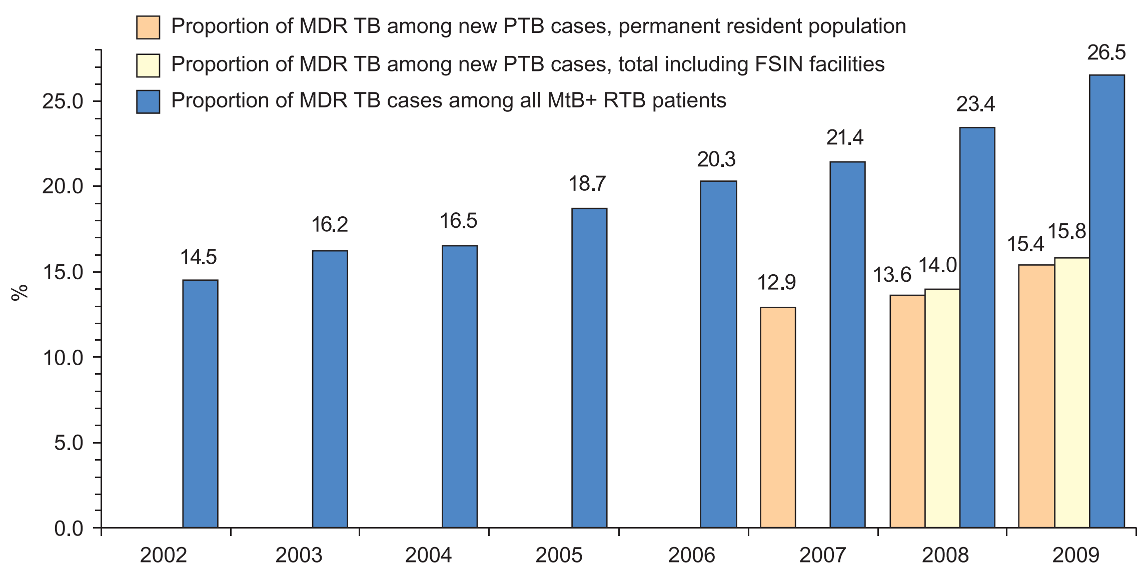


Fig. 3. Multi-drug resistant TB in the Russian Federation

[5] Reports of Federal Service of Punishment Execution ("FSIN"), MoJ, from penitentiary system – note of translation editor.

Section	Indicator, short description	**2008**	**2009**
TB IN PENITANTIARY SYSTEM (Facilities of Federal Service of Punishment Execution, "FSIN")			
8	**TB notification rate in FSIN facilities**	1,308 per 100K	1,306 per 100K
	Number of new TB cases	14,853	14,236
	TB notification rate decreased 3.3 times over the last 10 years, or by 70% (since 1999–2000 when 4,347 and 3,137 patients per 100K were registered, respectively). The annual number of new TB cases reached ~ 25,000 (24,500 in 2001). TB incidence in pre-trial detention centres is by ~ 25% higher than that in FSIN correctional facilities (prisons) (2009 – 1,600 and 1,200 cases, respectively)		
	Proportion of TB patients in FSIN facilities among the total number of new TB cases countrywide	12%	12%
	Proportion of new TB cases notified in FSIN facilities, among the total new TB cases in the country decreased two-fold – from 25% to 12–13%		
	TB mortality rate in FSIN facilities	80.1 per 100K	85.0 per 100K
	Over the past decade, TB mortality rates declined by 2.8 times – from 238 and 181 per 100K in 1999 and 2000, respectively, to 80–85 at present. The higher indicator in 2009 was due to the increased incidence of MDR-TB and TB/HIV cases		
	Number of TB patients registered in FSIN facilities at the end of the year	42,346	40,765
	The number of TB patients in FSIN facilities is steadily decreasing year-by-year (from almost 100,000 in 2001 to 41,000 in 2009)		
7 & 8	**Effectiveness of chemotherapy in new ss+ TB cases in FSIN system** (2007 and 2008 cohorts)	2007 – treatment success – 55,7% failure – 23.1% default – 4.1% died of TB – 2.9% transferred out – 14.2%	2008 – treatment success – 54,2% failure – 24.5% default – 3.5% died of TB – 2.5% transferred out – 15.3%
8	**Proportion of HIV-infected TB patients among all TB patients**	9.2%	11.9%
	Number of TB-HIV co-infected patients in FSIN facilities	3,912	4,870
	Numbers of people with HIV infection and TB/HIV co-infection is still growing in FSIN facilities		
	MDR-TB among new TB cases in FSIN facilities	18.6%	20.1%

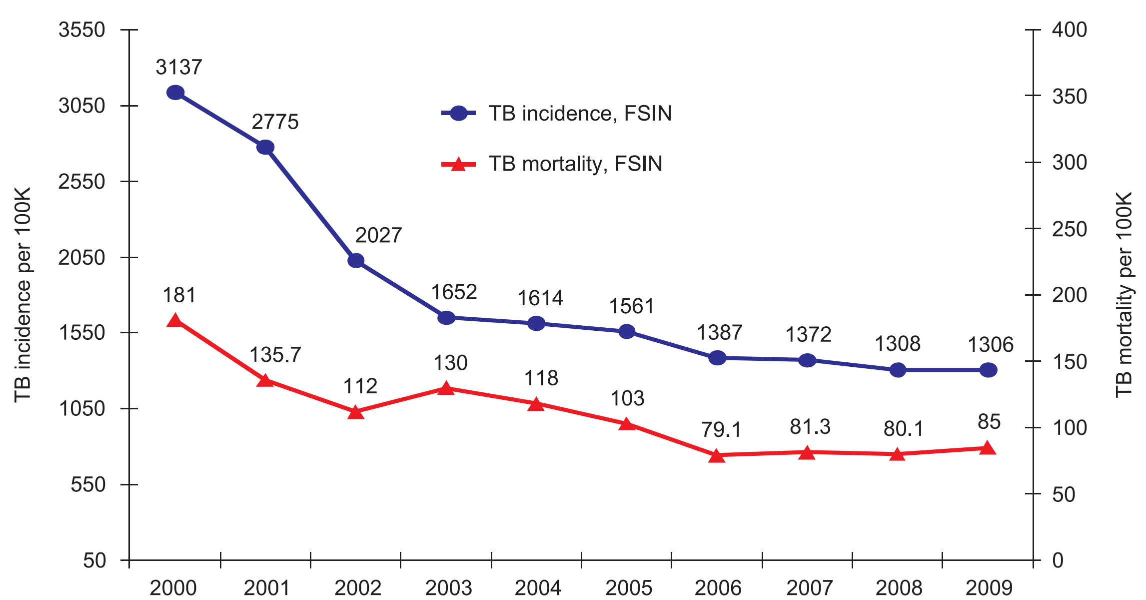


Fig. 4. TB in penitentiary system facilities (FSIN, Russia)

Section	Indicator, short description	**2008**	**2009**
TB-HIV CO-INFECTION			
9 (see also Section 8)	**Number of new TB-HIV co-infected cases registered in the reporting year**	7,387	9,253
	Proportion of TB-HIV co-infected cases among TB cases, permanent residents only	4.9%	6.2%
	Number of TB-HIV co-infected cases, permanent residents only	13,213	16,405
	Proportion of TB-HIV co-infectied cases among TB cases, including FSIN facilities	5.4%	6.8%
	Total number of TB-HIV co-infected cases, including FSIN facilities	16,813	20,775
	Annual growth of both number of cases and proportions of TB/HIV co-infection have place due to the overall increase of TB-HIV co-infection spread and improved registration of such cases		
PHTHISIATRIC SERVICES NETWORK. RESOURCES			
12.1	**In-patient and sanatoria treatment and care:** 2009: 5 research institutes (in Moscow, St.-Petersburg, Yekaterinburg, and Novosibirsk), 2 research and practical centres (in Moscow and Yakutsk), 341 TB dispensaries, 78 TB hospitals, 44 sanatoria for adult patients, 123 sanatoria for children with TB, and 2,430 TB rooms		
12.3	**Workforce**	2008	2009
	Number of phthisiatrist (TB specialists)	8517	8302
	Number of phthiatrists per 100,000 population	5.9 per 100K population	
12.4	**Financing**	2008	2010
	Funds allocated for TB control activities From budgets of RF regions and municipalities – 27.1 bln rubles (88.4%); from international sources – 0.25 bln rubles (0.8%)	32.3 billion rubles (US$ 1.08 billion)	34 billion rubles (US$ 1.13 billion)

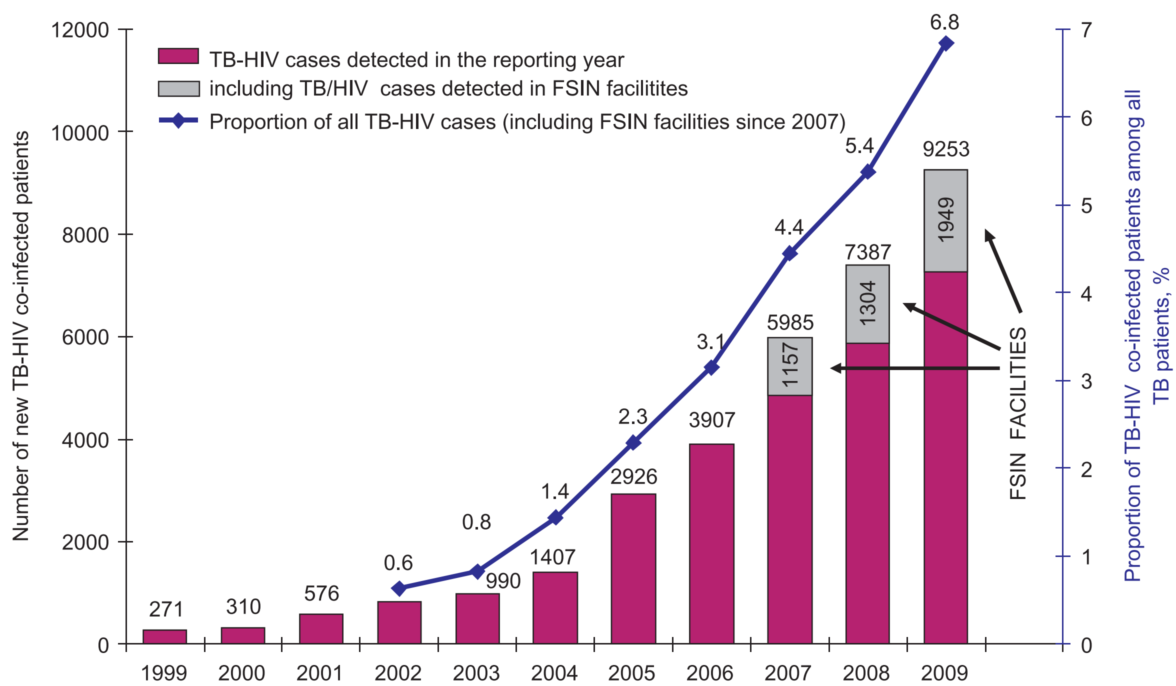
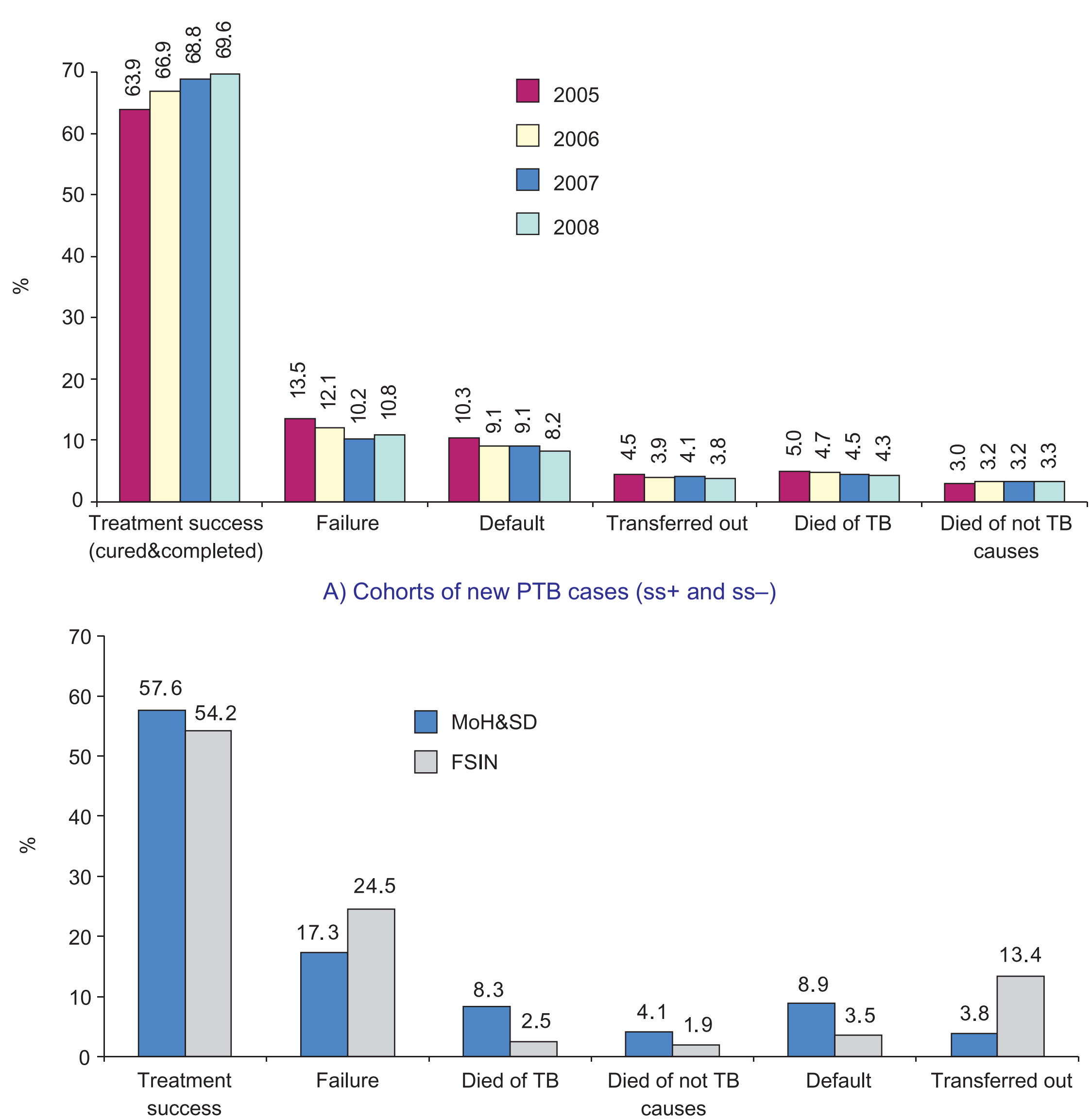


Fig. 5. TB-HIV co-infection in the Russian Federation

Section	Indicator, short description		
TREATMENT OF TUBERCULOSIS			
7	**Effectiveness of chemotherapy in new TB cases** (MoH&SD report)	2007 cohort: treatment success – 68.8% Failure – 10.2% Default – 9.1% Died of TB – 4.5% Transferred out – 7.4%	2008 cohort: treatment success – 69.6% Failure – 10.8% Default – 8.2% Died of TB – 4.3% Transferred out – 7.1%
	There was a statistically significant improved effectiveness of chemotherapy and reduced failures of chemotherapy and defaults as compared with the 2005 cohort when the indicators of effective treatment were 63.9%, defaults – 10.3%, and deaths in 5% of cases		
	Effectiveness of treatment in new ss+ TB cases (MoH&SD report)	2007 cohort: treatment success – 57.8% Failure – 15.5% Default – 10.0% Died of TB – 8.8% Transferred out – 7.9%	2008 cohort: treatment success – 57.6% Failure – 17.3% Default – 8.9% Died of TB – 8.3% Transferred out – 7.9%
	High levels of treatment failures were caused by high proportions of MDR-TB cases. This was accompanied with reduced levels of defaults and deaths of TB (2005 – effective treatment – 57.2%; defaults – 11.0%, deaths of TB – 9.9%)		



A) Cohorts of new PTB cases (ss+ and ss–)

B) Cohort of new ss+ PTB cases, 2008

Fig. 6. Effectiveness of treatment of new pulmonary TB (PTB) cases, Russian Federation

1. TB surveillance and the statistical reporting system in the Russian Federation

Son I.M., Skachkova E.I.

TB surveillance is a multi-level and organizationally complicated system, which is defined by the specificity of the disease onset and development. The system of statistical data formation and reporting must be developed accordingly.

A number of factors, reflected to varying degrees in the commonly used indicators, have an impact on TB spread processes [3, 23].

The factors influencing the spread of the disease include:

– regional specificity (demographic, social and economic characteristics, intensity of migration, etc.);
– political and macroeconomic processes (crises, conflicts);
– the influence of TB spread in the penitentiary system on TB notification rate;
– the level of development and peculiarities of the TB control system (management of TB prevention activities, timely case detection and effective treatment of TB patients in both TB specialized and public health facilities).

Registered values of TB indicators are also influenced to a vast degree by other factors directly not related to the effectiveness of TB prevention, case detection and treatment measures. Such factors include:

– the system of statistical surveillance (quality of filling the recording and reporting forms, completeness of data collection, and effective data flow management);
– qualifications of the staff who is responsible for data collection and processing, and the level of technical support (communications infrastructure, computers and software);
– the level of motivation of leaders and staff in the central and regional TB specialized institutions and authorities in receiving correct information.

Unfortunately, the limited space of this publication and the structure of available statistical data do not allow for a complete assessment of the impacts of these factors on the results received. Nevertheless, some of these factors will be examined during data analysis and interpretation.

The monitoring and evaluation of epidemiological rate changes and the indicators of TB activities effectiveness should be based not only upon information received from the federal statistical surveillance data, but also from results of special surveys. In this connection, it is important that the statistical reporting system ensures collecting reliable data at regional and federal levels by using up-to-date data processing techniques and provides a solid basis for taking appropriate administrative decisions.

Therefore, along with reviewing the traditional TB indicators, the current review considers ways to expand the use of the existing reporting forms and to calculate additional indicators.

Currently, the bulk of information used to assess the TB situation in the country is contained in 15 reporting forms.

The main TB reporting forms are as follows:

1. Federal statistics reporting forms:

– Form No. 33 “TB patients’ information” includes data on registered and followed-up TB patients in TB control facilities in the subjects of the Russian Federation from permanent residents of respective regions, along with data on the volumes of TB services provided for TB patients who temporarily live in the catchment areas of respective TB control facilities;
– Form No. 8 “Information on TB case notification” that includes all new and relapse TB cases registered in the subjects of the Russian Federation. The form includes information about cases registered in TB control facilities and in other sectors (including the Federal Service of Punishment Execution – FSIN), as well as about cases diagnosed postmortem and among foreigners, persons from other regions, and homeless people.
– Form No. 61 “HIV patients’ information” contains information about TB/HIV co-infection cases.
– Form No. 30 “Information on the performance of public health facilities” (numbers of phthisiatric departments/offices, patients examined for TB, health workers according to the staff schedule and actually occupied posts, tests performed, microscopes, etc.).
– Form No. 17 “Information on medical and pharmaceutical personnel” (number of phthisiatrists, their qualifications, certificates and areas of specialization).
– Form No. 14 “Information on in-patient facilities” (number of hospitalized, discharged, died patients, including data on the number of autopsies performed).
– Form No. 14DC “Information on day-care units at public health facilities” (number of hospital beds and patients treated).

– Form No. 47 “Information on public health facilities” (data on hospital beds for TB patients, occupation per hospital bed, number of dispensaries, their capacity and equipments, number of TB hospitals and data on their performance).
– Form No. 62 “Information on provision and financing of health services’ (data on funds allocated, major resources of funds and budget items). A new form introduced by the Federal State Statistics Service Executive Order No. 154 of 29 July, 2009 “On the Approval of Statistical Instruments for the RF Ministry of Health and Social Development Statistical Control in Public Health” is based on the data collected from all the regional TB control facilities irrespective of their jurisdiction (state or municipal/local).

These forms of State statistical control (SSC) are completed in the leading regional TB dispensaries (TBD) in the subjects of the Russian Federation and are submitted to the respective regional health authorities (health statistics offices and health information and analysis centres). Then these forms are submitted to the FHCOIRI Medical Statistics Department, which verifies and processes the forms and submits them to the MoH&SD and, finally, to the Federal Service of State Statistics (Rosstat).

2. Forms of sectoral statistical reports, introduced by MoH&SD Executive Order No. 50 of 13 February 2004 [26] are based on the data provided in [25]:
– Form No. 7-TB “Information on new and relapse TB cases”, which contains data on detection of TB patients and registration for treatment; and
– Form No. 8-TB “Information on chemotherapy outcomes in pulmonary TB patients”, which reflects results of chemotherapy TB treatment.

Information for these forms is collected and filled in by the organizational-methodological (TB management) divisions in the leading TBDs in the subjects of the Russian Federation, and thereafter it is submitted to the regional monitoring centres at specialized TB research institutes[6], where the reports quality is verified with support of the WHO coordination offices located at these institutes. At same time, the reporting forms are submitted to the FHCOIRI Centre for Monitoring TB Control in the Russian Federation (FCMTB) and to RIPP. The reports are verified and processed in FCMTB. Before 2008, The Monitoring Center at RIPP was responsible for data collection and analysis, but since 2008, this role was taken by FHCOIRI’s Federal Center for Monitoring TB Control in Russian Federation[7].

3. Sectoral TB forms of FSIN, Russia:
– Form No. 4-TB, annual, is filled in late January for TB patients registered and followed up at FSIN pre-trial detention centers (SIZO) and correctional facilities (convicts, defendants and persons on trial).
– Form No. 1-MED, a quarterly aggregated report on “Information on socially significant diseases in persons imprisoned in penitentiary system facilities and on selective indicators of health services”, which provides aggregated data from SIZO and correctional facilities on persons who is notified as a new case, registered as a patient or died of TB, HIV infection, TB-HIV, malaria and other socially significant diseases.

4. Demographic and socio-economic data, obtained from FSSS reports[8]:
– Form No. 1 (population in the subjects of the Russian Federation and nationwide for calculation of intensive indicators prior to 2006).
– Form No. 4 (population in the subjects of the Russian Federation and nationwide for calculation of intensive indicators for 2006–2009).
– Official WEB publications of FSSS [22].

The contents of the reporting forms must be periodically updated and adopted. Therefore, the Federal State Statistics Service Executive Order No. 12 of 28.01.2009 approved changes in reporting forms No. 8 and No. 33. Following these changes, the 0–2 year age group was deleted from Form. No. 8 and included in the 0–4 year age group. Changes were also made in the lines referring to the clinical structure of new TB cases, added lines on the number of people without permanent place of residence, and on the number of TB relapse cases with bacillary excretion.

Form No. 33 was substantially adopted in 2009. It was updated in conformity with the national and international requirements, particularly, in the sections referring to risk groups, TB patients with bacillary excretion, and

[6] In the subjects of the Russian Federation, the data is submitted to the following TB research institutes in accordance with the institutes’ areas of supervision: RIPP, CTRI, NTRI, St-PRIPP, and URIPP.

[7] The aggregated data presented in the 2007 Analytical Report were considered and approved by experts of the Thematic Working Group on Epidemiological Control (Russian Federation, WHO TB RF). In subsequent issues, the 2007 data was provided basing on the verified information contained in the FHCOIRI published sectoral reporting forms [20].

[8] It should be noted that prior to 2009, the intensive indicators, such as TB notification and mortality rates had been calculated based on the average population for the reporting year, and TB prevalence indicators – per population as of 1 January of the following year. Therefore, the intensive indicators for 2009 presented in this review should be regarded as preliminary, since they were calculated according to Form No.4 based on the population as of 01.01.2009. These indicators will be updated after receiving final data on the population in the subjects of the Russian Federation and in the country as a whole as of 01.01.2010.

effectiveness of chemotherapy. Data on TB patients with temporary residence in public health facility catchment area are now presented in a separate section; these measures improved completeness of information on the total number of TB patients in the country.

Besides, the review is based on the results of processed and analyzed data from SSTM databases, which includes information collected based on Rosstat approved TB recording forms.

2. TB notification rate in the Russian Federation

Belilovsky E.M., Borisov S.E., Skachkova E.I., Son I.M., Galkin V.B., Danilova I.D., Pashkevich D.D.

Along with TB mortality and TB prevalence rates, the TB case notification rate is a most important indicator characterizing the situation of TB in the country.

The notification rate has both epidemiological and "organizational" components [3], and reflects both the TB occurrence rate at the given territory and the capacity of the territorial TB control facilities to persuade people to come for medical examinations and to detect TB cases. The real capacity of TB control facilities is always insufficient to guarantee that all new TB cases will be detected. Therefore, the real values of TB incidence always differ to a certain extent from those registered by TB statistics.

Hereinafter we will use the term "TB notification rate" in this review"[9], a separate section in the end of this chapter will deal with the current methods used to estimate this indicator.

This chapter contains the following:

– epidemiological data on the TB notification rate in the Russian Federation as a whole, along with the TB notification rates in the territories of the Russian Federation (republics, oblasts, and geographical units – *okrugs*), and in individual population groups;

– analysis of the structure of new TB cases;

– review of the indicators referring to case-finding management (ways, channels and methods used for TB detection and confirmation of diagnosis);

– comparison of TB notification rates in the Russian Federation with respective data in the other former Soviet Union countries and in selected countries of the world;

– description of the methods used for the TB incidence rate estimation.

2.1. Trends in TB notification rates and the socio-occupational structure of new TB cases in the Russian Federation

Significant changes have been observed in TB notification rate in Russia over the past 20–25 years [3] as seen in figure 2.1. A gradual decrease in the rate in the 1970–80's, which reached a low 34.0 rate[10], was replaced by a significant increase in 1991–2000, rising to 90.7 (an increase by 2.7 times) with stabilization of the rate in the first decade between 82 to 85 cases per 100,000 population (82.6 cases per 100K in 2009).

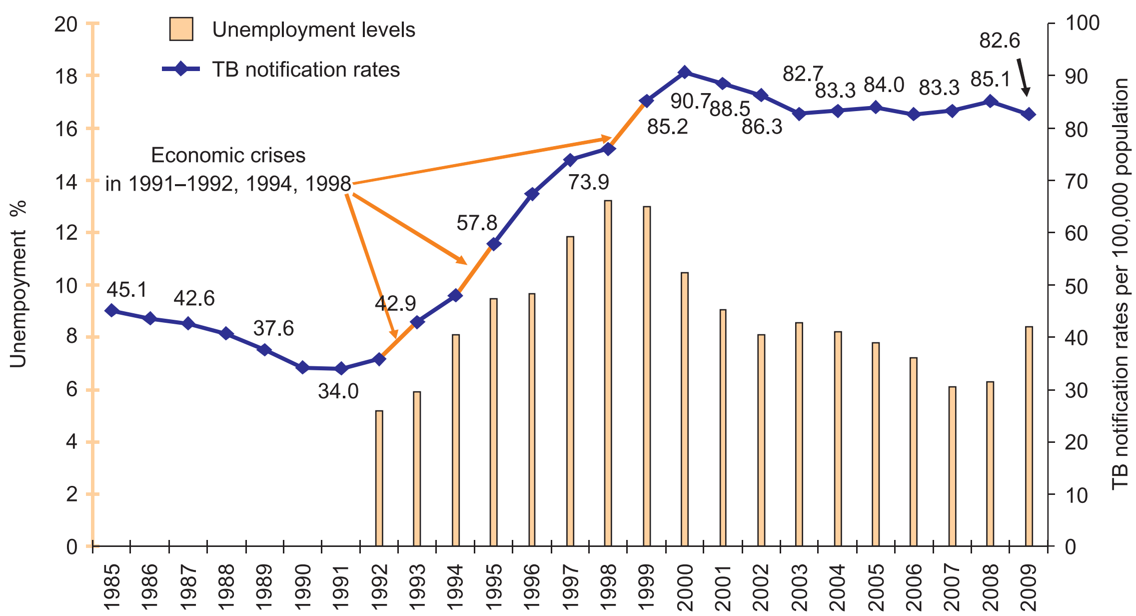


Fig. 2.1. TB notification rates and unemployment levels in the Russian Federation, 1985–2009, all sectors (Source: Form No. 8 and [29]; population: Forms No. 1 and No. 4)

[9] Russian language term "registered TB incidence" corresponds to the international English language terms "TB notification rate", as opposed to the English terms "TB incidence rate" or "TB morbidity", which reflect the real level of incidence, which can be estimated by special methods only (translator's note).

[10] Hereinafter, notification and mortality rates are calculated per 100,000 (100K) of the annual average population of the country, region, or among the reviewed population group.

Decreased TB notification rates in the Soviet Union in the years prior to *Perestroika* may present a vivid illustration demonstrating a relative stability in society and systematic efforts in combating TB spread including administrative measures. In those years, the government provided significant financial resources for TB control activities to ensure effective work of phthisiatric services in TB case registration and following-up of TB patients. The high quality of TB case-finding in permanent populations laid a solid basis for a relatively low level of hidden incidence and undetected cases. According to estimates made on the registration and reporting forms used at that time [36, 42], about 12–15%[11] of TB cases remained undetected in those years.

It should be noted that the definition of hidden TB incidence and new cases undetected within a certain period includes three patient subgroups [42, 53]:

1. people with TB who were not diagnosed by health services and recovered spontaneously, died or moved to another region;
2. people with TB who will be diagnosed in the following reporting period (e.g. next year) and were undetected sources of TB infection in the reporting year[12], and, finally,
3. people presenting new TB cases, who were erroneously registered as cases transferred-in from another region or as registered and followed-up in another TB facility (without completing Form 089/y-tub for the TB patient as a new TB case).

The accelerated pace in notification rates in 1988–1990 may be related to the socio-economic crisis in late 80's and early 90's. The crisis also entailed problems with reliability and completeness of case registration and with timely submitting of new TB case notifications for data entry into reporting documents in the regions.

The dynamics of notification rates after 1991 clearly reflects changes in the socio-economic situation in the country. Proven increases in TB notification rates were registered after the economic crises of 1991, 1994[13] и 1998 (increased by 19.8, 20.4 и 12.1% respectively) [42]. For these years, the State System of TB Monitorig (SSTM) individual patient data shows a significant growth in the percentage of unemployed among the new TB cases [2], mainly after the years of crisis. Today this percentage is more than 50% in most subjects of the Russian Federation, while the official unemployment rate in the country by the end of 2009 was 8.4%[14] ([22], see Fig. 2.2). This proves the well-known thesis that TB is a socially significant disease [2, 23, 34, 39, 50].

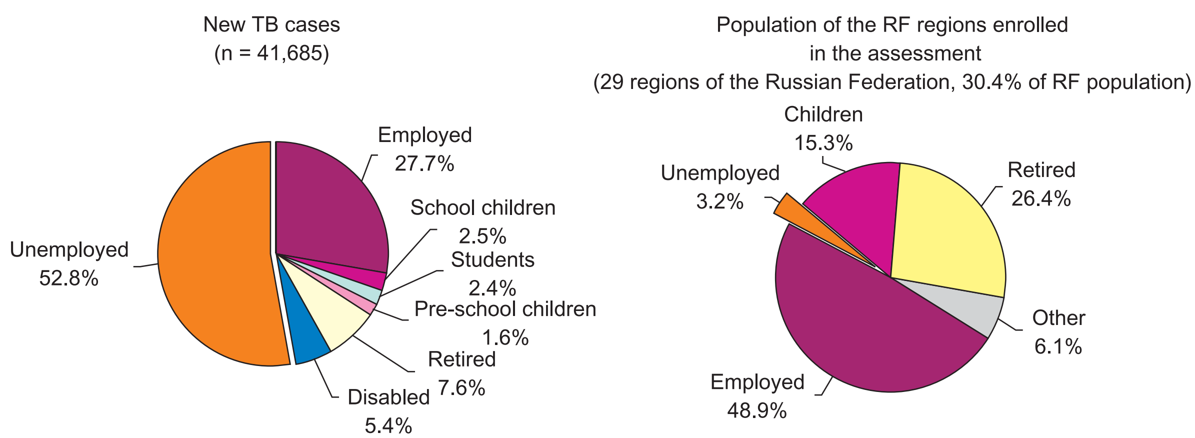


Fig. 2.2. Socio-economic status of new TB patients and the total population, 2007, 29 regions of the Russian Federation [29, 34, 39]

According to SSTM data [23, 34, 39], while the nationwide TB notification rate was 83.3 per 100,000 population in 2007, the notification rate among the unemployed amounted to 1000–1200 per 100,000 unemployed individuals, depending on calculation method; this level went up by almost 20% in three years (2004–2006). At

[11] Calculation is based on the number of postmortem diagnosed TB cases, cases of spontaneously recovered TB patients and on the level of registered new cases with severe late-detected TB.

[12] This component of hidden incidence was compensated by the number of registered patients who became ill with TB before the reporting period.

[13] The so-called "Black Tuesday" of 11 October, 1994, is referred to in this case, after which in 1995, according to official data, population incomes fell by 25–30% and the share of population living below poverty line increased proportionally (e.g., see "Report on Standards of Living: Definitions, Indicators, and Situation in Russia' issued in 1997 by the Centre of Microeconomic Analysis – at http://www.forecast.ru/_archive/projects/urg/urg.htm).

[14] Based on information received from sampling occupation surveys in the regions. Persons are considered unemployed if they are of able-bodied age and do not have a job (gainful employment), are searching for a job, and are ready to start working at the moment of evaluation [14–16].

the same time, the notification rate among employed populations was approximately only 45 cases[15], and 40 cases among disabled persons per 100,000 of respective population groups.

The available data on the social status of TB patients proves the need for further development of social support programs for TB patients in Russia [55]. The active participants of the social support programs implementation are MoH&SD, WHO TB RF, the Russian Red Cross and the International Federation of Red Cross and Red Crescent Societies.

In 2003–2007, the major epidemiological indicators for TB were relatively stable in Russia. This applied, first of all, to the TB notification rates [42]. This indicator varied between 82 and 84 cases per 100,000 population. Annual changes for these years were statistically non-significant and compatible with the value of 95% confidence interval, which is about 0.5 per 100,000 population[16] (see Fig. 2.3). Although in 2008 a relatively small but statistically significant growth to 85.1 cases per 100,000 population was registered, but in 2009 a marked decrease of TB notification rates to 82.6 per 100,000 population took place, which actually returned the notification rate to the level before the 1998 crisis.

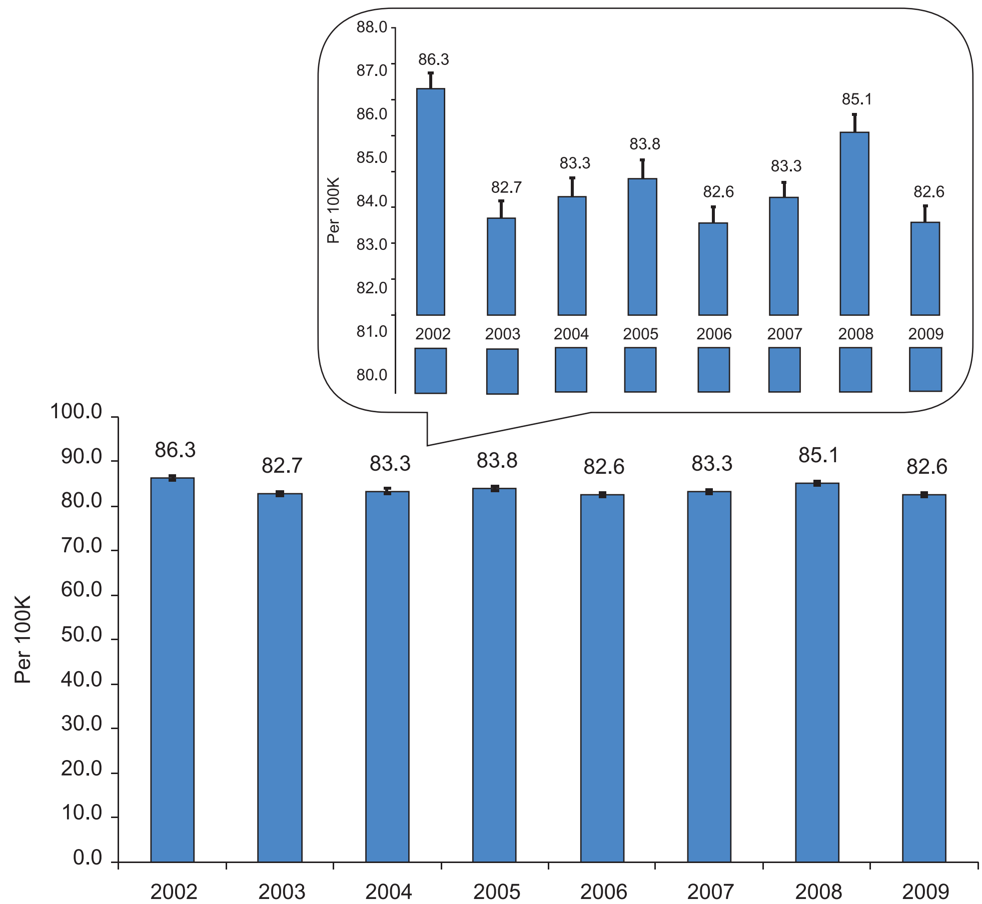


Fig. 2.3. TB notification rates in 2002–2009 in the Russian Federation. Range lines mark values of 95% Confidence Interval (CI) (Source: Form No. 8; population – Forms No. 1 and No. 4)

In Russia, the overall value of TB notification rate is calculated based on Form No. 8 reports that include data on the number of new TB patients (117,227 cases in 2009) registered by all agencies in different population groups – permanent residents, inmates and persons on trial in penitentiary system facilities, military personnel, etc. (Table 2.1). From Form No. 8 follows that the main contributor to the TB notification rate (86.1% in 2009) was TB cases detected among permanent residents, including homeless people and deceased persons not registered as TB cases before death. According to Form No. 33 (data on permanent residents), 80.8% of all new TB cases detected by the end of 2009 in the country were registered in MoH&SD TB control facilities (94,775 new cases, 2009).

15 The information has been obtained from the Federal Center for TB Control Monitoring (FCTBM) database including data from 31 subjects of the Russian Federation, where among 46,612 new TB cases notified in 2006, there were 24,009 unemployed, 12,717 employed and 2,556 disabled persons. According to FSSS data, in the same territories there were registered 2,254,000 unemployed or 2,481,000 not employed in economics among economically active ages population, and 28,440,000 employed individuals.

16 I.e. inter-annual changes in notification rate within 0.5 per 100,000 are not statistically significant.

Table 2.1

New TB cases registered in 2005–2008 in the Russian Federation, according to reporting forms No. 8 and No. 33

Indicator	Source (Form No.)	2005		2006		2007		2008		2009	
		No	%	No	%	No	%	No	%	No	%
New TB cases, total	8	119,226	100.0	117,646	100.0	118,367	100.0	120,835	100.0	117,227	100.0
Including TB cases among permanent residents[17]	8	103,432	86.8	102,809	87.4	102,379	86.5	103,834	85.9	100,938	86.1
– patients registered in TB control facilities in the subjects of RF (MoH&SD reported)	33	96,646	81.1	96,867	82.3	96,251	81.3	97,886	81.0	94,755	80.8
New cases among foreign citizens	8	896	0.8	554	0.5	2,123	1.8	2,500	2.1	2,217	1.9
New cases registered in other agencies	8	16,598	13.9	16,180	13.8	15,453	13.1	15,677	13.0	–	–
– including registered in FSIN facilities	8	14,898	12.5	14,283	12.1	13,865	11.7	14,501	12.0	14,072	12.0

TB cases detected in FSIN health facilities (convicts and persons on trial) still have a heavy impact on the overall notification rate in the country. In 2009, the proportion of all TB cases detected in FSIN facilities remained 12.0% (14,072 cases, Form No. 8). Anyhow, due to major efforts to improve the effectiveness of TB activities in the penitentiary system, the TB notification rate decreased from 4,347 in 1999 to 1,306 in 2009 per 100,000 FSIN populations including convicts, defendants and persons on trial (see Chapter 8 "TB in the penitentiary system"). Meanwhile, the notification rate registered in MoH&SD facilities among permanent residents (see Figure 2.5) was statistically significantly increasing until 2004, and thereafter stabilized at 67–68 cases. Now it is now preserved on the same level (66.8 in 2009), excepting a slight growth (69 cases per 100,000 population) in 2008.

The contribution of new TB cases among foreign citizens in the overall notification rate of TB is minimal (less than 2%). In addition, a significant increase in the number of reported cases among foreign nationals in 2007 was linked, first of all, not as much as with the increased spread of the disease in this category, but mostly with the improvement of the registration of the disease among them (implementation of Federal Law No. 115-ФЗ of 25.07.2002 "On the legal status of foreign nationals in the Russian Federation", governmental regulation No. 188 of 02.04.2003, and Federal Law No. 189-ФЗ of 05.11.2006 "On amending the Russian Federation Code of Violations of the Administrative Law"). Therefore, this increase in the number of this category of citizens in the structure of TB notification rate was due to mandatory primary medical examinations for TB for those arriving to Russia when they receive a temporary registration.

In assessments of the general TB notification rate dynamics in Russia (as well as any other epidemiological indicator) one should take into account changes in the indicator-related territorial factor (see below), as well as the proportion of TB notification rates in different population groups. The indicator dynamics may also be influenced by changes in the statistical reporting system and in the regulatory documents laid in the basis of the national statistics system.

For example, a slight increase in the number of new TB patients in 2007 compared to 2006 (from 117,646 to 118,367, see Figure 2.4) occurred primarily due to the improved registration of TB patients among foreigners (from 554 to 2,123 cases), while the absolute growth in new TB patients in 2008 (120,835 cases) was caused by increased notification rates in all major categories of the population, including permanent residents, patients in FSIN facilities, and foreigners.

In 2008–2009, the decrease of the number of new TB cases were observed both on the national level and in most territories. Regional TB notification rate defined by Form No. 8 increased in 56 of 83 subjects of the Russian Federation, and in 57 territories (subjects of the Russian Federation) the notification rates were reduced in permanent residents as defined by Form No. 33. Increased notification rates were registered in 25 subjects only.

[17] Total number of new TB cases according to Form No. 8, excluding FSIN data and data on new TB cases among foreign citizens.

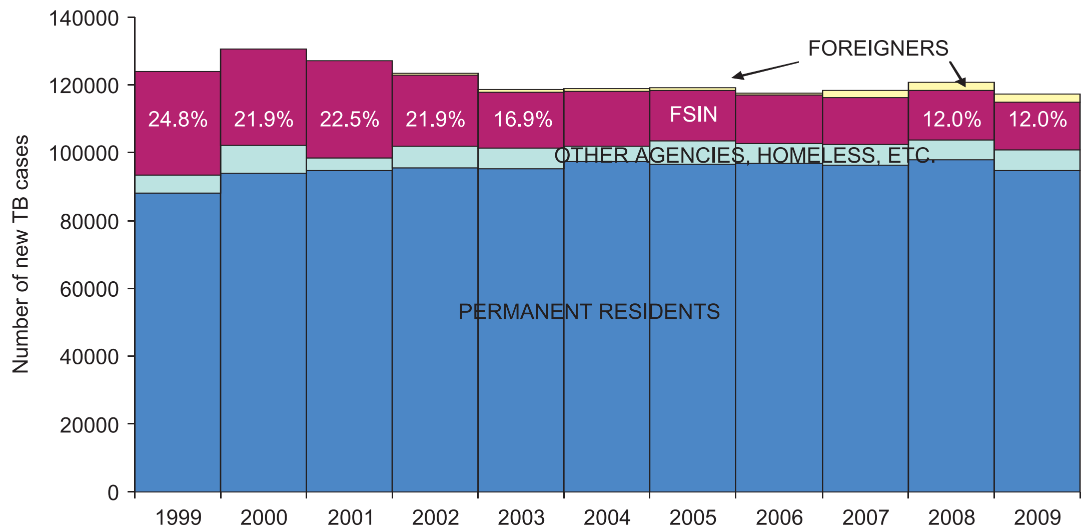


Fig. 2.4. New TB cases in the Russian Federation in 2002–2009 among permanent residents, FSIN populations, registered by other agencies and among foreign nationals (Source: Form No. 8)

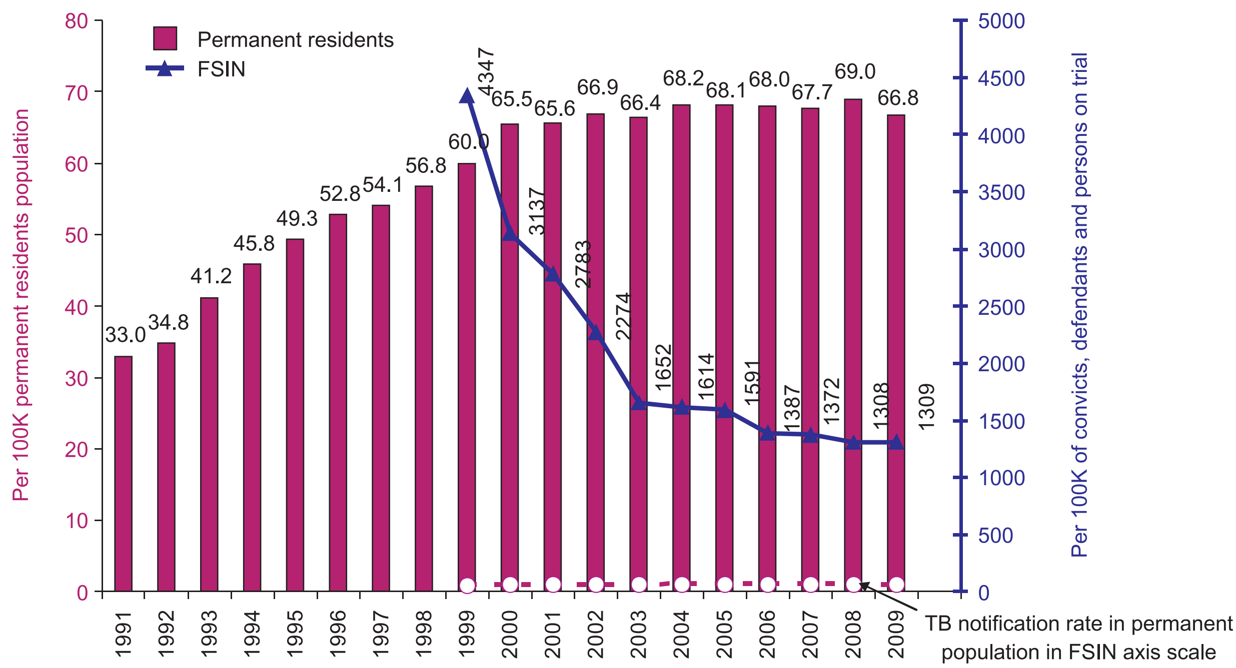


Fig. 2.5. TB notification rates among permanent residents and FSIN population, 1991–2009, Russian Federation. The dotted line and circles at the bottom right denote notification rates among residents reproduced in FSIN data right scale (Sources: Forms No. 8 and 4-tub; population – Forms No. 1 and No. 4)

Therefore, over the past decade till 2009, the trend in TB notification rate was influenced by two separate and diversified processes: an increase in the number of cases registered among permanent resident population (from 87,258 in 1999 to 97,886 in 2008, according to Form No. 33) and a decrease in the contribution to the rate's value of registered cases in the penitentiary system – from a quarter (25%) in 1999 to 12.0% in 2008 (see Figure 2.4). In 2009, the situation changed to a stabilized TB notification rate in the FSIN system with a decreased one among permanent resident population. It should be noted however that the notification rate among the FSIN population remains high (1,309 per 100,000 in 2009, see Chapter 8).

The notification rate in each group of the population is of a relative nature. It primarily reflects the risk of the disease in a particular group, not the part or portion of the absolute number of cases in the country. For example, the high level of TB notification rate in FSIN population (almost 1,300 compared with 66.8 cases per 100K permanent resident population) combines with a limited proportion of the absolute number of new TB cases from FSIN among all TB cases – less than 12%, while the permanent resident populations account for 86.1% of cases in 2009. It is therefore very important to know the absolute number of patients for planning the resources needed for targeted TB control activities.

2.2. TB notification rates in the Federal Regions and Subjects of the Russian Federation

The total (integral) value of any indicator derived for the whole country may substantially differ from those registered in separate territories. This is particularly true for Russia, the country with the largest area in the world, which includes regions significantly different in both geographic and demographic conditions, their socio-economic development and population structure.

Countywide indicators are not sufficient for management decisions in the organization of TB control in each particular subject of the Federation. Therefore, along with the average rates for Russia it is important to take into account notification rate changes on the level of separate regions and subjects of the Russian Federation.

TB notification rates differ significantly from territory to territory in the Russian Federation. The highest territorial rates (over 130 cases per 100,000 population; Form No. 8, 2009) are continuously reported in a number of territories in SbFR and FEFR[18]: in the Republic of Tyva (229.3 per 100,000 population), Primorskiy Krai (208.3), Jewish Autonomous Oblast (169.4), Republic of Buryatia (168.3), Kemerovo Oblast (147.1), Amur Oblast (144.0), Khabarovsky Krai (143.5), Kurgan Oblast (134.3), Irkutsk Oblast (133.7), Novosibirsk Oblast (132.9), Omsk Oblast (131.1), and in Altai Krai (130.1). The lowest rates are registered mainly in the northwestern and southern territories: in the Republic of Ingushetia (39.8 per 100,000 population), Vologda Oblast (44.3), Moscow city (45.3), St. Petersburg city (47.0), Yaroslavl Oblast (47.2), and in the Republics of Bashkortostan, Kabardino-Balkaria, and Karachaevo-Cherkessia (47.8, 48.0 and 48.0, respectively).

The low rates can be connected with a lower spread of the disease in the territories or with inadequate detection, diagnosis or notification of new TB cases.

TB notification rates were over 100 per 100,000 population in 24 subjects of the Russian Federation accounting for 28% of the nationwide population and 41.8% of new TB cases (see Fig. 2.6).

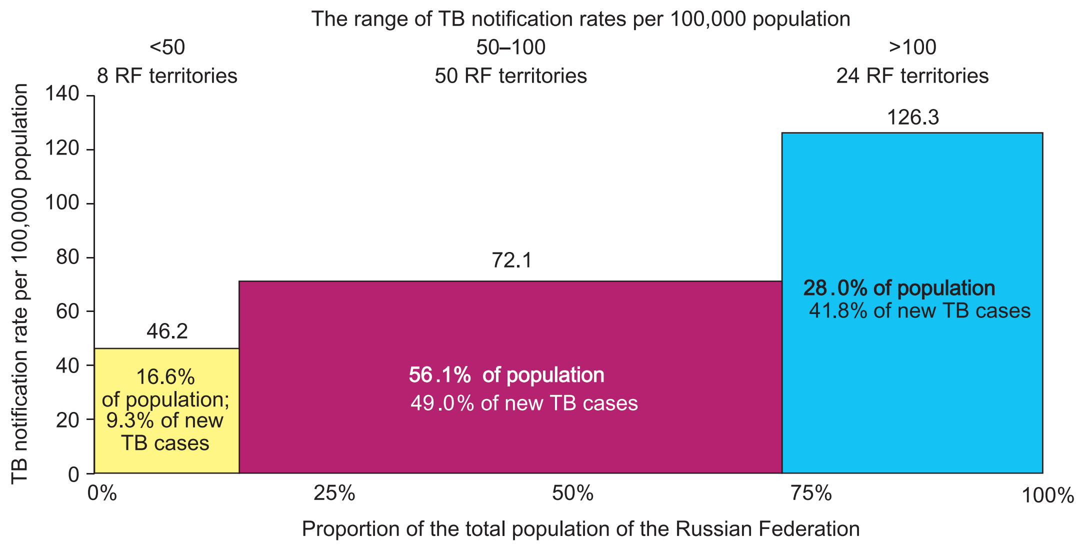


Fig. 2.6. Distribution of the population and the territories by the level of TB notification rate, 2009. Territories are divided into 3 groups: with a notification rate over 100, from 50 to 100, and lower than 50 cases per 100,000 population. The width of the rectangle represents the relative population covered by the territories; the height of the rectangle indicates the notification rates in respective groups of territories (Source: Form No. 8; population – Forms No. 1 and No. 4)

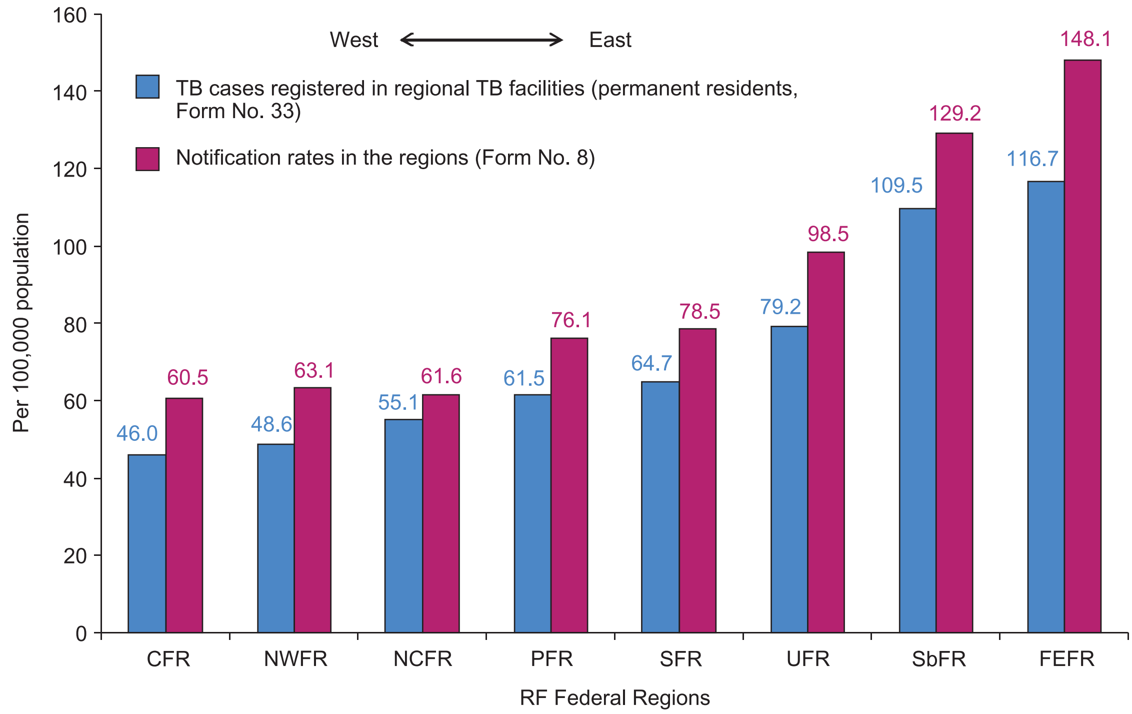
Relatively high notification rates (from 50 to 100 per 100,000 population) were registered in other 51 territories. These accounted for 49.0% of new TB cases detected in Russia and for almost 56.1% of nationwide population. Relatively low notification rates (below 50 per 100,000 population) were registered in eight territories only (9.3% of all new TB cases in 2009, 16.6% of RF population).

If notification rates in permanent residents (registered in Form No. 33) are considered apart from corresponding data in the penitentiary system, other agencies, cases registered postmortem, and without homeless who are not followed-up, the highest indicators (over 120 cases per 100,000 population) are observed in the same territories in SbFR and FEFR: in the Republic of Tyva (180.9), Primorskiy Krai (160.9),Jewish Autonomous Oblast (151.6), Republic of Buryatia (136.4), Kemerovo Oblast (127.6), and Amur Oblast (120,0). The lowest notification rates (below 40 cases

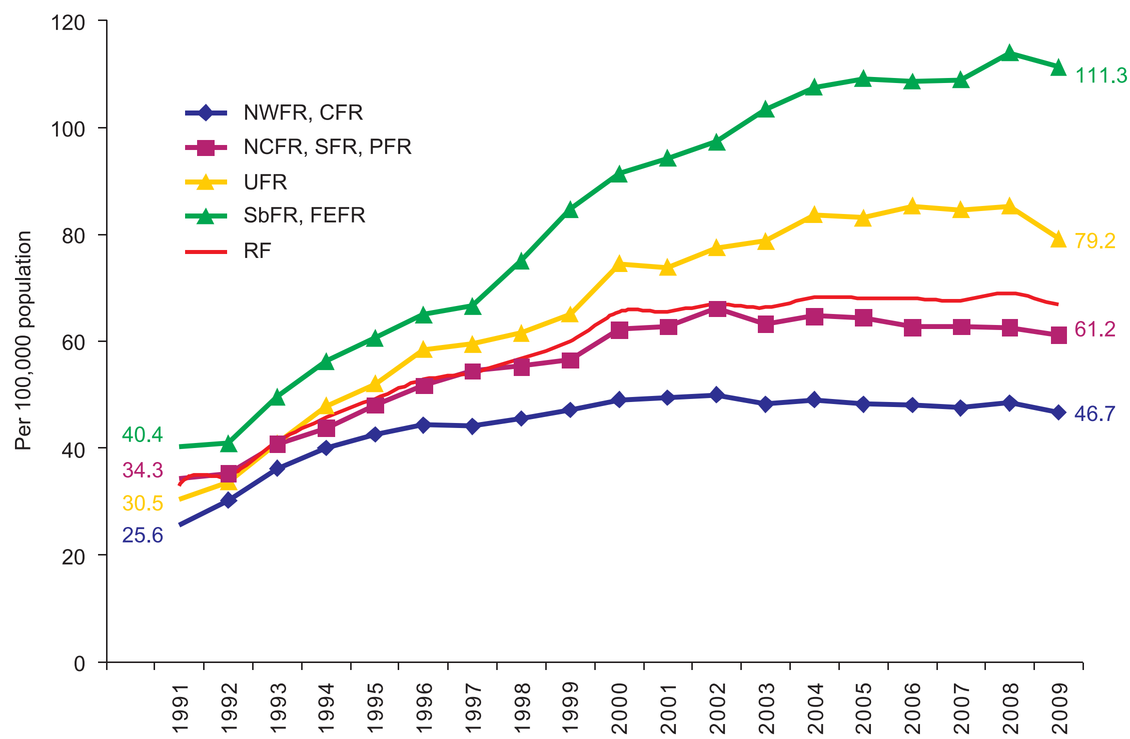
[18] Hereinafter, comparisons of notification rates take into consideration only territories with populations over 100,000.

per 100,000 population) in permanent residents are registered in Moscow city (28.3 per 100,000 population) and St. Petersburg city (36.6), Vologda Oblast (35.7), Yaroslavl Oblast (36.2), and in the Republic of Ingushetia (34.4).

There is a vivid correlation between the TB notification rates and the geographic location of Russia's regions. With the exception of the Kaliningrad region (oblast), which is situated at a considerable distance to the west from the main territory of Russia, the rate is gradually increasing from west to east (see Fig. 2.7a) – from 60.5 and 63.1 in CFR and NWFR to 129.2 and 148.1 in FEFR and SbFR, respectively (Form No. 8, 2009).



A) TB notification rate distribution by Federal region, form No. 8



B) Trends in TB notification rates in four groups of federal regions and in the Russian Federation, 1991–2009, Form No. 33, permanent residents

Fig. 2.7. Geographic distribution of TB notification rates by federal regions and trends by groups of federal regions, 1991–2009 (Sources: Forms No. 33 and No. 8; population: Forms No. 1 and No. 4)

The overall TB spread in the country is dominated by notifications rates in the territories located in three eastern federal regions – Urals, Siberia and Far-East. The eastern regions of the country continuously reported higher growth in notification rates. In the regions located in the east (SbFR and FEFR) and in the Urals (UFR), the notification rate increased by 2.7 times from 1991 to 2005, while in the west it increased by 1.8–1.9 times (see Fig. 2.7b).

However, lower increase in the notification rates in 2000–2003 in the more populated European part of Russia (CFR, NWFR, SFR and PFR) in part restrained the increase in the overall TB notification rate in the country and, finally, determined the process of TB notification rate stabilization. In three years (2005–2007), TB notification rate stabilized in all federal regions.

Therefore, the nationwide increase in the notification rate in 2008 was also primarily caused by the indicator growth in SbFR and FEFR (by 4–10%).

In 2009, TB notification rates decreased in almost all the federal regions with the exception of the Far-East Federal Region, where the indicator was steadily growing in the past three years (in 2006–2009 – at 128.2, 132.6, 145.4 and 148.1, respectively).

A strong relationship between territorial notification rates and socio-economic factors (first of all, the level of quality of life in territories) can be observed. The level of quality of life is characterized by such indicators as the percentage of the population with income below the cost of living (Figure 2.8) and the unemployment rates (Figure 2.9).

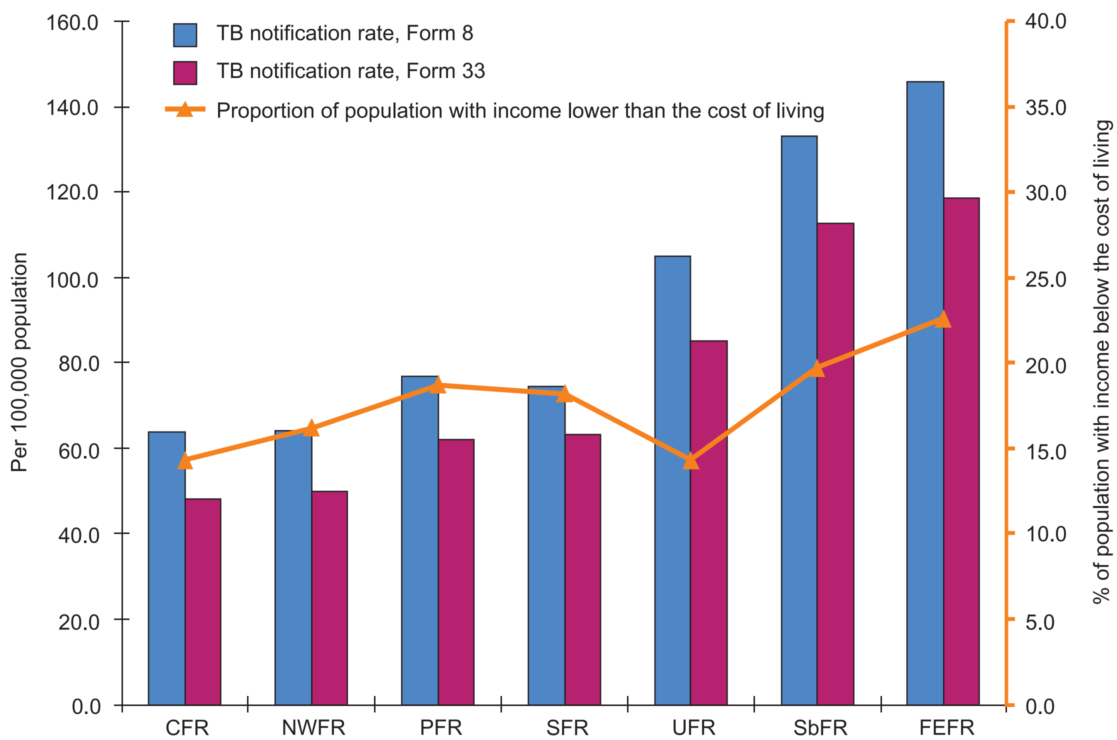


Fig. 2.8. Proportion of population with income below the cost of living and TB notification rates in the Federal Regions of the Russian Federation, 2008. The regions are displayed on the figure on a geographical basis: from North-West to the Far East. (Sources: Forms No. 8 and No. 33 [24])

Differences in the proportion of population with income below the cost of living in the federal regions in 2008 correlated *with* the TB notification rates in these regions, except UFR (Figure 2.8).

Changes in unemployment rates from region to region also correlate in general with the TB notification rates with the exception of SFR[19] (Figure 2.9). This effect is particularly evident if comparison is made between the regions in the European part of the country (CFR, NWFR and PFR) and in the east (SbFR and FEFR). Anyhow, starting 2008, this correlation between unemployment and TB notification rates is becoming less prominent.

It is important to note that in Russia, unlike many other countries, TB notification rate is higher among rural populations than among urban ones – 92.7 and 78.9 per 100,000 population respectively ($p < 0.001$, Form No. 8).

[19] SFR data was excluded from figure 2.9 because the total unemployment level for SFO is mainly defined by the unemployment levels in the Republics of Ingushetia (67.9%) and Chechnya (34.9%), which resulted from the recent Chechen crisis.

Fig. 2.9. Unemployment and TB notification rates in the Federal regions, 2008. Pink dotted curve line shows the total rate of unemployment in general and in by federal region. The regions are displayed on a geographical basis: from the North-West to the Far East. (Sources: Forms No. 8 and No. 33 [24])

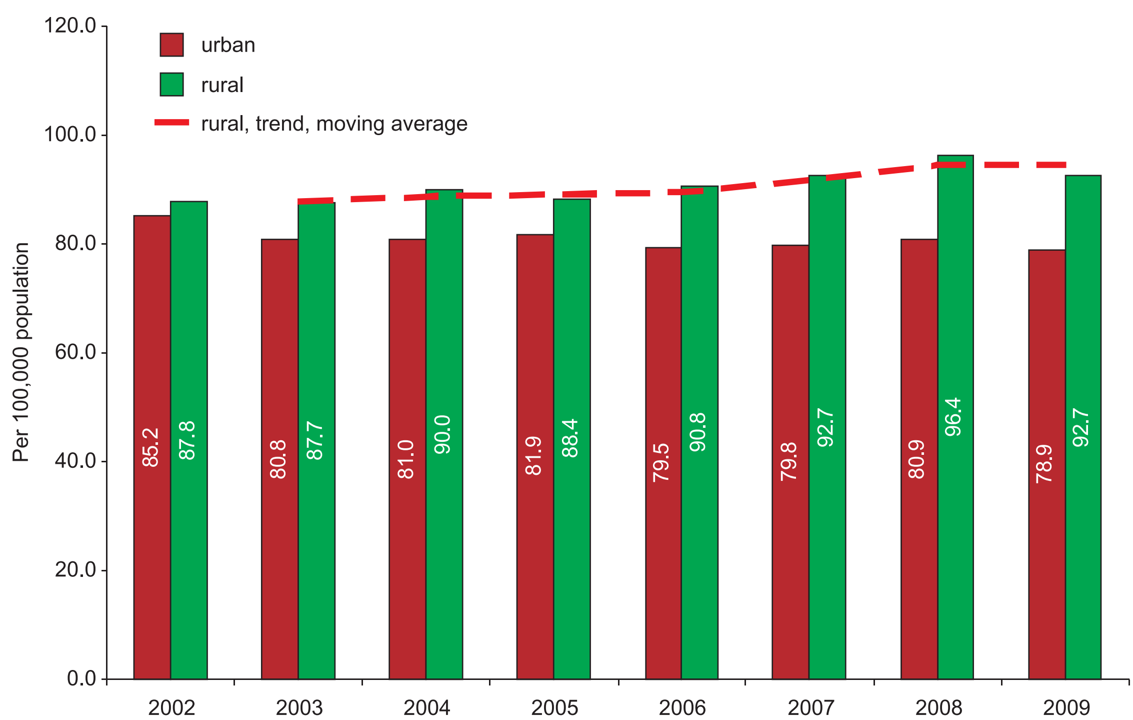


Fig. 2.10. TB notification rates in urban and rural populations, Russian Federation, 2002–2009 (Sources: Form No. 8; population, Forms No. 1 and No. 4)

All through the last 7 years, before 2009, TB notification rates increased practically due to growth in the notification rate in the rural population only (Fig. 2.10). Overall TB notification rate decrease in 2009 manifested itself with a statistically significant decline in TB notification rates among rural populations (by 4%, $p < 0.01$).

2.3. TB notification rates in different age and gender groups

People belonging to various age and gender groups are characterized by different degrees of susceptibility to TB infection and probability of a contact with the source of infection. Therefore, they require specific approaches in TB control programmes. It is also important to discriminate estimates of notification rates by gender and and/or age group.

Estimates of TB notification rates in different age and gender groups are often used for indirect assessment of the burden of the epidemiological situation of TB in a region or nationwide. It is considered that a substantially higher notification rate among males compared to that among females, as well as a significant peak of this indicator among people in middle and younger age groups, may be regarded as a prognostic indication of an unfavorable situation for TB in future [53]. These population groups are most socially active and, therefore, have a higher probability of social contacts, which increases the risk of TB spread in the population.

When assessing the age and/or gender specific characteristics of TB notification rates, it is also important to define in a separate group the penitentiary sector population due to its explicit demographic specificity, i.e. predominance of young males. It is shown below in the Review that this factor has a strong effect on TB notification rates in different age and gender groups, and that the anti-tuberculosis activities and organizational measures should be substantially different in penitentiary and general public health sectors.

In the Russian Federation, TB is more common in males (per 100,000 population): the notification rate among males is 2.6 times higher than that among females (2009, see Fig. 2.11). Anyhow, over the past several years, starting 2002 when it was 3.2, this ratio has been decreasing. In general, 70% of new TB cases are diagnosed among males (81,476 of 117,227 cases in 2009).

Over the past several years, a notification rate increase has been observed among females (from 41.9 per 100K in 2002 to 47.5 in 2008), with a decline among males in the same period (from 136.2 to 125.4 in 2002 and 2007, respectively). It should be noted that the decline in the notification rate among males was due to the decrease in the number of new cases registered in FSIN system facilities (among convicts, defendants and individuals on trial). The rate for males from permanent residence population practically did not change over these years (range of 105–107 per 100K – See Fig. 2.11B)

In 2008–2009, TB notification rates in males and females first demonstrated a growth followed by a decrease in 2009 to 124.1 and 46.9 respectively, which was caused by changes in the overall notification rate in permanent resident population. Although there was a decline in the total TB notification rate in men, this indicator was still growing in the Far-East Region (from 147.5 in 2002 to 171.2 per 100K in 2009).

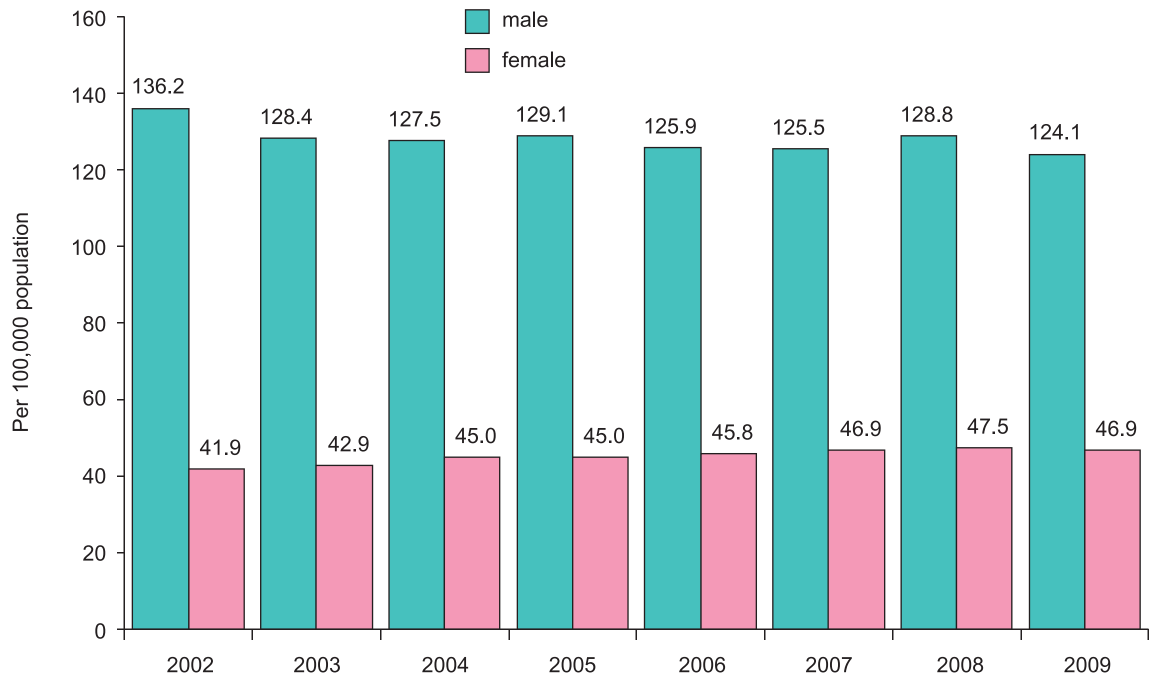
In the male population of the Russian Federation, the highest risk of TB is in 25–34 year old age group (205.3 per 100K in 2009; Fig. 2.12A). However, the higher notification rate among the FSIN population makes a considerable contribution (almost a quarter) to the overall rate in this gender/age group (TB notification rate in males in permanent resident population is 152.2 per 100K). When considering notification rate data on permanent resident males only (without FSIN), the highest rate in Russia falls at an older age group – 35–44 year olds (155.6 per 100K in 2009).

Basing on the individualized registers of SSTM [3] data, an analysis of 5-year age intervals (not 10-year, as accepted in Russian and international practice) for resident populations excluding FSIN in 2004–2008 allows to identify two pronounced peaks in TB notification rates among males of the age groups of 26–30 and 41–50 year olds.

It should be noted that the socio-economic burden and losses caused by the disease are largely determined by the absolute number of cases in economically active age groups, not by the TB notification rate. Analysis of Form No. 8 data shows that 70% of new TB cases among males occur during the most productive years, between 25–54 years, accounting for almost 60,000 new TB cases a year (Figure 2.12B). It is also noteworthy that over the past six years the number of new TB cases among men of the most productive age (25–34 years) has increased by 30% (Fig. 2.13).

The highest notification rates among females fall at the fertile age of 25–34 years (Fig. 2.12A). The notification rate in this age group has been increasing every year until 2008. From 1999 to 2008, the notification rate increased from 70.6 to 91.9 per 100K population (Figure 2.14), and the percentage of TB cases registered in this age group among all female cases increased from 23.3% to 28.3%. The current overall decrease in TB notification rates in the country was also registered in females of this age group. It was for the first time in many years that the notification rate declined to 86.6.

In general terms, the presence of peaks in the notification rate among the younger and more productive age groups in both males (25–34 and 45–54 year olds) and females (25–34 years old) indicates an unfavorable epide-



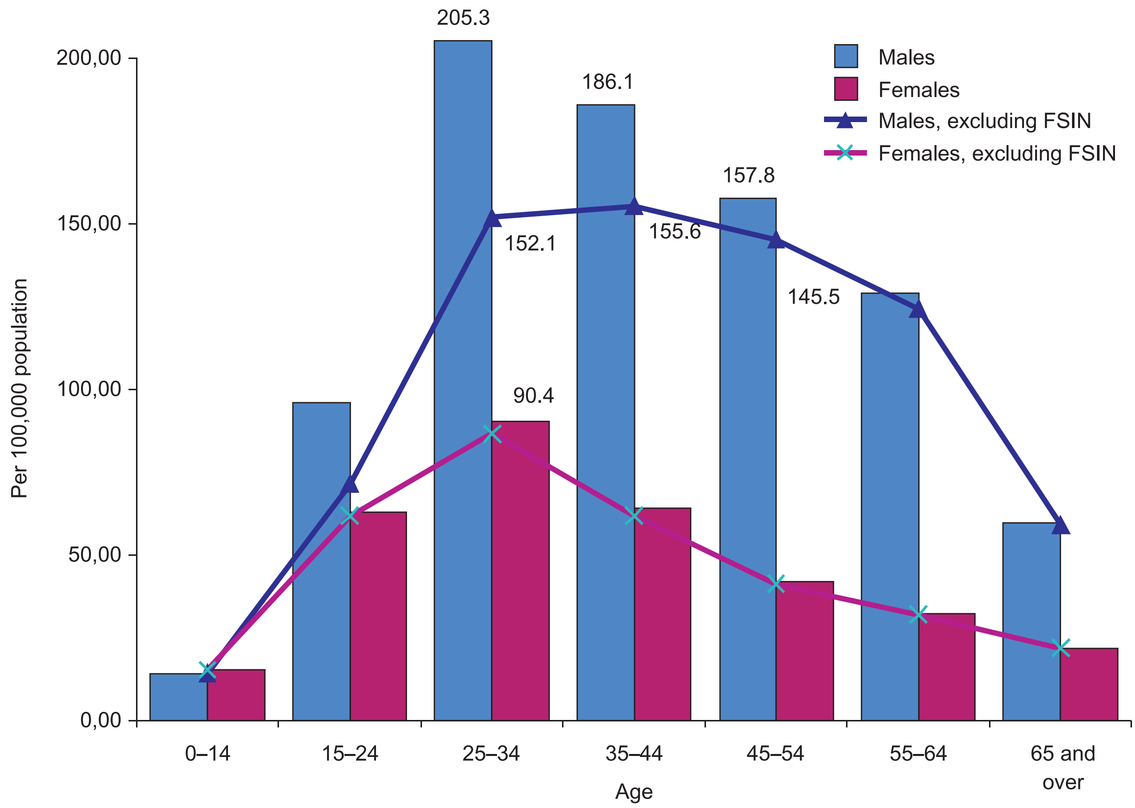
A) TB notification rates in males and females

B) Number of new TB cases among males and females, civil and FSIN populations. Percentage of cases detected in FSIN facilities is indicated above the bars.

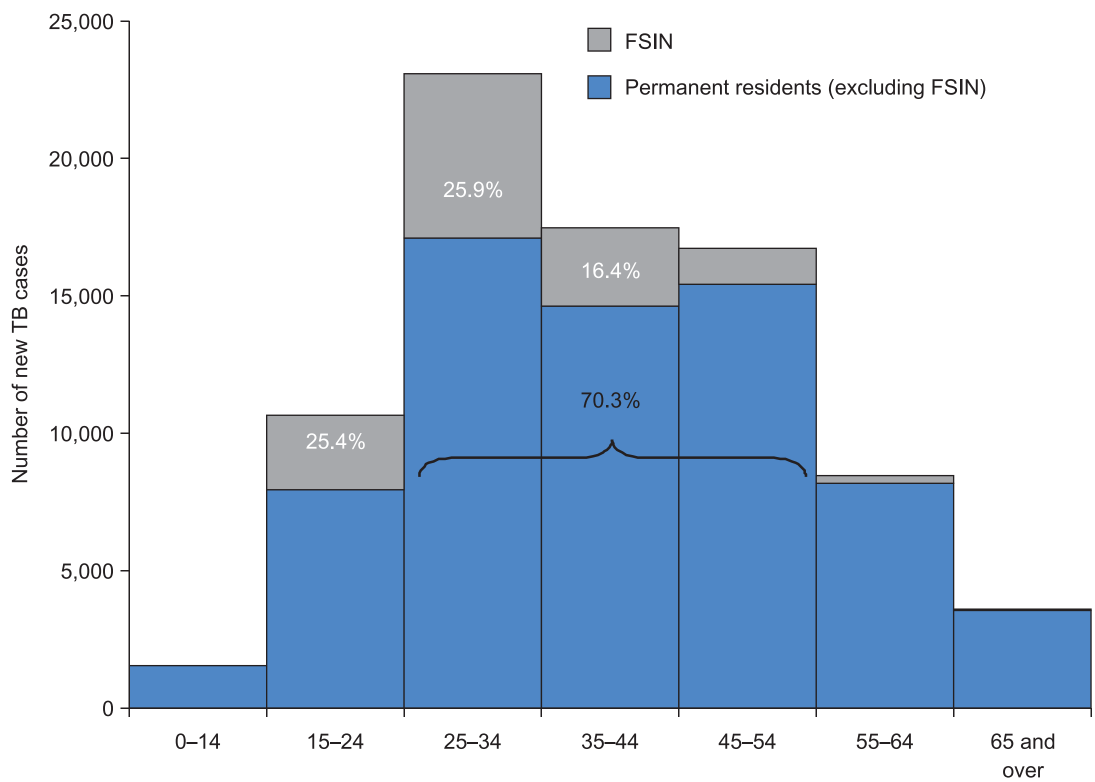
Fig. 2.11. New TB cases among males and females, Russian Federation, 2002–2009 (Sources: Form No. 8; population – Form No. 4)

miological situation of TB in the country. Furthermore, it suggests that a high level of TB spread will be retained in the near future if adequate TB control measures are not properly implemented. Thus, the high notification rate of TB in these age groups may be regarded as a prognostic sign of the deteriorating situation in the future.

Analysis of the gender and age structure trends in TB notification rates over the past eight years (2002–2009) shows that although the overall notification rate has stabilized, the age structure of patients was deteriorating during this period, with new TB patients becoming younger. This has been confirmed to a greater or lesser degree by the data obtained in all the federal regions of Russia.



A) TB notification rates for different age and gender groups of the entire population and permanent resident population (excluding FSIN) in the Russian Federation



B) Structure of new TB cases registered in males of different age groups. Cases among FSIN and permanent resident populations of the Russian Federation. Braces show percentage of new male cases in age group 25–54 years.

Fig. 2.12. TB notification rates and number of TB cases in different gender and age groups, 2009. The entire population, FSIN and permanent resident populations, the Russian Federation (Sources: Form No. 8, population – Forms No. 1 and No. 4)

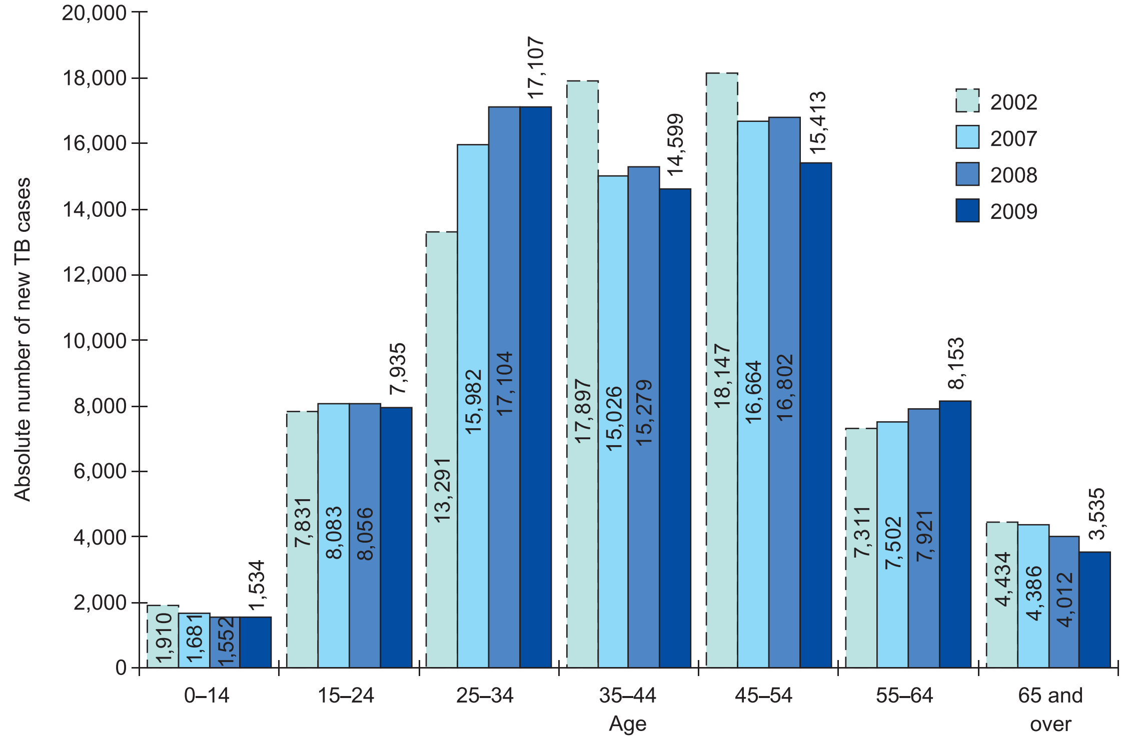


Fig. 2.13. Number of new TB cases among men of different age groups, permanent residents; the Russian Federation, 2002, 2007, 2008 and 2009. Information from Form No. 8 excludes data from FSIN (Sources: Form No. 8; population: Forms No. 1 and No. 4)

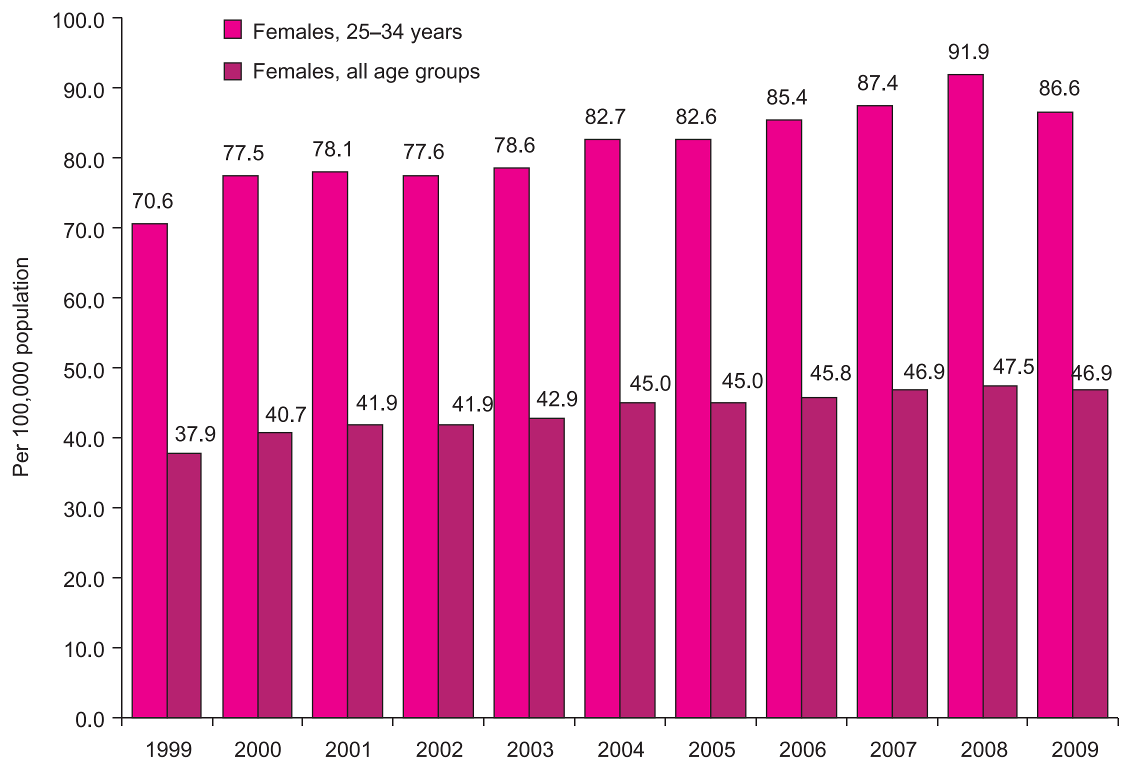
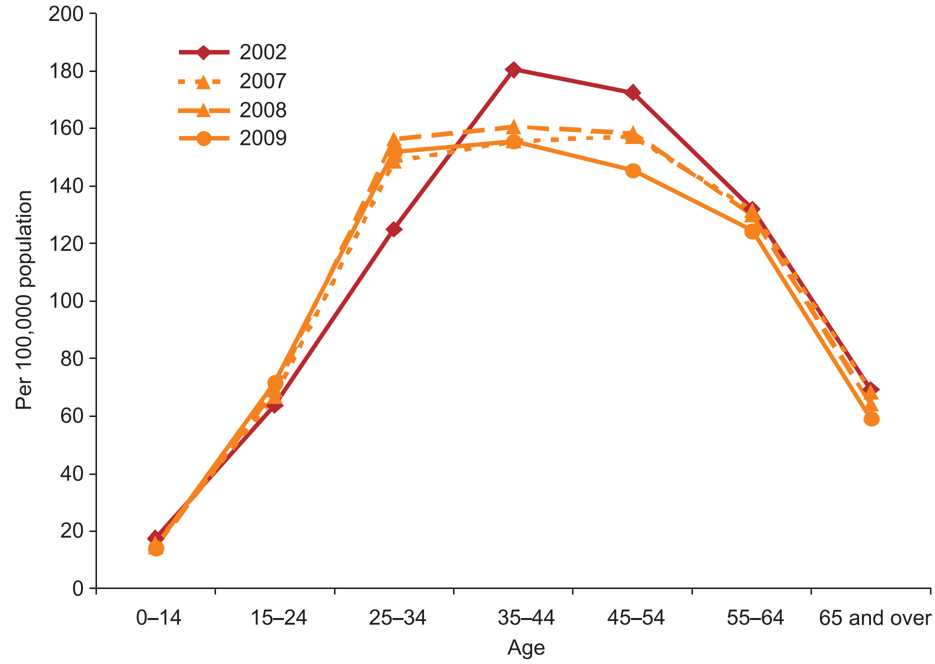
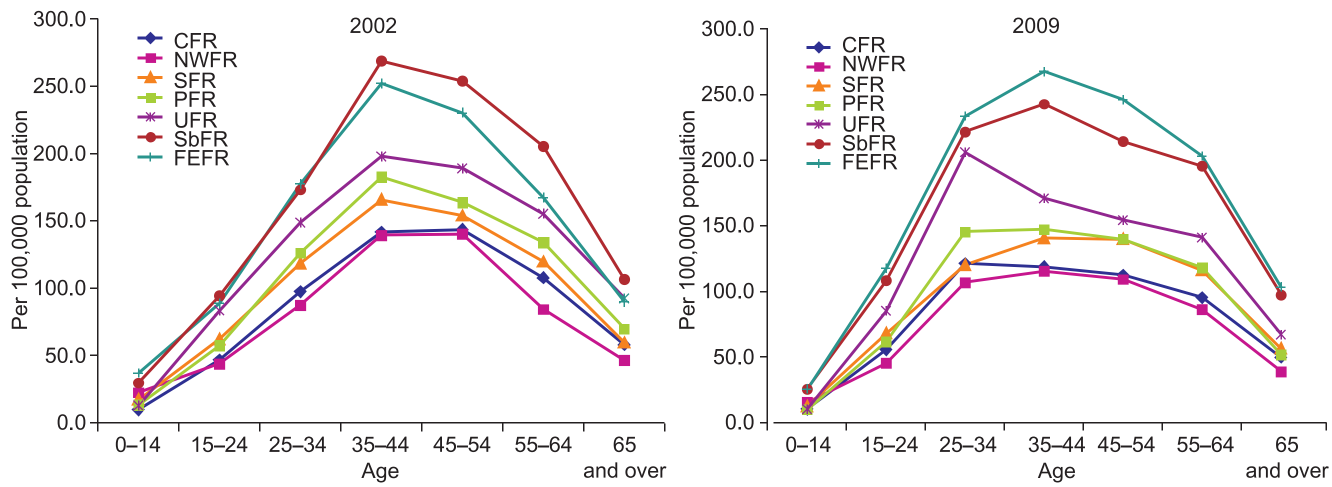


Fig. 2.14. TB notification rate among females (Sources: Form No. 8; population: Forms No. 1 and No. 4)

Graphs (figure 2.15 and 2.16) show the emergence in 2007–2008 of a new maximum of 25–34 years or a gradual shift towards age group of 25–34 years for men, especially in the Ural and Siberian Federal Regions. As noted above, in recent years an increase of TB notification rate among women aged 25–34 years was observed, especially in SbFR, FEFR and UFR.



A) The Russian Federation



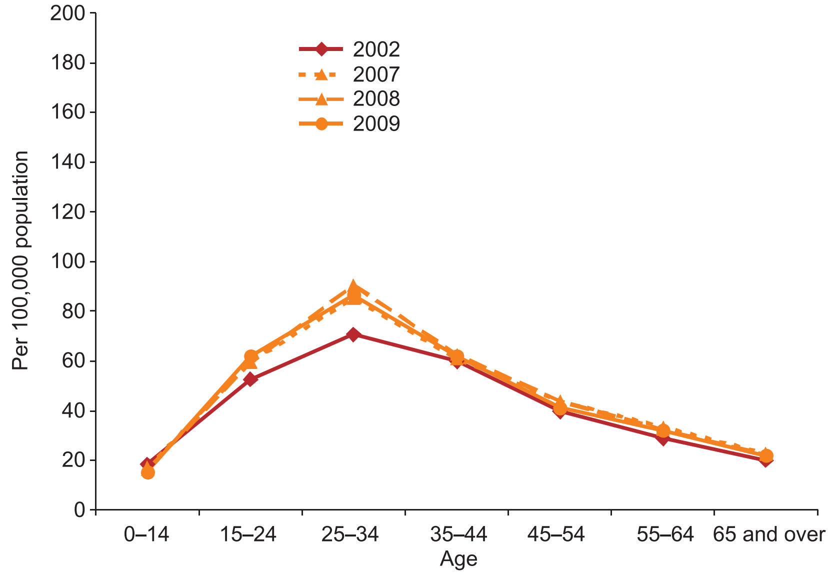
B) Federal Regions, 2002 and 2009

Fig. 2.15. TB notification rates in men of different age groups, permanent residents; the Russian Federation, 2002, 2007, 2008 and 2009. Data from Form No. 8, excluding FSIN (Sources: Form No. 8; population: Forms No. 1 and No. 4)

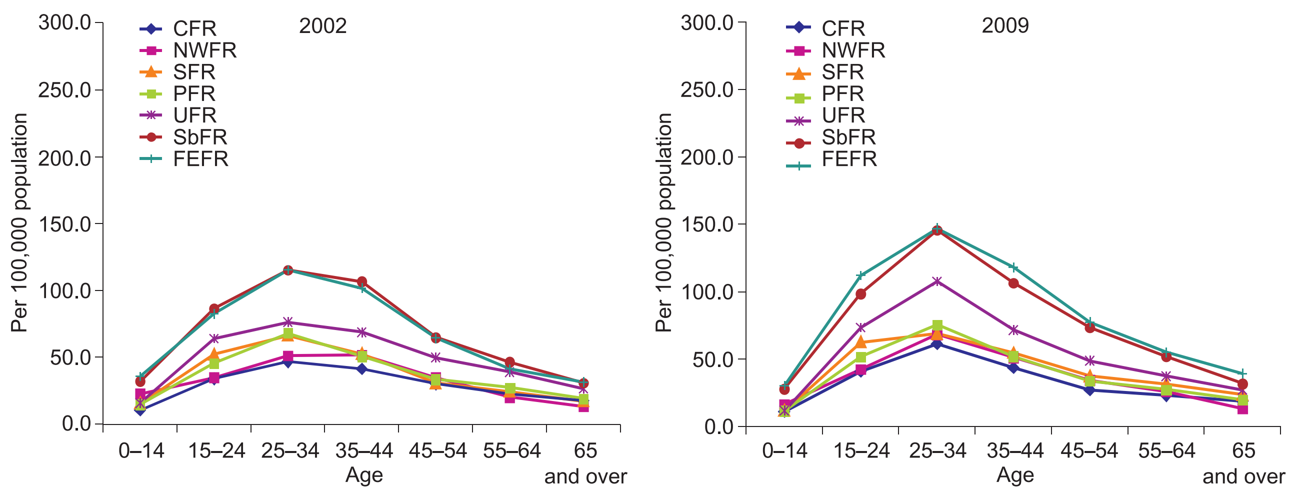
The noted 2009 notification rate decline was mainly due to decreased incidence in men of 45–54 years of age. This indicates to a possibility of a considerable decrease in the TB notification rate indicator by means of active TB control interventions in the socially and economically most active population, i.e. men of 25–44 years of age,. So far, no decline in TB notification rate has been registered in men of this age group.

In 2002, a marked maximum notification rate among men aged 25–34 was only in two territories – in the Republic of Tuva and the Yamalo-Nents AO (1.5–2 times higher than the overall notification rate in males in the permanent resident population). In 2009, there were 14 territories with peaks in TB notification rates among 25–34 year olds, exceeding the overall notification rate among men more than 1.6 times (the Khanty-Mansi AO, the Chukotka AO, in Tyumen, Irkutsk, Sverdlovsk, Moscow, Ryazan, Orenburg, Ulyanovsk, Chelyabinsk, Leningrad, Samara, Tver oblasts, and in the Republic of Bashkortostan). It is noteworthy, in 2009 this list did not include the Republic of Tyva (as before) because of a sharp change in the age-related specificity of maximum new detected TB cases in this region, which is now in males of 55–64 years of age. An expressed peak of TB notification in men older 55 years among permanent residents exceeding the average level more than 2-fold was also registered in Chechnya, Dagestan, Tyva Republics and in Yaroslavl Oblast.

Such age/gender related structure of TB notification rate may be indicative of a relatively favorable epidemiological situation in these regions. On the other hand, in some territories it may also be explained by inadequacy



A) The Russian Federation



B) Federal Regions

Fig. 2.16. TB notification rates among women of different age groups, permanent residents; the Russian Federation, 2002, 2007, 2008 and 2009. Data from Form No. 8, excluding FSIN (Sources: Form No. 8; population: Forms No. 1 and No. 4)

of TB control services and registration of younger patients (due to stigmatization of TB-diseased people), or by high migration of younger people from these regions, when the actual size of populations of respective age groups is overestimated.

The peaks of TB notification rates among female permanent residents of 25–34 years of age exceeds the respective territorial indicator for all women more than twice in 18 subjects of the Russian Federation (Pskov, Kurgan, Tambov, Penza, Ryazan, Orenburg, Vologda, Leningrad, Irkutsk, and Kursk oblasts, and in some other territories of the Russian Federation). In 2007, there were 14 such regions and only 7 in 2002.

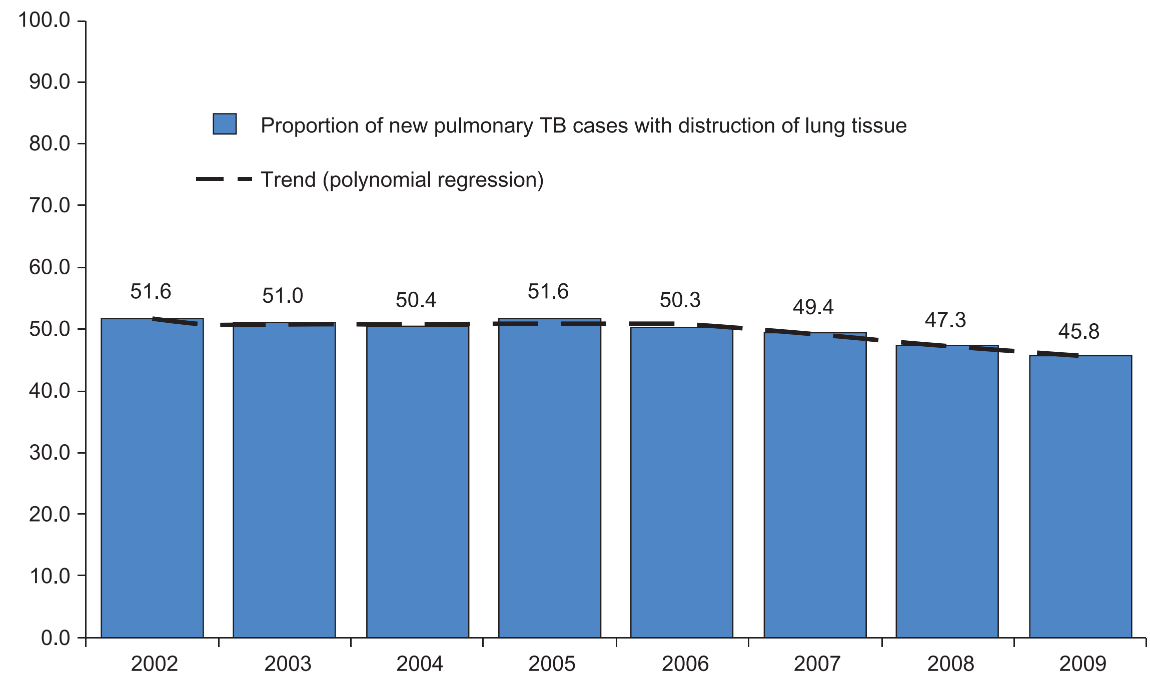
2.4. Structure of new TB cases in the Russian Federation

Pulmonary TB (PTB) is traditionally considered as epidemiologically most dangerous form of the disease.

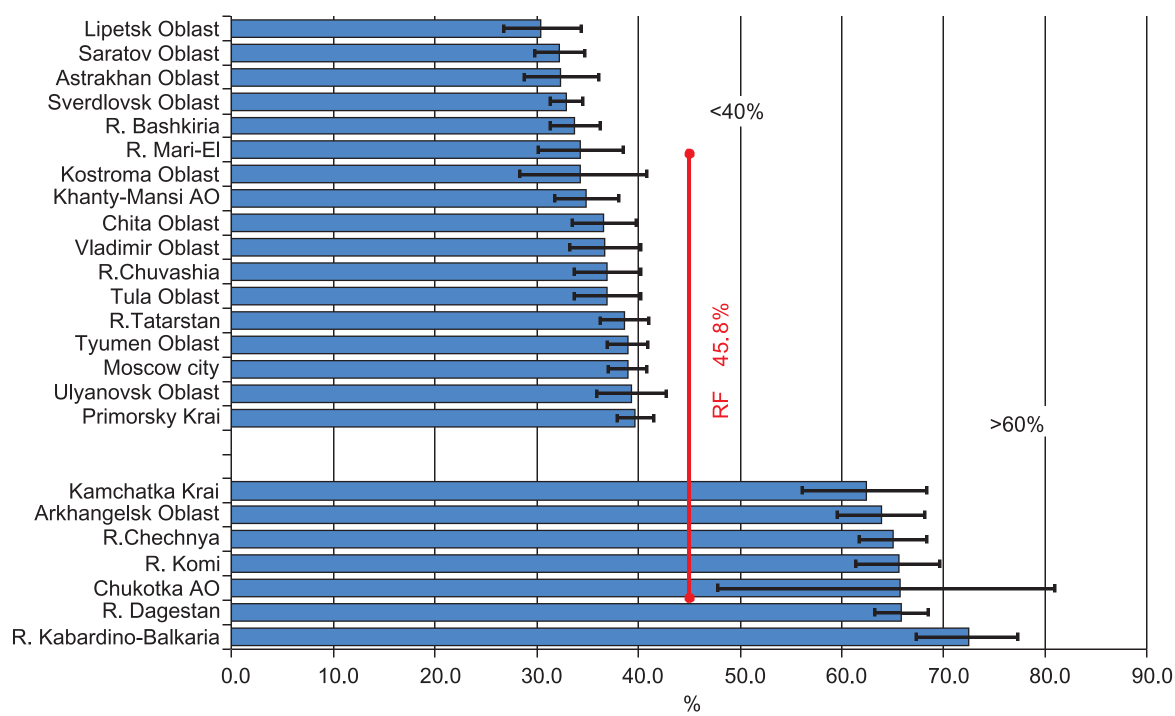
Among all new cases registered in all TB control services, 90.7% (2009, Form No. 8) are pulmonary TB. Among all new TB cases registered in TB control facilities in the subjects of the Russian Federation (Form No. 33), where the quality of diagnosis of extra-pulmonary forms of the disease is higher (*excluding data of the penitentiary system and other facilities – note of translation editor)*, PTB cases constitute 89.8% of all TB cases. The structure and localization of TB in new detected patients with extra-pulmonary forms of the disease and respiratory TB of extra-pulmonary localizations are discussed in detail in Chapter 6.

The effectiveness of TB detection activities is reflected in the proportion of **severe forms of the disease** among new **pulmonary TB** cases. TB cases with lung destruction (cavern) and fibro-cavernous TB[20] (FCTB) are registered in TB reporting forms. Special attention is attached to the most epidemiologically dangerous cases – bacteriologically positive TB cases confirmed with laboratory tests (see Section 2.5).

In recent years, the percentage of destructive pulmonary TB among new cases in Russia overall was statistically significantly decreasing from 51.6% in 2005 to 45.8% in 2009 (Fig. 2.17A).



A) Trend dynamics in 2002–2008



B) Proportion of destructive pulmonary TB among new detected TB patients in the Russian Federation regions with highest (over 60%) and lowest (below 40%) indicators. The Russian Federation, 2009 (the error bars indicate CI 95%)

Fig. 2.17. Percentage of new pulmonary TB cases with lung destruction registered in TB facilities in the subjects of the Russian Federation, 2002–2009 (Source: Form No. 33)

[20] These are the most severe pulmonary TB forms registered in statistical reports. "Fibro-cavernous" is defined as chronic TB with extended lung caverns and fibrosis – note of translation editor.

At the same time, this rate differs substantially by territory (Fig. 2.17B). The high rates of destructive forms of pulmonary TB can be partly accounted for by late diagnosis of the disease. On the other hand, a low notification rate may reflect either successful early detection activities or low effectiveness or limited use of X-ray diagnostics when evaluating TB patients.

A high percentage of FCTB cases among all detected pulmonary TB is an important indicator reflecting delayed TB detection (Figure 2.18). After an increase in the percentage of FCTB in late 80's to late 90's, since 1999 a step-by-step decline in the percentage of this epidemiologically severe form of pulmonary TB has been observed. In 2009, the percentage of FCTB among all new pulmonary TB cases was 2.0% (2.4% and 2.1% in 2007 and 2008, respectively). This decline in the proportion of FCTB may reflect improvements in early pulmonary TB diagnosis.

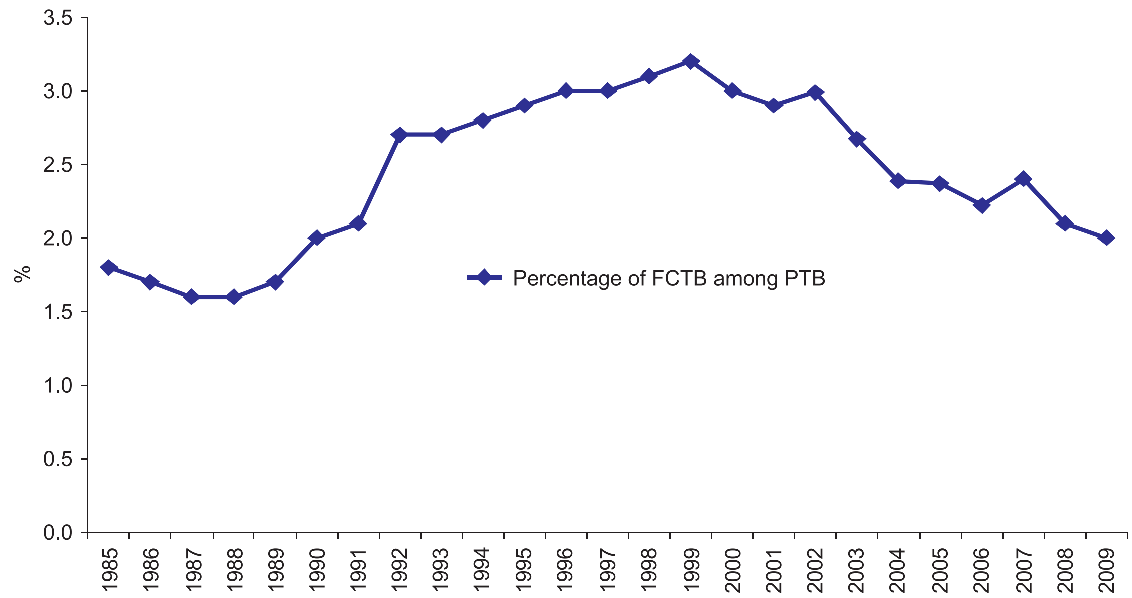


Fig. 2.18. Percentage of FCTB cases among new pulmonary TB cases registered in regional TB control facilities (Source: Form No. 33, permanent residents)

Similar to the proportion of destructive pulmonary TB, the percentage of FCTB varies considerably by territory. Although the number of territories with high prevalence of FCTB cases became relatively small in comparison with 2008, in some territories notification rates remain over 5% (Irkutsk Oblast – 6.6%, Nizhny Novgorod Oblast – 6.5%, Kaluga Oblast – 5.6%, Ryazan Oblast – 5.5%, Kamchatka Krai – 5.1%). In 2009, this form of pulmonary TB was not registered at all in four regions, while in six regions it did not exceed 0.2–0.3%, which may be explained by both a more effective performance of TB services or by inadequacies in PTB diagnosis and registration of PTB patients.

2.5. MbT+ TB case detection

In assessing the epidemiological situation of TB, TB cases confirmed by laboratory methods (i.e. new MbT+ TB cases) are considered with special attention. Particularly important are the notification rate of MbT+ cases and the proportion of MbT+ TB patients among new TB cases.

In recent years, similar to the overall notification rate, there has been a stabilization of the notification rate of TB cases confirmed by laboratory methods. The notification rate of MbT+ TB cases diagnosed by all methods remains at 34–35 per 100K population. At the same time, the notification rate of sputum smear positive TB detected with microscopy (ss+) is 23–24 per 100K population (see Fig. 2.19). The value of the indicator depends not only on changes in the number of these particularly epidemiologically dangerous cases, but also on the improvement of laboratory diagnosis resulting in higher proportion of notified TB cases with bacillary excretion. The latter indicator (percentage of MbT+ cases in different population groups, e.g. among new TB cases or among retreatment TB patients) may be used for indirect assessment of lab tests quality in TB diagnosis confirmation and/or in monitoring effectiveness of treatment.

The TB registration system currently used in Russia is characterized by somewhat redundant reporting. Therefore, there are several options for calculating the proportion of MbT+ among new TB cases. Depending on the reporting

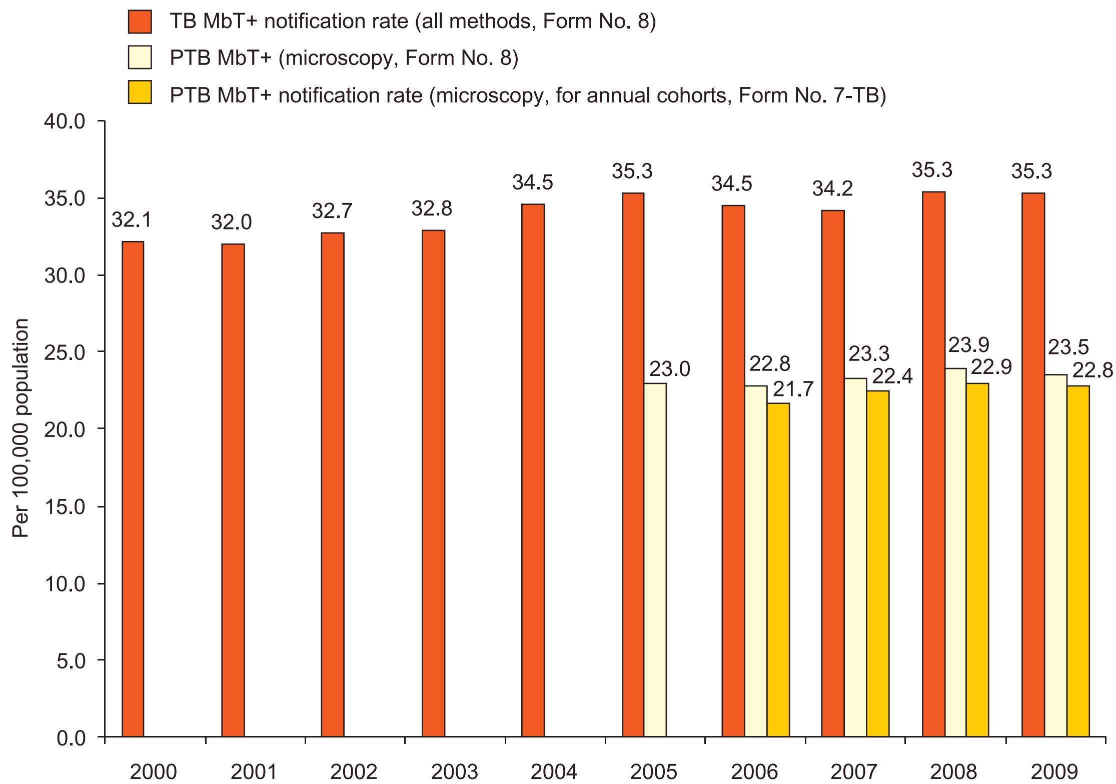


Fig. 2.19. Notification rates of MbT+ TB cases: (1) all localizations confirmed by any method (Form No. 8); (2) notification rates of MbT+ PTB cases diagnosed by microscopy (Form No. 8); (3) MbT+ PTB cases diagnosed by microscopy (annual cohorts data, Form No. 7-TB). (Sources: Form No. 8 and Form No. 7-TB used in MoH&SD and FSIN; data on population: Forms No. 1 and No. 4)

form used (Forms No. 33, No. 8 or No. 7-TB), different patient groups are used in the calculation process (all registered patients including the penitentiary system facilities or patients from the permanent resident population only), patients with different forms of the disease (all TB cases, RTB or PTB cases), or different methods used for MbT+ detection (all methods, microscopy or culture).

Fig. 2.20 presents the approaches most commonly used in the Russian Federation to determine the proportion of patients with bacillary excretion among all new TB cases and corresponding indicators in 2009[21] . Reporting form No. 8 allows for the calculation of percentage of new bacteriologically positive cases confirmed by any method among all new TB cases registered in all TB control facilities, including those under MoH&SD and FSIN (42.7%)[22]. Of special interest is the percentage of bacteriologically positive TB cases among new pulmonary TB cases confirmed by microscopy (31.4%). Form No. 33 allows for the calculation of the indicator for the permanent resident population (i.e., cases registered in TB control facilities of the subjects of the Russian Federation). Among them, the percentage of TB patients with bacillary excretion confirmed by microscopy was 31.9%, and by all methods – 47.7%.

Form No. 7-TB approved by RF MoH Executive Order No. 50 of 13.02.04 [26] shows laboratory tests results most fully and precisely. Annual reporting Forms No. 8 and No. 33, which have been used for many years in the Russian TB Service, contain aggregate information collected by the end of December. Therefore, these reports do not include data on the results of culture tests for most newly diagnosed patients who were registered in November and December of the reporting year, i.e. the MbT+ data contained in these forms are not complete[23]. Besides, it was only in 2009 that data on the number of MbT+ cases confirmed by culture were included in reporting forms No. 8 and No. 33.

Reporting Form No. 7-TB is submitted in the beginning of the second quarter following the end of the reporting year, and contains complete annual data on new MbT+ PTB cases diagnosed by both microscopy and culture. In addition, Form No. 7-TB provides information on the coverage of new detected cases by laboratory tests performed with both microscopy and culture, which is not included in Form No. 8 and Form No. 33. If in most regions of the country the microscopy tests coverage of new TB cases is relatively high (98.3% nationwide – from 95.5% in

21 With taking into account the 2009 changes in the structure of reporting forms No. 8 and No. 33.
22 All percentage values of MbT+ patients in the description of Figure 2.20 are given for 2009.
23 Same applies to drug resistance data (see below).

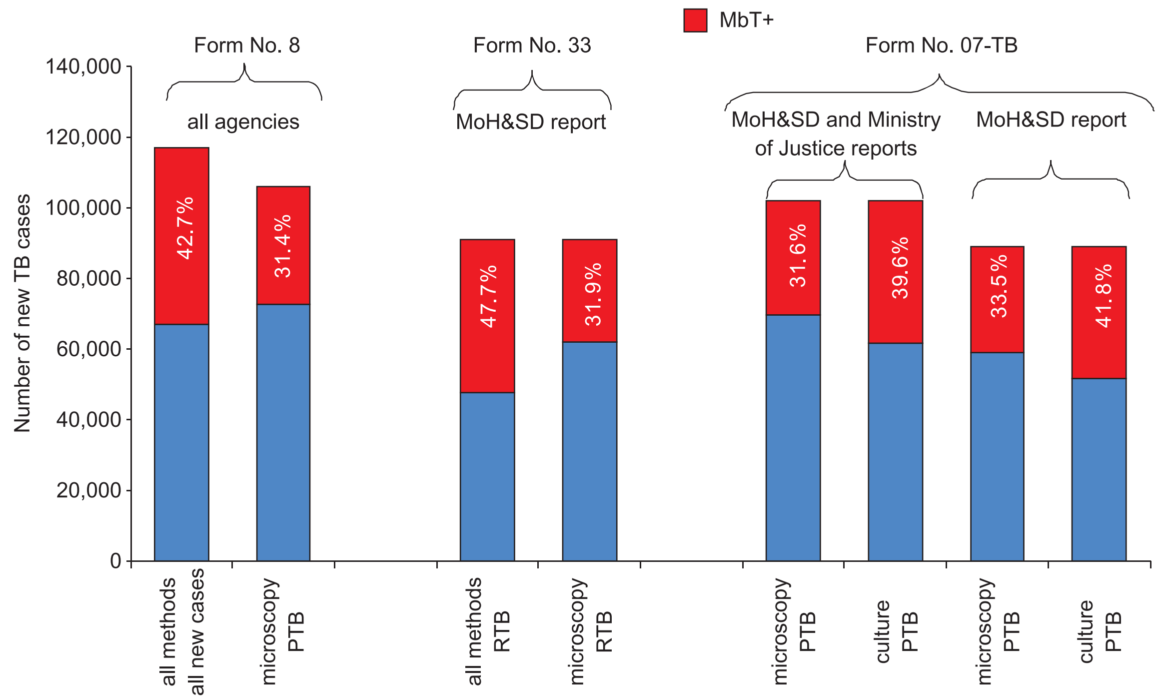


Fig. 2.20. Percentage of bacteriologically positive cases confirmed by different methods among new TB cases, new respiratory TB cases (RTB) and new pulmonary TB cases (PTB), Russian Federation (Sources: Forms No. 8, No. 33 and 7-TB, 2009)

NCFR to 98.3 in NWFR), the indicator of culture tests coverage depends on the availability of adequately equipped laboratory services. This indicator is below 80% in NCFR and FEFR (79.2% and 76.7%, respectively), although it is rather high in other federal regions (from 92.1% to 98.4%). It should be noted that culture investigations coverage is particularly low in Amur Oblast (14.2%) and Moscow Oblast (64.4%), and, according to the reporting form, this method of laboratory testing is actually not used in the Chechen Republic.

There is also another reason for not using data from reporting forms No. 8 and No. 33 for calculating such indicators as "the notification rate of MbT+ cases" and "the proportion of MbT+ among new TB cases". In the current guidelines on completion of tables in reporting forms No. 8 and No. 33 (which include data on the number of MbT+ patients among new TB cases), no information was specified on the date of MbT+ detection in relation to the date of case registration (or, to be more precise, to the date of starting chemotherapy).

Consequently, in some territories in notification forms on new TB cases, the dates of detection of bacillary excretion were indicated not only at the time of TB case registration, but also after registration if excretion was detected during treatment (e.g. 1–3 months after case registration). Consequently, new TB patients, who were initially not MtB+ and developed bacillary excretion during the chemotherapy stage, were included in registration forms No. 8 and No. 33 as new MbT+ TB patients, with subsequent changes in the notification forms.

Therefore, it should be stressed again that data on the number of MbT+ TB cases among all TB patients is collected for (a) assessment of the spread of this most dangerous form of the disease (PTB with bacillary excretion), and for (b) assessment of laboratory services effectiveness in the detection of new TB cases. Therefore, a patient has to be included in registration forms No. 8 and No. 33 as a "new TB patient with bacillary excretion" only if bacillary excretion was confirmed before treatment was started[24]. If this condition is met, the information collected may be used for the purposes as indicated above.

Detection of bacillary excretion during treatment, i.e. when the patient is followed-up, is not that important from the epidemiological viewpoint. Moreover, the indicator related to MbT+ TB cases, which are calculated including patients who became "MbT+ TB patients" after registration, reflects a kind of prevalence indicator, not the notification rate (see in detail in Chapters 4 and 9).

Therefore, presently the indicators of the number of MbT+ patients among all new TB cases can be most precisely calculated based on the data which are contained in Form No. 7-TB.

According to MoH&SD Form No. 7-TB, in 2009 [21], in the permanent resident population in RF regions, the proportion of registered new ss+ PTB cases was equal to 33.5% (33.0% in 2008), and culture confirmed new PTB cases – 41.8% (40.9% in 2008). As indicated above, according to the data provided in this reporting form, coverage

[24] To be more precise, if the sample was taken not later than the date of case registration or the date treatment was started.

by microscopy and culture in RF regions was quite high. Sputum microscopy was made in 98.3% of new PTB cases (98.2% in 2008) and culture tests were performed in 92.3% of new ss+ TB cases (91.8% in 2008 and 87.2% in 2007).

The reporting forms data also show (Fig. 2.21) that the lowest indicator of laboratory confirmed TB diagnoses was in 2000 (35.5% of MbT+ cases confirmed by all methods in patients with all TB localizations). Since then, a gradual increase in the proportion of MbT+ among new cases was observed up to 2005. Under the circumstances of a relative stabilization of the epidemic process, this indicated improved efficiency of laboratory services in TB detection. However, after 2005 the values of these indicators have not changed much and remained significantly lower than the internationally accepted values (50% for microscopy and 75% for culture) [53].

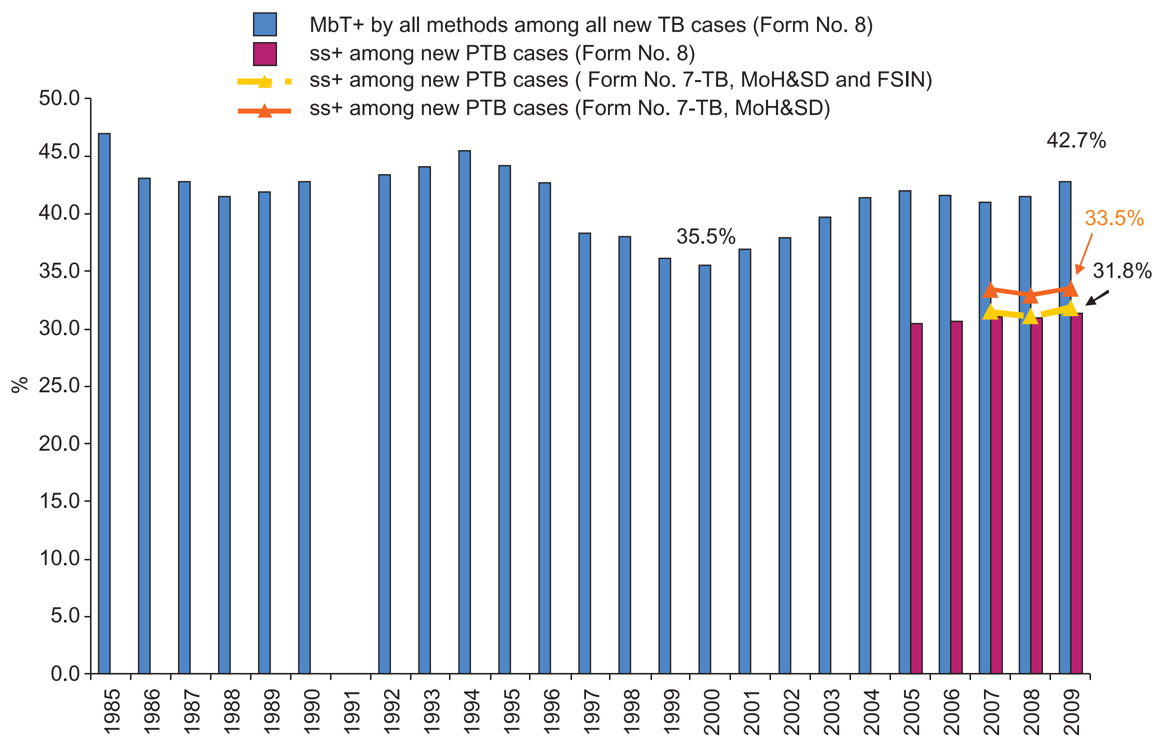


Fig. 2.21. Proportion of bacteriologically confirmed new TB cases in the Russian Federation. Based on data on bacteriologically positive cases confirmed by any method among all new TB cases (Form No. 8) and new ss+ PTB cases (Forms No. 8 and No. 7-TB)[25]

The 2009 data showed a statistically significant increase for two years running in the level of laboratory confirmed TB diagnoses – 42.7% (41.5% in 2008, $p < 0.001$). According to the cohort analysis reporting form (No. 7-TB) data, there was also a statistically significant growth in the proportion of new ss+ PTB patients– from 33.0% to 33.5% ($p < 0.01$) basing on the MoH&SD report data, and from 33.1% to 31.8% according to the MoH&SD and FSIN aggregated data.

It was only in 19 subjects of the Russian Federation (Fig. 2.22) that the proportion of new TB cases with MbT+ confirmed by all methods exceeded 50%, and in nine subjects it did not exceed 35%. At the same time, if in 2008 this indicator did not reach 30% in five regions, in 2009 this indicator was so low in only one region (Amur Oblast, 25.7%).

The percentage of ss+ pulmonary TB patients (Fig. 2.23) was over 50% in two regions only in 2009 (compared with five regions in 2008 and 8 regions in 2007). In 10 regions, this indicator did not exceed 25%.

In 2009, the proportion of new MbT+ pulmonary TB cases confirmed by culture was more than 55% in 16 subjects of the Russian Federation (Figure 2.24), while in 5 subjects this indicator did not exceed 30%. The graph does not include data for Amur Oblast with culture coverage below 15%, the Republic of Kabardino-Balkaria (only 7.1% culture confirmed PTB cases and lack of information on the number of patients for whom culture tests were not performed), and the Republic of Chechnya where culture was not performed in 2009 due to unavailability of required laboratory services. Particularly noteworthy is a very low coverage with culture tests (64.6%) and a low proportion of culture-confirmed diagnoses (19.1%) in such an essential region as Moscow Oblast. Even with exception of patients for whom culture tests were not performed, the proportion of culture-confirmed diagnoses

[25] For 2002, 2003, 2004 and 2005, data in Forms No. 7-TB were collected in 23, 24, 34 и 67 subjects of the Russian Federation, respectively. In 2006–2009, the data were collected in all RF subjects.

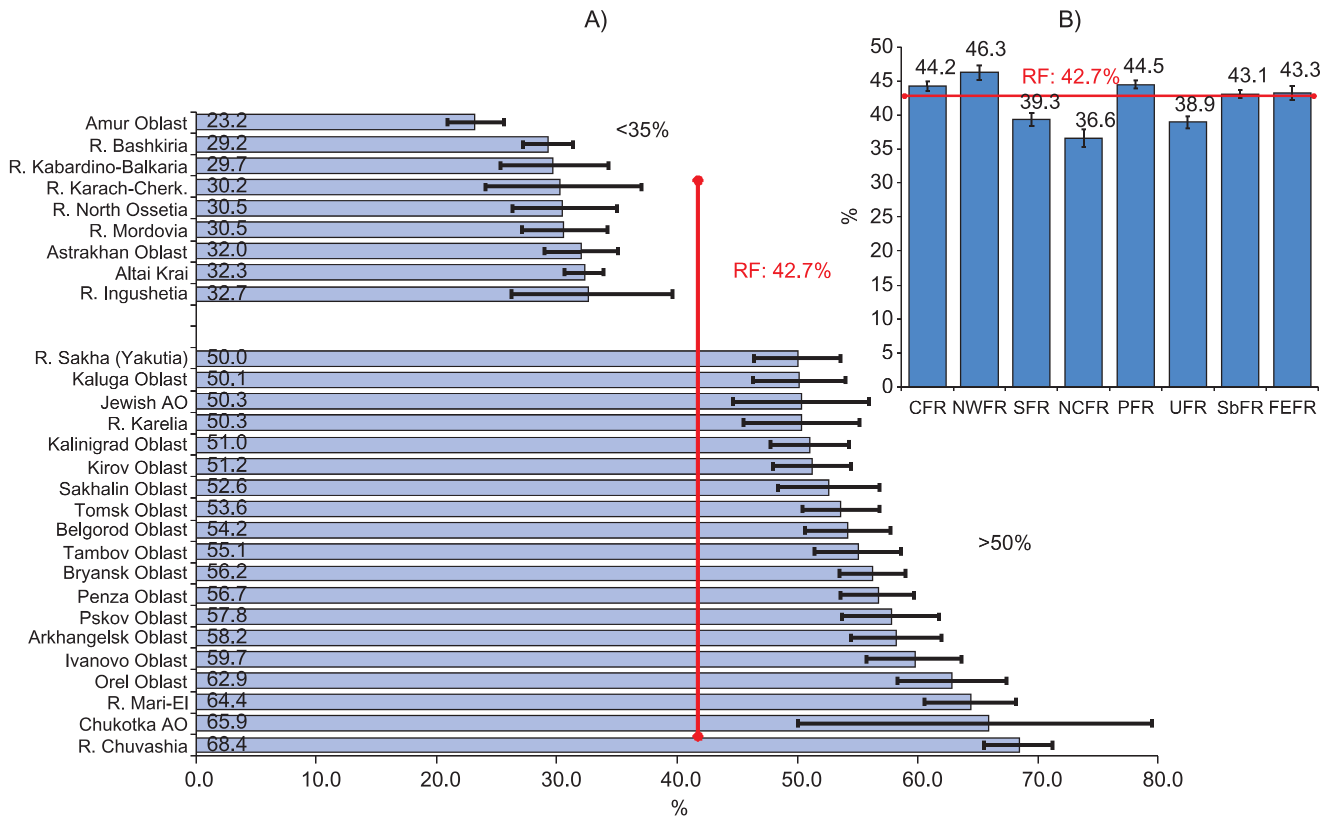


Fig. 2.22. Proportion of new MbT+ pulmonary TB cases confirmed by any method: (a) for territories with lowest (<35%) and highest (>50%) indicator values, and (b) by subject of the Russian Federation, 2009 (Source: Form No. 8; the error bars indicate CI 95%

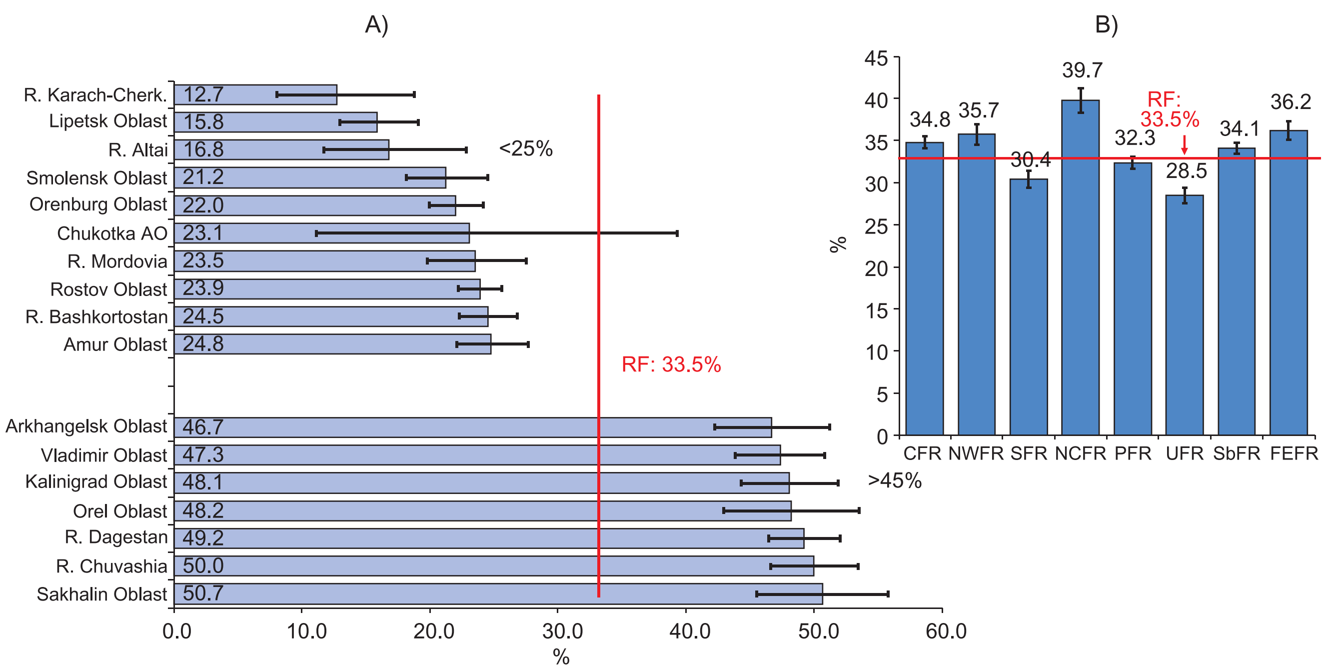


Fig. 2.23. Proportion of new ss+ pulmonary TB cases: (a) for territories with <25% and >45% indicator values, and (b) by subjects of the Russian Federation, 2009 (Source: Form No. 7-TB)

is very low (29.5%). Particular attention should be paid to the poor quality of laboratory diagnostics in Moscow Oblast – a region with 6.7 million population located in vicinity to the Moscow city megalopolis, where almost 3,000 TB cases are detected every year.

It should also be noted that data on low proportions of MbT+ cases determined by culture according to Form No. 7-TB, may also reflect incomplete or inadequate completing reporting forms on culture coverage and results

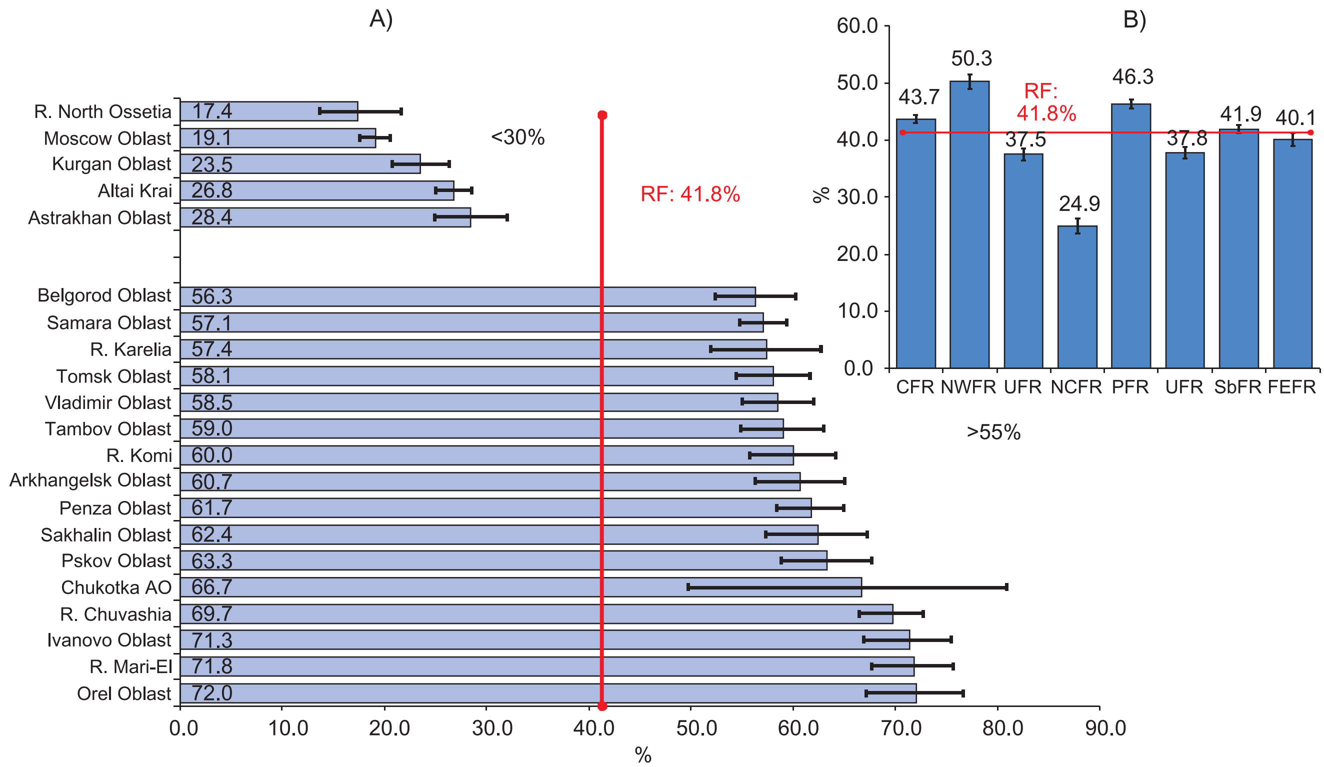


Fig. 2.24. Proportion of new MbT+ pulmonary TB cases diagnosed by culture; (a) RF territories with >55% and <30% values (b) by Federal Regions, 2009. Russian Federation (Source: Form No. 7-TB; including territories with culture tests coverage of new TB patients above 50%). The error bars indicate CI 95%

in some RF regions, i.e. show insufficient collaboration between the laboratory and epidemiological surveillance TB services.

In general, these indicators stress the need for further improving laboratory services, particularly in Southern, North Caucasus and Ural Federal Regions. It is also obvious that quality of laboratory tests (both microscopy and culture) is high in North-West Federal Region.

An important indicator pointing to the effectiveness of TB control services administration is the ratio of the number of smear-positive PTB cases detected in PHC facilities to the number of cases diagnosed in TB control facilities [25, 26]. This indicator is based upon data contained in Form No. 7-TB. The value of this indicator is not that significant on the national level, but there has been a statistically reliable trend to growth in recent years – from 12.5% in 2006 to 17.1% in 2009. Sputum smear microscopy should become a routine method of differential diagnosis of TB in PCH facilities. Anyhow, in spite of its simplicity, this method is insufficiently used in PHC facilities, although the situation varies widely throughout RF regions. In 2009, the proportion of microscopy-confirmed smear positive PTB cases detected in PHC facilities was over 40% in 12 subjects of the Russian Federation (Fig. 2.25).

An important indicator reflecting effectiveness of microbiological laboratories is the ratio of MbT+ cases to the number of patients with destructive pulmonary TB (TB with cavity of the lung) among new respiratory TB cases. This ratio reflects how often bacterial excretion is diagnosed in patients with the most severe forms of respiratory TB and the degree of laboratory services involvement in diagnosis and detection of TB cases. In recent years (Fig. 2.26), the value of this indicator on the national level in Russia has reached or slightly exceeded 100%, and the most significant increase was registered in the last two years (from 100.3% in 2007 to 111.8% in 2009). This indicator being calculated according Form No. 33 (Fig. 2.26), in spite of its limited character, is sufficient for an indirect assessment of multi-year development of and changes in the laboratory confirmation of TB cases with lung destruction.

Laboratory performance can be assessed more precisely basing on the proportion of MbT+ patients **among** new PTB cases with lung destruction, which directly reflects the possibility of microbiological confirmation of diagnosis. Such indicator values became available after sectoral reporting Form No. 7-TB was introduced in 2005 [25, 26].

According to the cohort analysis based on Form No. 7-TB data, in 2009 in Russia TB diagnosis was confirmed by bacterioscopy in only 59.0% of PTB patients with lung destruction, which indicates insufficient effectiveness of bacteriological diagnostics. At the same time, this indicator is rather high in some regions of the Russian Federation (Fig. 2.27). It is over 80% in the Republic of Chuvashia, in Ivanovo, Orel, Kostroma, and Vladimir

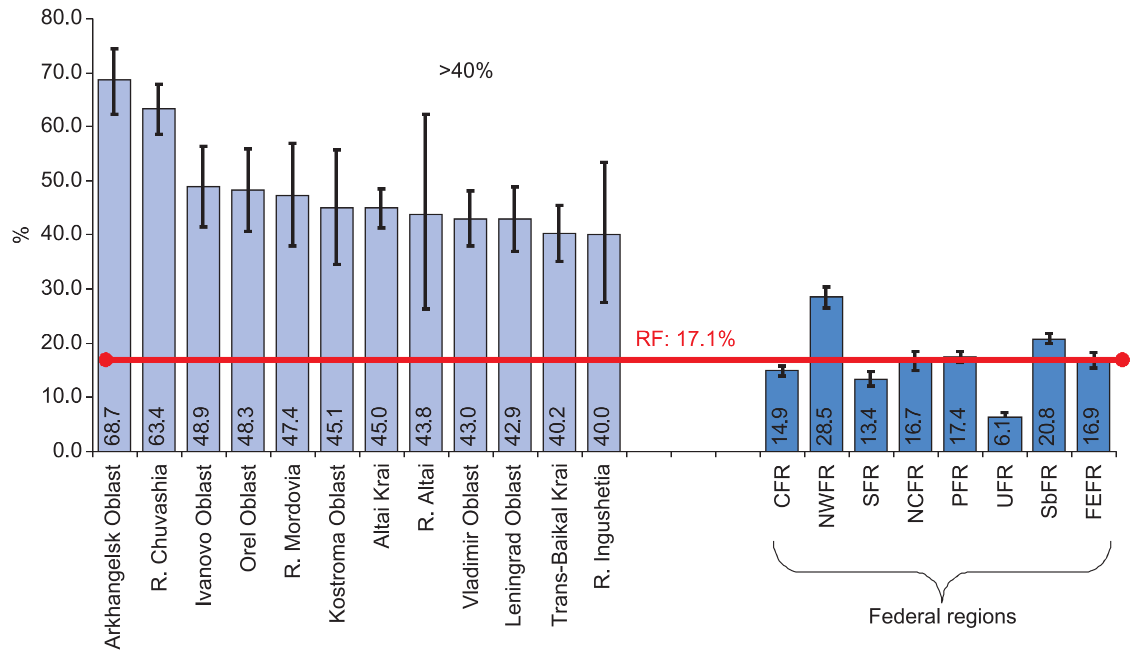


Fig. 2.25. Proportion of the ss+ TB cases detected in PHC facilities among those detected in TB control facilities. Subjects of the Russian Federation with values more than 40%; by federal region (Source: Form No. 7-TB). The error bars indicate CI 95%

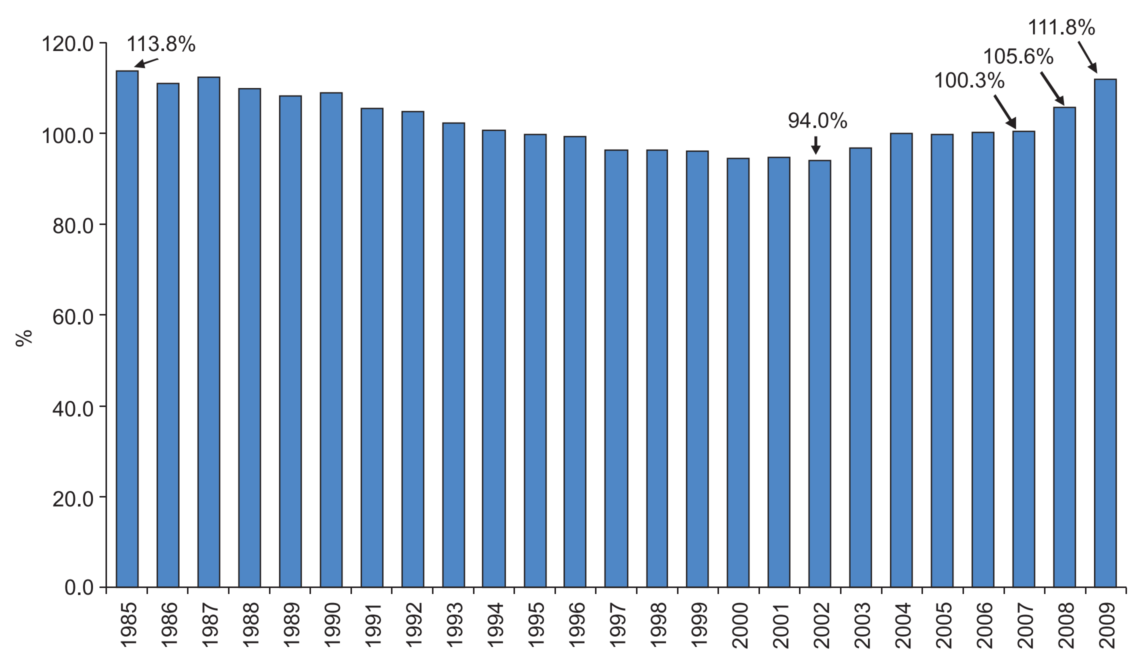


Fig. 2.26. Ratio between the number of MbT+ cases and the number of TB patients with lung destruction among RTB cases (Source: MoH&SD data, Form No. 33)

oblasts, and it is below 45% in Lipetsk, Orenburg, Leningrad, Smolensk oblasts, in Karachaevo-Cherkessia, Altai, Kabardino-Balkaria republics, and in Chukotka AO.

Presently, the ratio between new MbT+ TB cases and new TB cases with lung destruction and the proportion of MbT+ cases among new TB patients with lung destruction are the indicators of microbiological diagnostics quality rather than of quality of radiological examinations. From this point of view, these indicators present an integral and clear picture of microbiological diagnostics as a whole. Values of these indicators are directly influenced by such factors as the quality of collection of diagnostic materials and the quality of laboratory techniques, which, in their turn, depend on medical workers' qualification and performance. In recent years, a system of external quality assurance of laboratory investigations based on panel tests has been introduced in Russia. The system ensures verification of laboratories potential in performing tests for detection of *Mycobacteria tuberculosis*, which is a

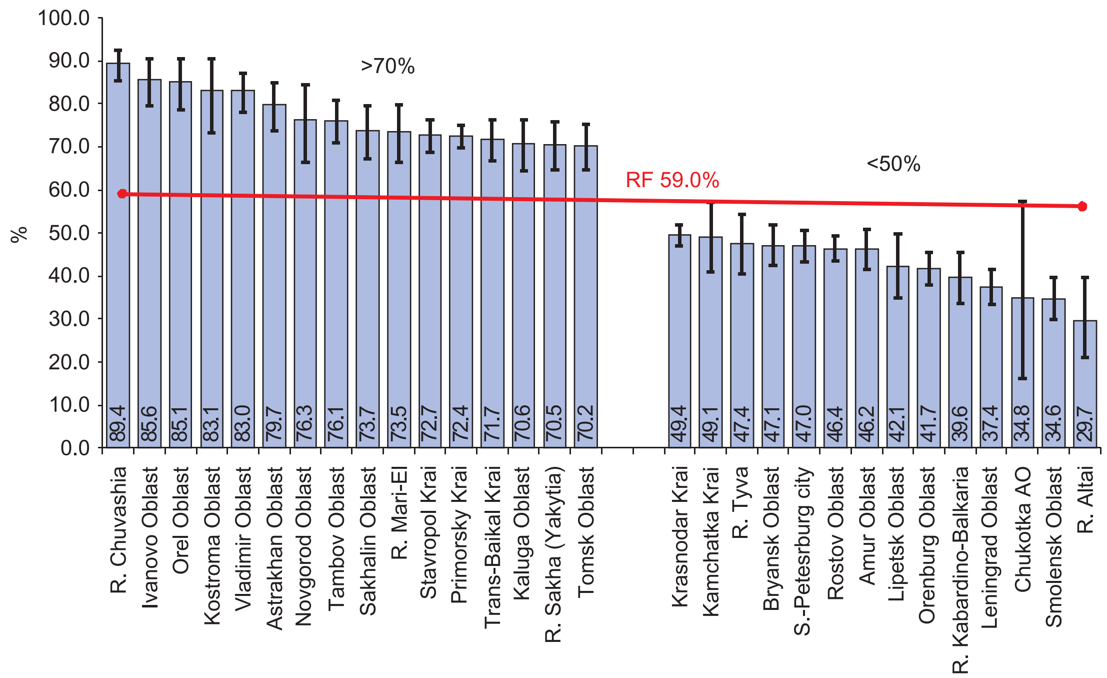


Fig. 2.27. Portion of MbT+ cases (ss+) among PTB patients with pulmonary destruction, 2009. Two groups of federal regions – with low (less than 50%) and relatively high (more than 70%) values of indicator (MoH&SD data, Form No. 7-TB). The error bars indicate CI 95%

very important but not the only component of effective performance of laboratory services. This system will be described in detail in Section 11 "Laboratory testing quality assessment".

2.6. TB notification rates for persons having contacts with TB patients

Form No. 33 contains a very important information block on the number of new TB patients who had contacts with TB patients with and without bacillary excretion. By the beginning of the 21st century, TB notification rate among individuals who had been exposed by MbT+ patients exceeded 800 per 100,000 annual average numbers of contacts. In recent years, the indicator value started to decline, reaching the level of 774.1 per 100,000 contacts in 2007 compared with 805.3 in 2006 and 777.5 in 2008 (Fig. 2.28).

In 2009, the structure reporting aggregated data about the number of contacts with TB patients and those who became ill with TB was slightly changed to comply with the statistical data on dispensary follow up groups (DFG) IVA and IVB. In particular, since that time, the statistical data included information on the number of individuals who had professional contacts with sources of TB infection (DFG IVB) and those who fell ill with TB because of such contacts.

In 2009, 2,040 TB cases were notified among contacts with MbT+ patients (including 1,277 adults who had household or occupational contacts, 207 adults who had professional contacts, and 556 children of 0–17 years of age[26]. The overall number of registered contacts with MbT+ patients was equal to 364,550 individuals by the end of 2009 (including 189,540 adults who had household or occupational contacts and 83,153 adults who had professional contacts).

The overall notification rate among people who had household and occupational contacts with MbT+ patients and TB incidence among adults who had household or occupational contacts with MbT+ patients decreased respectively to 568.9 and 695.4 per average annual 100,000 contacts in 2009 compared with 577.5 and 864.8 respectively in 2008[27].

In 2009, the notification rate was for the first time calculated for individuals who had professional contacts with MbT+ patients. It was 248.5 cases per 100,000 contacts registered by the end of the year, which is three times greater than the average notification rate in the country and approximately two-fold if compared with the notification rate in populations of productive age groups.

[26] See Chapter 5.

[27] Before 2009, individuals who had professional contacts with MbT+ patients were not enough considered in the overall notification rate. Therefore, this change has a significant impact on the indicator value (the numerator and particularly the denominator).

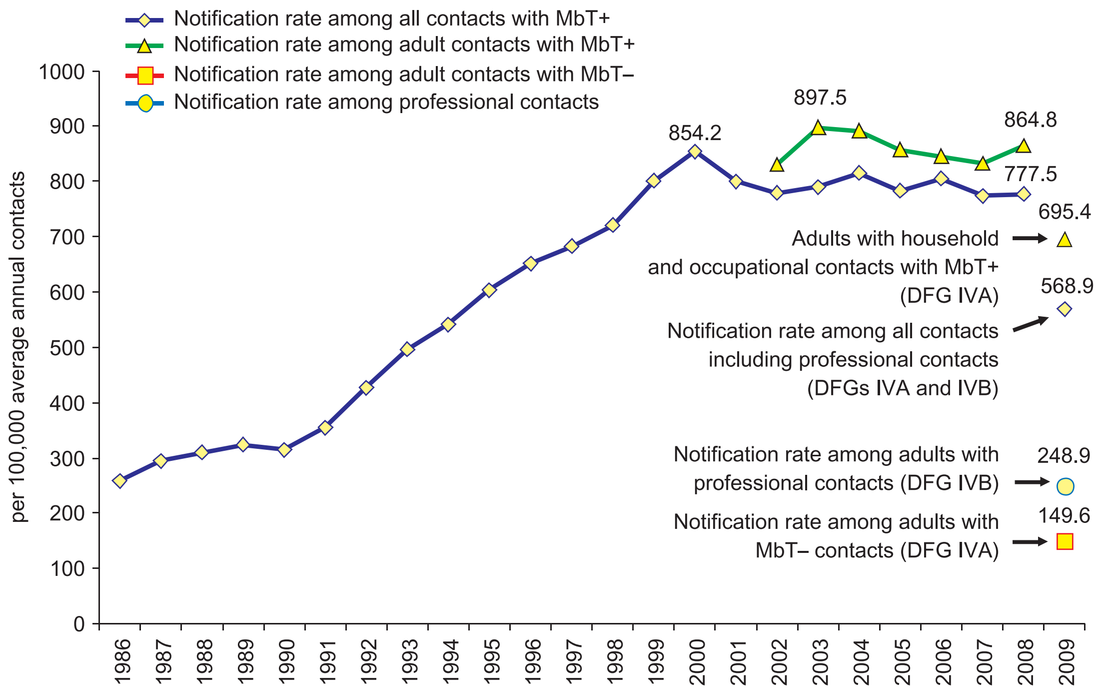


Fig. 2.28. TB notification rates among adults exposed to MbT+ and MbT– patients in the Russian Federation (Source: Form No. 33, 2007; data for 2007 does not include the Republic of North Ossetia[28])

In 2009, the overall notification rate among contacts with MbT+ patients was 7 times higher than that in permanent population.

The overall notification rate among adults who had household or occupational contacts with MbT+ patients (695.4 cases per 100,000 average annual contacts in 2009) was 4.6 times higher than the respective indicator for contacts with TB patients without bacillary excretion (149.6 cases 100,000 average annual contacts registered by the end of 2009). This proves again the necessity to pay special attention to MbT+ patients as epidemiologically most dangerous group.

2.7. TB case-finding management in the Russian Federation

The levels of TB notification rates and TB incidence structure in a region to a large degree depend upon case-finding management [2].

In the RF at present, radiological (X-ray) methods are predominantly used for TB case-finding. Fluorography is performed in polyclinics for all patients who visit polyclinics and those who were not examined by X-ray in the current year, as well as for people belonging to high-risk groups for TB (patients with diabetes, patients receiving corticosteroids, on radiation therapy, etc.).

In 1985–1987, the highest coverage of the population by TB screening was attained, reaching 75% of the total population. During the first post-soviet years, the situation changed dramatically: the scope of planned and actual screening activities decreased, and less than half of the population subject to routine tests for TB was screened. By 2000s, the populations covered by active mass screening increased slightly and stabilized in the range of 57–59%. Anyhow, the percentage of TB cases detected by screening activites did not exceed 53–54% (Fig. 2.29, Table 2.2). Over the last three years, there was a statistically significant growth in both indicators. In 2009, a 62.4% coverage with screenings was attained and the proportion of TB cases detected through mass screenings (active TB detected – note of translation editor) reached 61.5%[29]. It should be noted, as indicated above, the notification rate decreased in 2009[30].

In assessments of TB case-finding scope and quality in 2007–2008, it should be emphasized that at that time modernization was being performed in primary health care facilities, including provision of digital fluorography

28 See note in the beginning of Section 2.6).

29 The proportion of TB cases detected by screenings was calculated from the overall number of detected cases without cases detected post mortem.

30 In the reporting forms received from 4 territories (Novgorod Oblast, North Ossetia, Chuvashia and Tyva) the data on TB detection by fluorography was shown at 100%, which overestimated the national data. Therefore, corrections were made in these territories, and the average national indicator of TB case detection by prophylactic screenings is now estimated at 60%.

equipment within the National Health Project, and the national TB services were equipped with bacteriological laboratories (equipments and laboratory staff were financed from IBRD loan and GF grant). Thanks these activities and following the implementation of subprogram "Urgent measures to combat tuberculosis in Russia" of the Federal Target Program "Prevention and Control of Social Diseases (2002–2006)", it became possible to increase the proportion of population coverage by screening, as well as the proportion of TB cases detected through screenings.

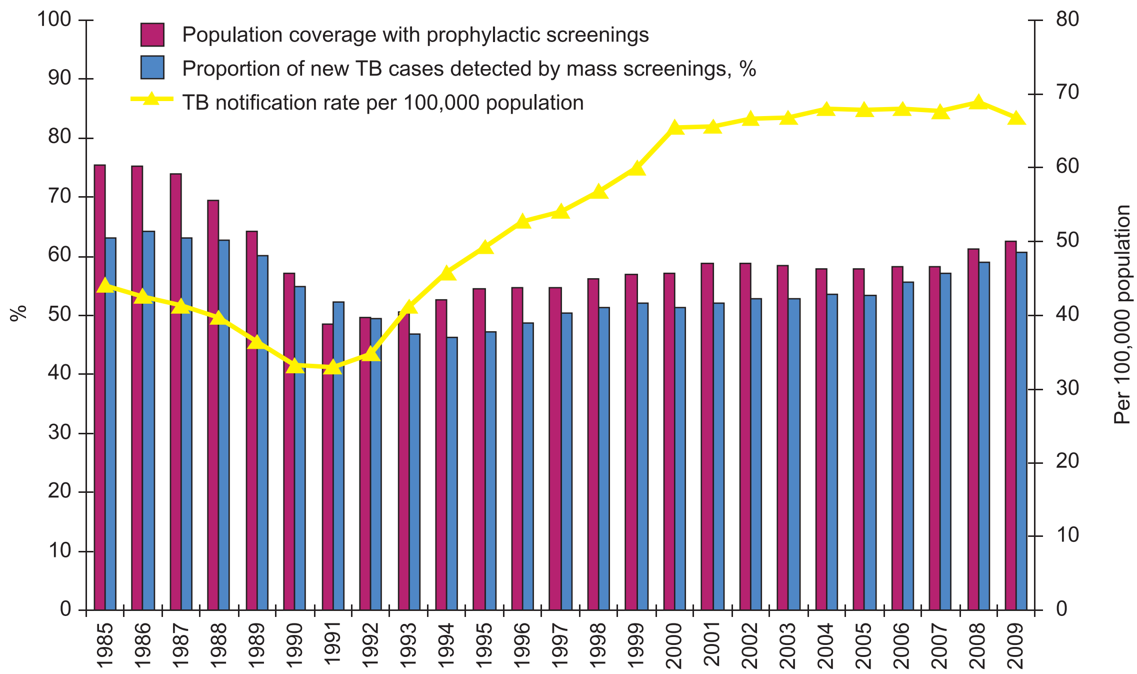


Fig. 2.29. Active detection of TB cases in the Russian Federation. Coverage by mass screening, percentage of new TB cases found through active detection activities[31], TB notification rates in permanents residents (Sources: Forms No. 33 and No. 30)

In 2009, the proportion of new TB cases detected by prophylactic screenings was over 70% in 12 regions of the Russian Federation (in 7 regions in 2008) – in Rostov, Lipetsk, Saratov, Magadan, Voronezh, Omsk oblasts, in Kamchatka, Khabarovsk, Trans-Baikal and Krasnoyarsk krais, in republics of Buryatia, Altai and Morodvia. In 2008–2009, in all RF regions (excluding Chechnya), the proportion of new TB cases detected by prophylactic screening reached over 40%, while in 2003–2007 the number of such regions decreased from 21 to 6.

On the whole in 2009, in permanent residents (according to Form No. 33) and with taking into account permanent residents with diagnoses established post mortem, 59.6% of new TB cases were detected by active prophylactic interventions, 38.7% during patients' visits to health facilities with complaints, and 1,7% of cases were detected post mortem (1681 cases from permanent residents)[32].

In 2009, TB case-finding rates were relatively high in all screening activities (0.65[33] per 1000 individuals examined), fluorographic examinations (0.8 per 1000 persons examined). This indicator reflects two processes – fluorography service performance in the detection of TB-related pathological conditions and the performance of TB control facilities in additional examinations of suspicious (supposed) patients and registration of detected TB cases. Anyhow, the reporting forms do not contain information on the number of detected pathological conditions that require additional examinations. On the other hand, some people with suspicion of TB after prophylactic examination do not apply to TB control facilities.

[31] From the line of Form 33 "detected patients with TB diagnosed for the first time in their lifetime out of the number of persons screened for TB".

[32] According to Form No.8, 2064 TB cases were diagnosed postmortem in the country in 2009. The contribution of FSIN facilities to this number was not that significant – according to Form No. 4-tub, only 10 cases were post-mortem detected in penitentiary system facilities in 2006 (see Chapter 8).

[33] It should be noted that the calculation of this indicator is not reliable, because the denominator shows data from Form No. 30 (i.e. received from all sectors), while the numerator includes information from Form No. 33 completed in regional TB control facilities.

Table 2.2

Populations tested for TB, Russian Federation, 2005–2009 (Source: Forms No. 33 and No. 30)

Indicators	2005	2006	2007	2008	2009
Screened for early detection of TB by all methods (persons): Total	82,833,191	82,957,322	82,901,835	87,121,448	88,669,142
% of total population	57.9	58.2	58.3	61.3	62.5
Including: covered by fluorography (persons)	59,586,046	59,904,093	61,054,847	63,923,789	65,966,287
% of all examined	71.9	72.2	73.6	73.4	74.4
% of total population	41.6	42.0	43.0	45.0	46.5
% of the population 15 years and older	49.0	49.3	50.3	52.7	54.6
Including: tuberculin skin tests for children of 0 – 17 years (persons)	21,149,813	20,521,136	19,584,049	20,524,971	20,520,663
% of all examined	25.5	24.7	23.6	23.6	23.1
% of total population	14.8	14.4	13.8	14.5	14.5
% of children (0–17)	73.7	74.7	73.3	77.7	78.8
Including: tested by microscopy (persons)	973,256	919,996	980,025	1,047,162	1,111,538
% of all tested	1.2	1.1	1.2	1.2	1.3
% of total population	0.68	0.65	0.7	0.7	0.8
of them in general health care facilities (persons)	600,098	627,412	732,026	833,789	939,838
% of all tested by microscopy	61.7	68.2	74.7	79.6	84.6
TB cases detected by screening	51,591	53,881	55,031	57,748	58,279
% of TB cases detected by screening*	53.4	55.6	57.2	59.0	61.5
detected per 1000 examined patients	0.62	0.65	0.66	0.66	0.66
TB cases detected by fluorography	48,923	51,160	52,334	52,414	52.443
Detected per 1000 examined	0.8	0.9	0.9	0.8	0.8
% of all TB cases detected by screening	94.8	94.9	95.1	90.8	90.0
TB cases detected by microscopy	1,851	2,242	2,123	2,170	957
% of all TB cases detected by screening	3.6	4.2	3.9	3.8	1.6

* percentage calculated per all new TB cases without new TB cases detected postmortem.

2.8. TB relapses

There are two ways to define "relapse" in the Russian Federation. One approach is based on dispensary follow-up definitions, which have been used for almost 50 years. [25]. Following these definitions, a relapse case is concerned with manifestations of active TB in people who have already received successful treatment from the disease, considered cured, followed-up in DFG III (DFG for cured TB patients, see Annex I – note of translation editor) or taken-off from the register of TB patients after cure.

The other Russian definition of a relapse was introduced in accordance with MoH&SD Executive Order No. 50 and is based on treatment history of the patient, particularly, on chemotherapy outcome [26] (see Annex I). According to this definition, a relapse case is defined as a "new episode of the disease in patients with previous effective course of chemotherapy, and new evidences of TB confirmed by positive results of sputum microscopy or culture tests and/or clear clinical-radiological evidence of TB".

Both definitions include references to a previous cure or successful course of chemotherapy during previous TB disease episode. Therefore, at present due to the reduction of duration of follow-up in DFG I after the primary course of therapy [20] both definitions of relapses have become closer each other. The rate of relapse cases is an important indicator of effectiveness both dispensary follow up activities and TB treatment control.

Two types of relapses are considered in the dispensary follow-up system: "early" relapses – those who were registered in DRG III at the time of repeated TB diagnosis; and "late" relapse cases, i.e. TB relapses in individuals previously removed from dispensary registration[34].

The MoH&SD data (Form No. 33, Fig. 2.30) showed an increase in relapse TB cases in 2004–2005, with a statistically significant decrease in 2007 (from 9.2 in 2006 to 9.0 per 100,000 population, i.e. from 13,171 to

[34] Until 2004, late relapse cases also included relapse cases from dispensary follow-up group VIIA – cured persons with significant residual effects as a consequence of TB.

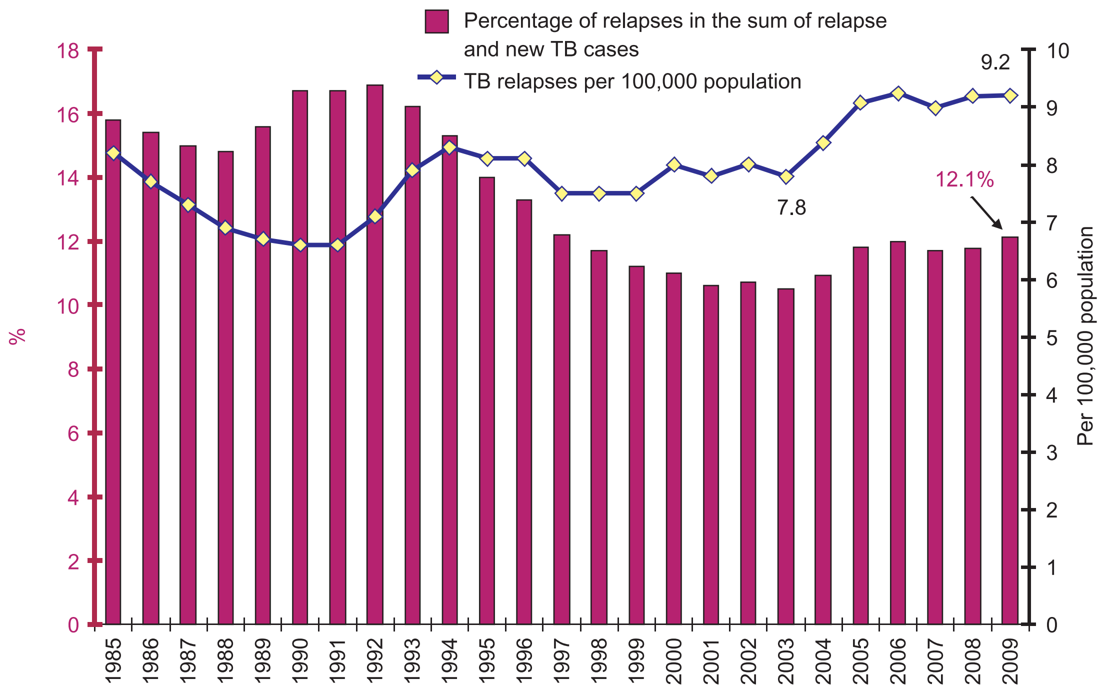


Fig. 2.30. TB relapses. Proportions relapses in the total number of TB relapses and new TB cases and the rate of relapses per 100,000 population, Russian Federation (Source: Form No. 33)

12,771 cases). In 2008, this indicator showed a small growth (to 9.2 per 100,000 population) and remained on the same level in 2009 (13,059 cases). According to data from all agencies[35], the number of relapse cases gradually increased from 10.3 (14,677 cases) in 2005 to 12.0 (17,048 cases) in 2009. With the reduced number of new detected TB cases, this caused a greater proportion of relapsed TB in the total number of notified TB cases (12.7%).

According to the data presented in Fig. 2.31, the increase in relapsed TB rates in 2003–2006 was due to early relapses resulting from ineffective treatment and some shortcomings in the formation of DRG III during the 2004 revision of dispensary follow up groups. Reduced rates of TB relapses were registered nationwide after 2006, which was due to a broad scope of activities to increase effectiveness of national TB control programs and to improve the regulatory basis of TB control activities in the country, including shortening of following-up in DRG III [25, 26]. By 2007–2009, early relapse cases were reduced to 4700–4800 cases per year, while the percentage of early TB relapses among all relapse cases decreased from 39.7% in 2006 to 37.6–37.9% in 2008–2009 ($p < 0.005$)[36].

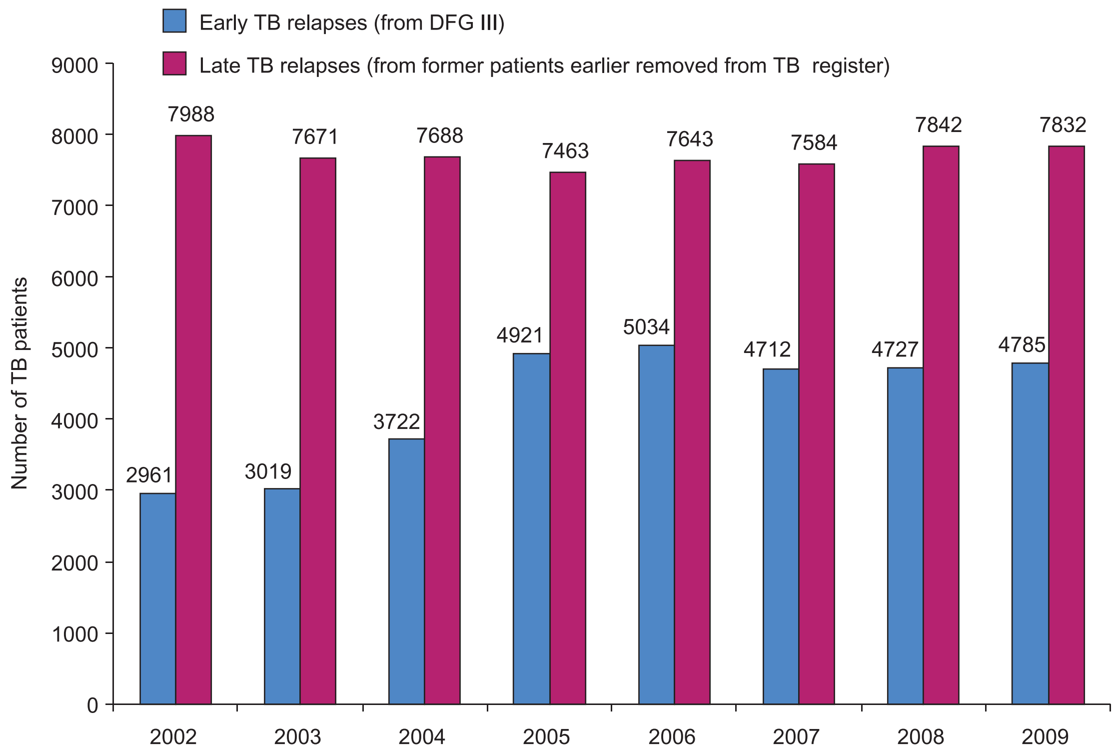
An increase in the number of early RTB relapses was observed in 75 subjects of the Russian Federation in 2003–2006. The highest increase was reported in the Republic of Kalmykia (by 3.8 times), Khabarovsk Krai (by 3.7), Republic of Kareliya (by 3.5), Chelyabinsk Oblast (by 3.4), and in the Republic of Altai (by 3.1). In 9 territories, there was a reported decrease in the number of early relapses, most strongly in Belgorod, Tambov, Orel oblasts, and in the Republic of Tyva.

In 2006–2009, reduced rates of early relapses were registered in almost 50 federal regions. Nevertheless, there was a slowdown in the decreasing trend and even a statistically insignificant growth of early relapses (from 4727 to 4785 cases) in 2008–2009 against the smaller TB notification rates in the period.

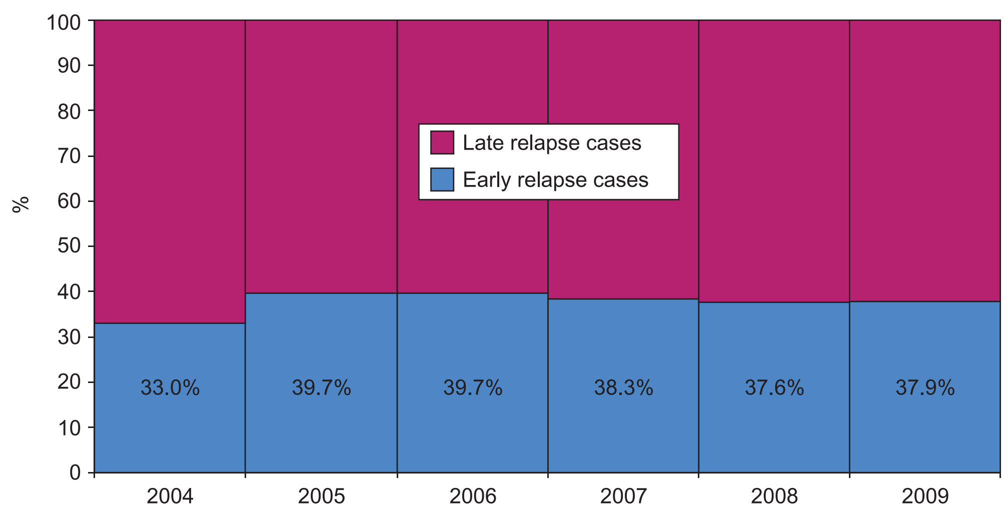
Anyhow, the available data does not support the concern expressed by many Russian experts that the new approaches to TB case-finding and treatment management may lead to higher notification rates of relapses. On the contrary, in 2002–2005, prior to the implementation of improved TB control, there had been a significant growth of early relapses, which indicated substantial shortcomings in TB patient management. These shortcomings may also cause the current increase in late relapses, i.e. recurrence of the disease in patients who received basic treatment courses before 2005–2006.

The number of relapse TB patients included in cohorts for chemotherapy (i.e. the relapses determined basing on patients' chemotherapy histories, Form No. 7-TB) was somewhat higher in comparison with the number of relapse TB cases registered in the dispensary follow-up system (13.683 and 13,059, respectively, according to MoH&SD 2009 data). It is noteworthy that in 2007–2009 the gap between the relapse TB cases determined basing on dispensary follow-up system and cohort analysis data was tending to narrow. If in 2007 the total number of all relapse TB patients included in the treatment cohort exceeded by 7% the number of patients registered in respective dispensary groups

[35] The number of relapse TB cases from all sectors has been registered in Form No. 8 since 2005.
[36] CI for three proportions in 2006–2008 was calculated by chi-square.



A) Absolute annual numbers of early and late TB relapses



B) Proportions of earlyTB relapse cases in all registered TB relapse cases.

Fig. 2.31. Early and late relapse of respiratory TB, Russian Federation (Source: Form No. 33)

(13,659 and 12,771 relapse TB patients, respectively), this percentage fell down to 4.8%. Indirectly this indicates a shorter period of transfer of TB patients to the DRG category of non-active TB after successful courses of chemotherapy.

In 2009, the number of relapse TB patients included in the treatment cohort increased by 20% the number of relapse TB cases registered in DFG I in 8 regions (Republic of Adygea, Tula, Yaroslavl, Kaliningrad, Kaluga, Smolensk, Vladimir oblasts and Moscow city). This may be caused by a delay in patients' transfer to DRG III. Moreover, the relapse develops after effective chemotherapy treatment and before transfer to DRG III. As a result, the patient is included in the re-treatment cohort without relapse case registration in the dispensary follow-up system.

Part of relapse cases were not included in re-treatment cohorts in 10 regions, so the number of relapse cases registered in Form No. 7-TB is by at least 2% less compared to those registered in dispensary follow-up documents (Form No. 33). This concerns the Republic of Kabardino-Balkaria, as well as Kursk, Tambov, Moscow, Chelyabinsk, Penza, Voronezh, Novgorod, Tyumen oblasts and Stavropol Krai.

Cohort analysis reporting forms allow for determining the proportion of TB cases confirmed by microscopy (37.4%, hereinafter according to MoH&SD Form No. 7-TB, and culture (48.1%), as well as for calculation of patients with lung destruction (55%). The data contained in the form proves in statistical terms that TB relapse patients have more severe forms of the disease than new TB patients do.

2.9. Comparison of TB notification rates in WHO European region countries, worldwide and the Russian Federation

In assessments and comparisons of TB notification rates in different countries it is important to take into account differences in the nationally adopted systems of detection and diagnosis of TB cases. The real TB incidence differs from TB notification rate in any country. This difference is sometimes significant and depends primarily on the effectiveness of healthcare facilities in TB case-finding and is different not only between countries but also within regions in individual countries.

Therefore, WHO [46] has developed a system of estimating the real values of major indicators (TB incidence, MbT+ TB incidence, TB mortality and TB prevalence), which is used for estimating and publication in annual reports of TB-related data and for comparisons between countries.

In comparisons of indicators between countries, in addition to the *TB notification rate* (i.e. registered new TB cases), which is discussed in this chapter, international publications (including WHO) also include estimated values of *TB incidence* (or *estimated TB incidence rate).* The TB notification rate indicator discussed in the Chapter 2 reflects the frequency of new TB cases in the population that has been measured (registered) by the national health statistics service and differs to a certain extent from the real incidence value.

WHO performs annual assessments of the major TB indicators that reflect the burden of the disease (incidence, prevalence and mortality), basing on the information received from the national TB control services (on registered TB morbidity and mortality data) based on expert estimates and as a result of consultations with national experts [54].

According to the WHO definition, the estimate of TB notification rate includes new TB cases and TB relapse cases[37] of all forms and localizations registered in a year.

In 2008–2009, the WHO Global Task Force on TB Impact Measurement updated the methodology of assessing TB incidence, mortality and prevalence [47, 60]. Improvements to the methods included a “systematic documentation of expert opinion, simplification of models, updates to parameter values based on the results of systematic reviews, much greater use of mortality data from vital registration systems and systematic documentation of uncertainty” [54].

The major sources of data used for updating TB incidence estimates in 1990–2008 included

1) number of registered new TB cases and TB relapses;
2) expert opinions documented at the workshops that were held in five WHO regions on TB cases coverage by TB control systems;
3) measurements of TB prevalence based on results of special studies;
4) measurements of TB mortality based on vital registration systems data;
5) use of capture-recapture method;
6) use of earlier published data on dynamic series of TB notification rates.

The current publications of the World Health Organization stress the need for using estimates with certain precaution because of a relatively high uncertainty of the results of such estimates. The WHO latest publications indicate three basic levels of estimates: best (i.e. most probable) estimate, high and low uncertainty bounds of estimate, – all of which reflect different degrees of uncertainty of indicators.

For the Russian Federation, WHO epidemiological indicators are based on the expert estimate of the proportion of TB cases detected by the National TB control system in all people with TB. This proportion is given for a certain reference year and extrapolated over other years following a special procedure.

Presently, the expert estimation of the proportion of new detected TB cases among all people with TB has been reconsidered and changed for a new reference year (2007) and its value is considered equal to 0.85[38]. This value was proposed by RF experts and documented at the WHO/EURO meeting on epidemiological surveillance, Berlin, April 2009.

Besides, Russian experts are working on a dynamic estimation method, which will allow for making annual amendments depending on the current specificity and structure of detected cases. This approach will provide a basis for estimating actual incidence rates both nationwide and in the subjects of the Russian Federation.

---

37 According to the WHO definition, relapse cases are defined as people who have been previously treated for TB and for whom there was bacteriological confirmation of cure or documentation that treatment was completed. Relapse cases may be true relapses or a subsequent episode of TB caused by reinfection.

38 Before 2009, estimates of new detected TB cases in the Russian Federation were made upon the value calculated in 1997 by Prof. A.G. Khomenko basing on data received from questionnaires distributed among Moscow and regional experts. The proposed estimate for the reference year (1995) was adopted in a joint protocol between RF and WHO in 1997. Russian experts hold that only 76% of TB cases were registered as related to the actual incidence rate in 1995.

Of course, all these approaches are only approximate. However, more precise methods of estimation have not yet been developed. Therefore, in the meantime it is essential to have at least an approximate estimation of the real incidence.

WHO most recent publications [54] contain the following major data on TB detection in different countries:

- estimates of the total number of new TB cases and TB relapses (all forms, i.e. all localizations irrespective of whether or not bacillary excretion is present), along with estimates of incidence rates per 100,000 population;
- estimates of the total number of new pulmonary TB cases with sputum smear-positive microscopy (ss+) and estimates of ss+ TB incidence rates per 100,000 population;
- the number of notified TB cases and respective indicator per 100,000 population for the following patient groups:
  - overall number of new pulmonary TB cases and pulmonary ss+ TB relapses;
  - new pulmonary ss+ TB cases;
  - new pulmonary ss– TB cases, including those with unknown results of bacterioscopy;
  - new extra-pulmonary TB cases (extra-pulmonary sites including intrathoracic lymph nodes, pleura, upper respiratory tract and bronchi);
- proportion of ss+ cases among new pulmonary TB cases;
- distribution of new ss+ pulmonary TB cases by age and gender;
- case detection rate determined as proportion of notified TB cases to estimated incidence rate (all localizations irrespective of whether or not bacillary excretion is present);
- case detection rate (ss+) determined as proportion of notified TB cases to estimated incidence rate.

According to WHO estimates [54], there were 9.4 million new TB cases globally (140 per 100,000 population) in 2008, including 4.3 million ss+ TB cases (64 cases per 100,000 population). Among new TB cases, about 15% (13–16%)[39] were patients with TB/HIV co-infection (about 1.4 million). Most of TB/HIV cases (78%) were registered in the WHO African Region , and 13% – in the WHO South-East Asia Region[40].

Most of the estimated number of cases occurred in Asia (55%) and Africa (30%), with smaller proportions of cases in the Eastern Mediterranean Region (7%), the European Region (5%) and the Region of the Americas (3%).

With the overall estimated incidence rate in the African region at 350 cases per 100,000 population, in Swaziland and South Africa this indicator reaches as much as 1200 and 960 cases, respectively. High levels of estimated incidence rates are also in South-East Asia countries (180), and the lowest estimated incidence level is in the WHO Region of the Americas (31).

The five countries that rank first to fifth in terms of total numbers of TB cases in 2008 were India (1.6–2.4 million), China (1.0–1.6 million), South Africa (0.38–0.57 million), Nigeria (0.37–0.55 million) and Indonesia (0.34–0.52 million). India and China alone accounted for an estimated 35% of TB cases worldwide.

According to the WHO data, highest rates in the European Region (over 120 cases per 100,000 population) were in Tajikistan (200), Kazakhstan (180), Republic of Moldova (170), Kyrgyzstan (160), Romania (130) and Uzbekistan (130).

In 1999, the new term 'global TB burden' was introduced [46], i.e. the burden inflicted by the disease to international community. This (somewhat economic) definition was used to select 22 countries with high burden of TB [46], i.e. countries that contribute most to the global TB burden judging from the absolute number of TB cases in these countries and not calculated per 100,000 populations.

The list of high burden countries includes the countries that contribute 80% of new TB cases in the world according to WHO estimates[41] (Table 2.3, Fig. 2.32).

The Russian Federation is among the 22 high-burden countries (Table 2.3). At the same time, the estimated rate of TB burden in Russia is not among most significant in the world (110 (91–130) cases per 100,000 population). According to WHO estimates, in 2008, Russia's contribution among the 22 high burden countries was not significant either – 2.0% of 7,540,000 cases in the high-burden countries and 1.6% of 9,400,000 new TB cases worldwide. At the same time, according to WHO estimates the Russian Federation accounts for 35.3% of all TB cases notified in the WHO European Region.

As indicated above, the completeness of case registration in national TB control systems is different, and by far not in all countries the case notification rate reflects the real TB incidence rate.

To assess the completeness of TB case detection coverage in individual countries, WHO uses such indicators as 'case detection rate, all forms' (CDR) and 'ss+ case detection rate' (CDR ss+). These indicators are calculated in percentage values and show to what extent the notified case detection is less than the real incidence rate (for all new TB cases and for ss+ new TB cases).

[39] Hereinafter WHO estimates include best estimates along with low and high estimates (shown in brackets) reflecting different degrees of uncertainty.
[40] Hereinafter countries in the WHO Regions may not correspond to respective geographic regions.
[41] The list of 22 countries with high burden of TB does not change very often. Following the initial list, Peru was replaced by Mozambique.

Table 2.3

TB case detection in some countries and WHO regions, 2008 (Source: [53, 54])

Countries	WHO estimated rates				TB notification rates**				Case detection rate ss+
	All new TB cases and ss+ TB relapses		New pulmonary TB cases ss+		All new TB cases and ss+ TB relapses		New pulmonary TB cases ss+		
	Number of cases	Per 100K	Number of cases	Per 100K	Number of cases	на 100 тыс.	Number of cases	Per 100K	%
Worldwide	9,400,000	140	4,300,000	64	5,721,344	84.8	2,656,147	39.4	62
Europe	430,000	48	130,000	15	339,164	38.1	105,238	11.8	79
Africa	2,800,000	350	1,300,000	160	1,329,581	165.2	595,184	73.9	47
Americas	280,000	31	160,000	17	218,249	23.7	119,862	13.0	77
India*	2,000,000	170	890,000	75	1,332,267	112.8	615,977	52.1	70
China*	1,300,000	97	640,000	48	975,821	73.0	462,596	34.6	72
South Africa *	480,000	960	200,000	410	343,855	692.3	138,803	279.5	68
Nigeria*	460,000	300	200,000	130	85,674	56.7	46,026	30.4	24
Indonesia*	430,000	190	210,000	92	296,514	130.4	166,376	73.2	80
Bangladesh*	360,000	220	170,000	110	151,062	94.4	106,373	66.5	61
Ethiopia*	300,000	370	130,000	160	141,157	174.9	40794	50.5	32
Philippines*	260,000	280	130,000	140	139,603	154.5	85,025	94.1	67
DR Congo *	250,000	380	100,000	160	104,426	162.5	69,477	108.1	66
Myanmar*	200,000	400	97,000	200	124,037	250.3	41,248	83.2	43
Vietnam*	170,000	200	86,000	99	97,772	112.3	53,484	61.4	62
Russian Federation*	**150,000**	**110**	**46,000**	**33**	**128,263**	**90.7**	**33,949**	**24.0**	**73**
Kenya*	130,000	330	54,000	140	99,941	257.8	36,811	95.0	68
Uganda*	98,000	310	42,000	130	42,178	133.2	22,766	71.9	54
Zimbabwe*	95,000	760	41,000	330	36,650	294.1	9,830	78.9	24
Mozambique*	94,000	420	40,000	180	39,261	175.4	18,824	84.1	47
Thailand*	92,000	140	45,000	66	55,252	82.0	28,788	42.7	64
Brazil*	89,000	46	50,000	26	73,395	38.2	37,697	19.6	75
Korean PDR	82,000	340	40,000	170	72,541	304.6	28,026	117.7	70
Cambodia*	71,000	490	35,000	240	38,927	267.3	19,860	136.4	56
Zambia	59,000	470	25,000	200	43,686	346.2	13,211	104.7	52
Afghanistan*	51,000	190	22,000	79	28,301	104.0	13,136	48.3	61
Ukraine	47,000	100	14,000	31	37,832	82.3	14,574	31.7	100
Uzbekistan	35,000	130	11,000	39	17,040	62.7	5,117	18.8	48
Peru	34,000	120	19,000	67	32,193	111.6	17,989	62.4	93
Rumania	29,000	130	8,800	41	21,724	101.7	9,511	44.5	110
Kazakhstan	27,000	180	8,300	54	23,140	149.1	6,193	39.9	74
Namibia	16,000	750	6,800	320	13,340	626.3	4,828	226.7	71
USA	15,000	5	5500	1.7	12,904	4.1	4,742	1.5	87
Tajikistan	14000	200	4200	61	6396	93.6	2,057	30.1	49
Botswana	14,000	710	5,800	300	8,562	445.7	3,351	174.4	57
Swaziland	14,000	1200	6,100	520	8,685	743.7	3,105	265.9	51
Kyrgyzstan	8,600	160	2,600	49	6,628	122.4	1,712	31.6	65
R. Moldova	6,300	170	1900	54	4,442	122.3	1,533	42.2	79
Georgia	4,600	110	1,400	33	4,412	102.4	1,868	43.4	130
Germany	4,200	5	1,100	1.3	3,664	4.5	954	1.2	87
Czech Republic	930	9	290	2.8	807	7.8	249	2.4	87
Estonia	460	34	160	12	401	29.9	144	10.7	88
Israel	420	6	200	2.8	367	5.2	173	2.5	87

* 22 high-burden countries [53].

** accumulate notification rates for separate countries and three WHO regions were calculated per 100,000 population basing on population data tables [54].

According to WHO data, 5,721,344 new TB cases and ss+ relapse were notified globally in 2008, which accounted for 61% of the estimated incidence rate. At the same time, 2,656,147 new ss+ TB cases were registered worldwide with the case detection rate value of 62% (Table 2.2).

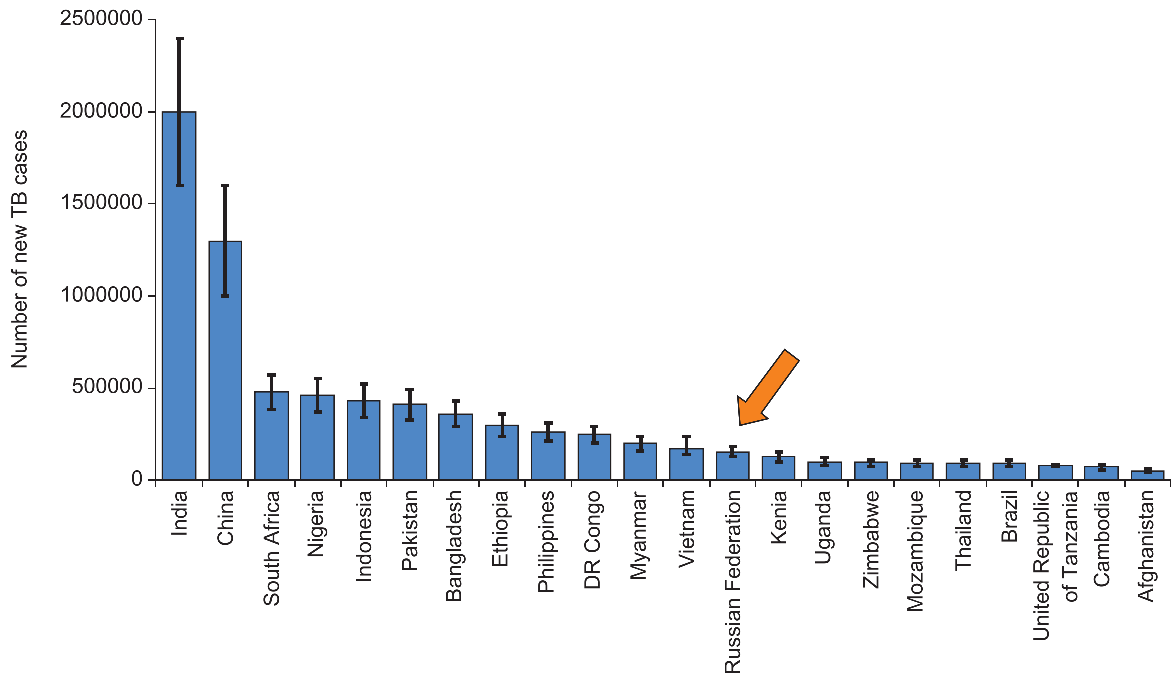


Fig. 2.32. Estimated number of new TB cases in 22 high-burden countries, 2008. The graph shows best estimates, the error bars indicate degrees of uncertainty, i.e. low and high bounds of estimated values (Source: [53, 54])

According to the estimates, the largest number of new TB cases occurs in India and China with almost 40% of the worldwide number of new TB cases and ss+ TB relapses.

The highest TB notification rates are registered in the African region – 162.5 cases with all forms of the disease and 73.9 new ss+ TB cases, which make a 47% detection rate. The highest notification rates of TB are in Swaziland and South Africa (744 and 692 cases per 100,000 population, respectively). High rates of notified cases are also in South-East Asia (118 cases per 100,000 population). The lowest rates are registered on the American continent (24).

In 2008, the notification rate in the Russian Federation was 90,7 new TB cases and ss+ relapse TB cases per 100,000 population, which accounted for 2.2% of all TB cases notified worldwide and 2.8% of TB cases registered in the high-burden countries. If consider the WHO European Region countries [41], the contribution of the Russian Federation to the total number of notified new and ss+ relapse rates is very significant – 37.8%. In 2008, the case detection rate of all new TB cases was 85% and new ss+ cases equal to 73%.

The case detection rate (CDR) indicator is often used for integral assessment of national TB control programmes effectiveness. This indicator corresponds to one of two targets established by World Health Assembly ("detect at least 70% of new sputum smear-positive TB cases"), i.e. the ss+ TB case detection rate (CDR ss+) must be not less than 70%.

As indicated above, after the introduction by WHO of new methods of measuring estimated indicators and approval by Russian TB experts of a new detection rate coefficient (0.85) at the meeting on epidemiological surveillance in the European Region, the CDR indicator in the Russian Federation exceeded the target value and is now equal to 73% (Fig. 2.33).

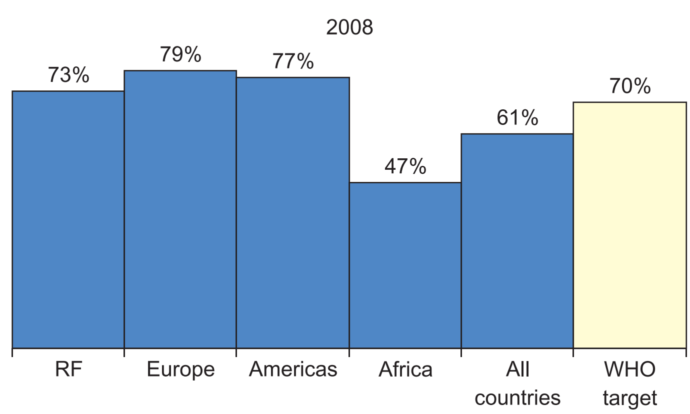


Fig. 2.33. Case detection rate for new ss+ TB cases (portion of notified ss+ patients in estimated new ss+ TB cases in the population). The Russian Federation, 3 regions of the World Health Organization and all countries, 2008 (Source: [54])

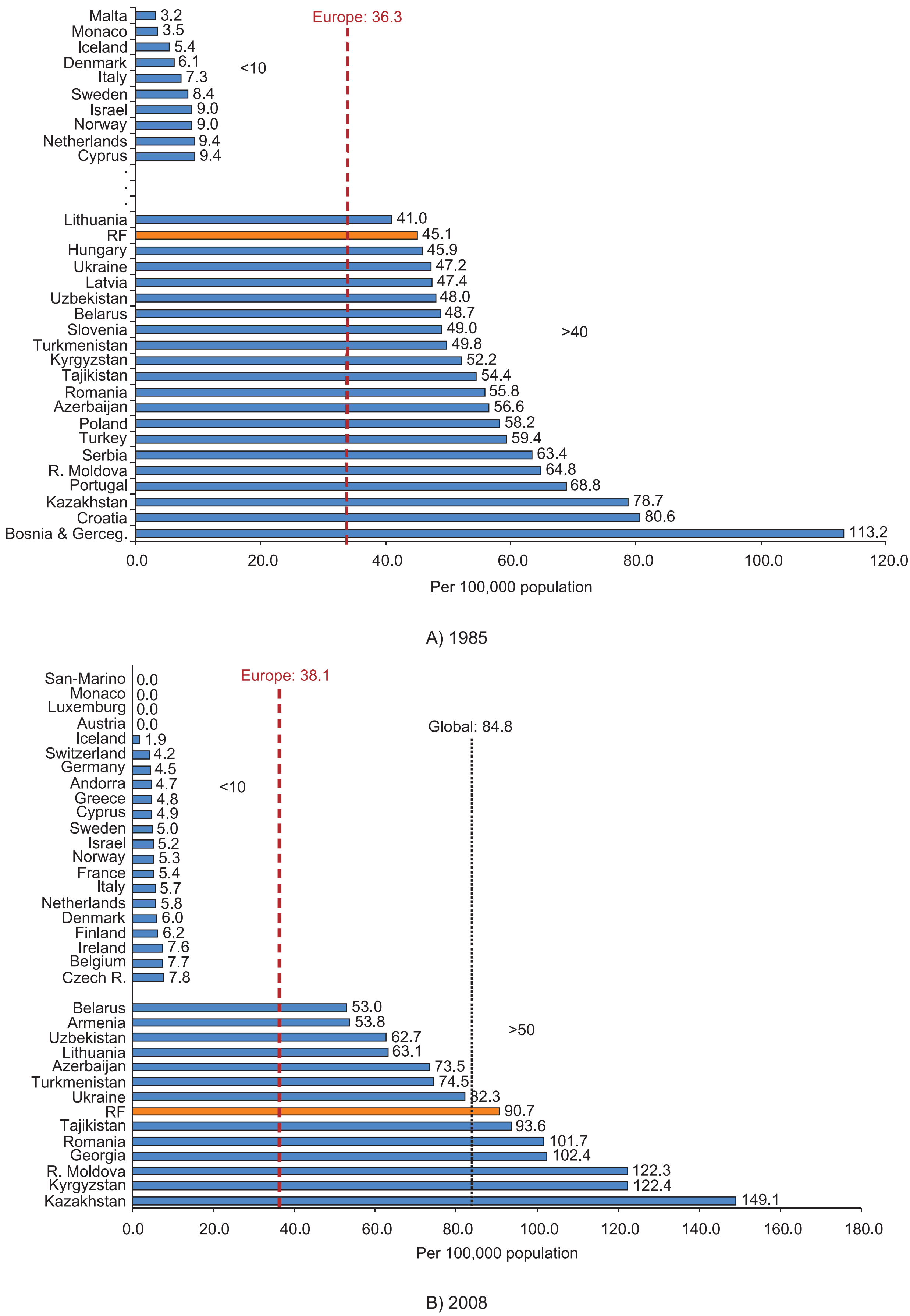


Fig. 2.34. TB notification rates in the countries of the WHO European region in 1985 (A) and 2008 (B). Rates include new TB cases and ss+ TB relapses. Countries with the lowest notification rates (<10) and the highest notification rates (>40 in 1985, and >50 in 2008) are indicated (Source: [53, 54])

However, it should be noted that this indicator (the WHO target to detect at least 70% of new sputum smear-positive TB cases with respect to estimated ones) is sometimes interpreted erroneously as "to ensure the laboratory confirmation of TB diagnosis in 70% of all new TB cases", i.e. to provide microbiological confirmation of TB diagnoses in 70% of new cases. In reality, this target must be understood as the proportion of detected ss+ TB cases in the real number of ss+ TB cases in the population calculated based on the estimation method described above. Therefore, it should be noted that, in spite of the high overall detection of ss+ cases, the proportion of patients with confirmed ss+ among all people with TB is still very low in the Russian Federation, as indicated in Section 2.5 above (only 33.5%).

In Europe, Russia is among 18 high-priority for TB countries[42]. Russia does not only detect over one third of all new TB cases in the Region, but also holds the seventh highest position in terms of notification rates per 100,000 population after Kazakhstan (149.1), Kyrgyzstan (122.4), Moldova (122.3), Georgia (102.4), Romania (101.7) and Tajikistan (93.6) – Figure 2.34B. It is noteworthy that of the 15 countries with the highest notification rates in the region (more than 45 per 100,000), 14 are former Soviet Union (FSU) republics. In 1985, in terms of notification rates, Russia was in the 20th position (Fig. 2.34A).

In 1990s, notification rates increased in almost all the republics of the former USSR by almost 2–2.5 times (Fig. 2.35). At the same time, in all non-FSU countries of the former Warsaw Pact, with the exception of Romania and Bulgaria, there was a considerable decrease in TB notification rates over the same time period (by 1.5–2 times)[43].

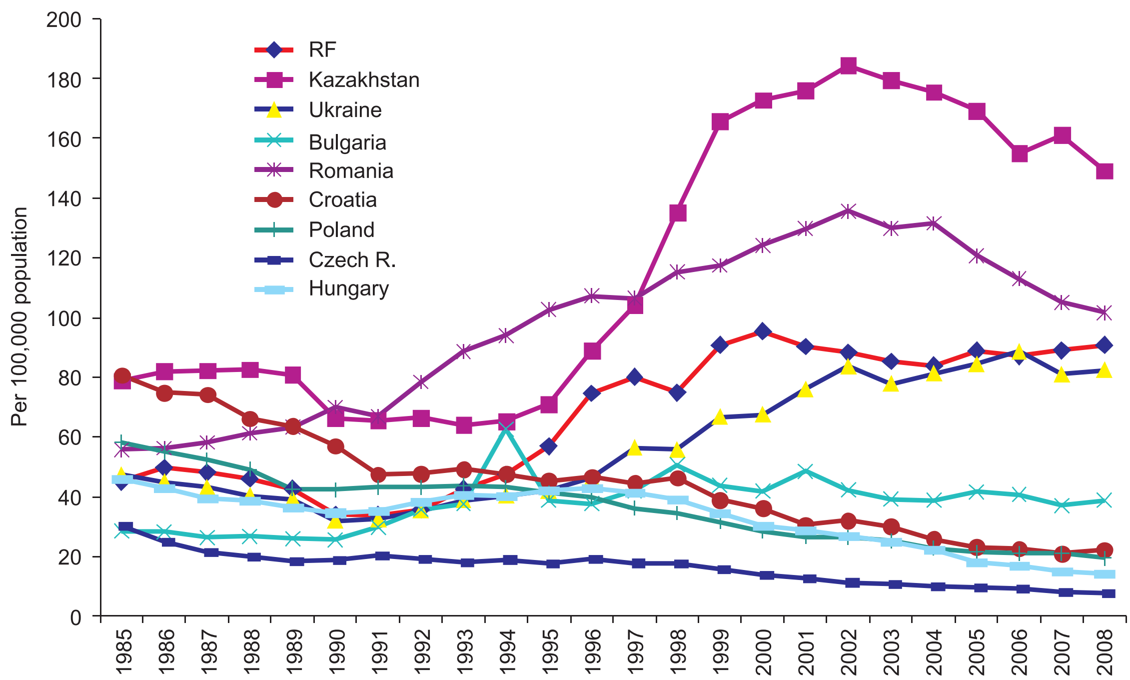


Fig. 2.35. TB notification rates in selected countries of the WHO European Region, 1985–2008 [53, 54]

Conclusion

The reporting data for 2009 demonstrate relative improvements in the epidemiological situation of TB in the Russian Federation. It was for the first time in recent years that the notification rate of TB has decreased. On the other hand, the indicator is considerably high and therefore still more efforts are required to provide effective anti-tuberculosis measures in the country.

42 Plan to Stop TB in 18 High-priority Countries in the WHO European Region, 2007–2015, World Health Organization, 2007.

43 The definitions of a TB case in the FSU countries and the non-FSU Warsaw Pact countries did not changed substantially and therefore such changes could not influence to a vast extent the notification rates in these countries.

3. TB mortality in the Russian Federation

Borisov S.E., Belilovsky E.M., Skachkova E.I., Son I.M., Shilova M.V., Galkin V.B., Danilova I.D.

3.1. General information

Information on patients who died of TB is contained in three forms – No. 52, No. 33, and No. 8.

State statistical Form No. 52 includes data on all deaths with indication of the cause of death, including patients who died of TB. These data provide basis for calculating the mortality rate from tuberculosis in the Russian Federation. Reported data are based on the information contained in the registration form No. 106/y-98 "The medical certificate of death", which in sent for state registration to the vital registration offices and then to the Federal State Statistics Service. The data on all deaths are copied by the regional TB dispensaries in order to verify post-mortem diagnoses and to control the numbers in each dispensary group.

Form No. 8 contains information on TB patients with a post-mortem diagnosis only, regardless of whether the patient was from the permanent resident population (MoH&SD) or under another jurisdictional entity with its own TB service (FSIN, Ministry of Internal Affairs, etc.).

Form No. 33 contains information on all patients who died of TB and had been registered in regional TB dispensaries in respective territories. The data in this form are presented separately for patients who died of TB and those with other causes of death. In addition, the form contains information on patients who died of TB and were not registered before death at regional TB control facilities. This form allows for the calculation of the TB mortality rate for the resident population in the region, taking into account persons who died of TB without having been registered before as a TB patient.

Since these forms are filled out in various ways and by different facilities, the data contained therein may differ to some extent.

For example, in 2009, according to Rosstat Form No. 52, there were 23,633 registered cases of death from TB [16a], or 16.5 per 100,000 population compared with 25,388 cases (17.9 per 100,000) in 2008. According to Form No. 33, 22,252 deaths from TB were registered, including deaths of TB among patients who "were not registered before in MoH&SD TB control facilities" and "patients from permanent residents with TB diagnosis established post mortem". In the previous year (2008), Form No. 33 contained data on 23,653 deaths from TB.

For a complete analysis, TB patients who died of TB and other causes should both be considered.

In 2009, according to Form 33, 43.7% of patients registered at regional TB control facilities died of other causes (other diseases and external factors). Over the past two years, this rate has increased to a certain extent (40.9% in 2007, $p < 0.01$). According to 2009 data, the mortality rate from non-TB diseases and external factors among TB patients (52.0 per 1,000 TB cases registered at regional TB control facilities, overall 13,798 cases) exceeded the overall mortality rate in the general population by approximately 3.6 times[44] (14.2 per 1,000 population, 2009). This shows that people with TB are in a high-risk group for death not only from TB, but also from other causes; it is essential to pay special attention to further investigation and resolving this problem.

It should be noted that in some cases (and in some countries) TB patient management effectiveness is considered from the position of the overall death rate irrespective of what was the cause of death (TB or other diseases/causes). This indicator is important in terms of monitoring changes in the number of infectious TB patients in the region. Besides, the cause of death is not always registered correctly, which leads to wrong classification of the cause of deaths from tuberculosis and deaths from other causes.

Available data leads to the conclusion that the problem of reducing mortality rate among TB patients needs to be addressed in two ways bearing in mind two objectives, i.e. reducing mortality from both tuberculosis and other causes. For the first objective, the organization of early detection and increased TB patient treatment and treatment effectiveness are important, for the second objective – the effective treatment of co-morbidities (concomitant diseases), as well as social and psychological support of patients with tuberculosis.

[44] A more precise value of this parameter can be obtained by comparing the standard mortality rates by gender and age among the general population and among TB patients, which are standardized by age and gender. However, it is not possible to do this based on the existing reporting forms. However, in general, such a modification will not change the conclusion about a higher mortality rate of non-TB causes among TB patients compared with the overall mortality rate among the general population.

3.2. Trends and regional specificities of TB mortality rates

It is generally accepted that the emergency of the epidemiological situation for tuberculosis significantly defined by the TB mortality rate. It is also suggested that this indicator depends to a lesser degree on the quality of registration than the TB notification rate indicator.

After a long period of decreased death rates from tuberculosis from the early 70s to the beginning of 90s (from 18.6 to 7.7 per 100,000 population), the rate began to rapidly increase and reached maximum in 2005 when the death rate from TB increased by more than 2.5 times compared with 1991 and was equal to 22.6 per 100,000 population.

Two periods can be distinguished in comparing the trends of the overall mortality and mortality from TB (Figure 3.1). Before 1991 with a markedly decreased mortality from TB, a parallel increased overall mortality among the population took place, which demonstrated a high efficiency of anti-TB interventions during those years. In the 1990s and in the beginning of the XXI century, changes in both indicators followed the increasing trend with the same patterns. In those years, the mortality rate from TB had a greater influence of a generally deteriorating socio-economic situation in the country, rather than of activities of the national TB control services.

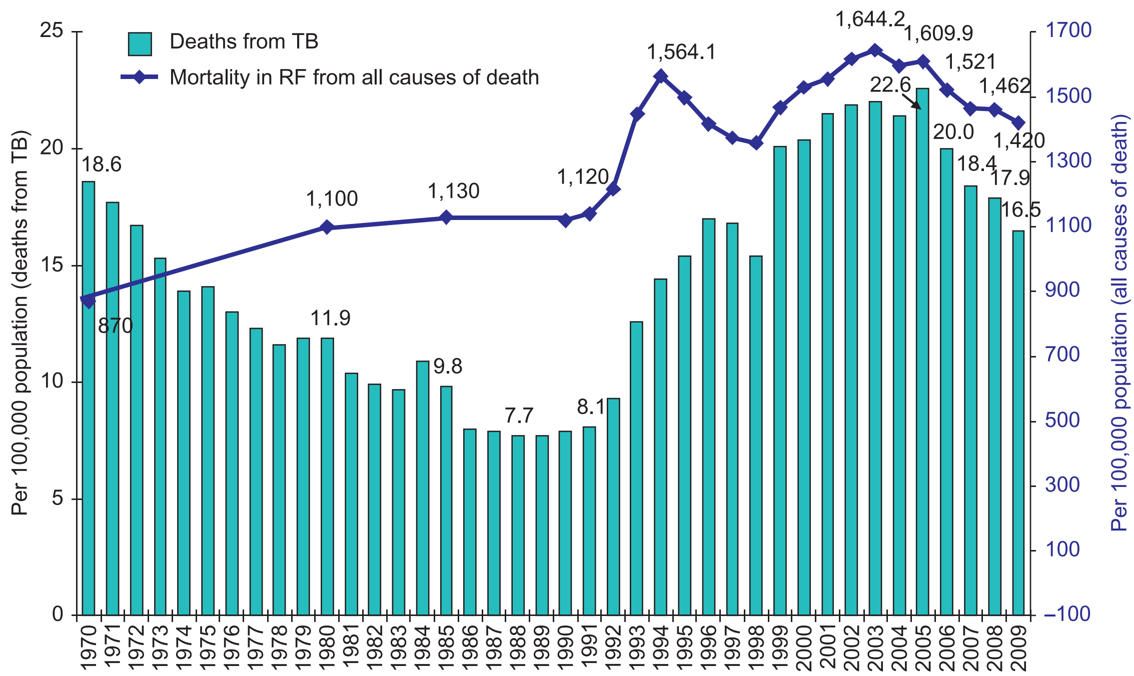


Fig. 3.1. TB mortality rate and mortality rate from all causes of death in RF (Sources: Form No. 52 [14, 15, 22])

In the last four years since 2005, the mortality rate from tuberculosis started to decline significantly (from 22.6 in 2005 to 16.5 per 100,000 population in 2009). In 2006–2007, the reduction of TB mortality rate was synchronous with decreasing overall mortality rates from 16.1 per 1,000 population in 2005 to 14.6 in 2007). However, in 2008–2009 death rates from TB continued to decrease against actually the same overall mortality rates in the Russian Federation [14, 15, 22]. This may indirectly reflect a growing effectiveness of anti-TB activities in the country.

The level and the structure of the TB mortality rate in the Russian Federation once again prove the need to pay special attention to the disease. TB is the leading cause of death among infectious diseases in the Russian Federation, accounting for 74% (2008) of deaths from "several infectious and parasitic diseases" (A00-B99 by ICD-10), as notified in the reporting forms [16][45].

Persons who died of TB are mostly from productive (working) age group of the population (87%, Fig. 3.2). In all other classes of diseases responsible for major death rates, the majority of patients (over 70%) die in older ages. Persons who die from external causes[46] (77% of them of productive age) are the only exception.

[45] The list of infectious diseases, according to 2008 data, also includes diseases caused by the human immunodeficiency virus (HIV) – 10.5% of patients who died of infectious diseases; septicemia – 4.2%, viral hepatitis – 3.3%, and intestinal infections – 1.3%, etc.

[46] The main parts (63%) of external causes of death are poisonings including alcoholic intoxication, suicides, accidental injuries and road accidents.

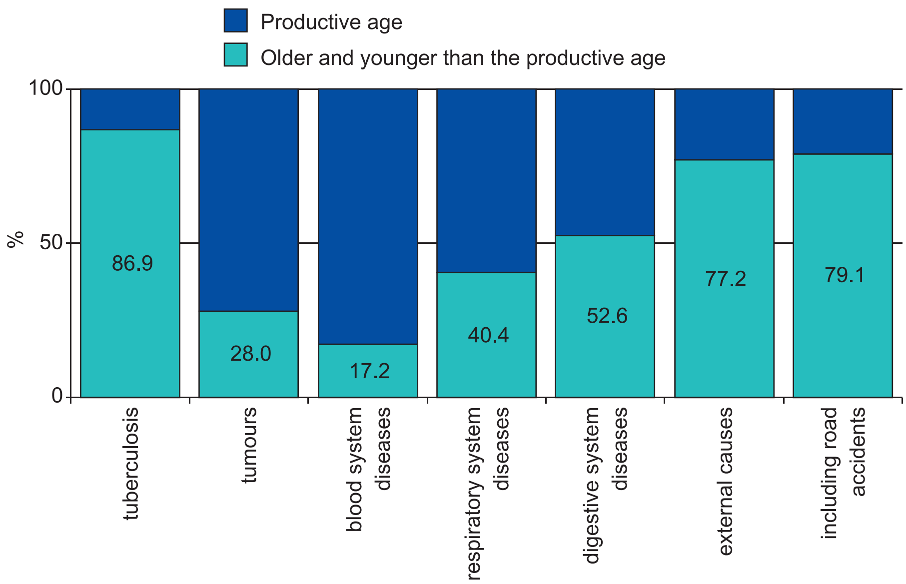


Fig. 3.2. Percentage of persons who died at productive age[47] by the main classes of cause of death, RF, 2008 (Source: [13]; population: Form No. 4)

The peak of TB mortality rates is observed in a broad age-group of TB patients of 45–59 years of age (approximately 35–40 per 100,000 population in 2006–2008; Fig. 3.3). Decreased mortality rates registered since 2006 were mostly among TB patients of 40–65 years of age.

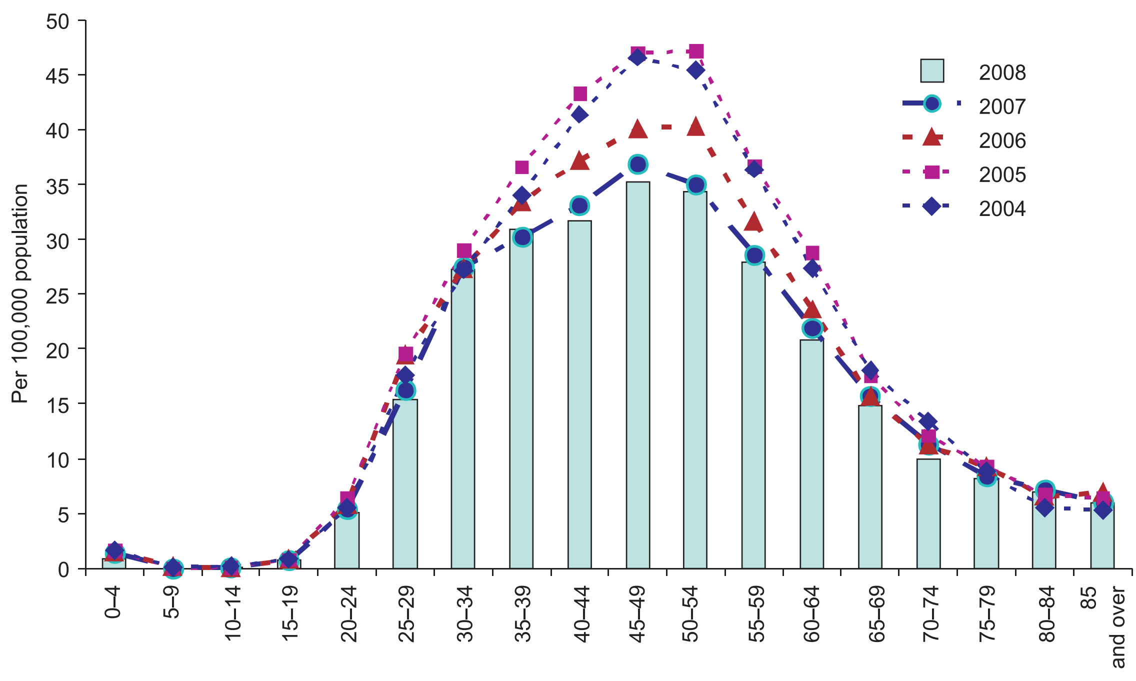


Fig. 3.3. Age-specific TB mortality rates, RF, 2004–2008 (Source: [14–16])

It should be noted that in 2008 [5a] the proportion of deaths from TB in the Russian Federation was equal to 1.2% of the overall death rate, while the proportion of deaths from TB in the most socially and economically active age group of 30–34 years age was as high as 6.0% (Fig. 3.4). This rate is comparable with the proportion of deaths in this age group from the leading causes of mortality in Russia – cardiovascular diseases (15.6%), digestive system diseases (8.5%), and malignant neoplasm (4.4%). Besides, each of these causes of death includes not just one disease, but a set of nosological forms. According to WHO estimates for 1999 [44], worldwide TB was the cause of deaths in 9% of women who died at the age of 15–44 years, while military conflicts accounted for women's deaths in only 4% and cardiovascular diseases – in 3% of cases.

[47] Productive age: men – 16–59 years, women – 16–54 years.

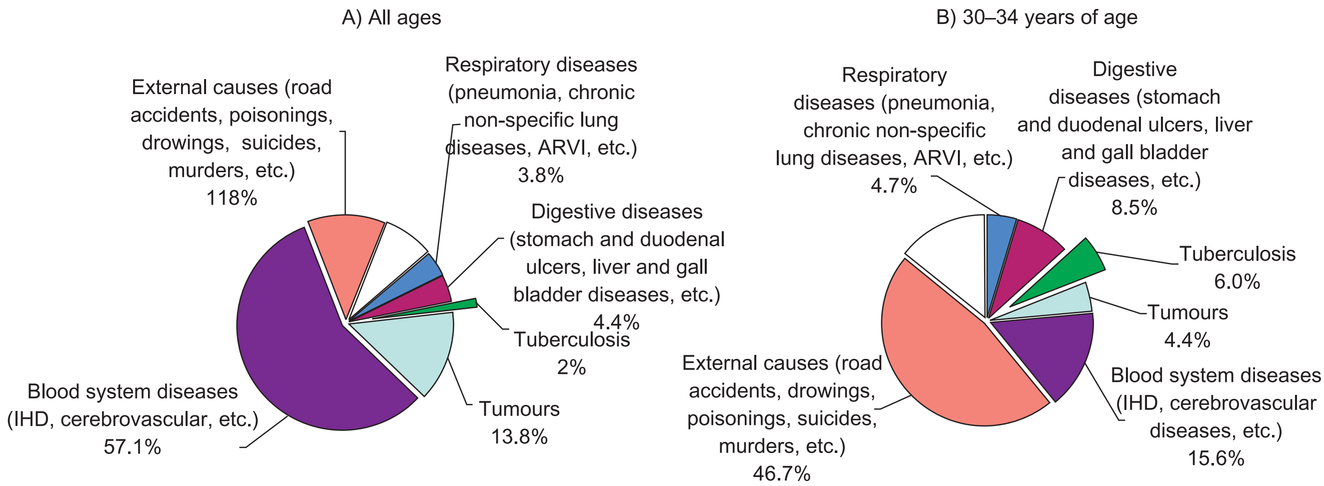


Fig. 3.4. Major causes of death in the Russian Federation, 2008 (Source: [16])

These facts emphasize that TB is not only a medical, but also is a social and economic problem, since it involves the most economically active segments of the population.

In the Russian Federation, the TB mortality rate, just like the TB notification rate, gradually increases from the West to the East (from 12.0 to 27–29 per 100,000 population – Fig. 3.5A). This does not correspond to the distribution of mortality rates for all causes of death, which is at its highest peak in the Central and North-West Federal regions (about 16 per 1,000 population). This fact at least partially can be explained by the unfavorable demographic situations in most territories in these regions with a vivid trend to population ageing (16, 16a).

A significant variance in TB mortality rates in the territories of the RF was preserved in 2009 [16a] (Fig. 3.5B). More than 10 times difference was observed in territories with low mortality rates (Orel Oblast – 3.1, Belgorod Oblast – 3.9, Kostroma Oblast – 5.8, Moscow city – 6.2) compared with regions with high rates of TB mortality (Republic of Tyva – 78.9, Jewish AO – 46.1, Irkutsk Oblast – 40.0, Kurgan Oblast – 38.7, Amur Oblast – 37.7).

In 2009, with an overall decline in mortality rates from tuberculosis in Russia, the TB mortality rate exceeded 40 per 100,000 population only in three regions, while in 2005 it was in 13 regions.

Such significant differences in registered TB mortality rates may indicate both differences in anti-tuberculosis activities performance and inadequacies in the registration of causes of death in some regions.

3.3. TB mortality rate components

When analyzing TB mortality and determining strategies to decrease the rate, it is essential to consider the structure of the mortality rate indicator. The TB mortality indicator may be subdivided into three main components: 1 – patients with post-mortem diagnosis (previously not registered as TB case), 2 – patients who died within the first year after new TB case registration, and 3 – the other (remainder) cases of death from tuberculosis Various factors affect each of the components, which requires specific approaches.

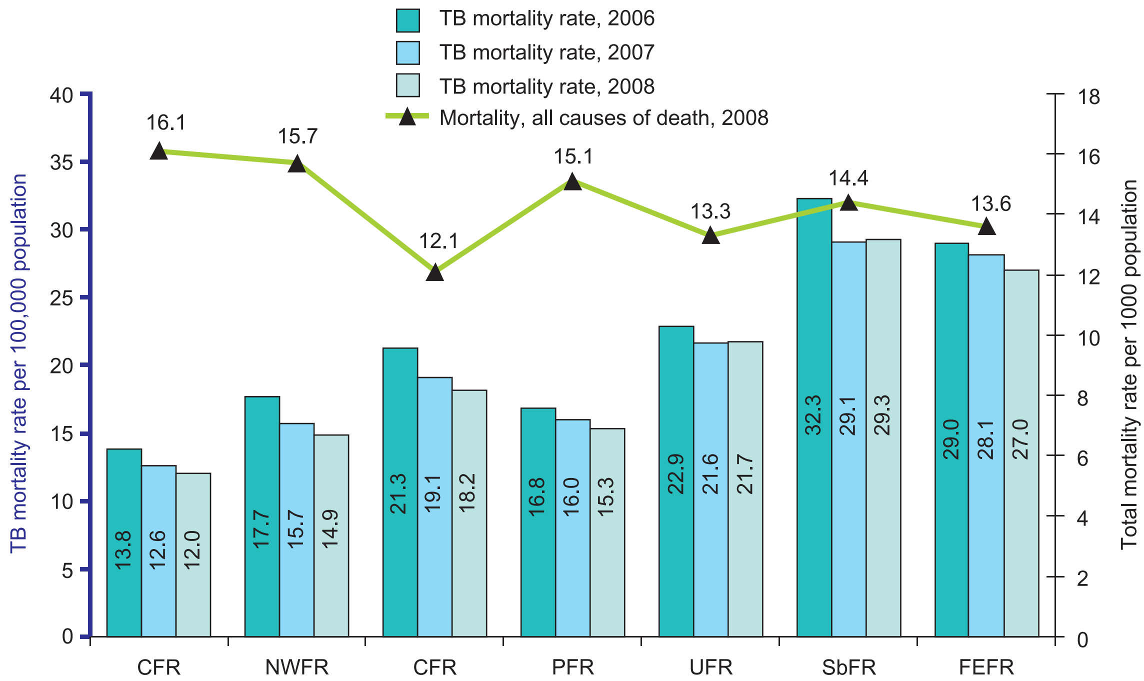
The number of TB patients with post-mortem diagnosis depends on timeliness of case-detection and may help in revealing possible inadequacies in the detection and diagnosis of TB in a territory, and in particular – problems in the quality of activities at the PHC level, effectiveness of educational activities among general public and other factors in TB control activities. In 2009, the number of people among permanent residents who were diagnosed postmortem amounted to 1,621 cases (7.7%) – Fig. 3.6.

The number of patients who died within a year following new TB case registration (17.1% in 2009, 3,593 patients) indirectly reflects the effectiveness of activities in detection, management and treatment of new cases.

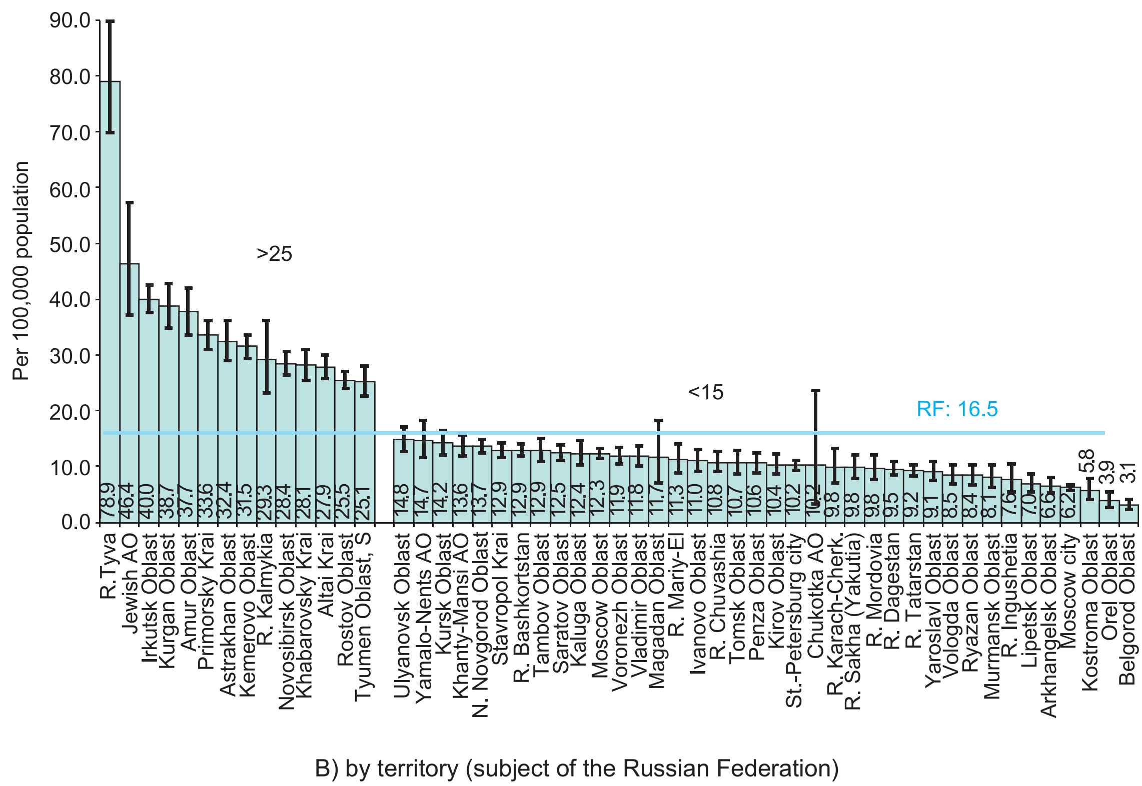
Finally, the percentage of remaining TB death cases (about 75% in 2009) depends on the effectiveness of treatment activities performed for relapse cases, re-treatment cases and chronic cases, as well as on the quality of dispensary work and preventive activities.

Reporting Form No. 33 includes data on "patients who died of TB and were not registered in regional TB control facilities"[48]. In accordance with the current instructions on completing Form No. 33, the number of people

[48] Patients with other causes of death and with post-mortem TB diagnoses are not included in the reporting form. Such patients were not registered in regional TB facilities, as they are considered as part of hidden (not registered) TB incidence.



A) by federal region



B) by territory (subject of the Russian Federation)

Fig. 3.5. The distribution of mortality rate by federal region (A) and by subject of the Russian Federation with mortality rates >25 and <15 cases per 100,000 population, 2009. The vertical error bars indicate 95% CI [16, 16a]

who died of TB and were not registered in anti-tuberculosis institutions includes TB patients not registered in any TB facility, i.e. foreigners, homeless persons and patients diagnosed post mortem and those who did not live in respective region on a permanent basis. Such cases partially relate to hidden TB incidence in respective subjects of the Russian Federation. On the national level, such cases accounted for 3% of new detected TB cases (2,842), but in some territories this may reach 7–10% of new detected cases (10,5% in Moscow, 7.5% in Yaroslavl Oblast, 7.1% in Sakhalin Oblast and Jewish AO).

The overall number of people who died of TB (according the 2009 Rosstat data, Form No. 52, Fig. 3.7A) includes patients registered in anti-tuberculosis facilities (76.3%), post mortem detected cases (8.8%, Form No. 8), TB patients in FSIN facilities (4%), and other people who died of TB and were registered in other regions, foreigners, etc. (10.9%).

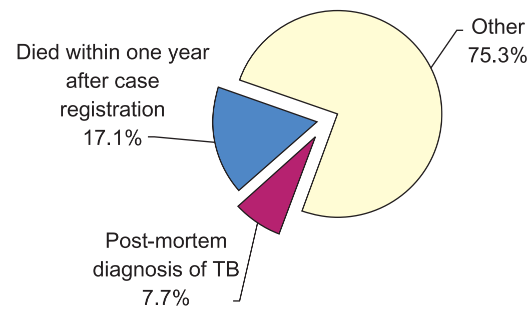


Fig. 3.6. Components of TB mortality rate in the permanent resident population. RF. 2009 (Source: Form No. 33)

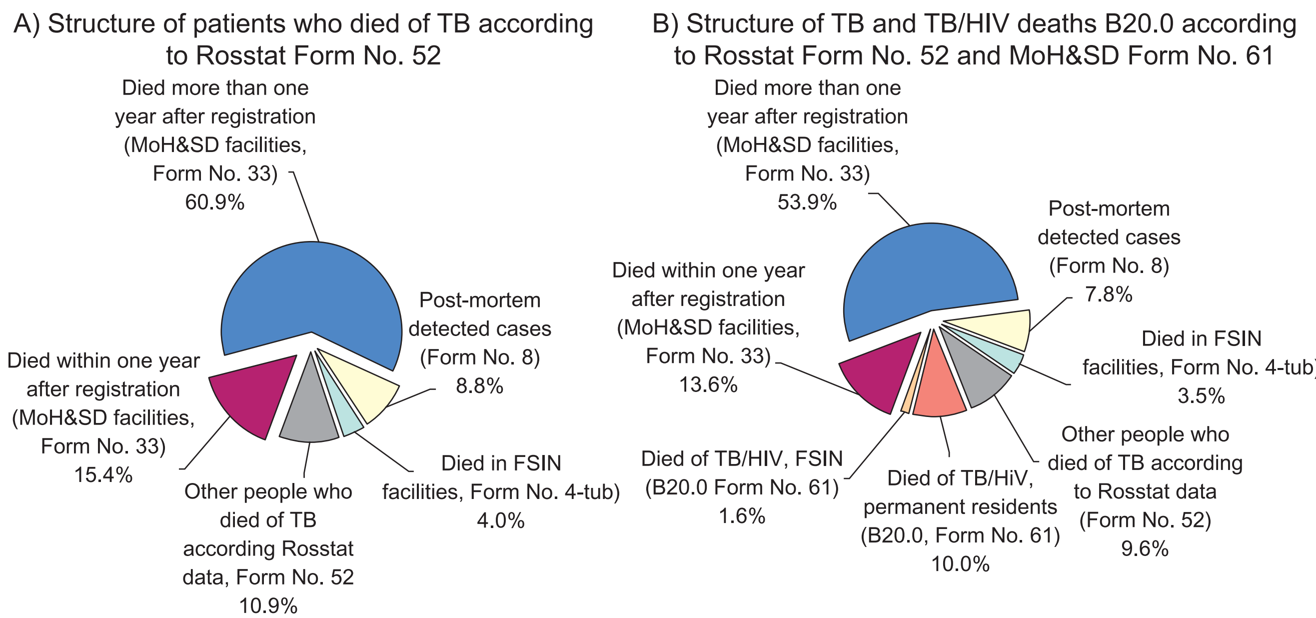


Fig. 3.7. Structure of TB deaths, including TB/HIV cases, according to data contained in different reporting forms, Russian Federation, 2009 (Sources: Forms No. 52, No. 33, No. 8, No. 61 and No. 4-tub)

The real number of patients who died of TB-associated diseases (TB and TB-HIV co-infection, classified as B20.0 according to ICD-10) exceeds the Rosstat data by 3.069 cases (11.6% of the total number of deaths) – Fig. 3.7B.

The indicators calculated as percentage of different components of TB mortality (or patients who died of TB) can be used as a source of information for defining various managerial activities in order to decrease the general mortality level. These indicators can also be used to define resources needed for timely detection and adequate treatment activities (i.e. these indicators are of managerial and economic importance).

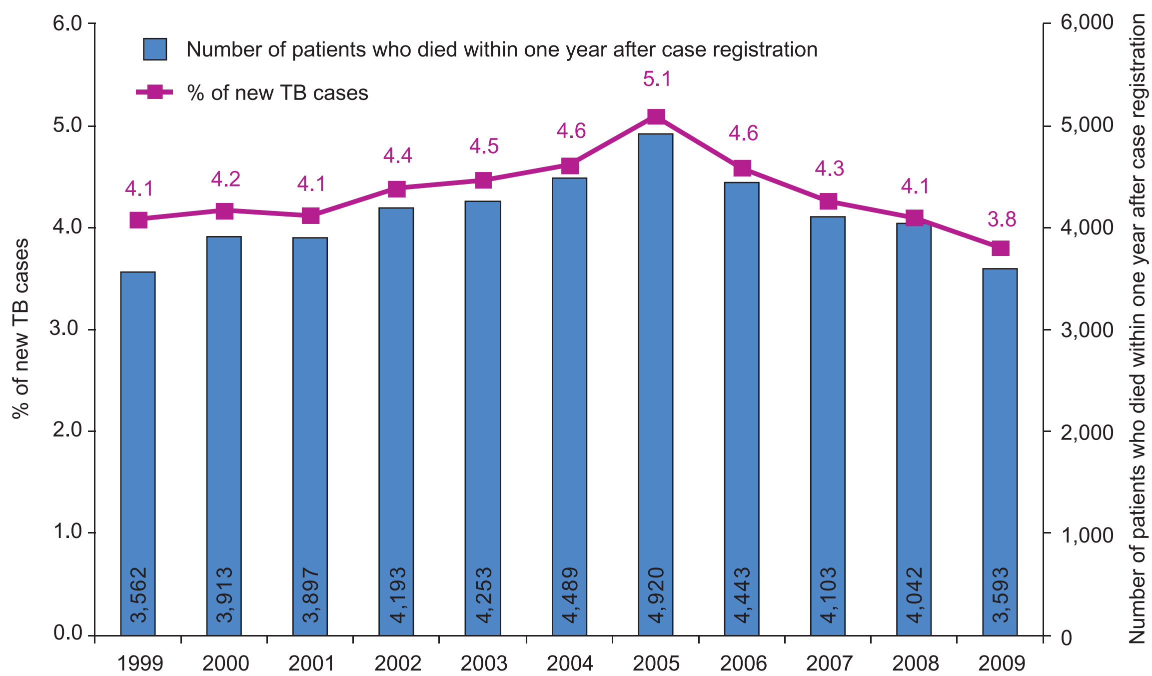
However, correctness is questionable whether percentages among all TB deaths of post-mortem diagnosed TB cases or percentages of patients who died within the first year after case registration **for the comparison of territories and for the analysis of trends.** This is because an increase in the percentage of one of the mortality components could occur either when the absolute number of this category of patients is increased or when the number of patients in another category is decreased.

The change in the mortality structure in 2003–2004 in Orel Oblast can be used as an example. In those years, a considerable decrease in the number of patients who died from TB was reported in Orel Oblast – from 40 to 26 persons. This happened due to decreased mortality in the third component – deaths among re-treatment cases and patients with chronic TB.

Therefore, although the number of patients who died within the first year following case registration decreased from 15 to 13, and the proportion to the number of new cases also decreased from 3.4% to 3.0%, the percentage of deaths within the first year following registration increased from 37.5% to 50%. Also, the percentage of patients with port-mortem TB diagnosis rose sharply (from 17.5% to 34.6%), although the number of such patients did not increase largely in terms of statistics – from 7 to 9.

This is why later, in comparisons of RF territories calculations were made based on these indicators in proportion to the number of new TB cases registered the same year in permanent residents in respective territories.

The ratio of the number of patients who died of TB within the first year following case registration to the number of new TB cases in the permanent resident population[49] (Form No. 33), increased in the Russian Federation from 4.1% in 1999 to 5.1% in 2005 (Fig. 3.8). After that, this indicator gradually decreased during the past four years to 3.8% in 2009, which may indicate improved diagnosis and treatment of TB patients in the regions. The indicator decrease was registered in the past two years in all the federal regions except NWFR and SFR (together with NCFR where there was a slight increase in 2009). In 2009, the highest levels of this indicator were observed in Leningrad (12.1%), Tver (8.5%), Irkutsk (7.5%), Arkhangelsk (7.5%), Murmansk (7.0%) oblasts and in the Republic of Karelia (8.4%). In general, half territories of Russia have the value of this indicator in the range from 2.4% to 5.1% (25% and 75% quartiles).



A) Russian Federation

B) Federal regions

Fig. 3.8. Ratio of patients who died of TB within one year after case registration and new detected TB cases. Permanent residents, Federal Regions, the Russian Federation nationwide[50]

[49] The TB mortality rates for penitentiary system, see in the Chapter 6.

[50] Data for 2005 for SFR are dotted, since these data require clarification on the number of deaths within the first year in Rostov Oblast. Data for Rostov Oblast (Form No. 33): 2004 – 24, 2005 – 415, 2006 – 20 cases of death within one year after case registration. The 2005 indicator value for SFR was calculated after averaging the Rostov Oblast data for 2005 based on data for 2004 and 2006. The rate for the Russian Federation in 2005 (5.1%) is given after the noted above recalculation. Form No. 33 data for 2005 demonstrates the value 5.5%.

On the other hand, a low rate of the ratio in a territory may indicate both successful treatment of TB patients and a lack of information in registration forms. Information incompleteness may be caused by the fact that these data are not inherently available in the registration forms currently in use in the Russian Federation.

Such indicator called “the proportion of patients who died during treatment within the first year following new TB cases registration” can be obtained with the help of cohort analysis based on the well-developed calculation technique currently in use in the country, which enhances the quality of calculation as compared to that described above. This indicator is based on a chemotherapy treatment outcome and calculated using reporting Form No. 8-TB[51]. This approach allows for the calculation of the percentage of patients who died from the fixed cohort of new cases rather than the calculation of an abstract relationship between the number of patients who died within the first year following case registration to the number of new cases (which are not directly related to each other). The results of a cohort analysis of new pulmonary smear-positive TB cases registered in 2008 showed that death from TB occurred in 8.3% of cases in this group of patients and in 4.3% of cohort of all new TB cases (MoH&SD Form No. 8-TB, see Chapter 7).

From 1999 to 2004, there was an increase in the percentage of cases with post-mortem diagnosis among new cases (from 2.2% to 2.8%, see Fig. 3.9). From 2006, this indicator started to decrease to 1.8% (2008, 2009 data, Form No. 8). In 2009, this indicator declined in 42 of 83 subjects of the Russian Federation.

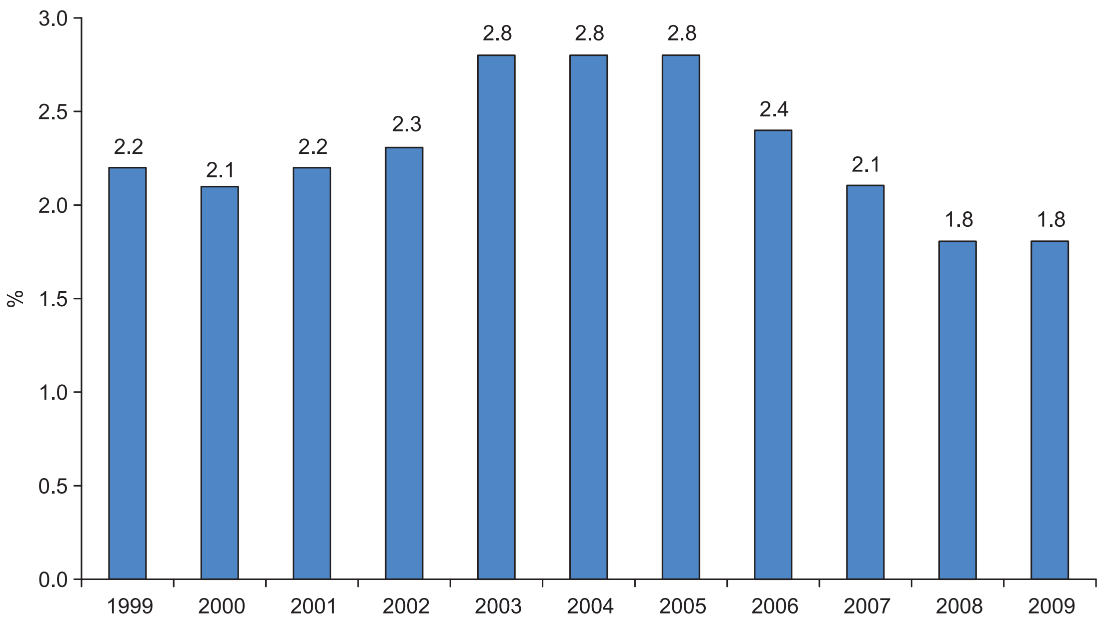


Fig. 3.9. Percentage of deaths within the first year following case registration among new TB cases. Russian Federation (Sources: 1999–2004 – Form No. 33; 2005 and thereafter– Form No. 8)

According to Form No. 8 data, the variation of this indicator is quite high in different territories – from 0% in six regions (including four territories in the North-Caucasian Federal Region) to over 4% in Sakhalin (5,2%, CI 95% 3.6–7.4%), Moscow (4.7%, CI 95% 4.0–5.46%), Leningrad (4.4%, CI 95% 3.4–5.6%) and Kaliningrad oblasts (4.3% CI 95% 3.1–5.7%). Absence of data on post-mortem diagnosed TB cases in a territory may be caused by inadequacies in TB deaths registration.

Figure 3.10 indicates variability in the percentages of post-mortem diagnosed TB cases by federal region. It can be hypothesized that the data for the Southern FR are underestimated due to the traditionally low percentage of post-mortem examinations (autopsy) of patients in this region. In addition, we should note a relatively high percentage of post-mortem diagnoses in the permanent resident population in CFR and NWFR.

Therefore, it is evident that particular components of the mortality rate, similar to the overall rate, can be effectively used for the purpose of TB control activities. The level of the rate proves that TB nowadays is a major socio-medical and economic problem in the country.

[51] Cohort analysis was introduced in Russian TB control after 2004–2005 [26], the TB dispensary follow up approaches were only used before. So that explanation is addressed to Russian specialists not always familiar yet with a cohort analysis. – note of the translation editor.

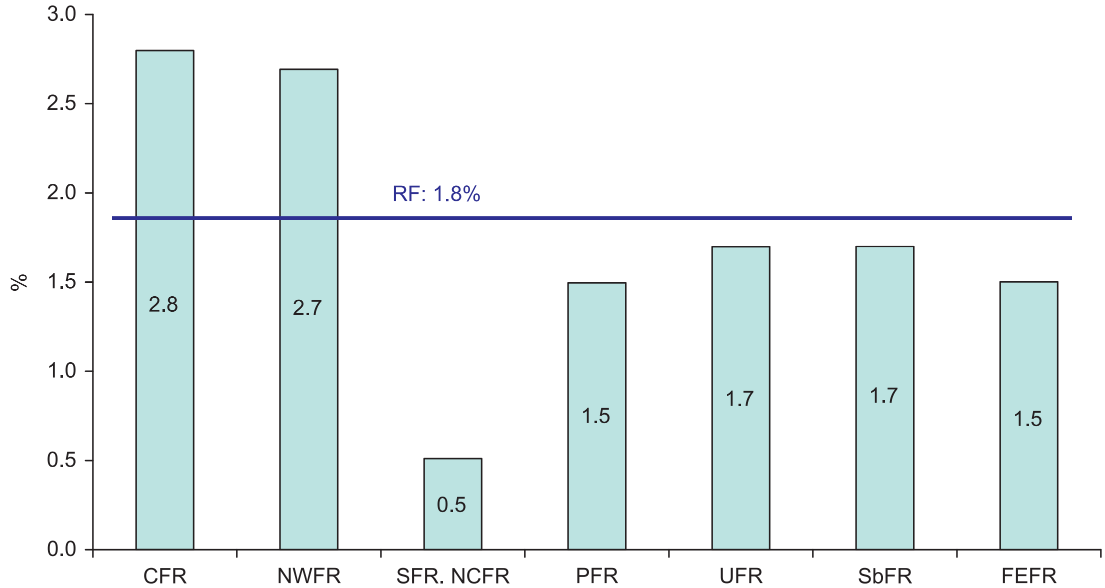


Fig. 3.10. Percentage of post-mortem diagnosed cases among new TB cases, Federal Regions of the Russian Federation, 2009 (Source: Form No. 8)

3.4. TB mortality rates in the Russian Federation and other countries

A high quality and complete registration of deaths from TB is a serious challenge in many countries.

To use effectively the TB mortality rate data in TB control activities, it is necessary to establish a well-developed system of vital registration based on adequate registration forms with a broad coverage of registered death cases and coding causes of death in compliance with ICD-10.

In countries with free market economy and in most countries of the former USSR including the Russian Federation, effective national vital registration systems are being used, including vital registration statistics. Anyhow, in many countries TB patients deaths are currently registered and assessed basing on a treatment outcome without differential analysis of causes of death (i.e. whether death resulted from TB or other causes). If this approach is used, it is the lethality of TB patients that is assessed, not the indicator of TB mortality rate in the population, although the latter is much more significant from the epidemiological point of view.

The Russian Federation, in addition to the system of vital registration, has a well-developed system of dispensary follow-up of TB patients, which improves the quality of TB patients' deaths registration. Dispensary follow-up of patients allows for performing a differential analysis of death cases depending on the duration of the disease (including post-mortem diagnosis)and with due account of diagnostic and treatment interventions performed.

This approach includes not only deaths from TB, but also from TB/HIV co-infection and other causes.

The data provided in the 2009 World Health Organization Global Report [53] show that of 196 countries of the world –

- only 93 countries in 2005 had national systems of vital registration that cover more than 70% death cases in accordance with WHO estimates (coverage over 90% was registered in 57 countries, including the Russian Federation – 99%);
- medium and high quality systems of death coding were available in 76 countries in 2005;
- only 35 of 196 countries (including the Russian Federation) submitted information to the WHO database on death cases for the reporting period 2005–2006 with 90% vital statistics coverage and with medium and high quality of death cause coding.

As a result, according to the WHO Mortality DataBase [62], by 1 July 2010, only 72 countries submitted data on death rates for 2006 in the required format with indication of causes of death (ICD 10 or ICD9), by gender and age. 45 countries provided data for 2007 and 28 countries submitted data for 2008 (the last data provided by the Russian Federation was for 2006).

The WHO Mortality DataBase [62] includes information only from the countries that meet two criteria: 1. the national system of vital statistics should cover over 70% of the registered number of deaths, and 2) undefined causes of death should be indicated in less than 20% of cases.

Therefore, systems of registration of TB mortality rates with required quality exist in a limited number of countries. This is why WHO publications, including Global Reports [53], and many other international publications do not contain data on registered deaths from TB and respective analyses of TB mortality rates, but only mathematical estimates of mortality indicators. At the same time, the recommendations of the WHO Global Task Force on TB Impact Measurement pertaining to the assessment of the progress made in decreasing TB notification rates, prevalence and mortality, stress the need for improving and strengthening national systems of vital registration.

WHO estimates of TB mortality rates[52] are based on the data received from the countries that meet the criteria mentioned above. The TB mortality estimate as such is made basing on the yearly incidence estimates and expert assessments of death rates in four subgroups of TB patients: HIV-positive and HIV-negative TB cases (TB patients with HIV positive/negative status) and registered and unregistered TB cases.

According to WHO estimates, in 2008 1.3 million people died of TB in the world (bounds of estimation – from 1.1 to 1.7 million), or 20 death cases per 100,000 population[53]. This number does not include people with HIV-positive status. The estimates show that additional 500,000 people die of TB among people infected with HIV. Therefore, according to the WHO estimates, about 1.8 million persons die from diseases associated with TB (28 per 100,000 population). It should be noted that the TB mortality estimates are calculated separately for people with HIV-positive and HIV-negative status because in compliance with the International Statistical Classification of Diseases (ICD-10) deaths from TB among HIV-positive patients are attributed to HIV-infection [53][54].

The 2007 estimates of the World Health Organization show (Table 3.1) that the highest TB mortality rates were in the African countries (51 cases per 100,000 population and 93 cases per 100,000 population among patients with TB/HIV co-infection). In the African Region, 350,000 people die of TB/HIV every year. In 2007, more than 200 deaths per 100,000 population caused by TB (including TB/HIV cases) were estimated in Swaziland (317), Zimbabwe (265), Lesotho (263), and South Africa (230). Without HIV-positive cases, the highest TB mortality rates (over 80 death cases per 100,000 population) were in Sierra Leone (140), Togo (92), Mali (81) and Mauritania (80). The estimated indicators of TB mortality in these countries are highest in the world.

According to the most recent estimate (2008) [54], the highest rates in the WHO European Region were registered in the Central Asia countries – Tajikistan (44 per 100,000 population), Uzbekistan (27), Kyrgyzstan (25), Kazakhstan (24), Azerbaijan (21), the Russian Federation (15), Ukraine (15). It should be noted that of 16 European countries with highest rates of TB mortality, 14 countries are former USSR republics.

The estimates of TB mortality rates showed a trend to decrease starting 2000 both in individual countries and in all six regions of the World Health Organization (Fig. 3.11).

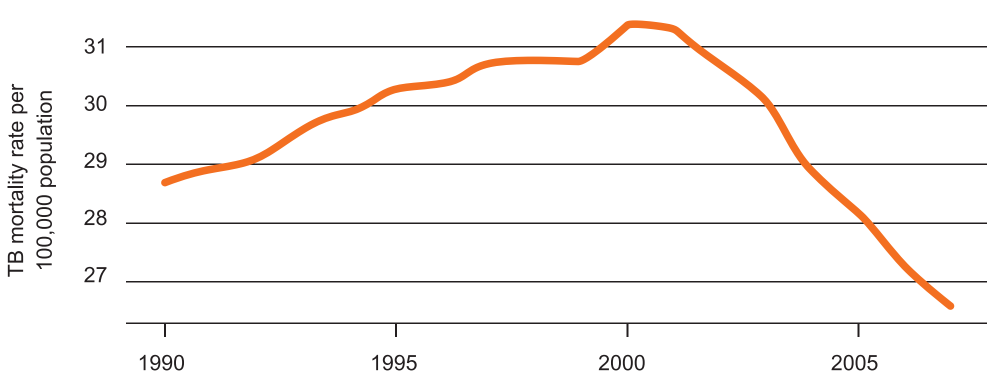


Fig. 3.11. TB mortality rates, including people with TB/HIV co-infection (per 100,000 population), according to WHO estimates (Source: [53])

One of the goals of the Stop TB Strategy was to reduce by half TB mortality rates by 2015 compared to 1990. However, the most recent WHO Global Reports [53, 54] indicate that the African and European regions of the World Health Organization in all probability will not attain this goal by 2015.

52 In 2010, the methods used for WHO estimates of TB mortality changed, which resulted in some differences in the estimates published in 2009 [41] and 2010 [1a].

53 The overall data for all countries are given according to the WHO Global Report [41]; all the other data are based on the initial tables published in [1a] and presented at WHO site http://www.who.int/tb/coountry/data/download/en/index.html. The values shown in the tables may be different from those published in the WHO Global Report [41] – see note to Table 1 below.

54 The WHO Global Report contains the total TB mortality data for 2007 including TB/HIV cases and separate data for TB/HIV cases patients. The updated Global Report [1a] presents data for 2008 excluding patients with positive HIV-status.

Table 3.1

Estimates and registration of death cases caused by TB in different countries [53, 54, 62][55]

Country, Region	WHO estimates of TB mortality rate				Number of registered deaths from TB [62][1]			Quality of registration of TB deaths [53]	
	Number of TB death cases including patients with HIV co-infection, 2007 [53]		WHO best estimates without TB-HIV cases, 2008 [54]		Year	Number of deaths	Per 100,000 population.	Coverage[2] %	Data quality[3]
	Number of deaths (x 1000)	Per 100,000 population	Number of deaths (x 1000)	Per 100,000 population					
Worldwide	1,771.7	26.6	1,400	21	–	–	–	–	–
Africa	734.9	92.7	410	51	–	–	–	–	–
America	40.6	4.5	31	3	–	–	–	–	–
Europe	63.8	7.2	58	7	–	–	–	–	–
India#	331.3	28.3	280	23	NDA	NDA	NDA	NDA	NDA
China#	200.6	15.1	160	12	NDA	NDA	NDA	NDA	NDA
South Africa#	111.9	230.4	19	39	2007	76,761	159.1	79	L
Philippines#	36.3	41.3	47	52	2003	26,657	36.5	85	M
Brazil#	8.4	4.4	7.3	3.8	2004	4,980	2.7	79	M
Thailand#	13.6	21.3	13	19	2002	6,751	10.8	87	L
Russian Federation#	**25.4**	**17.8**	**21**	**15**	**2006**	**28,474**	**20.0**	**99**	**M**
Armenia	0.3	10.4	0.4	12	2006	175	5.4	63	L
Azerbaijan	0.9	10.4	1.8	21	2007	289	3.4	68	M
Belarus	0.8	8.2	0.5	5.2	2007	890	9.2	98	M
Estonia	0.08	6.1	0.025	1.9	2008	47	3.8	100	H
Georgia	0.4	9.3	0.6	13	2001	255	5.6	97	M
Republic of Moldova	0.7	19.0	0.2	4.6	2008	560	15.7	80	H
Kazakhstan	2,7	17.4	3.8	24	2008	2,644	16.9	77	M
Kyrgyzstan	0.9	17.9	1.4	25	2008	627	11.9	70	M
Tajikistan	3.1	45.5	3	44	2005	622	9.5	54	L
Uzbekistan	4.5	16.4	7.4	27	2005	2,784	10.6	73	H
Romania	3.5	16.4	1.6	7.7	2008	1,639	7.6	100	H
Czech Rep.	0.1	1.0	0.06	<1.0	2008	52	0.5	100	M
USA	1.3	0.4	0.8	<0.1	2005	648	0.2	100	H

On the list of 22 countries with high burden of TB.

1 Information is provided for the last year for which data are available in the WHO database on TB mortality [62]. This publication contains separate data on mortality rates from respiratory and non-respiratory (extra-pulmonary) TB cases in men and women. Basing on this data and on the male and female populations provided in this database, estimates were calculated of the total numbers of deaths from TB and the mortality rates from TB per 100,000 population, as indicated in this table.

2 Based on WHO survey of 2005 [53]. The number is calculated as quotient of the number of registered deaths in national vital statistics to the WHO estimates for the same year.

3 Based on WHO survey of 2005 [53]. Data quality was assessed by WHO experts basing on the applied systems of coding of death cases and on the proportion of deaths indicated with improper coding: L – low quality, M – medium quality, H – high quality. NDA – no data available

55 Data is provided basing on the initial tables attached to the WHO Global Report [41] and presented at WHO site http://www.who.int/tb/coountry/data/download/en/index.html. The mortality rate values shown in the initial tables may be higher than those indicated in the text and tables shown in the WHO Global Report [62].

4. Registered TB prevalence in the Russian Federation

Belilovsky E.M., Borisov S.E., Skachkova E.I., Son I.M., Shilova M.V., Danilova I.D.

4.1. General information. Structure of the indicator and trends in recent years

The indicator of TB prevalence is calculated based on the number of TB patients in the overall population or in part of the population at a certain point of time. In the Russian Federation, this indicator is determined as the number of TB patients registered in dispensary follow-up groups (DFG I and II) at the end of the year per 100,000 population registered at the end of the same year [35]. In registered prevalence calculation, the total number of TB cases includes all TB patients irrespective whether or not they have been included in one of the cohorts for treatment[56].

The prevalence of TB among the population is an important and integral indicator reflecting the effectiveness of treatment and follow-up activities. In most other countries, due to the lack of a developed system of follow-up of TB cases (follow-up being confined to determination of chemotherapy effectiveness in certain cohorts of TB patients), this rate, as a rule, is estimated only by means of mathematical calculations (see Section 4.9).

Russia has a well-developed system of dispensary follow-up of TB patients, therefore, the "registered TB prevalence rate" is calculated on the basis of the number of patients registered in dispensary follow-up groups – DFG I and II at the end of the year, which include TB patients with so called "active" forms of TB[57]. Data on the number of cases of tuberculosis among permanent resident populations are reported in Form No. 33, and for the population of FSIN – in Form No. 4-tub (see Chapter 8). This chapter provides information only on TB prevalence in permanent resident population based on Form No. 33.

Therefore, in Russia, the prevalence rate depends entirely on the rules and the methodological approaches applied to the formation of the follow-up groups. The most recent major changes in these approaches occurred in 2004, in line with MoH&SD Executive Order No. 109 of 23 March 2003 [25].

Fig. 4.1 provides data on the registered TB prevalence in the RF based on patient numbers in the follow-up groups that included patients with active forms of TB in the corresponding years. Until 2004, TB prevalence was calculated basing on patient populations in the DFGs I and II that had been defined by the MOH executive orders issued prior to 2004. Before 2004, DFG I included patients under basic courses of treatment and those under indication treatment (IA) and patients with chronic forms of TB (IB). DFG II included patients with so-called "abating" TB, which included patients with a completed course of treatment who were still followed-up as active TB cases because they were considered a group of patients at risk of relapse. It should be noted that from the international perspective, such patients would not be considered as TB cases.

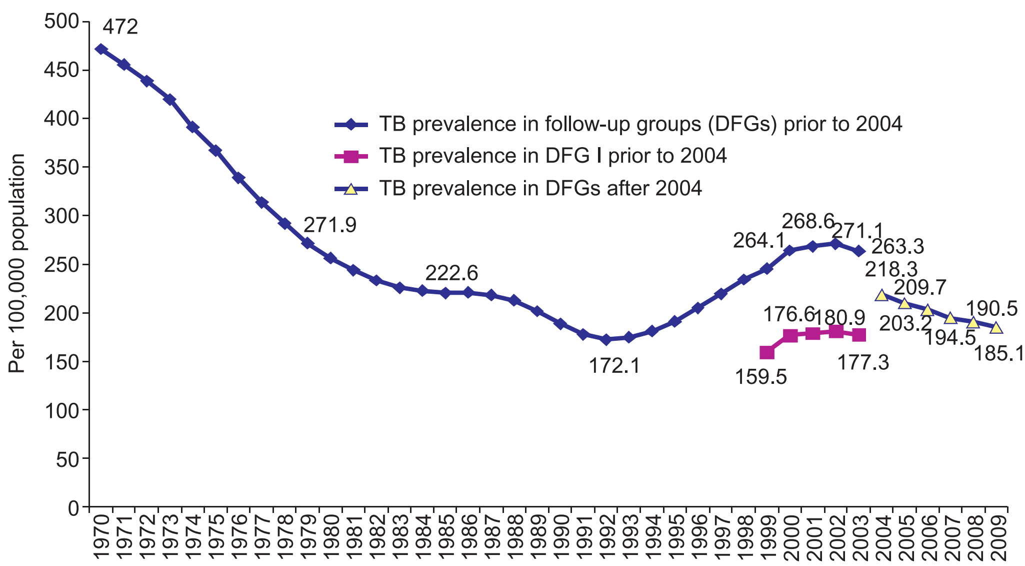


Fig. 4.1. Registered TB prevalence in permanent resident population in the Russian Federation. Calculations are based on the size of all TB patient follow-up groups (DFGs I and II), and only on DFG I before the 2004 revision of the follow-up groups (Source: Form No. 33)

[56] Due to the presence of a relatively effective Russian TB dispensary follow up system, the indicator of "TB prevalence" calculated based on the real number of TB patients can be successfully used for both Russian regions and countrywide. To distinguish the Russian indicator from the worldwide used "TB prevalence" indicator, which is calculated as a WHO estimation, we apply the English term of "registered TB prevalence". – note of translation editor.

[57] The calculation of TB prevalence does not involve follow-up groups with persons at risk of TB or at risk of TB reactivation (III, VI, V, IV and "0"), for more information see Annex.

In 2004, the "abating" TB patient group was abolished and a new system of dispensary grouping was introduced [25] (see also Annex 1). According to this system, TB patients were distributed in the following groups: IA (new cases), IB (relapse cases), IC (patients with an interrupted course of treatment and those evading evaluation) and, finally, DFG II – patients with chronic TB.

The registered TB prevalence rate, calculated based on DFGs I and II as defined by MOH executive orders prior to 2004, decreased regularly until 1992, and at this point it was 172.1 per 100,000. The rate then began to increase sharply, and at the beginning of the 21st century it reached 271.1 cases per 100,000 population, i.e. returned to the level seen in 1979 [42].

Since 1999, the reporting forms have included a separate piece of information on the number of patients registered in DFG I only – i.e., those under basic treatment. This allowed for the calculation of the prevalence rate close to the definition accepted in other countries (see Fig. 4.1). In 2003, the prevalence rate, calculated based on DFG I only, was 180.9 per 100,000 population.

After the follow-up groups revision in 2004, the prevalence rate decreased from 271.1 (2002) to 218.3 (2004) per 100,000 population, because "abating" TB DFG (DFG II in the old system) was not used any longer. During recent years, the prevalence rate steadily declined and reached 185.1 per 100,000 population in 2009 (at the end of 2009 in MoH&SD facilities had 262,718 registered TB patients).

The trends in the absolute numbers of DFG patient populations (Fig. 4.2) make evident several important issues regarding the formation of the follow-up groups for patients with "active" forms of TB during the DFG revision. The "old system", or the "former" DFG II group of "abating" TB cases, abolished in 2004, accounted for one third of the prevalence rate (33.3% in 2001). After it was abolished, patients from the former group I were divided into two new groups – DFG I and DFG II. The latter included TB cases from the former DFG I and part of the former DFG II patients.

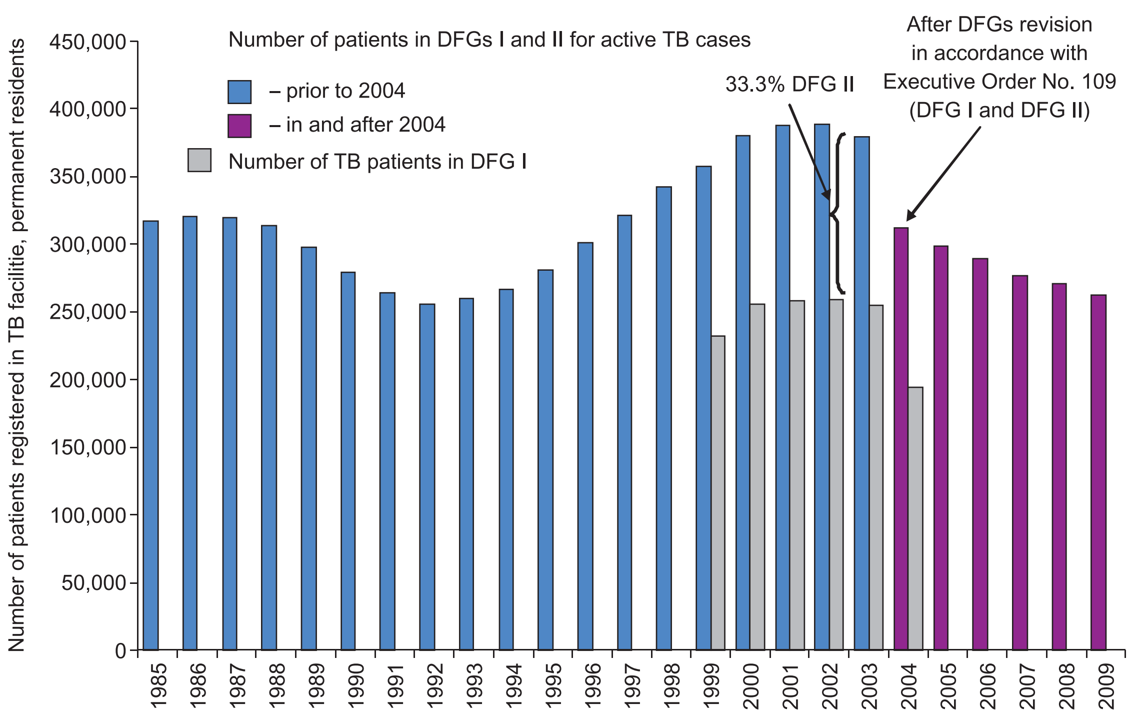
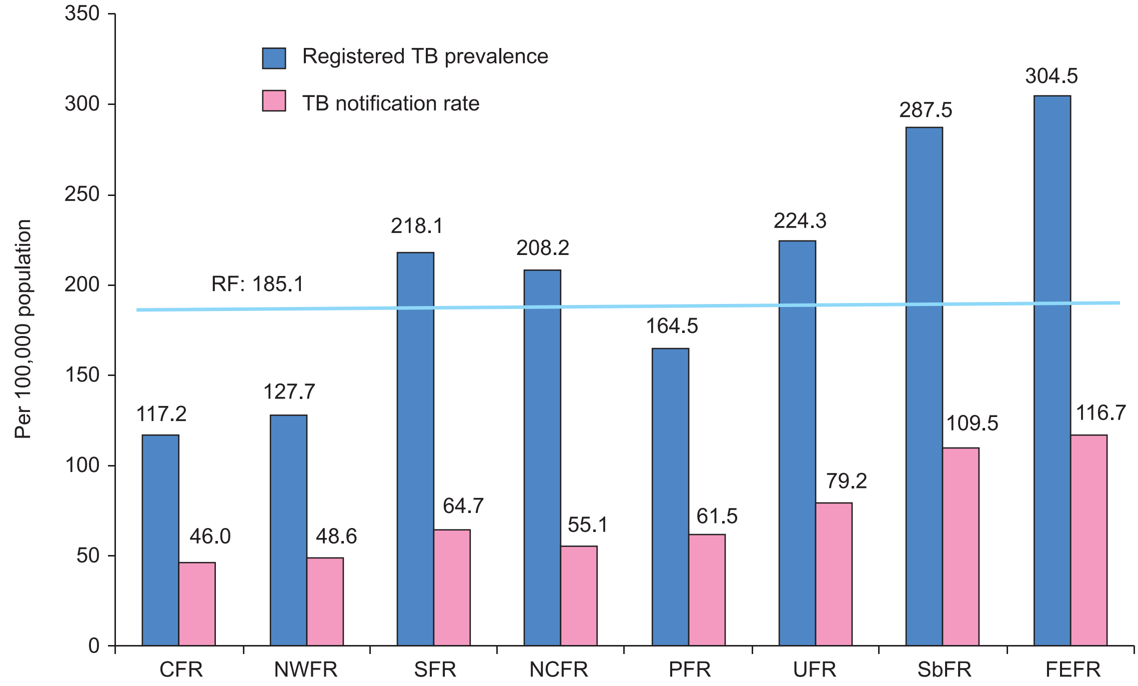


Fig. 4.2. Number of TB patients registered in follow-up groups before and after the groups' revision in 2004 (see text), permanent resident population, Russian Federation. (Source: Form No. 33)

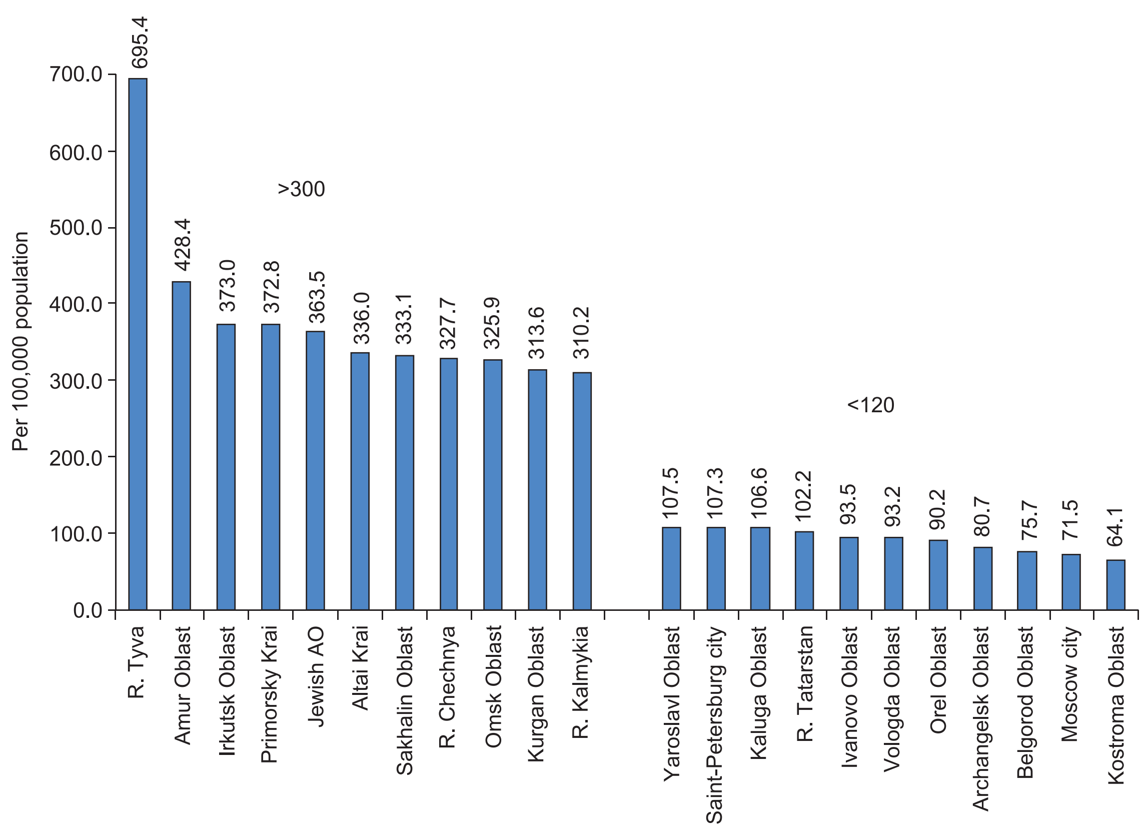
While analyzing prevalence rates, the prevalence and notification rates ratio should be taken into account, which reflects the average duration of the disease and, to some extent, the duration of patient treatment course [13]. The ratio of registered TB prevalence to TB notification rate has decreased in the world over the past 15 years from 2–2.5 to 1.2–1.7, which demonstrates the global trend towards shorter disease course and treatment course duration. In the Russian Federation, this indicator is still high – 2.8.

4.2. TB prevalence in the Russian Federation territories

Similar to TB notification and mortality rates, registered TB prevalence rates also differ substantially by territories in the Russian Federation (Fig. 4.3).



A) by federal region



B) by subjects of the Russian Federation with TB prevalence rate over 300 and less than 120 cases per 100,000 population

Fig. 4.3. TB prevalence in the federal regions (okrugs) and territories (subjects) of the Russian Federation, 2009. Comparison of TB prevalence and notification rates data in permanent population by federal region (Source: Form No. 33; population – Form No. 4)

As seen in case with the notification rate, the prevalence rate in general increases from the West (117–127 cases per 100,000 population, 2009) to the East across the country. In SbFR and FEFR, the rates reach 287.5 and 304.5 cases per 100,000 population (2009), respectively. At the same time, a high level of TB prevalence and its great elevation over the TB notification rates were reported in the territories of the Southern Federal Region (SFR) and North-Caucasian Federal Region (NCFR) – 218.1 and 208.2 cases per 100,000 population (hereinafter among permanent residents according to Form No. 33). If in the other federal okrugs the prevalence rates exceeded the notification rates by 2.5–2.7 times, in SFR and NCFR this proportion was about 3.5 and 3.8, respectively. This may indicate a significantly late discharge of TB patients from the active TB groups or, otherwise, inadequacies in effective detection and/or treatment of TB patients.

In 2007–2009, decreased prevalence rates were registered in all the federal okrugs except for FEFR, where this indicator increased by 9% (from 277 to 304 cases per 100,000 population).

Relatively low prevalence rates (not exceeding 120 per 100,000 population) were reported in 11 subjects of the Russian Federation,– in Yaroslavl, Kaluga, Vologda, Orel, Ivanovo, Arkhangelsk, Belgorod and Kostroma oblasts, in the cities of Moscow and Saint-Petersburg, and in the Republic of Tatarstan. At the same time, in 11 territories the prevalence rate exceeded 300 per 100,000 population: in the Republics of Tyva, Kalmykia, Chechnya, and in Amur, Irkutsk, Sakhalin, Omsk, Kurgan, Omsk oblasts, in Altai and Primorsky Krais and in Jewish AO. In the Republics of Tyva and Amur Oblast, this indicator exceeded 400 cases per 100,000 population.

The prison system contributes to a certain extent to the overall prevalence of the disease in the population of the Russian Federation (see Chapter 8). The overall TB prevalence in country including FSIN facilities amounting to 213.9 per 100,000 population. Anyhow, in 2001 TB patients registered at FSIN facilities contributed almost 28%, in 2009 – only 13.4% of the total number of 312,870 patients registered by the end of the year in Forms No. 33 and No. 4-tub.

4.3. Structure of TB patients registered in MoH&SD facilities

Fig. 4.4 shows the distribution of TB patients among and within DFGs in 2009. New detected RTB cases constitute slightly over half (50.3%) of active TB patients registered in anti-tuberculosis facilities, while patients with chronic RTB make a considerable proportion (33.1% among all TB cases and 34.3% among RTB cases), which, first of all, resulted from ineffective treatment in previous years[58]. A significant number of patients with chronic TB is a permanent risk factor for the spread of the disease including MDR-TB (see Chapter 8). This indicates a continuing challenging epidemiological situation of TB in the Russian Federation.

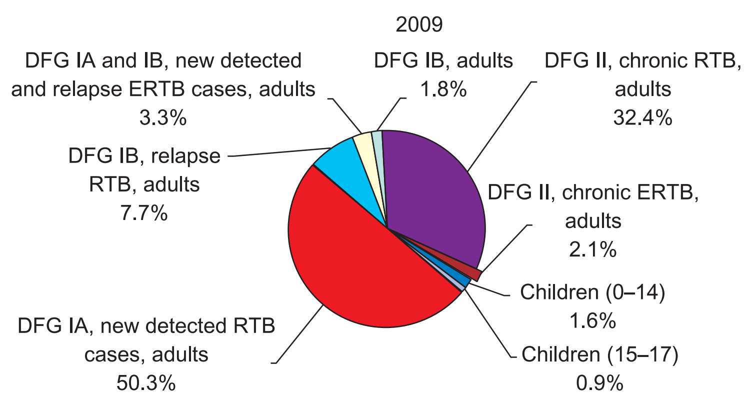


Fig. 4.4. Distribution of TB patients among and within dispensary follow-up groups, the Russian Federation, 2009 (Source: Form No. 33)

It should be noted that by 2006, the proportion of patients with chronic RTB increased to 43.1%, and then it decreased to 34.3%, and in 2009, the decline was observed in more 62 territories of the Russian Federation.

In 2009, the proportion of chronic RTB was less than 25% in 17 territories. It was less than 20% in 9 territories – in the Republics of Chuvashia, Mari-El, Karelia, and in Orel, Kirov, Belgorod, Tomsk, Ivanovo, and Sakhalin oblasts. In Yamalo-Nents AO and in the Republic of Ingushetia the proportion of chronic RTB forms exceeded 50%.

[58] The number of patients in DFG II may also be influenced by wrongful transfers of some patients to this group and unjustified delays in transfers from this group.

The prevalence of bacteriologically positive (MbT+) cases in the country remains still significant (see Fig. 4.5 for RTB patients). The revision of dispensary follow-up groups practically did not have any impact on this rate, which has been declining since 2002 (88.0 per 100,000 population) and reached 77.2 per 100,000 population in 2009. The prevalence of MbT+ cases exceeds the notification rate of confirmed MbT+ cases by 2.5 times in 2009 (at the end of the 90's, by 3.3 times). Although this proportion has been steadily decreasing since 2000, it has not reached the recommended value 1.5–2.0 [13]. This indicates the accumulation of the so-called 'bacillary patients pool' (registered MbT+ patients) and indirectly demonstrates the insufficient effectiveness in MbT+ patients management. Noteworthy is that in some territories, including Orel oblast and the Republic of Mary-El, for patients with respiratory TB this proportion decreased from 2.4–3.0 to 1.2–1.3 in 2002–2009.

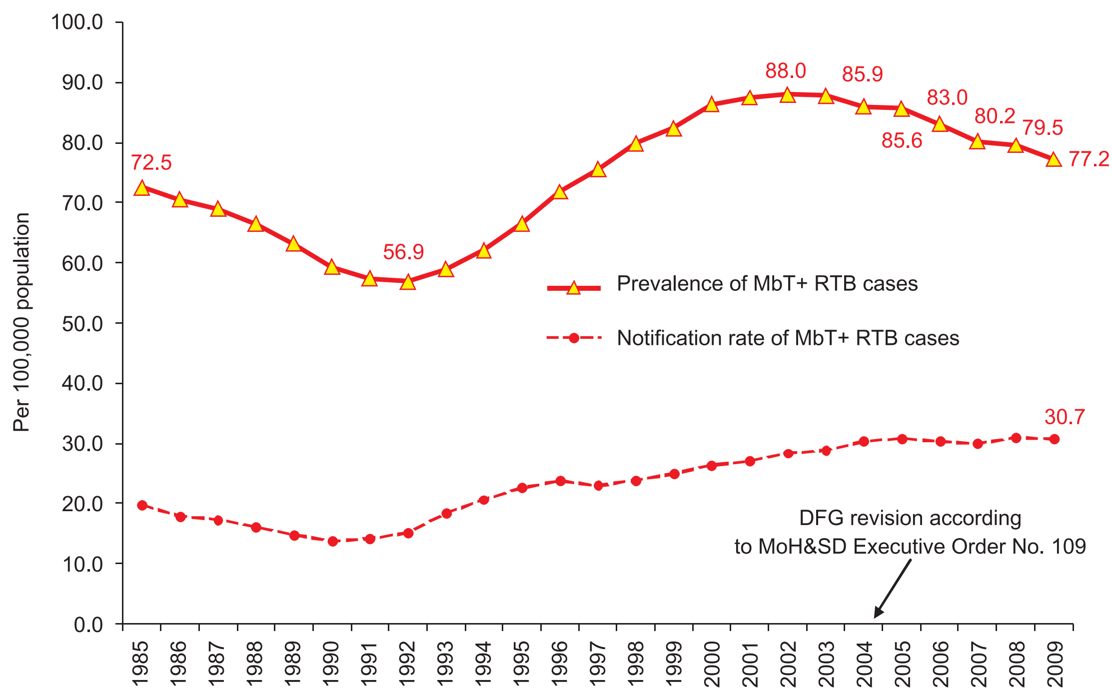


Fig. 4.5. Prevalence and notification rates of MbT+ RTB cases, the Russian Federation (Sources: Forms No. 33; population – Forms No. 1 and No. 4)

A similar situation has been observed among patients with destructive pulmonary TB (Fig. 4.6). The highest prevalence of destructive pulmonary TB forms was reported in 2002 (82.1 per 100,000 population), after that, a decrease to 72.2 per 100,000 population in 2009 was observed. However, this rate is 2.6 times higher than the notification rate for destructive PTB in the Russian Federation. This is an indication of an excessive accumulation of severe pulmonary TB forms in the patient population due to inadequate treatment and insufficient follow-up activities.

The percentage of cases with destructive forms of pulmonary TB registered in TB dispensaries varies significantly in territories. The lowest rates in 2009 were reported in the territories of UFR and CFR (35.8% and 39.0%, respectively), the highest levels were registered in NWFR (46.3%) and in the east of the country (SbFR – 46.4%, FEFR – 48.8%). Figure 4.7 shows the territories with the highest and lowest values of this rate (>50% and <35%).

The high level of portion of fibrous-cavernous TB (FCTB), the most severe form of pulmonary tuberculosis, remained in 2004–2009 – over 13% of all pulmonary TB patients (13.2% in 2009). The presence of a large number of FCTB cases shows that there are problems in regional TB control services both with early case detection and particularly with treatment effectiveness. The overall level of FCTB in the country reached 21.9 cases per 100,000 population (2009). The greatest notification rate of this form of TB is registered in SFR, SbFR and FEFR – 32.8, 39.6 and 42.7 cases per 100,000 population, respectively.

At the same time it should be noted that in 2004–2009 there was a continuous decline in the absolute number of patients with FCTB in the country (from 36,295 до 31,130 cases) and in the spread of this form of the disease in the population (from 25.4 to 21.9 per 100,000 population).

The proportion of FCTB cases among pulmonary TB patients (13.2%) is much higher than the proportion of this form of the disease among new TB cases (2.0%)[59]. As found in [42], a predominantly large number of patients

[59] Form No. 33.

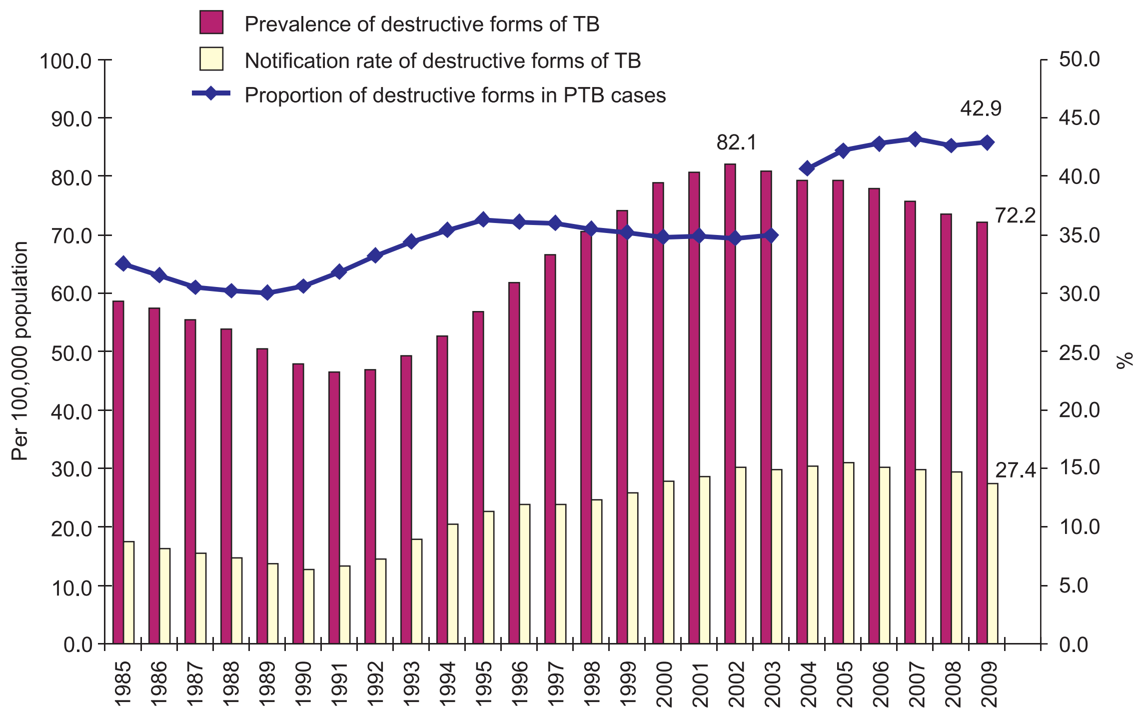


Fig. 4.6. Registered TB prevalence and TB notification rates of destructive forms of pulmonary TB and the proportion among all pulmonary TB patients registered at the end of the year, the Russian Federation. Dispensary follow-up groups were revised in 2004 in line with MoH Order [25] (Sources: Form No. 33; population – Forms No. 1 and No. 4)

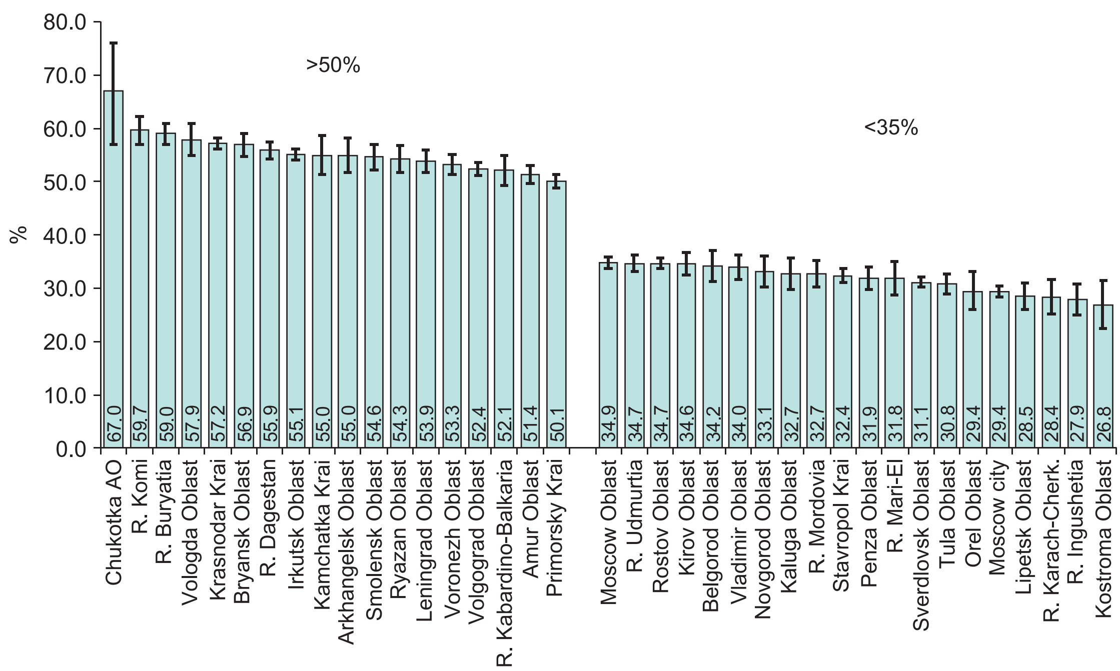


Fig. 4.7. Proportion of pulmonary TB patients with destructive TB forms among all PTB patients registered at the end of the year in Russian Federation territories with rates > 50% and < 35%, 2009. The error bars indicate 95% CI

with FCTB (up to 70%) occur within a year after case detection and starting treatment. Figure 4.8 shows the prevalence and notification rates of FCTB cases in the past years to illustrate the problem of the accumulation of TB patients with severe forms of the disease in the process of treatment and follow-up. In Russia overall, the spread of FCTB exceeded the notification rates of this form of the disease by 18 times in recent years. Especially high difference in prevalence rates over notification rates were reported in UFR (42 times), SFR (32 times) and NCFR (28 times). In the past five years, the prevalence rates of FCTB exceeding more than 50 times over the notification rates was registered in Rostov Oblast (743 FCTB patients registered at the end of 2009), Amur Oblast (483), Orenburg Oblast (259), Perm Krai (609), Khanty-Mansi AO (174), in the republics of Bashkortostan (682), Tyva

(412) and Dagestan (902). The smallest difference between prevalence and notifications rates of FCTB (<8 times) with a relatively low prevalence (less than 12 cases per 100,000 population) was observed in such territories as Tomsk, Orel, Ivanovo, Arkhangelsk, and Kaluga oblasts.

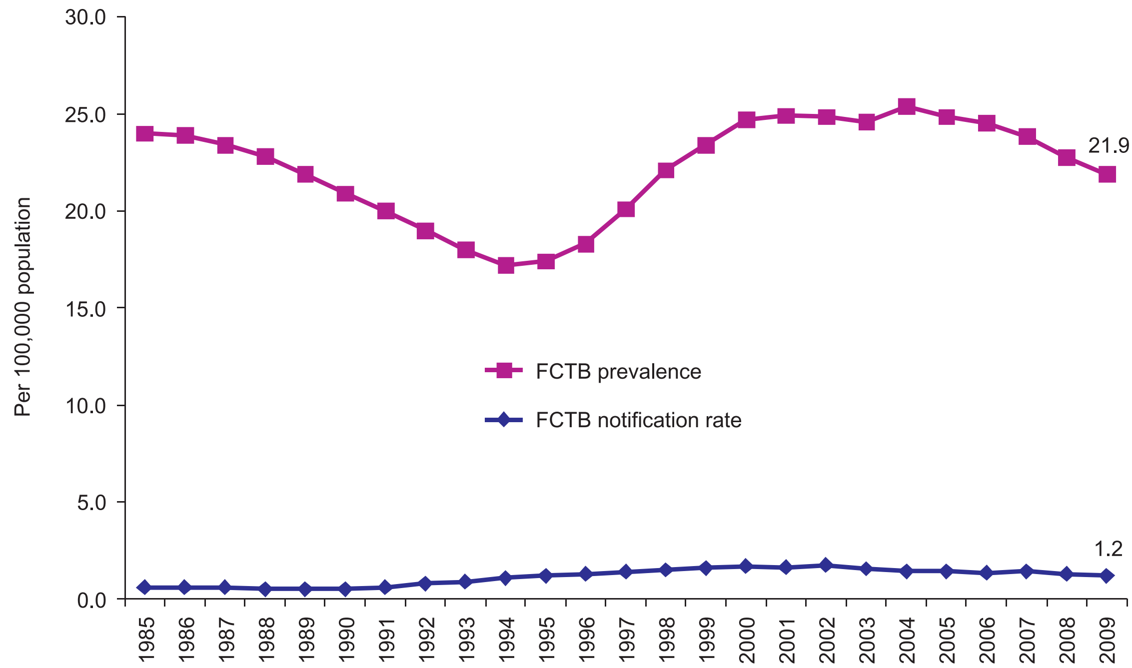


Fig. 4.8. Prevalence and notification rates of fibro-cavernous TB (FCTB) among the permanent resident population of the RF (Source: Form No. 33; population – Forms No. 1 and No. 4)

Even considering possible errors in case detection and registration of FCTB patients, these data make evident the low TB treatment effectiveness in the past 10–15 years [4] and emphasize the necessity to take additional measures to improve TB treatment in many regions in Russia.

4.4. TB prevalence and transfers of TB patients in the Russian Federation

Changes in the numbers of TB patients in each territory (e.g., the number of patients registered by the end of the year) depend not only on the number of new detected and relapse TB cases (see Chapters 2, 5 and 6), mortality rate (see Chapter 3) and cure rate (see Chapter 9), but also on the number of patients transferred to other territories and patients who were detected earlier in other territories and arrive from other territories, and also on the number of patients detected and transferred to/arriving from institutions other than MoH&SD facilities (e.g. penitentiary sector – FSIN).

Even though this information is very important for the assessment of inter-departmental coordination in performing TB control activities and required to avoid presentation of incorrect data on the number of TB patients and to monitor treatment effectiveness, this aspect receives proper consideration in a limited number of publications [42].

Overall, in the Russian Federation, without TB patients transferred in and out from the penitentiary (FSIN) system, the number of transferred-in TB patients was by 11% less than the number of transferred-out[60] cases – 14,600 and 16,000 cases, respectively. In 2009, transferred-in patients accounted for 11.9% of TB patients registered during the year (i.e. arriving, new TB cases and relapses). This indicator reached almost 20% in SFR, which may be associated with a difficult socio-economic situation in this territory (migration from neighboring NCFR territories, high stigmatization of TB patients, which makes patients avoid registration in local TB control facilities and seek medical treatment in neighboring regions, etc.). High proportions of patients arriving from other territories in relation to all TB cases registered during 2009 can be found not only in some territories of SFR (Astrakhan and Rostov oblasts, Republics of Karachaevo-Cherkessia, North-Ossetia – Alania, and Kalmykia), where the indicator

[60] The Russian statistical system includes in reports the number of patients "displaced" from one follow-up facilities to another, doing that without special attention to the treatment succession. That is why the Russian terms "transferred-in" and "transferred-out" are different from the ones used in the most countries when its means a treatment continuation under another TB control facilities. – note of translation editor.

reached 20–28%, but also in the territories with different social and economic conditions – in the Republic of Bashkortostan (31.5%), Novgorod (23.9%), Tyumen (20.5%) and Irkutsk oblasts (20.4%).

In 2005–2009, there was also a continuous decrease in the number of transferred-out patients in the country – from 19,514 to 16,640 (without TB patients transferred-out to FSIN facilities). This may indicate an improved surveillance of patients in TB dispensaries due to the implementation of measures addressed at improved detection and treatment of TB patients based on the cohort approach [25, 26].

At the same time, as indicated in Chapter 8 below, coordination is still inadequate between MoH&SD TB control services in territories and the respective institutions under the jurisdiction of the RF Ministry of Justice (FSIN). As shown below, the FSIN facilities register 2.4 times more transferred-in TB patients than the number of patients transferred-out to FSIN institutions from MoH&SD TB facilities (according to Form No. 33, 9,914 and 4,139 patients, respectively).

Moreover, it will be shown in Chapter 8 that FSIN facilities detect a substantial number of TB cases that have not been detected in health facilities in the civil sector. On the other hand, only 60% of TB patients released from FSIN institutions are registered in MoH&SD TB control services.

Therefore, in the Russian Federation, control of patient flow between territories, as well as between permanent resident and penitentiary sectors should become an important component of epidemiological surveillance of TB spread in the country.

4.5. TB prevalence in the Russian Federation compared to other countries

The TB prevalence rate indicators as presented in the WHO Global Reports and most international publications are estimates calculated based on mathematical models. This is because most countries do not use well-developed dispensary systems of TB patient follow-up. At the same time, the dispensary follow-up system allows to assess the disease prevalence level, which is very close to the real values, in comparison with all other systems of estimation, which have considerable degrees of uncertainty.

In the recent WHO Global Report, the prevalence indicator is determined as the total number of TB cases of all forms of the disease in a territory at particular time [54]. It is suggested that a registered TB patient be not a person with TB in average after 3 months following case registration, because bacillary excretion cessation occurs in 3 months time in most TB cases (determined by sputum microscopy), and such patients cannot be identified as confirmed TB cases[61]. This formal approach to the determination of disease duration brings for some countries (including the Russian Federation) some inconsistent results of TB prevalence estimates.

Therefore, to estimate TB prevalence, WHO experts use both the results of special population studies on TB prevalence and a formula based on multiplying the estimated notification rate (see Chapter 2) and the duration of the disease course. The latter is calculated basing on expert estimates separately for groups of patients with due account of the following conditions: absence or presence of TB/HIV co-infection; absence or presence of bacillary excretion determined by microscopy; whether treatment is performed with or without DOTS, or no treatment is provided.

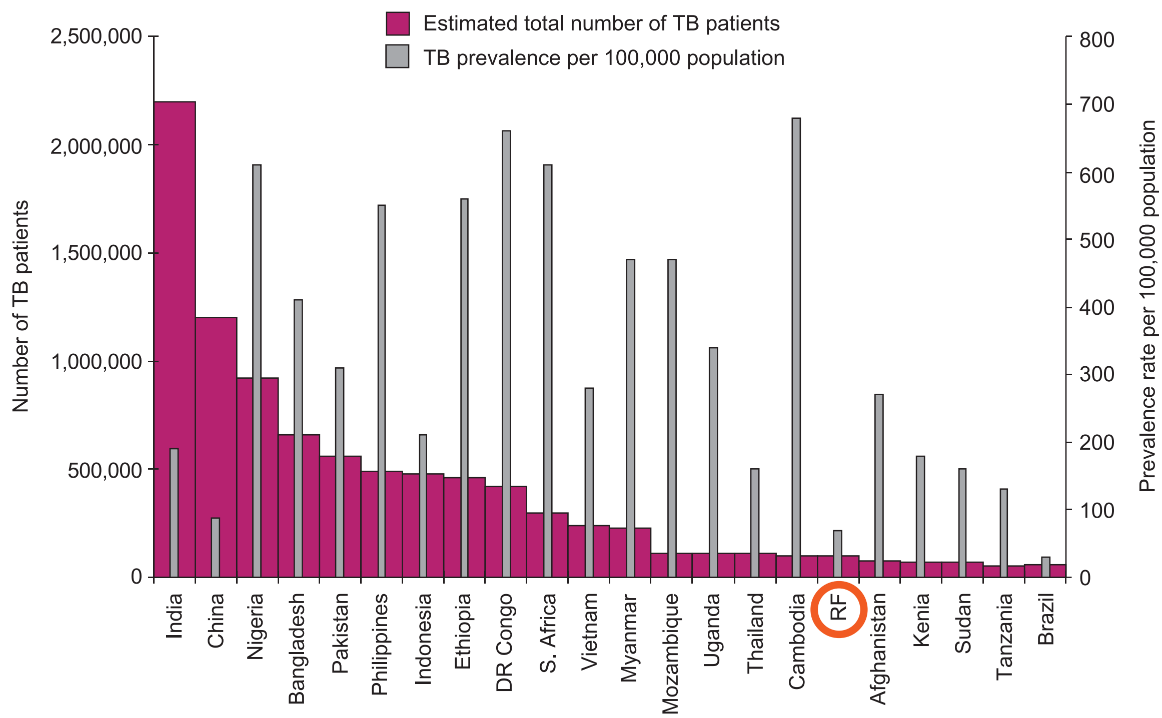
According to the WHO estimates [54], in 2008 there were 11 million people with TB in the world (with the estimate inaccuracy or degree of uncertainty of estimation – from 9.6 to 13.3 million people), which indicate the prevalence rate at 170 (150–210) cases per 100,000 population. In the WHO European region, there were, according to the estimates, about 350,000 (from 250,000 to 550,000) TB patients (39 cases per 100,000 population). In the countries of the African and South-East Asia Regions there were 3.9 million TB cases each. The highest numbers of people with TB live in India (2.2 million) and China (1.2 million). Almost half of people with TB live in five countries – India, China, Nigeria, Bangladesh and Pakistan.

According to the WHO estimates, the Russian Federation accounts for no more than 1% of the global TB burden and less than 30% of people with TB in the WHO European Region. In Russia, the total number of people with TB, as calculated in line with the WHO model, is about 100,000, or 69 TB cases per 100,000 population, with the estimated range from 15 to 140 cases per 100,000 population. The high value of estimate divergence and the difficult-to-explain significant predominance of the TB incidence rate over the estimated TB prevalence rate may be caused by the uncertainty of the estimated average duration of TB disease in the country[62].

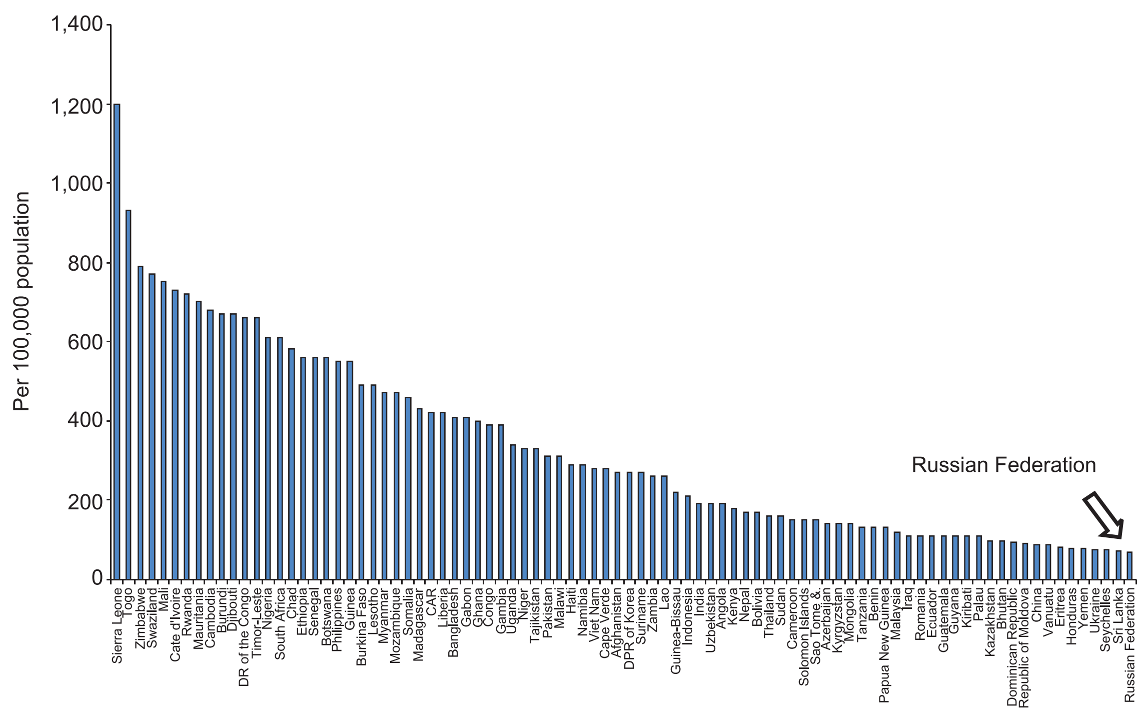
[61] Since results of special investigations are used to calculate the indicator, the prevalence estimates are assessed basing on this case definition. which requires 3 months for case detection.

[62] After consultations of the WHO Office, Russian Federation, with experts from Russia and WHO HQ, in 2010 adjustment was made in the estimate of TB disease duration in Russia. The new edition of the WHO Report on Global Tuberculosis Control will contain the estimated TB prevalence rate for RF higher than the TB incidence rate and closer to the real registered values.

Fig. 4.9A shows prevalence rates in countries with high burden of TB in line with the WHO definition. According to 2008 estimates, about 80% of all TB patients in the world live in these countries. This list includes the Russian Federation. At the same time, if the prevalence rate were calculated per 100,000 population, Russia would be approximately in the middle of the list of 196 countries included in the WHO Global Report (Fig. 4.9B).



A) Estimates of the number of TB patients and the disease prevalence in the High TB Burden countries according to the WHO definition. The diagram includes the countries that involve 80% of the total number of TB patients in the world



B) Countries with high rates of TB prevalence. The graph includes countries with higher rates of TB prevalence compared with the Russian Federation [54]

Fig. 4.9. WHO estimates of TB prevalence in the World. 2008 (Source: [54])

According to the 2008 data, the highest TB prevalence rates were in African countries – in Sierra Leone (1,200 per 100,000 population), Togo (930), Zimbabwe (790), Swaziland (770), and Mali (750). In the European Region, the highest prevalence rates were registered in Tajikistan (330 per 100,000 population), Uzbekistan (190), Azerbaijan (140), Kyrgyzstan (140), Romania (110), and Kazakhstan (98).

According to the WHO data [53], the ratio of prevalence to notification in the world decreased from 2.0–2.5 to 1.2–1.7 in the last 15 years, which indicates a global trend to a reduced duration of the disease and shorter courses of treatment.

Conclusion

The prevalence data stress the need for improving the effectiveness of treatment of TB patients in the Russian Federation. With relatively high rates of TB mortality, there is also a significant accumulation of MbT+ cases and patients with severe forms of the disease, as well as the growing number of patients with MDR-TB (See chapter 10). The registered prevalence rate indicator (with due account of the specificity of its calculation in Russia) may be effectively used for TB control purposes, assessment of TB burden in individual territories, and for monitoring outcomes and effectiveness of TB control activities in the country.

5. TB in children and adolescents

Aksenova V.A., Sterlikov S.A., Belilovsky E.M., Mushkin A.Yu., Danilova I.D.

5.1. TB notification rate in children and adolescents in the Russian Federation

The TB notification rate in children is a major prognostic epidemiological indicator reflecting the overall epidemiological situation of TB in the region and predetermining under unfavorable conditions a further development of a reservoir of TB infection [18]. This results from the fact that tuberculosis in children commonly develops after an immediate contact with a source of TB infection. To diagnose TB in children, some subjective approaches are often used; therefore, the notification rate of TB in child age groups substantially depends on the organizational approaches used for TB case finding and registration.

In international practice, the definition "child" includes individuals aged from newborns to 17 years 11 months 29 days. However, it is clear that from the epidemiological point of view this group is too heterogeneous for a correct analysis. Possible approaches to TB diagnosis in this broad age group are also entirely different. Apart from the biological processes of growth and hormonal changes, it is particularly important to view the adolescent group aged 15–17 separately, because this age is characterized by increased communication and social activity. Moreover, patients at this age predominantly have specific age-related localizations of the disease. For example, pulmonary TB cases occur from 18–20% of 0–14-year-olds to almost 85% of TB cases with this localization in adolescents aged 15–17 years. Given this information, this section contains summary data for child population of 0–17 years of age along with separate data for children 0–14 years of age and adolescents aged 15–17 years.

Overall, in the RF, from 1992 to 2001, the TB notification rate among children 0–14 years of age increased more than two-fold (from 9.4 to 19.1 per 100,000 children, Fig. 5.1). High notification rates in 1999–2001 were supposedly related to hyperdiagnosis following the introduction of computer tomography [1]. Over the following five years, the rate did not substantially change (16.2–16.4 per 100,000 population with some minor fluctuations within the 95% CI limits), followed by a proven decline to 15.3 per 100,000 population in 2008 and to 14.7 in 2009. The proportion of children 0–14 years of age in the structure of overall TB incidence (Form No. 8) fell from 3.8% in 1999 to 2.7% in 2009.

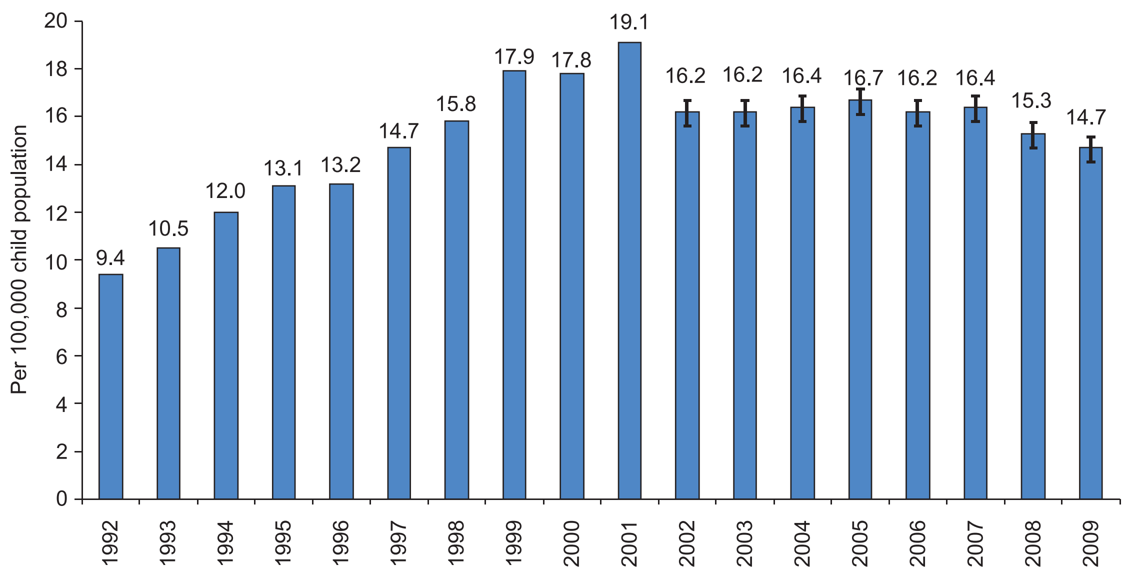
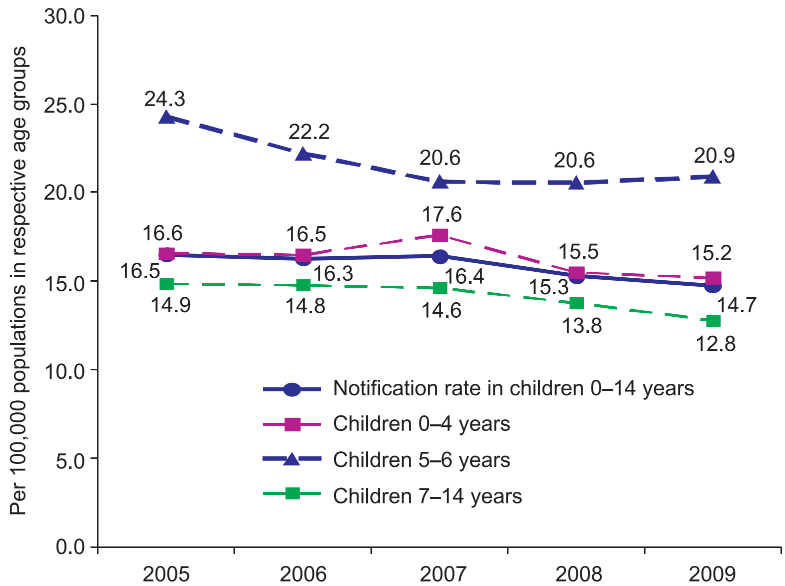


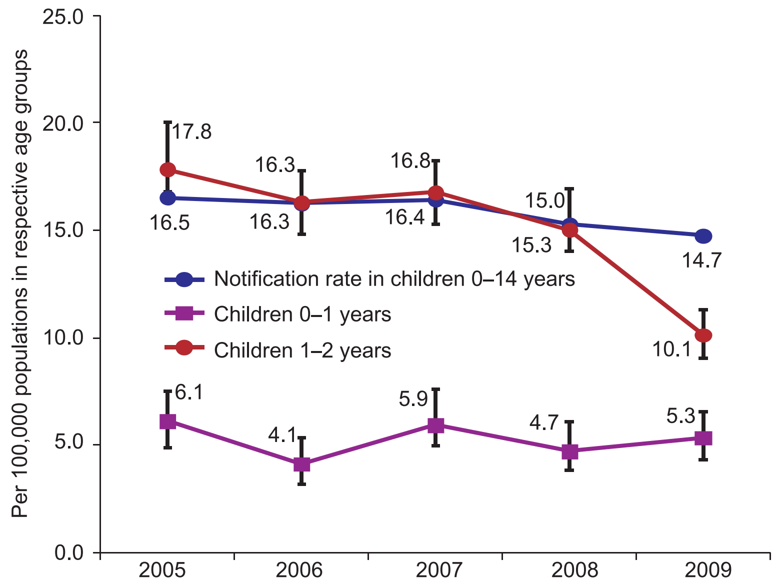
Fig. 5.1. TB notification rate in children 0–14 years, the Russian Federation, 1992–2009.
The error bars in 2002–2009 columns indicate 95% CI (Sources: Form No. 8; population – Form No. 1 and 4)

The notification rate decline was observed in almost all the age groups of children (Fig. 5.2). However, over the past three years this indicator remained virtually unchanged in age groups 0–1 and 5–6 years (5.3 and 20.9 in 2009, respectively), while the highest notification rate could be observed in the age group of 5–6 year-olds.

TB incidence in adolescents of 15–17 years of age can be registered more reliably than in the 0–14 year age group due to more pronounced manifestations of the disease with significant radiological changes and bacillary



A) In age groups 0–14, 0–4, 5–6 and 7–14 years



B) In age groups 0–14, 0–1 and 1–2 years

Fig. 5.2. TB notification rates in children of 0–14 years of age in different age groups, 2005–2009.
The Russian Federation (Sources: Form No. 8; population – Form No. 1 and Form No. 4. Error bars indicate 95% CI)

excretion. Most adolescents pass X-Ray screening during their education in educational facilities and in connection with mandatory screenings prior to military service [18].

In contrast to children aged 0 to 14 years, TB notification rates among adolescents (15–17 years) had increased until 2005 (Fig. 5.3). From 2002 to 2005, the notification rate in this age group increased from 32.7 to 40.5 cases per 100,000, followed by a statistically significant decline and stabilization at 37–38 per 100,000 adolescents with insignificant changes within the 95% CI interval (37.4 in 2009)[63].

Over the past eight years, TB notification rates among adolescents were more than two-fold as compared to those among children aged 0 to 14 years. On the other hand, this indicator for adolescents was 2–3 times lower as compared with those registered in older age groups (see Fig. 5.4 and Fig. 2.12) in spite of a more significant coverage of adolescents with screening. The proportion of adolescents among all new TB cases (Form No. 8) was within 2.4% in 2004 and 1.6% in 2009, and could not have a considerable impact on the epidemiological

[63] The accuracy of notification rate calculation may be influenced by a significant reduction in the number of adolescent population in 2004–2009 (from 7,462,000 to 4,963,000 as of January 1), which is generally used for the calculation of "annual average population 15–17 years of age" that is used as the denominator. Average annual population in this age group, which is used as the denominator, could be not the same reservoir where most of disease cases was developed.

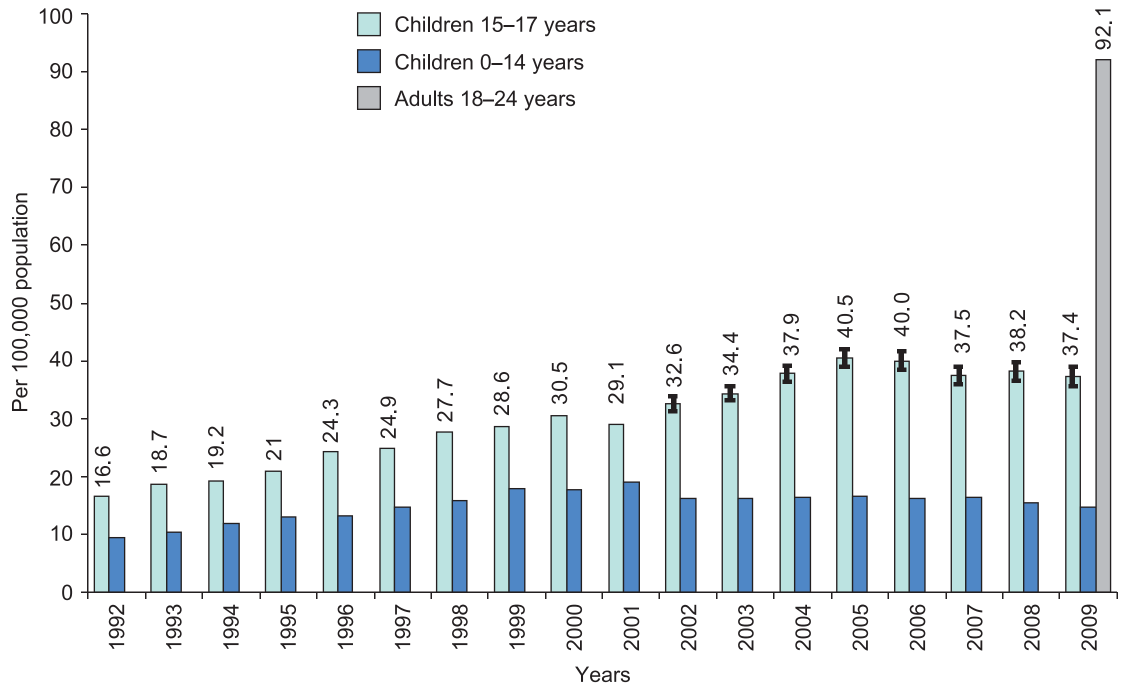


Fig. 5.3. TB notification rates in children (0–14), adolescents (15–17), and adults 18–24 years, the Russian Federation, 1992–2009. Error bars (for adolescents, 2002–2009) indicate 95% CI (Sources: Form No. 8; population – Form No. 1 and Form No. 4)

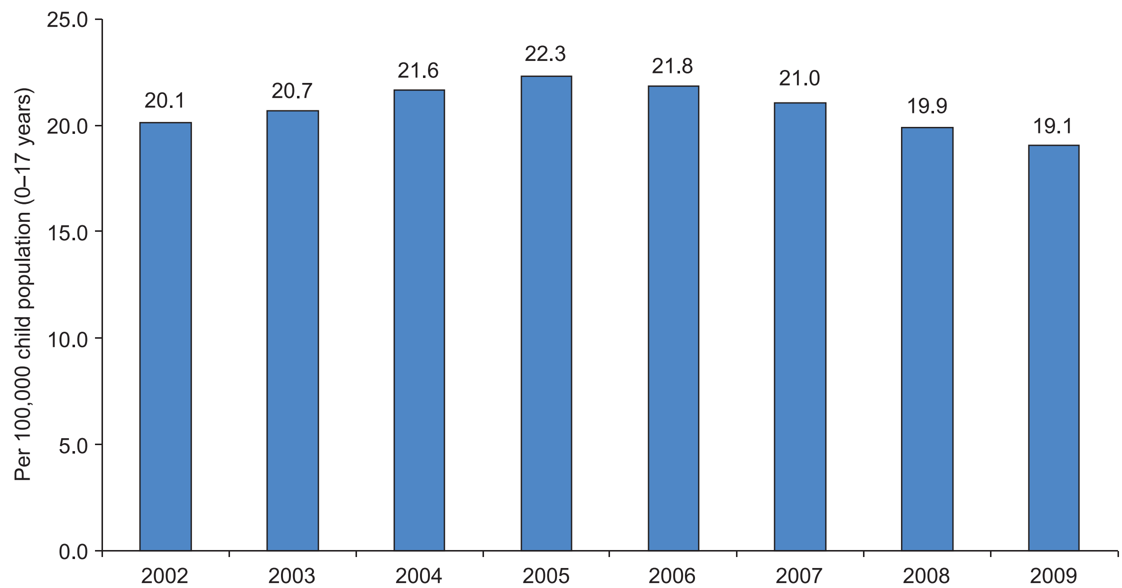


Fig. 5.4. TB notification rate in children (0–17 years), the Russian Federation, 2002–2009 (Sources: Form No. 8; population – Form No. 1 and Form No. 4)

situation of TB in the country. Anyhow, considering the broad coverage of adolescent population with screenings, the notification rate in this age group may be used to control the completeness of TB case-finding among adult populations in respective regions.

Overall, notification rates in children 0–17 years of age decreased from 22.3 in 2005 to 19.1 cases per 100,000 population in 2009. (Fig. 5.4).

When considering TB notification rates and trends in different regions, it should be taken into account that the number of children with TB registered in each subject of the Russian Federation is relatively small. In 2009, according to Form No. 8, in half of RF territories the number of reported new cases among children did not exceed 30 cases, and in 70% of territories it was below 50 cases (difference between 25% and 75% quartiles equal to 11–48). Differences in the number of new TB cases in individual territories are also significant by year. Therefore, it seems appropriate to calculate the average TB notification rate for a period exceeding 1 year.

Over the past two years (2008–2009) as compared with the previous two years (2006–2007), decreased TB notification rates were registered in almost 50 subjects of the Russian Federation with an average decline of 8.1%. The indicator decreased by more than one third in 8 territories (Sakhalin, Ryazan, Vologda, Belgorod oblast, Khanty-Mansi AO, Jewish AO, and in the Republics of Karelia and Kalmykia).

Anyhow, increased TB notification rates among 0–14-year-olds were registered in 32 subjects of the Russian Federation, including those with more than 20% growth (Kostroma, Amur, Pskov, Kursk, Kirov, Voronezh, Orel oblasts, in the Altai, Mordovia, Adygea and Chechnya Republics, Primorsky Krai, and in St.-Petersburg city).

Fig. 5.5 shows the distribution of RF territories by notification rate in two-year period 2008–2009 based on the total number of new TB cases registered among children in 2008–2009 and two-fold (aggregate) average population[64]. Notification rates varied from 76.0 (Kamchatka Krai) and 73.5 (Kaliningrad Oblast) to 5.3 (Murmansk, Kursk oblasts and the Republic of Adygea)[65] cases per 100,000 population.

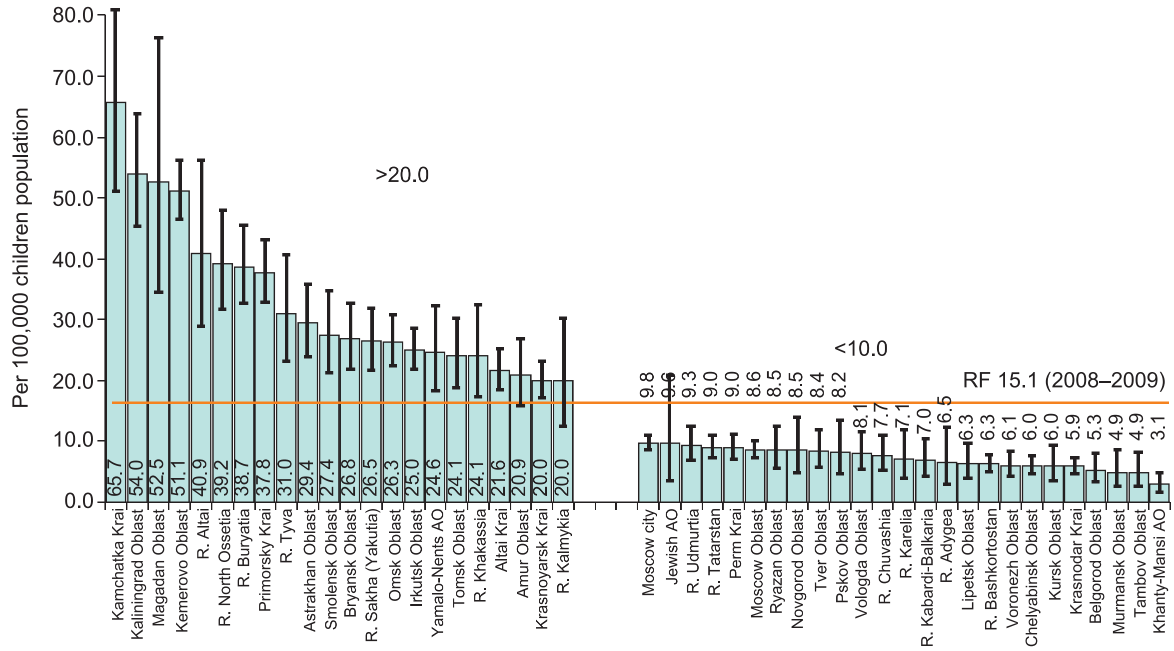


Рис. 5.5. TB notification rates among children in the Russian Federation, aggregated data for 2 years (2008–2009). Error bars indicate 95% CI (Sources: From No. 8; population – Form No. 4)

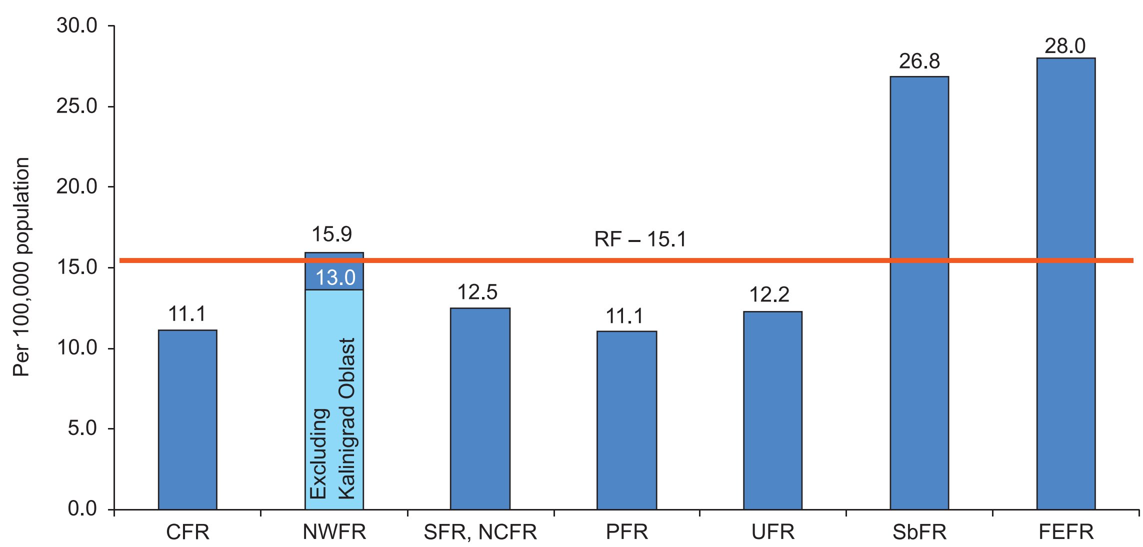


Fig. 5.6. Notification rates among children in the federal regions of the Russian Federation calculated for two-year period (2008–2009). Data for NWFR is presented both in total and without Kaliningrad Oblast (Sources: Form No. 8; population: Form No. 4)

64 According to the classical rule, the notification rate is calculated based on the number of new cases in relation to the number of people at risk multiplied by the total time of being at risk, or the number of new cases / (number of people * time). In the proposed calculation, this formula includes the number of new cases in relation to the average number of child population multiplied by 2 years.

65 The indicator is shown for territories with children population over 25,000.

The data confirms that the epidemiological situation of tuberculosis in the eastern regions is much more severe than that in the west.

5.2. Sites and diagnostic structure of TB in children

TB structure and TB sites in children are substantially different in age groups (Fig. 5.8), and the **structure** of new cases reflects TB control effectiveness in prevention and early detection of the disease in the region. The clinical forms of the disease are characterized by dominance of respiratory TB cases with lesions of intrathoracic lymph nodes without involvement of the lung tissue.

In children <7 years, respiratory TB with lung tissue involvement (pulmonary TB) is found in 6–7% of cases, 7–14 years – 28.8%, and in adolescents – 83.5% of cases.

The proportion of cases with bacillary excretion in 0–14-year-olds is only 6% (118) of all cases (Fig. 5.7). Anyhow, taking into account the predominant involvement of intrathoracic lymph nodes in children, bacillary excretion should not be considered the major criterion of pathologic process development.

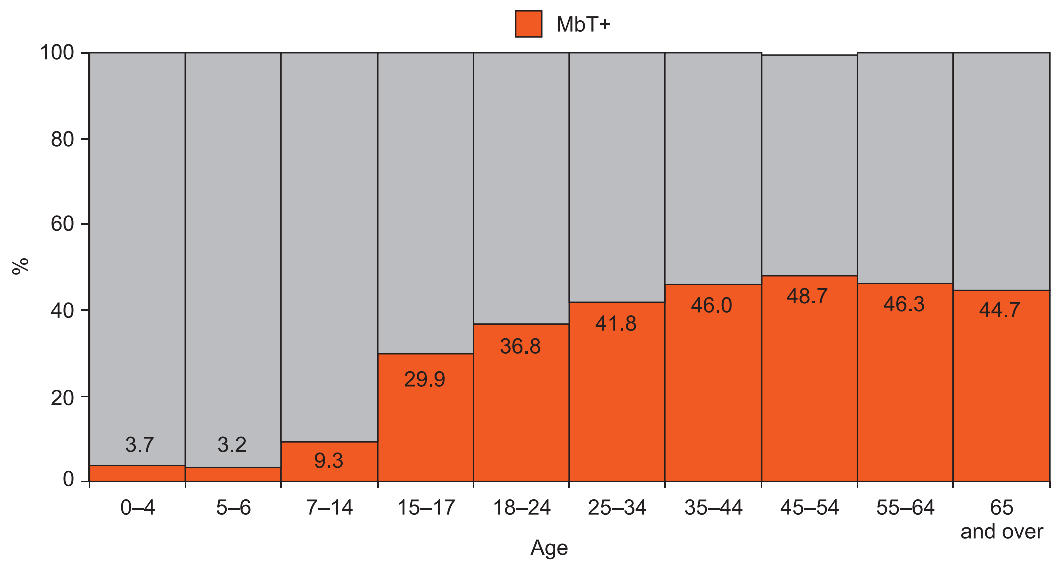


Fig. 5.7. Percentage of patients with bacillary excretion detected by any method in different age groups of new TB cases of all disease sites. The Russian Federation, 2009 (Source: Form No. 8)

In spite of the fact than the number of children and adolescents with bacillary excretion is not significant (167 children and 426 adolescent cases registered in all the regional TB dispensaries at the end of 2009, Form No. 33), comparatively high level of MDR-TB could be observed among them – 16.9% and 17.3% of cases, respectively.

In children < 14 years, extra-pulmonary respiratory TB (without parenchyma involvement) is mostly prevalent with intrathoracic lymph nodes involvement (64%–90%)[66].

Extra-respiratory TB (see Chapter 6) are not so frequently (from 5% to 12% of all cases depending on age group), while the proportion of such disease sites have a trend to decline over the past 15 years. Such cases are mostly revealed through the passive detection.

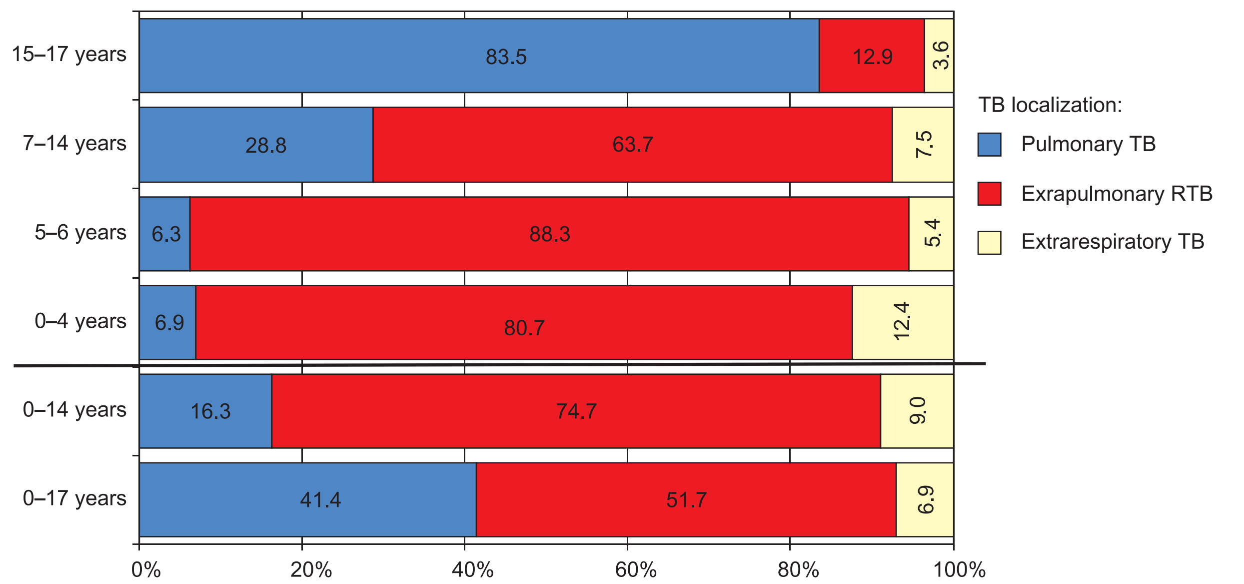
In 2009, in children 0–14 years of age with extra-respiratory TB (Fig. 5.8), there was a trend to more prevalent TB cases of bones and joints (45.5%). According to 2005–2008 reporting forms , this site of the disease was registered in 60% of cases in children younger 2 years[67], which can be explained by the BCG-induced etiology of these cases (bacteriologically unconfirmed cases of osteitis caused by BCG vaccination).

As compared with the previous year, there was a decrease in the proportion of urinogenital TB cases from 16.3% to 12.9%[68]. Non-diagnosed urinogenital TB in children never is cured spontaneously and progresses with the age resulting in destructive processes with frequent dysfunction of the organ leading to resection.

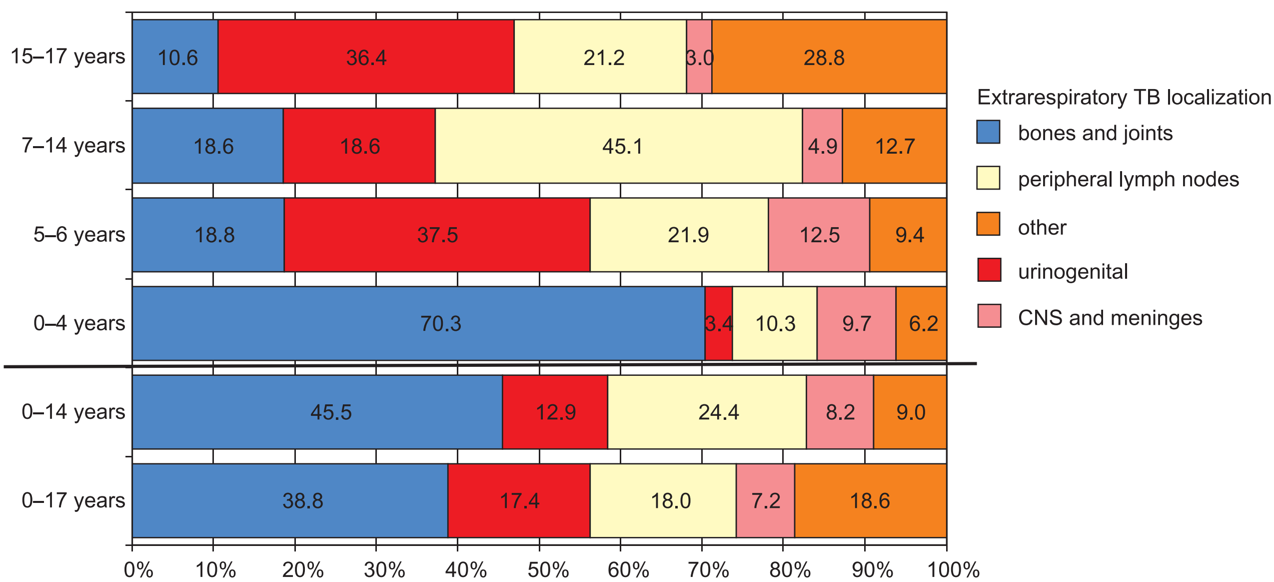
[66] Some extra-pulmonary sites TB data are not available in the currently used Russian reporting forms, the number of such cases are included in total EPTB aggregated data.

[67] The information for 0–2 age group was available in national TB reports only before 2009.

[68] It should be noted that there was an unexpectedly high rate of patients with 'other forms of extra-respiratory TB' in 2009 (9% among children and 28.8% among adolescents), which was presumably caused by inaccurate completing Form No. 8 in regional TB control facilities.



A) TB localizations among all new TB cases



B) Localizations of extra-respiratory TB

Fig. 5.8. The clinical structure (localization) of new TB cases in different age groups of children. The Russian Federation, 2009 (Source: Form No. 8)

Over the past four years, after a decline in 2005–2006, there was stabilization in the rates of tuberculosis meningitis, which is considered an indicator of vaccination effectiveness on the local level (1997 – 38, 2005 – 27, 2006–2009 – 22–23 cases).

It is noteworthy that the substantial differences in the structure of TB cases in 0–14 and 15–17 age groups require a separate epidemiological analysis of TB spread among children and adolescents. It should also be noted that adolescents and adult TB patients have almost the same TB localizations, and the methods of TB case-finding, diagnosis and treatment used for patients older than 17 years of age are also the same.

5.3. TB prevalence and mortality rates in children

As in case of the total TB prevalence rate, changes in the disease prevalence rates among children aged 0–14 were also caused by the 2004 TB patient groups revision (see Chapter 4), when the indicator rate sharply fell from 40.4 (2002) to 23.5 (2004) per 100,000 child population. Since 2006, the indicator value has been continuously decreasing to 19.5 cases per 100,000 child population. In 2009, the overall prevalence of TB among children and adolescents 0–17 years of age was 23.8 cases per 100,000 child population.

TB mortality rates in children are very low in recent years: in age group 0–14 years, it amounts to 0.08 cases per 100,000 child population (17 cases in RF in 2009).

5.4. TB notification rate among children in risk groups

The following children and adolescents are included in risk groups for TB followed-up in TB control facilities:

- newly infected by *M. tuberculosis* persons (cases of conversion of tubercular tests registered in DFG VIA);
- children with hyperergic sensitivity to tuberculin (registered in DFG VIB);
- children with increasing sensitivity to tuberculin (registered in DFG VIC);
- children who had contacts with TB patients (registered in DFG IVA and DFG IVB if they had contacts with TB patients with or without bacillary excretion, respectively, or with diseased animals).

By the end of 2009, 678,908 children and adolescents from risk groups for TB were registered in these DFGs and followed-up in TB control facilities[69], i.e. 26 cases per 1,000 followed-up patients of 0–17 age group (2.6% of the total child and adolescent population). TB disease developed in 1,125 children and adolescents, or 163.7 cases per 100,000 average annual population in corresponding DFGs (Table 5.1). This rate is 8.6 times higher compared with the TB notification rate among all children and adolescents of 0–17 years of age (19.1 per 100,000 population).

The main part of new TB cases notified in risk group of children are new TB cases detected among children who had contact with TB cases (674 cases or 60% of all new TB cases notified in IV and VI DFG). The TB notification rate is particularly high in children who had contacts with MbT+ patients – over 600 cases per 100,000 average annual population of this age (In 2009, there were 556 registered TB cases among children 0–17 years, who were in contact with MbT+ patients, with the average annual population of this age group 89,332).

Value of the indicator exceeded 600 cases per 100K of average annual of this population group in the beginning of the XXI centure (691 and 731.4 in 2002 and 2006, respectively) demonstrating trend slowed down to 605.7 cases in 2009. Data collected before 2008 inclusive on children contacts (0–14 years of age) with MbT+ patients also showed a lower rate compared with 2007 (464.6 cases per 100,000 average annual contacts in 2008, Fig. 5.9).

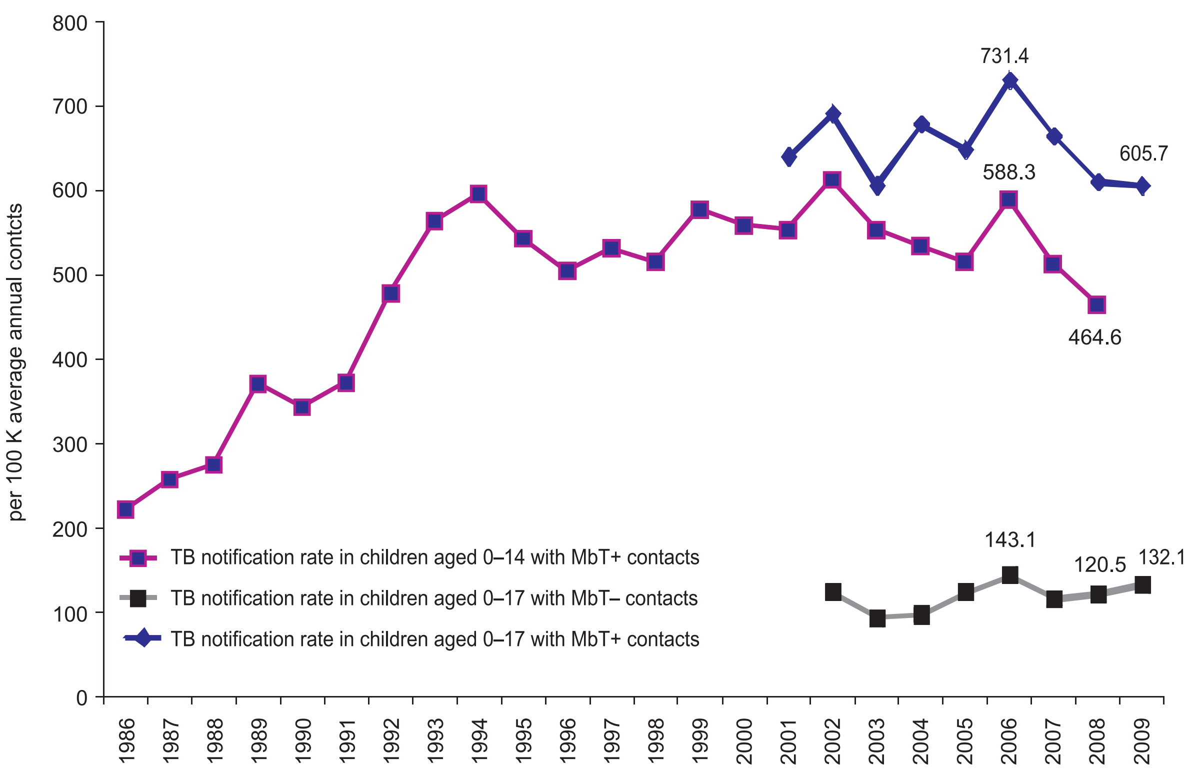


Fig. 5.9. Notification rates among children who had contacts with MbT+ and MbT– patients, the Russian Federation (Source: Form No. 33). The 2007 data is presented without N.Ossetia[70]; after 2008, the notification rate among children aged 0–14 with MbT+ contacts was not registered in national report Form No. 33)

[69] Starting 2009, Form No. 33 includes aggregated DFG numbers of children and adolescents without data subdivision on 0–14 and 15–17 age groups.
[70] See note to Fig. 2.28, Chapter 2.

In 2009, the notification rate in children (0–17 years, who contacted with MbT+ patients was 31.4 times higher compared with the TB notification rate for the resident population in these age groups In 2008, the notification rates for contacts in children (0–14 years) was 30 times and in adolescents (15–17 years) 25 times higher compared with the respective indicators in the overall populations in these age groups in the Russian Federation[71] (Table 5.1).

Table 5.1

Dispensary follow-up groups (DFG) of children aged 0–17 at risk for TB, the Russian Federation, 2009

Dispensary Follow-up Group (DFG)	Newly registered in DFG in the reporting year	Notified new TB cases	Total registered by the end of the year (in follow up register)	TB notification rate in the DFG per 100,000 average annual population in this age group	Newly registered in the DFG in the year per 100,000*	Registered (in follow up register at the end of the year) per 100,000*
Contacts with MbT+ patients (IVA)	49,698	556	91,857	605.7	190.7	352.5
Contacts with MbT– patients and children from families of cattle-breeders or with animals with TB (IVB)	56,594	118	90,281	132.1	217.2	346.5
Initial period of primary TB infection (VIA)	277,645	177	330,750	52.6	1,065.6	1,269.4
Earlier infected, with hyperergic reaction to tuberculin and from social risk groups with expressed reaction to tuberculin (VIB)	44,098	192	55,510	345.1	169.2	213.0
With increasing sensitivity to tuberculin (VIC)	90,560	82	110,510	72.0	347.6	424.1
Total	518,595	1,125	678,908	163.7	1,990.4	2,605.6

*Per 100,000 population 0–17 years.

Besides, the total notification rate in children aged 0–17 who had contacts with MbT+ patients is 4.6 times higher compared with the respective indicator for children who had contacts with MbT– patients (605.7 and 132.1 per 100,000 annual rate of contacts in 2009, respectively). This stresses the need for a particular attention to MbT+ patients as the most epidemiologically dangerous patient group.

The high incidence rates in children and adolescents in TB infection foci must draw phthisiatrists' special attention and emphasizes the need for revising approaches to prevention activities in children and adolescents.

Trends in major epidemiological indicators, such as the TB notification and prevalence rates, do not completely reflect the prevalence of TB infection among children [4a]. At the same time, the number of children registered in DFG VI allows for calculation of the indicators that potentially show the prevalence of latent TB infection in the country.

Primary TB infection in children (conversion of tubercular tests) is reflected in the numbers of DFG VIA group. Overall, such cases are detected in a little more than 1% of children aged 0–17 population (1.1% in 2009).

In 2009, 177 new TB cases (Table 5.1) were notified among 330,750 children (0–17) with primary TB infection, or 52.6 per averaged 100,000 children registered in DFG VIA group. 192 new TB cases were detected among 44,098 (345.1 per 100,000) children with hyperergic reaction, and 82 TB cases in 90,560 (72.1 per 100,000) children with increasing sensitivity to tuberculin. These high indicators of TB incidence were registered in spite of periodic examinations and preventive measures in children with primary TB infection.

5.5. Assessment of TB diagnosis and case-finding effectiveness based on DFG IIIA registration data

The specificity of TB in children can be seen in the possibility of spontaneous cure from the disease due to limiting the inflammation foci followed by the formation of petrified areas or fibrosis in adjacent tissues. Such

[71] Until 2008, national reports gave a possibility to assess notification rates in children (0–14 years) and adolescents (15–17 years) separately.

outcomes most often can be seen in TB cases with damaged lymph nodes (in the form of calcification), liver and spleen. Residual signs of post-tuberculosis changes can be detected by X-ray examinations performed in children who have tuberculin-positive test results (2TU) or another pathological condition.

Therefore, the quality of TB case-finding in children and adolescents in Russia can be indirectly assessed basing on the proportion of patients of 0–17 years of age registered in DFG IIIA in relation to all detected TB cases in this population group [18]. Overall, not more than 800 TB cases are registered annually in the country among children aged 0–14 with residual post-tuberculosis changes (771 cases excluding data from the Chechen Republic)[72]. Over the past 2 years, the proportion of children registered in DFG IIIA in relation to new children with TB varied within 23–25% (23.8% in 2008).

There are considerable variations by year in data received from selected regions, which is due to small numbers of cases. Anyhow it should be noted that in the last two years high values of this indicator (in average, over 60%) were registered in Ivanovo, Magadan, Murmansk, Nizhniy Novgorod, Tyumen, Lipetsk and Novgorod oblasts, in the republics of Chechnya, Sakha (Yakutia), Mari-El, and in Khanty-Mansi and Yamalo-Nenets AO.

It should be noted, if these cases are detected in a timely manner, the official notification rate data in the Russian Federation would increase by nearly a quarter. Cure of TB with residual changes in the form of calcification and cicatricial changes in the damaged foci may by only partial. Number of these children has residual TB-induced intoxication, which indicates a preserved activity of TB infection. A possible future activation of the process (particularly, in adolescents and youths) may require a surgical intervention for removal of large residual post-tuberculosis changes.

5.6. Effectiveness of tuberculin skin tests for TB diagnosis in children 0–17 years

Tuberculin skin tests (tuberculinization) are used in mass screenings of children and adolescents for detection of specific sensitization. This method can be used with the same child/adolescent patient in different health facilities; therefore, the indicator of tuberculin skin tests coverage calculated according to the standardized technique [37] may indicate a greater number of patients compared with the actual number of children/adolescents tested.

In 2009, the overall percentage of children and adolescents examined with tuberculin skin tests was 90.3% in 0–14 year age groups and 34.3% in adolescents (15–17 years)[73]. Low coverage rates in children (0–14 years) were registered in Ingushetia (44.7%), Chechnya (57.5%), and in Kursk Oblast (60.0%). More than 50% of adolescents were tested in only 18 subjects of the Russian Federation[74]. In all the other regions, the indicator did not reach 50% or data were not reported.

Mass tuberculin skin test screenings facilitate the following measures:

- detection of primary TB infection cases;
- detection of children and adolescents with hyperergic and increasing reactions to tuberculin;
- selection of groups of children for anti-tuberculosis vaccination with BCG-M vaccine starting with infants of 2 months of age if they were not vaccinated after birth and for BCG revaccination;
- early diagnosis of TB in children and adolescents;
- determination of epidemiological indicators of TB (TB infection in the population as a whole and the annual risk of infection).

The indicators of TB case-finding in children with primary MbT infection and new cases of TB among children and adolescents are most informative from the perspective of assessing the epidemiological situation of TB in the country and for adequate decision-making.

A high proportion of children with primary MbT infection reflects adequate quality of tuberculin skin testing. On the other hand, this also indicates a considerable number of undetected patients with bacillary excretion. The highest values of primary TB infection were registered in Stavropol Krai (4.3%), Voronezh (3.7%), and Orenburg (3.3%) oblasts. The lowest indicators were in the republics of Chechnya and Ingushetia (0.1%), Novgorod and Pskov oblasts (0.2%). Such low values of primary TB infection obviously demonstrate inadequacies in tuberculin skin testing coverage.

In the Russian Federation, the proportion of child patients with hyperergic reactions to tuberculin was 0.21% of the total number of tuberculin skin testing coverage. The highest values of hyperergic reactions were registered

72 The 2009 data was presented without the Chechen Republic, which included 282 newly detected cases with post-tuberculosis changes in children 0–14 years of age. The data needs verification.

73 Data on the number of tuberculin skin tests performed in 15–17-year-olds were not received from Kaluga, Yaroslavl, Arkhangelsk (with Nents AO), Kaliningrad, Astrakhan, Orenburg, Ulyanovsk, Kurgan, Chelyabinsk oblasts, republics of North Ossetia-Alania, Bashkortostan, Mordovia, Chuvashia, Perm Krai, and from St.-Petersburg city. The non-reported data was taken into account when calculating the average national data on TB tests coverage of adolescents (15–17 years of age).

74 Data received from the Chechen Republic showed a 110.7% coverage of adolescents, which may result from an erroneous calculation of a significant number of patients who were tested twice during the year.

in the Central Federal Region – Voronezh (3.7%), Ryazan (2.0%), Bryansk (1.8%), Belgorod (1.5%), Lipetsk (1.4%), Moscow (1.1%), Smolensk (1.0%) and Tambov (1.0%) oblasts. In territories in other federal regions, most significant numbers of children with hyperergic reactions to tuberculin were found in the republics of Tyva (1.25) and Chechnya (1.0%). Relatively low values were registered in Adygea, Ingushetia and Tatarstan (each – 0.6%). Such significant deviations from the average national indicator still require special investigation to avoid inadequacies in tuberculin skin testing and/or under-registration.

The average countrywide proportion of patients with increasing reaction to tuberculin was 0.4%, with the highest values of this indicator in the Nenets AO and in the Republic of Kalmykia (both about 2%).

Overall in Russia, the effectiveness of tuberculin skin testing as a method of TB case-finding in children and adolescents (0–17) was about 0.1 detected TB cases per 1,000 examined children. Unfortunately, because of inadequate completing Form No. 30 in some territories, the indicator cannot be now calculated separately for age groups 0–14 and 15–17. In spite of the fact that tuberculin skin testing allowed for detection of more than half of TB cases in children and adolescents aged 0–17, the low effectiveness of the method requires a further improvement of TB case-finding in children and adolescents or the elaboration of indications for a differentiated use of this method of preventive testing for TB.

5.7. Anti-tuberculosis vaccinations for children and adolescents

Immunization with BCG and BCG-M vaccines is the main method of TB prevention in children. According to the currently used in the Russian Federation immunization schedule against child infections, the primary BCG vaccination is performed for all healthy newborns on 3–5 day after birth, with subsequent revaccinations of 7–14-year-olds with a stable negative Mantoux (tuberculin) test (MT) of 2 tuberculin units (TU). Infected children are not revaccinated. Anti-tuberculosis vaccination is not performed for adolescents aged 15 years and older irrespective of tuberculin skin test results. All the vaccination activities are performed in compliance with the immunization schedule for children (RF MoH executive order No. 229 of 27 June, 2001, and RF MoH&SD executive order No. 673 of 30 October, 2007), and following RF MOH executive order No. 109 [26]. RF MoH executive order No. 673 included a special provision to the effect that, starting 2007, in territories with TB notification rates over 80 per 100,000 population vaccinations for newborns are performed with BCG vaccine, while in territories with lower TB notification rates BCG-M vaccine should be used. The first revaccination is performed for 7 year-old children or at 14 years (if it was not performed at 7 years), and the second revaccination is not used any longer.

In 2009, the overall BCG vaccination coverage for newborns accounted for 88.0% of the total number of live births[75] (or 88.3% of the total number excluding newborns that died in the first 24 hours). In most regions, this indicator is well above 90%, but there are also territories with lower indicators of BCG vaccination coverage.

In half subjects of the Russian Federation, BCG vaccination coverage indicators varied from 86% to 92%. The lowest BCG coverage was registered in the Republic of Kabardino-Balkaria (58.3%), which was caused by a shortage of BCG vaccine in this region. The most significant reason for a decreased BCG vaccination coverage in the country was the presence of medical contraindications for vaccination (a list of contraindications is provided in RF MoH executive order No. 109 [26]).

The statistical reporting forms allow for the calculation of the number of newborns with low birth weight (less than 2500 g), and the number of newborns from HIV-positive mothers (accounting respectively for 97,671 newborns or 5.9% of live births excluding newborns who died in the first 24 hours, and 7,941 newborns or 0.5% of live births). There is only limited data available referring to other causes accounting for non-vaccination; therefore, such information is not presented in this review. It should be noted, however, that the recommendations for medical withdrawals from BCG vaccination were not always followed. According to the data contained in the State Statistical Control Form No. 32, newborns with birth weight below 2,500 g received BCG vaccine in Ryazan, Irkutsk, Kemerovo oblasts, Kamchatka Krai, Jewish AO, and in the Republic of Tyva. Of 320 children born outside health facilities, 240 (68.6%) were vaccinated.

Therefore, the BCG vaccination coverage is rather complete in the Russian Federation. The utmost threat to immunization coverage is the shortage of BCG vaccine in some territories. Medical contraindications are not that significant for BCG vaccination coverage, because most children are vaccinated in health facilities at a later stage.

Anyhow, another problem posed with BCG vaccination is connected with post-vaccination adverse effects. BCG and BCG-M vaccines, as any other live vaccine, may induce a TB development process both in the site of injection and in a generalized form. Such cases must be followed-up by a phthisiatrist. Since 2005, children with adverse events

[75] In 2009, according to Form No. 32, the number of BCG-vaccinated newborns in Krasnodar Krai was more than the number of live births. The data was not included in this review as incorrect.

following immunisation (AEFI) are followed-up in DFG V group. Over the past 5 years, there were in average 631cases (0–17 years) with effects following immunization (658 cases in 2009). In 15–17-year-olds there were only sporadic cases (maximum – 7 AEFI cases in 2008). BCG induced AEFI prevalence in 0–14 year-old children was 2.7–3.4 per 100.000 children 0–14 years of age. Severe AEFIs following BCG vaccination (generalized and disseminated BCG infection requiring in-patient treatment) were in average 168.2 children 0–14 years of age during the past 5 years (132 cases in 2009). All other cases had local and/or limited adverse effects (cold abscesses and BCG lymphadenitis).

5.8. Tuberculosis in children and adolescents in the Russian Federation and other countries

According to WHO estimates [31], children 0–15 years account for about 11% of all new TB cases registered worldwide, i.e. 1 million cases per year.

In compliance with the recommendations provided by WHO, CDC&P and other organizations, when analyzing TB notification rates, only the 0–14 year group should be taken into consideration, in which, according to available published data, both diagnosis and clinical manifestations of the disease are substantially different from TB patients in other age groups. In world practice, the age group of 15–17-year-olds (adolescents) is considered together with adults.

The methods used for TB notification rate estimates in children, as well as notification values are not presented in WHO annual Global Reports. At the same time, as shown in well-known publications and in a number of WHO documents [57], in selected countries children account from 3% to 25% of the total TB incidence rate (Table 5.2).

Table 5.2

TB in children 0–14 years-old, WHO estimation for TB High Burden Countries, 2000 [57]

Countries	New TB cases in children	Percentage of all new TB cases	TB notification rate in children*	Total TB notification rate**
India	185,233	10.2	53	179
China	86,978	5.3	27	129
Indonesia	15,691	2,7	23	263
Bangladesh	33,166	10.2	61	236
Pakistan	61,905	25.3	103	172
Philippines	12,167	5.3	43	304
South Africa	35,449	16.1	237	501
Russian Federation	7,778	4.2	30	126
Brazil	23,520	20.7	47	66
Vietnam	7,559	5.3	29	183
22 High TB Burden countries	659,397	9.6		

* per 100,000 child population.

** per 100,000 total population.

Low quality TB case-finding and under-registration of TB cases among children are also noteworthy. This appears to be due to the following shortcomings in the organization of TB surveillance in children. First, t**he high proportion of extra-pulmonary** TB cases in children leads to difficulties in the **verification of TB diagnosis**, since the use of laboratory methods alone is insufficient for TB case investigation. The proportion of children with TB with bacillary excretion is limited, which partially explains **the absence of a standardized definition** of a TB diagnosis in children. **Under-prioritizing of TB cases in children in public health**, because most such cases are not epidemiologically dangerous, also contributes to inadequate quality of **registration of TB in children in national TB control systems**.

WHO Global Reports on TB control contain only data on registered pulmonary TB cases in children aged 0–14 with positive sputum smear bacterioscopy (ss+), which accounts for only 1.8% of all new M+ TB cases.

On the other hand, the data contained at WHO site http://www.who.int/tb/country/data/download/en/index.html provides more detailed information on the registration of new TB cases among children, which was used for the report [57]. According to these data, in recent years TB case-finding in age group 0–14 has significantly improved. Only 55% of countries (which accounted for 74% of all new TB cases [49]) provided information on new pulmonary ss+ TB cases among children in 1995. The number of such countries increased to 63.2% in 2008 (the total number of notified new TB cases there amounting to 98.8%). Moreover, in 2008, 63.2% of countries provided information for narrower age groups (0–4 and 5–14-year-olds), and about 65% of countries submitted data on new pulmonary ss– TB and extra-pulmonary TB cases among children.

It should be noted that all the data have been collected for many years in the RF national reporting system of health statistics.

The data are extremely diversified among countries with regard to the proportion of new cases detected in 0–14-year-olds (Fig. 5.10). In the Russian Federation, the percentage of children among all notified TB cases is relatively low (2.8%). In the structure of new TB cases among children, the number of cases in age group 0–5 is up to 50% in USA, Canada and SAR (Fig. 5.11), while in Russia this indicator is slightly over 1/3 (36.5%).

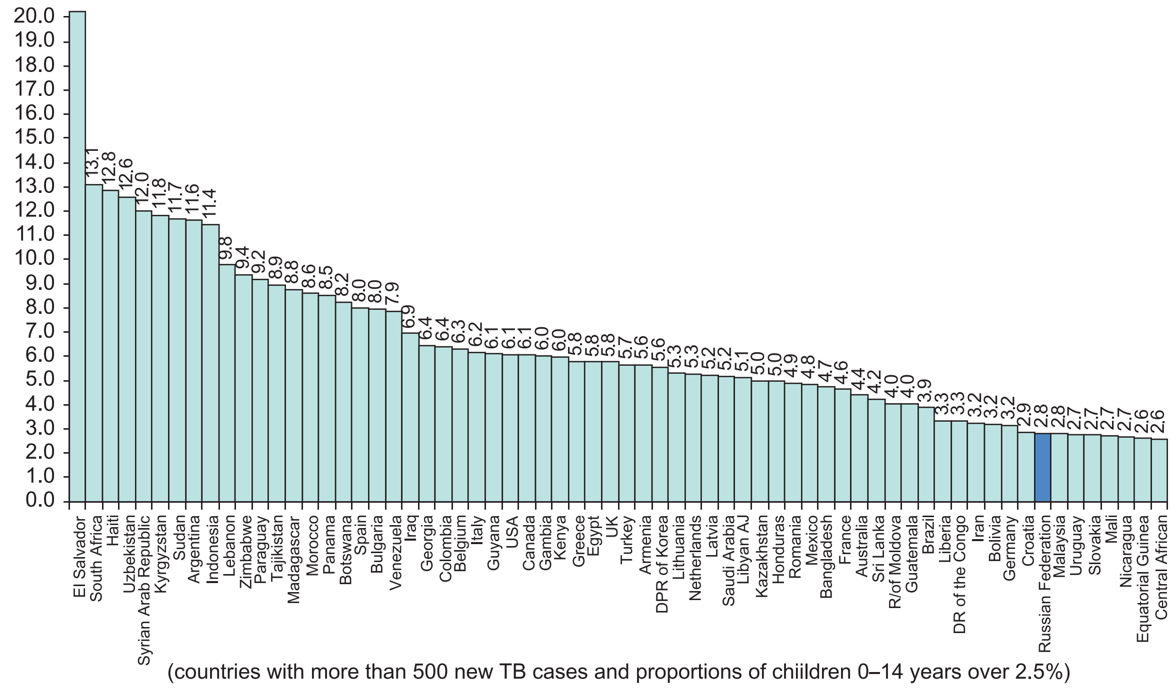


Fig. 5.10. Percentage of new TB cases notified among children 0–14 years old in the Russian Federation and other countries (2008). The data provided includes only countries with more than 500 new cases and proportion among children 0–14 years over 2.5% (Source: tables from WHO Global Report [54])

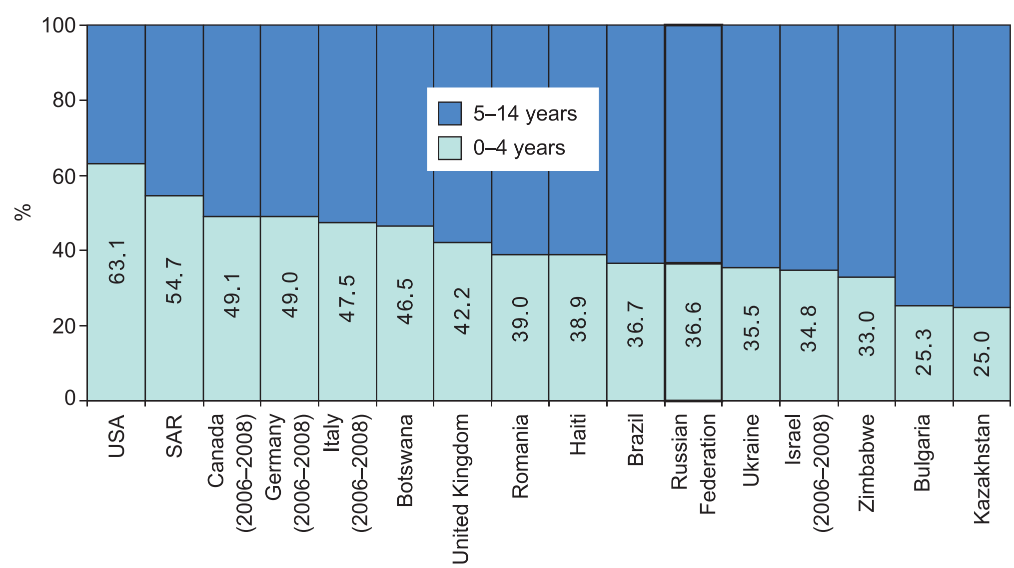


Fig. 5.11. Age-related composition of new TB cases among children 0–14 years in selected countries, 2008 (Source: tables from WHO Global Report [54])

The diagnostic structure of new TB cases in children also differs among individual countries (Fig. 5.12).

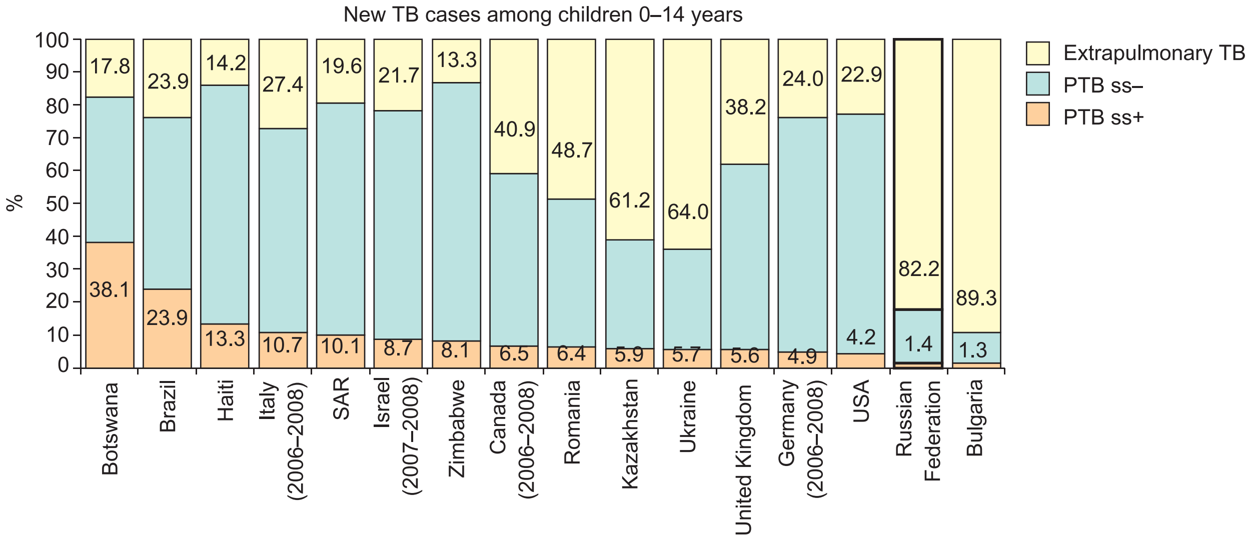
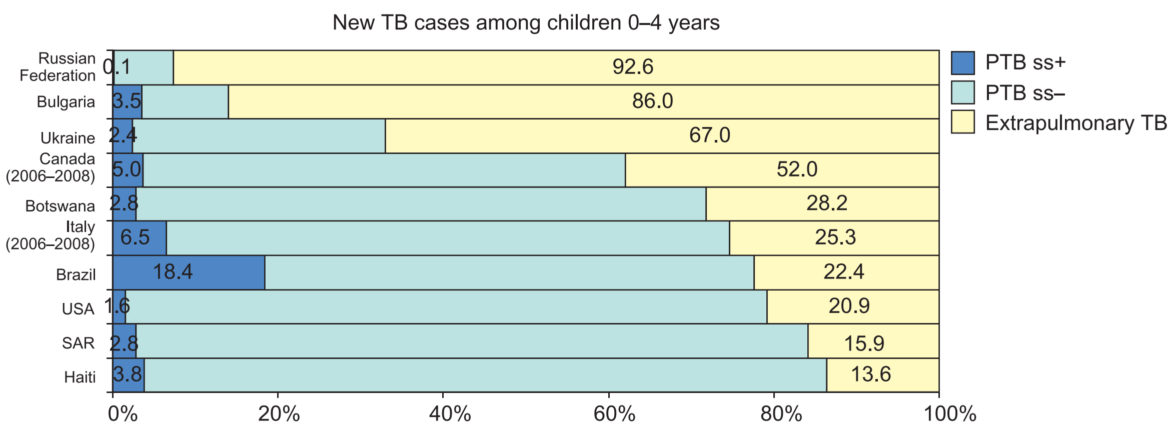
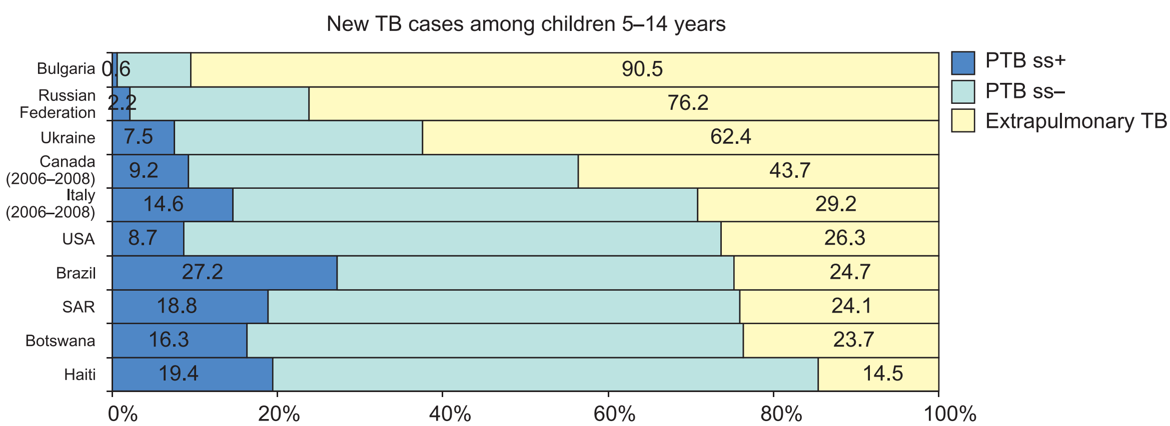


Fig. 5.12. Structure of TB cases in children 0–14 years in selected countries, 2008
(Source: tables from WHO Global Report [54])



A) Children 0–4 years



B) Children 5–14 years

Fig. 5.13. Structure of TB cases in children 0–4 and 5–14 years in selected countries, 2008
(Source: tables from WHO Global Report [54])

As it was noted before, in the Russian Federation, TB without parenchyma involvement is more prevalent (82.2% in 2008), while in most countries the proportion of such cases varies from 20% to 40% (USA – 22.9%, UK – 38.2%, Brazil – 23.9%). Confirmation of such cases with laboratory methods in the Russian Federation is very low – 1.4% (overall confirmation by bacterioscopy in USA – 4.2%, Brazil – 23.9%). According to the available data (MMWR 1997: 46 (No. RR-10); 40–41, L.Nillson, Ch, CDC), not only bacterioscopy is used in USA for laboratory confirmation of TB cases, but also culture and molecular methods (DNA probes and nucleic acid amplification techniques), which allows for confirmation of TB diagnosis in 24.8% of new cases among children 0–14 years.

In the Russian Federation, microscopy and culture methods are used for laboratory confirmation of TB diagnosis. This explains why in 2009 TB was confirmed with laboratory methods in only 3.7% of children with TB (Fig. 5.7).

Between individual countries, there are also significant differences in TB sites in children of different age groups (Fig. 5.13), which results from different approaches to TB diagnosis in children.

6. Extra-pulmonary tuberculosis

Yablonsky P.K., Mushkin A.Yu., Belilovsky E.M., Galkin V.B.

As indicated in Chapter 2, pulmonary TB cases are mostly registered in the Russian Federation (90.7% in 2009). On the other hand, the extra-pulmonary TB notification rate characterizes both the general epidemiological situation of TB and the effectiveness of TB case-finding and patient follow-up in the country. The timely detection of patients with extra-pulmonary TB (EPTB) is also important because of the high proportion of late detection of chronic TB cases and incapacitation of EPTB patients [30].

Historically, in the USSR and later in Russia, for monitoring and evaluation purposes, TB cases have been are divided in respiratory TB cases and extra-respiratory TB cases[76]. For the purpose of bridging the gap between the Russian and international definitions, a special definitional unit of **respiratory TB of extra-pulmonary localization (REPTB)** has been introduced in this review (which includes TB of upper respiratory tract, bronchi, intrathoracic lymph nodes and pleura *without parenchyma lesions*), along with the proper **extra-respiratory TB (ERTB)**.

Overall, the notification rate of **ERTB**[77] is not that significant in the Russian Federation. Anyhow, case finding remains rather subjective since it strongly depends on the knowledge and qualification of medical workers in regional health facilities (urologists, orthopedists, gynecologists, dermatologists, ophthalmologists, etc.), and in regional TB control facilities (mostly pulmonologists). As indicated above, in a considerable number of regions there is a shortage of specialists in ERTB, and such posts are usually vacant or formally occupied by co-workers or do not exist at all [32].

In spite of the earlier prognosis, which was based on the specificity of ERTB development (its 'delayed' development 3–7 years following an episode of pulmonary TB and, consequently, deferred growth of ERTB incidence after the '90s crisis), the ERTB notification rate remained stable in 1992–2001 at 3.3–3.5 cases per 100,000 population and starting 2003 began to decrease annually by 0.1 and fell to 2.6 per 100,000 population by 2009 (Fig. 6.1). It should be noted that the percentage of ERTB among all TB patients was significant in the '90s (10.2% in 1992), but in the early 2000s it dropped to 4% and in 2009 it was 3.2% of the total number of new TB cases.

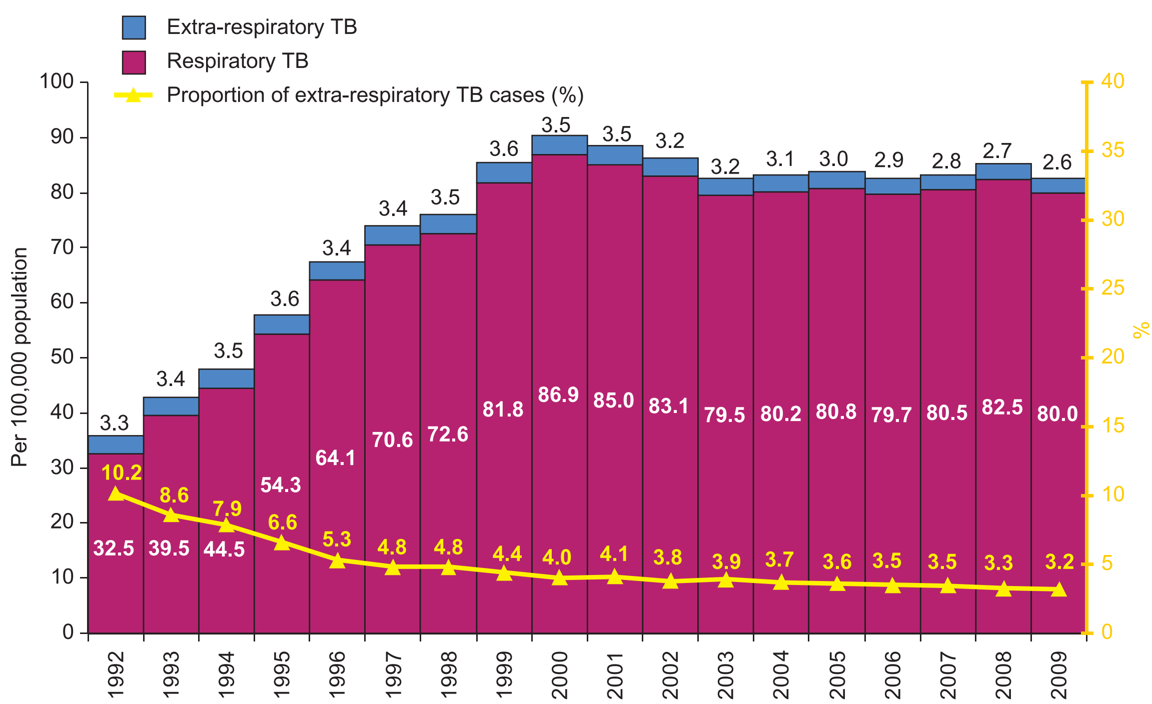


Fig. 6.1. Notification rates of respiratory TB, incidence and proportion of extra-respiratory TB cases in the Russian Federation, 1992–2009 (Sources: Form No. 8; population – Forms No. 1 and 4)

76 The Russian historical definition named as "extra-pulmonary TB" is used to indicate TB-induced specific lesions in organs and systems (bones, joints, genitourinary tract, CNS, etc.) excluding the lungs, upper respiratory tract, bronchi, pleura and intrathoracic lymph nodes. This definition does not exactly correspond to the specifically linguistic meaning of this term, including the meaning used in international practice. The definitions used in this analytical review have been brought closer to the internationally accepted terminology – note of translation editor.

77 Hereinafter, in the Russian version of the TB review the term "extra-pulmonary" (EPTB) is used in the meaning traditionally accepted in Russia (not internationally), if not indicated otherwise – note of translation editor.

The ERTB notification rate also depends on the current dispensary follow-up system. The RF system envisages the registration of a TB case by a single major localization, i.e. mostly by respiratory site. Therefore, even in generalized TB cases, which *a priori* presuppose an extra-pulmonary lesion, another (i.e. extrathoracic) localization of the TB process is not registered. The same reason accounts for non-registration of TB-induced multiple damages. It should be noted that among patients who receive treatment against ERTB the percentage of generalized TB cases in RF regions ranges from 28% to 70% [*A.Yu. Mushkin*, unpublished data].

According to the 2009 reports from the regions, the proportions of extra-respiratory TB (ERTB) cases among all new cases of the disease differs widely between RF territories (Fig. 6.2). The notification rates did not exceed 1% in Kamchatka, Khabarovsky Krai, Republic of Khakassia and Jewish AO, while they were above 6% in Chukotka AO, republics of North Ossetia, Tyva, Karachaevo-Cherkessia, Dagestan, and in Stavropol Krai and Voronezh Oblast.

Significant variations were also registered in the rates of respiratory TB of extra-pulmonary localization (REPTB) among all new cases of the disease (Fig. 6.2). In Sakhalin, Novosibirsk, Penza, Volgograd, Lipetsk oblasts, in the Republic of Chuvashia and Krasnodar Krai the rate was 2–3%, while in Kamchatka Krai, Magadan, Kaliningrad and Kurgan oblasts, in the republics of North Ossetia, Ingushetia and St.-Petersburg city it was over 10% (with the national average rate 6,2%).

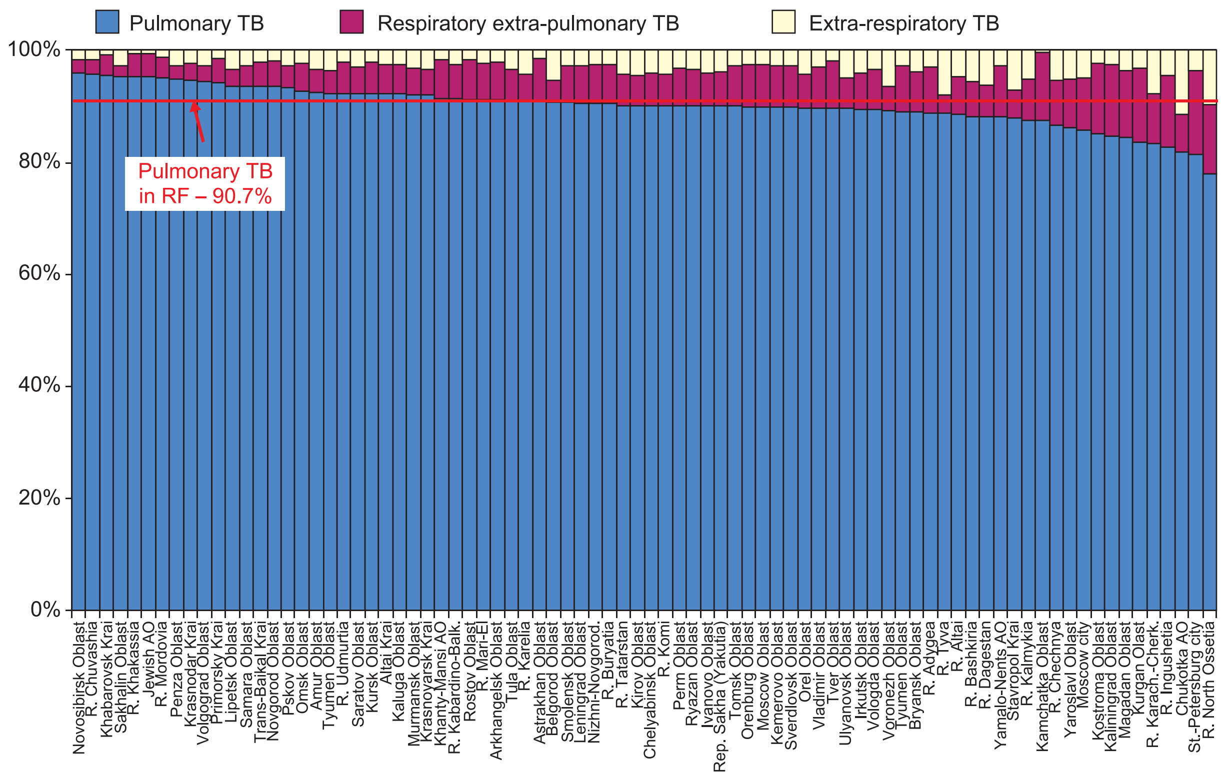
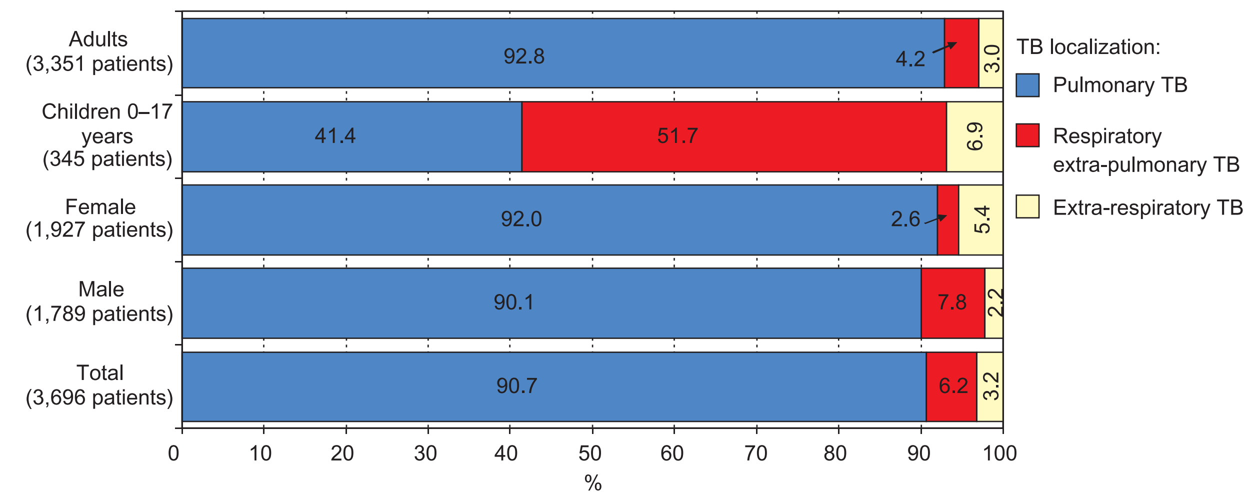


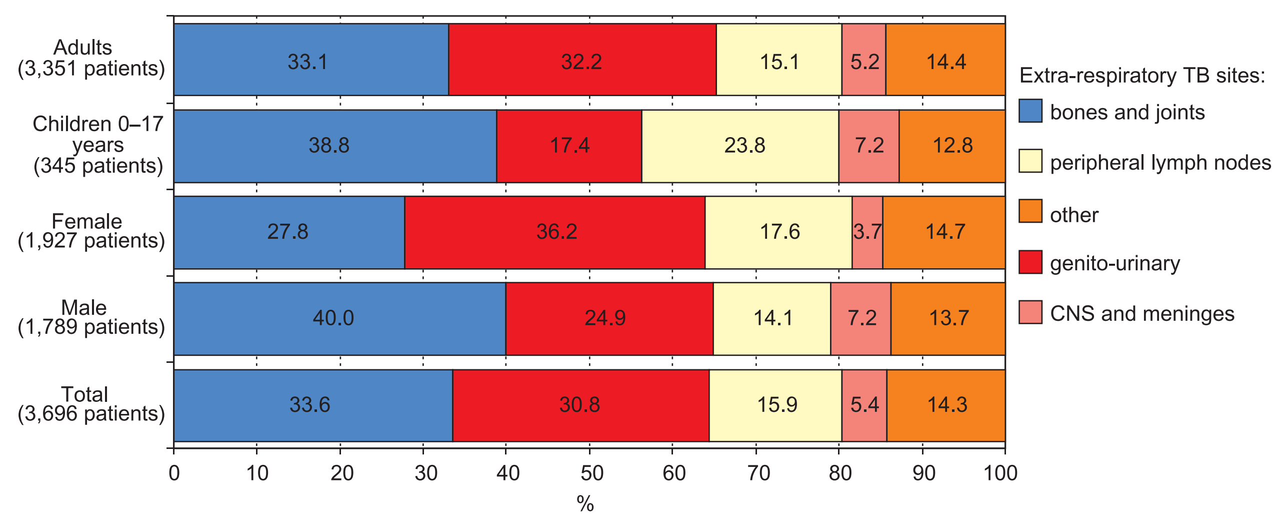
Fig. 6.2. Structure of TB sites among new patients registered in territories of the Russian Federation, 2009. Pulmonary TB, respiratory TB of extra-pulmonary sites and extra-respiratory TB (Source: Form No. 8)

TB localization also depends to a vast degree on patient age and gender. In children and adolescents (0–17 years of age), the proportion of extra-respiratory TB is registered in 6.9% of cases, while respiratory extra-pulmonary TB reaches 51.7% of cases (Fig. 6.3a). In men, respiratory extra-pulmonary TB is more frequent, while extra-respiratory TB the proper is more common in women.

The available statistical reports allow for estimating extra-respiratory TB notification rates by major sites (which is impossible with regard to respiratory extra-pulmonary TB cases). For many years, the major part of ERTB were cases with TB of bones and joints, genito-urinary organs, which of which account for about one third of all TB cases. In 2006–2008, the statistically reliable proportion of genitor-urinary TB cases was 4%–10% higher comparing with TB of bones and joints (i.e. 29.7% and 35.5%, respectively, $p < 0.05$). But in 2009, the number of new bone and joints TB cases became prevalent – 33.6% (so far statistically not significantly, $p > 0.05$) in comparison with other localizations of the disease with a high proportion of genitor-urinary TB (30.8%) and a lower percentage of TB of peripheral lymph nodes (15.9%), specific lesions of CNS and meningeal TB cases (5.4%), and other sites (Fig. 6.3B).



A) TB localizations in new TB patients



B) Extra-respiratory TB sites

Fig. 6.3. Clinical structure (sites) of new TB cases, Russian Federation, 2009 (Source: Forms No. 8)

The clinical structure of new ERTB cases in males and females is different. TB of bones and joints is more prevalent among men (40.0%), while genito-urinary TB is more common in women (36.2%). The age-related incidence rates are also different. In recent years, among children of 0–17 years of age, bone and joint TB has become more common (38.8% in 2009), while TB of peripheral lymph nodes was more prevalent prior to 2006. Anyhow, this data should be treated with a certain amount of precaution, since there are still contradictions in the differentiation of the foci forms of bone TB and BCG-induced bone affects and complications among younger children.

In recent years, some other indicators have also been continuously decreasing, which reflects the general situation of extra-respiratory TB in the country. The ERTB notification rates fell from 14.2 in 2004 to 10.8 in 2008 per 100,000 population and the proportion in the prevalence rate has been decreasing over the past 15 years to 5.7% in 2008.

Therefore, the official statistical data confirm that extra-respiratory TB incidence does not significantly influence the overall TB notification rate in the country. Unfortunately, the decrease in all the ERTB indicators (the absolute number of new ERTB cases, notification and prevalence ERTB rates – see Section 2.5.) cannot be explained solely by improved situation for TB in the Russian Federation. Apart from the factors indicated above (low qualification and knowledge of physicians in general health facilities and phthiatricians on issues related to extra-respiratory TB), which leads to poor case-finding and sometimes to ignoring the ERTB problem [9], and along with ineffective case registration resulting from the current TB registration system, two other factors are also noteworthy:

– many forms of extra-pulmonary TB have a tendency to a chronic undulating development; they are not considered in case registration practice and still manifest themselves in the prevalence rate indicator that is 4 times higher comparing with the ERTB notification rate;

– a specific and ever-growing problem is also posed by concomitant TB/HIV cases, in which ERTB reflects the late stages of HIV-infection development; such cases are not regarded as a separate disease case, but as an associated infection case with respective requirements for registration.

It appears necessary to introduce the concept of combined site TB cases into the TB recording and reporting forms. This would allow for a more accurate calculation of the level of extra-pulmonary TB spread in the country. Such a measure is important for defining the need for ERTB specialists in the regions and for conducting training courses on ERTB diagnostics for physicians of all fields of expertise. It should be noted that the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) uses a 3-digit coding (A15-A19) of major TB disease classes with an additional fourth sign that codes the bacteriological and/or histological verification.

According to the Russian clinical classification of tuberculosis, which is “a highly informative… system including all the major notions of the disease, … registration techniques, and statistical and clinical analysis” [30], the ICD-10 definitions were complemented with a more detailed coding [25]. Particularly, a seventh coding sign was added to designate “TB-induced concomitant lesions of human organs”. However, this coding is currently not used in the existing statistical reporting forms.

7. Monitoring of treatment effectiveness in the Russian Federation

Bogorodskaya E.M., Borisov S.E., Danilova I.D., Belilovsky E.M., Yablonsky P.K., Sterlikov S.A., Pashkevich D.D.,

7.1. General information on treatment effectiveness indicators

Treatment is one of the main components of TB control activities. Assessment of treatment effectiveness is a complicated multifactor task based on a system of indicators reflecting different stages of patient management, all of which can be divided into several groups [13, 25, 26, 35, 42]:

– indicators that reflect effectiveness of individual courses of chemotherapy;
– indicators reflecting the effectiveness of separate stages of treatment (in-patient, out-patient and sanatorium treatment);
– indicators that reflect the effectiveness of TB patient management as a whole, from the time of case-finding to the completion of the follow-up stage; these indicators may serve for the assessment of dispensary follow up work with TB patients[78];
– indicators of the effectiveness of health facility performance (effectiveness of the treatment provided in in-patient clinics and sanatoriums);
– aggregated indicators that reflect the work of the service as a whole in the organization and management of TB patient's treatment.

Chemotherapy is a major method of TB treatment providing cure of a substantial part of both new TB patients and TB relapses, which contributes to the prevention of TB infection spread in the population. To ensure adequate assessment of TB treatment effectiveness and for correct decision-making, it is particularly important to take into account basic prerequisites of effective patient management – the availability of adequately trained physicians, high-performance TB control services and facilities, and adequate anti-tuberculosis drug supplies of guaranteed quality. Anyhow, the analysis of all these factors influencing the effectiveness of TB patient treatment is beyond the scope of this section and it is partially described in Chapter 12. The factors reviewed in this section are confined to the monitoring and assessment of TB chemotherapy basing on the existing system of statistical registration and reporting data.

To assess the effectiveness of the organization and use of TB chemotherapy and to establish adequate management decisions, the indicators of effective monitoring of TB patient management should include the following information:

- **Coverage of TB patients by treatment.** One of the serious problems is the patient's initial denial to receive treatment, or impossibility to provide treatment due to different reasons. The proportion of patients who are not enrolled in treatment (especially new TB cases and relapses) is an important prognostic factor influencing on development of the situation for TB in the region.
- **Adequacy of chemotherapy (doses and regimens)**. Prescription and administration of the necessary quantity of drugs, their doses and duration of chemotherapy with due account of the patient group and the previous treatment history (new case, relapse, etc.) are the prerequisites for treatment success and for the prevention of treatment failure and subsequent development of drug resistance. The introduction (2003) of standardized treatment regimens [25] laid a solid basis to reduce errors in the administration of wrong treatment regimens and doses of anti-tuberculosis drugs.
- **Control over anti-TB drugs intake**. This component also needs to be evaluated, since treatment under direct observation of a medical worker guarantees patient compliance with the prescriptions made by physician.
- **Continuity of treatment.** Patient compliance with physician's prescriptions and patient's motivation for convalescence are the major factors influencing treatment outcome. Assessment of the level of defaults is the key component of TB treatment monitoring which needs the permanent control and evaluation. Following the prescribed course of treatment without interruption is critical in patient management.
- **Treatment succession.** As a rule, several types of facilities (in-patient and out-patient clinics, dispensaries, sanatoriums, TB cabinets, and others) are involved in planning, implementation and monitoring of treatment. In addition, general health care network facilities (such as medical out-patient posts, rooms and clinics, family doctors offices, district hospitals, etc) are also involved in the controlled distribution and administration of anti-TB drugs. Besides, TB patients may be transferred to TB control facilities in other territories or between different jurisdictional entities (e.g. transfer from a treatment facility in the civilian sector to one in the peni-

[78] Dispensary follow up work means regular medical check-up activities based on special recording follow up forms – notes of translator.

tentiary system, and vice versa). In such cases, it is very important to evaluate and monitor the actual treatment continuity and to use standardized treatment forms when changing health facilities.

- **Intermediate and final evaluation of treatment course outcomes**. The outcome of any particular treatment course should be defined and evaluated. The intermediate evaluation of treatment is also very important, especially in epidemically dangerous TB patients. This should be estimated, for example, by the indicator of bacteriological conversion at the end of the intensive phase of chemotherapy. This data is essential for the assessment of TB control facilities' performance, patient compliance and for the timely correction of chemotherapy courses for individual patients and at the facility level.

The treatment effectiveness monitoring system used by the Russian TB services have substantially changed since 2004. The RF MoH&SD executive orders No. 109 of 21.03.2003 and No. 50 of 13.02.2004 [25, 26] contributed to wider monitoring of the effectiveness of TB treatment and patient management.

Before 2004, four indicators of the effectiveness of TB treatment were considered in the Russian Federation [11, 28]:

1. bacteriological conversion confirmed by any method in new TB patients;
2. closure of cavernous lesions in new TB patients;
3. "clinical cure of TB patients"[79];
4. "cessation of bacterial excretion" or "transfer to abacillary status" or "abacillarity"[80].

The first two indicators reflected treatment effectiveness in new respiratory TB patients with bacillary excretion confirmed by different methods (microscopy and/or culture) and in TB patients with cavernous lesions in lung tissue. Only patients registered within a year prior to the reporting year were considered. These indicators were only partially used in accordance with the cohort principle (annual cohort), i.e. for calculation purposes, new TB patients transferred in from other territories were added to the cohort and some patients from the previous year (who died from causes other than TB, transferred out, etc.) were excluded from the cohort. Besides, as such, these indicators did not reflect the effectiveness of treatment for all TB patients, but only the elimination of one of the signs of the disease in part of patients.

These two indicators were targeted at the evaluation of treatment effectiveness (beforetreatment completion) for a new TB patient over 12–24 months of treatment, without taking into account the number of courses of chemotherapy provided over this period, i.e. bringing them closer to the indicators of dispensary (follow-up) activities. Finally, these indicators were confined to the evaluation of treatment effectiveness only for part of the whole cohort of new MbT+ cases and new cases with cavernous TB without evaluating the effectiveness of treatment in other groups of patients, which excluded from the evaluation from 50% to 60% of new TB cases and from 80% to 85% of all registered TB patients. The indicator of completed treatment effectiveness in all new TB cases was not evaluated.

Starting 2005, the data used for the calculation of indicators of bacteriological conversion and closure of cavernous lesions were removed from reporting form No. 33. Anyhow, starting 2009, the new version of reporting form No. 33 recommenced including this data for the evaluation of treatment effectiveness, which allowed for use of dispensary follow-up indicators for analysis.

The indicators referring to "clinical cure" and "abacillarity" were used before 2004 and are still being used now. They cumulatively reflect the dispensary follow up work effectiveness in the organization of patient treatment. The indicator of "clinical cure" refers to transferring a cured TB case from a dispensary follow-up group (DFG) of active TB (DFG I and II) to a group of patients followed-up as a risk-group (group III). The indicator of "abacillarity" shows the removal of a respiratory TB patient from the registry of MbT+ cases within a specified time after obtaining a number of negative laboratory test results. These indicators (which do not have analogs in other countries) are convenient for the demonstration of the overall effectiveness of dispensary treatment management in all groups of patients – new cases, relapses, re-treatment and severe chronic TB cases. They are also helpful in controlling the pool of MbT+ cases, indirectly evaluating the timeliness of TB detection, the results of the complex treatment of some patients with respiratory TB, and observing the flow of patients and their transfer to respective dispensary follow-up groups.

However, these indicators do not allow for the evaluation of treatment effectiveness in the basic and possible subsequent courses of treatment for all groups of patients, which (effectiveness of separate courses of TB treatment) should be targeted as a prerequisite for all dispensary follow up sucess [5].

Therefore, the registration and reporting system that was used prior to 2004 was able to provide data only on final outcomes of treatment in all patient groups and for two indicators of separate groups of patients[81]. It did not

79 "Clinical cure" defined by reregistered (transfered) TB patient from DFG of "active" TB cases to DFG of cured TB cases after specified time, see the following text. The indicator will be used in the text in quotes because it is conventional indirect indicator– note of translation editor.

80 "Cessation of bacterial excretion" defined by transfer of a TB patient from follow up register of bacteriological positive persons after specified time, see the following text The indicator will be used in the text in quotes because it is conventional indirect indicator – note of translation editor.

81 Preliminary results of treatment of MbT+ patients could be partially assessed basing on Form No. 33 that was used in 1999–2003 and contained information on the number of patients who converted after 4 months of chemotherapy (identified with microscopy method). However, the use of these data without application of cohort analysis substantially reduced their value.

show the effectiveness of the main (basic) treatment courses and individual chemotherapy courses. Besides, it did not allow for assessing such parameters as treatment coverage, adequacy, control, succession and continuity.

Noteworthy is that before 2004, the international indicators of treatment outcomes were also used in the Russian Federation. They were introduced only in some regional pilot projects. This made it difficult and at times impossible to compare the effectiveness of treatment management in the Russian Federation with the results achieved in other countries. Moreover, it hampered the use in the Russian Federation of advanced expertise in the field from abroad.

The statistical data reviewed in the previous sections of this review on TB mortality and prevalence in the Russian Federation in the 1990s indirectly show that treatment effectiveness was low; there was a high level of TB mortality, a substantial accumulation of MbT+ cases, patients with severe forms of TB and an increase in MDR TB cases.

Therefore, to stabilize the epidemiological situation of TB in the country, MoH Executive Orders No. 109] and No. 50 [25, 26] were issued to form a basis for new approaches to TB detection and treatment outcomes evaluation. The new approaches included approved standardized treatment regimens, new recording and reporting forms for TB case-finding based on cohort analysis and for the evaluation of effectiveness of separate courses of treatment. As a result, starting 2005, the possibility arose to improve efficacy of treatment monitoring including control of effectiveness of separate chemotherapy courses and to assess the causes of insufficient treatment effectiveness [5] (see Appendix 1).

The system of treatment monitoring and branch statistical reporting, implemented in accordance with the recent MoH executive orders [25, 26], complies with the WHO basic recommendations and supplements the national recommendations developed in Russia based on the long-term experience and existing capacities of the TB services in the Russian Federation. The system of treatment monitoring currently applied in Russia, as compared to the basic WHO recommendations, includes also the assessment of treatment effectiveness based on culture examination methods and clinical-radiological evidence. It performs a separate evaluation of cases died of TB and other causes of death and reviews cohorts of MbT– relapses established at the time of patient registration.

7.2. Evaluation of treatment effectiveness on the basis of dispensary follow-up indicators

Treatment effectiveness of new TB cases, as defined by the criteria of closure of cavernous lesions and bacteriological conversion [20], declined from 1992 to 2004 by 1.2 times. Closure of cavernous lesions was reported in 76.6% of TB cases in 1992 and in 63% of TB cases in 2004. Bacteriological conversion was reported in 86.8% of TB cases in 1992 and in 73.5% in 2004 (Figure 7.1).

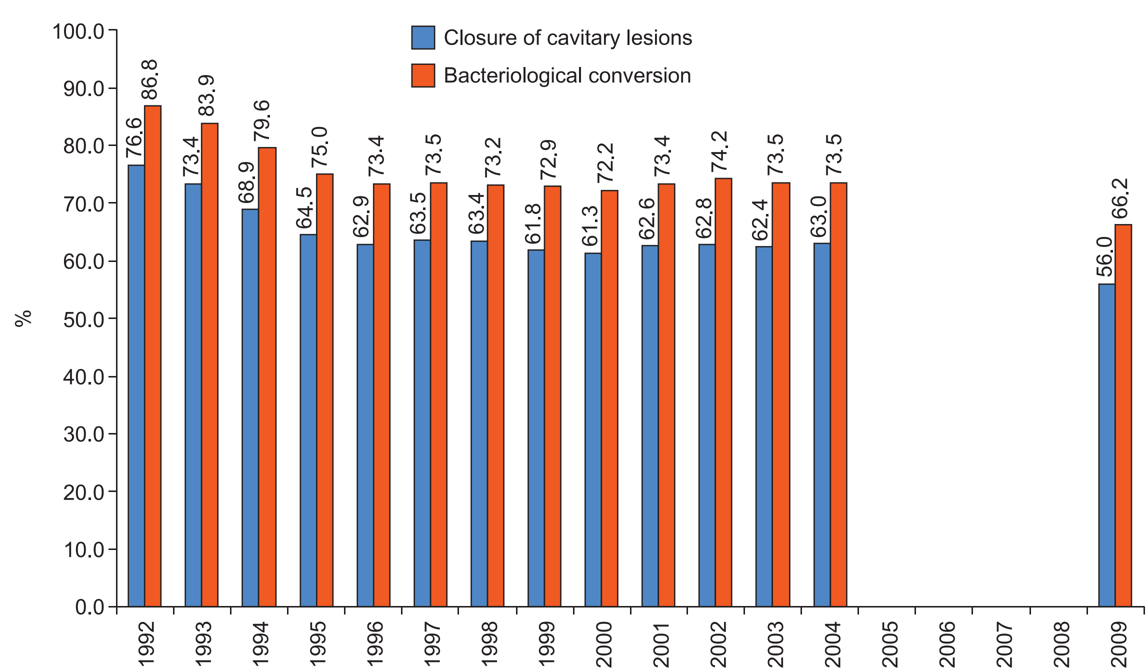


Fig. 7.1. Effectiveness of treatment of new respiratory TB patients, 1992–2009.
Data for 2005–2008 were not available in the reporting forms (Source: Form No. 33)

In 2005–2008, following the introduction of a new version of Form No. 33, it became impossible to assess the indicators of bacteriological conversion and closure of cavernous lesions in new TB cases due to the lack of corresponding data. Anyhow, the collection of the data was resumed in 2009. The rate of bacteriological conversion was 66.2% and the rate of cavity closure was 56% in 2009, which was much lower compared with respective indicators in 2004. This was primarily due to the changes in the calculation method pertaining to these indicators. Before 2004, the cohort of TB cases detected in the previous year did not include cases with fatal outcomes from other causes of death and transferred-out patients with adding TB patients coming from other territories. Starting 2009, the denominator included the entire annual cohort, which allowed for the real cohort analysis of treatment effectiveness.

Any comparison of "clinical cure" and "abacillarity" basing on data before and after 2004 would be incorrect because of the revision of the DFG system in 2004 (see Fig. 7.2). Before 2004, the "abacillarity" rate indicator practically did not change, and the clinical cure rate of respiratory TB patients after some decrease in the beginning of the 1990s was increasing slowly after 1998. After 2004 (when the revision of the dispensary follow-up groups took place with deleting the old version of DFG II of 'abating TB cases' and shortening the period of epidemiological follow-up of bacillary excretion – see Chapter 4), these indicators automatically increased[82] becoming more precise to reflect effectiveness of management of bacteriologically positive TB patients and those with lung cavities.

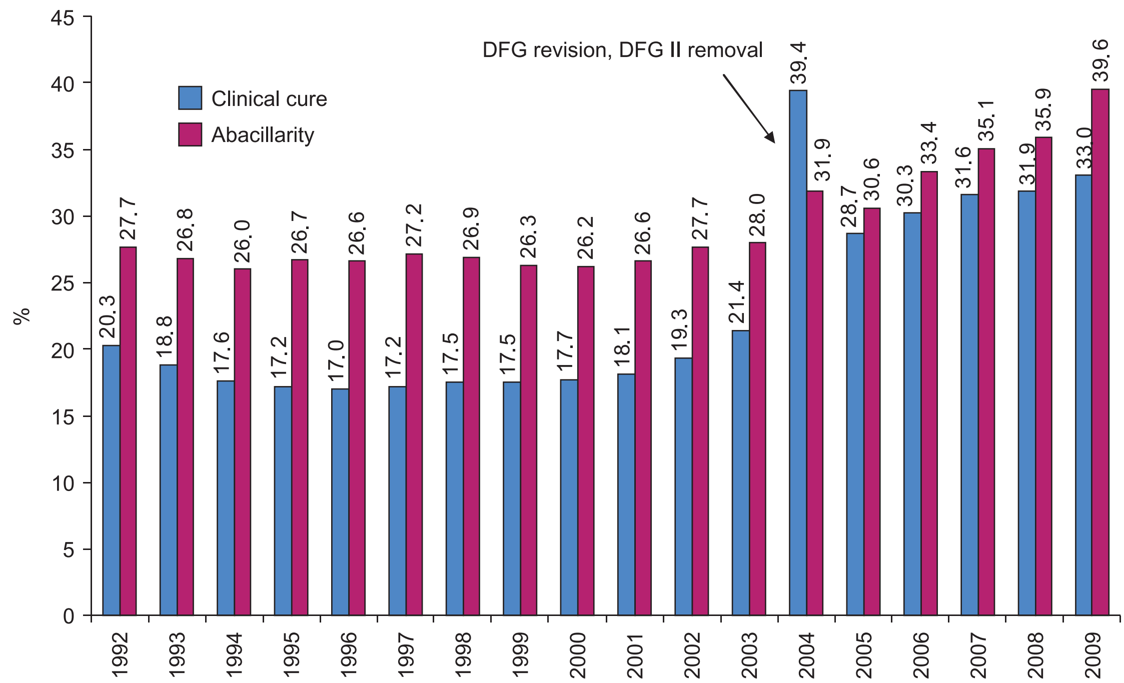


Fig. 7.2. "Clinical cure" and "abacillarity" in respiratory TB patients in the Russian Federation, 1992–2009 (Form No. 33)

It should be noted that both indicators were steadily increasing after 2005 with a particularly speedy growth in the "abacillarity" rate. In 2009, this indicator reached 39.6% of all registered RTB patients, which was 30% higher compared with 2005 and 10% higher compared with 2008 ($p < 0.001$). In 2009, 33.5% of RTB patients were transferred to DFG III ("clinically cured" TB patients), which was statistically significantly higher the "clinical cure" indicator in 2008 (32.2%). In 2006–2008, in new TB patients included in DFG IA, this indicator was 46–47% after growth in 2004–2005 partially due to the DFG revision. Starting 2009, according to the revised Form No. 33 it became possible to calculate only the aggregate indicator of "clinical cure" for new and relapse TB cases, i.e. for patients included in DFG IA and IB (46.3% in 2009).

It should also be noted that the clinical cure indicator reflects both the fact of patient cure and the timeliness of patient transfer to DFG III [4]; therefore, its value is underestimated in terms of treatment effectiveness indicator in regions with inadequate follow-up management.

[82] Starting 2005, the denominator of clinical cure indicator decreased by approximately 1/3 following the deletion of DFG II; the number of chronic MbT+ TB patients (in the conversion rate denominator) due to a shorter period of follow-up of such cases is declining more gradually in recent years.

7.3. Evaluation of surgical treatment effectiveness

The data on surgical TB treatment presented in the existing federal reporting forms allow only for the calculation of the coverage of patients receiving this type of treatment. Indicators that could directly show the effectiveness of surgical treatment of TB patients are not included in the MoH&SD forms.

In 2001–2009, the proportion of RTB patients who received surgical treatment (see Fig. 7.3) statistically significantly increased from 2.6% to 5.3% (13 160 surgical TB cases in 2009). After a slight increase in the proportion of patients with fibro-cavernous TB (FCTB) treated surgically in 2004–2006 from 4.2% to 4.7%, in 2007–2008 the number of such patients increased statistically insignificantly (4.7–4.8%, $p > 0.05$). 1,461 FCTB patients received surgical treatment in 2009 (4.7%). In 2009, the proportion of patients surgically treated remained relatively high among patients with TB of bones and joints (17.7%, 802 patients), urinogenital TB (7.3%, 438 patients), and TB of peripheral lymph nodes (38.5%, 542 patients).

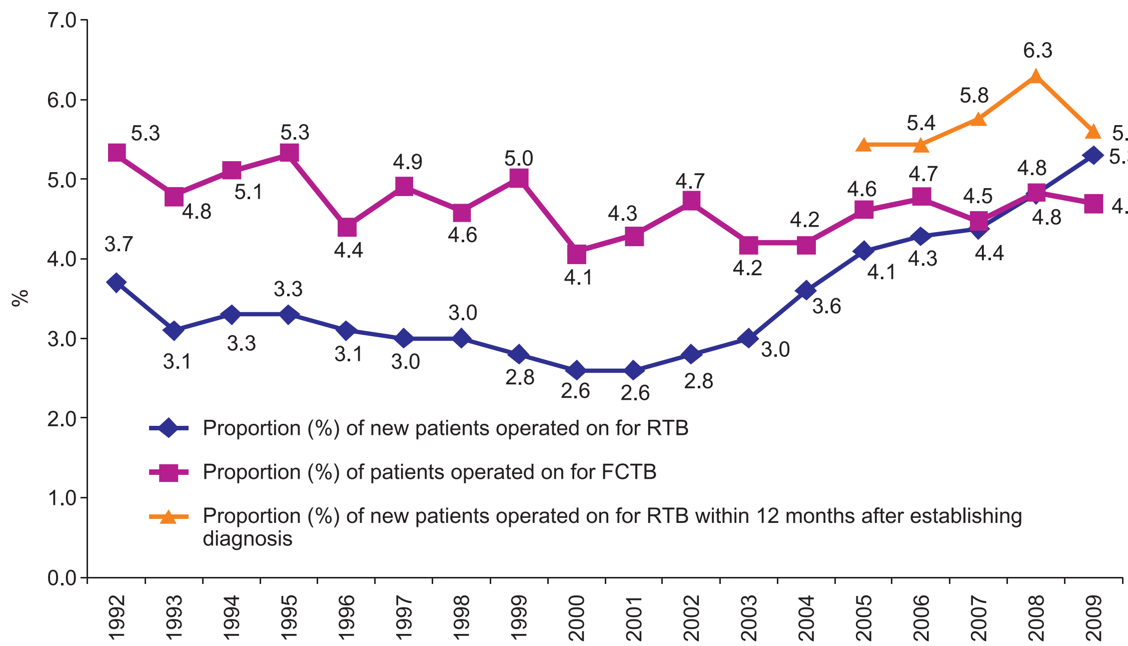


Fig. 7.3. Proportions of respiratory TB cases (RTB), fibro-cavernous TB (FCTB) and new respiratory TB cases receiving surgical treatment with 12 months after establishing diagnosis, the Russian Federation, 1992–2009 (Source: Form No. 33, see note 22 at page bottom)

Beginning 2006, the reporting forms allow for the calculation of the percentage of RTB patients who had surgical treatment within one year after diagnosis (6.3% in 2008). In 2009, 5.6% of new RTB patients received surgery (5,097 cases)[83].

The involvement of surgical interventions is uneven in different regions of the Russian Federation (Fig. 7.4). On the whole, surgical treatment of TB patients is more actively used in Central, Privolzhsky and Far-East Federal Regions (6.0%, 6.3% and 6.4% of patients, respectively). New TB patients are more often operated on in Central, Povolzhsky and Far-East Federal Regions (6.6%, 7.3% and 8.0% of patients respectively). Over 10% of new TB patients received surgical treatment in the republics of Mordovia (32.7%) and Sakha (Yakutia), in Kostroma, Penza, Tambov, Voronezh, Lipetsk, Kursk, Kirov, Sakhalin oblasts and in Trans-Baikal Krai. The highest rates of surgical interventions (over 10%[84]) in all RTB patients were registered in Magadan, Tambov, Penza, Kostroma oblasts, and in the republics of Mordovia and Sakha (Yakutia).

Low rates of surgical interventions in some territories (less than 2% of all RTB cases in 14 subjects of the Russian Federation) are connected with lack of medical personnel and poor material and technical basis of TB control facilities.

[83] The definition of this section in the reporting form was changed in 2008, which could influence the indicator value. Prior to 2009, Form No. 33 included data on "operated on new patients <with respiratory TB> not later than 12 months after the diagnosis was made", while starting 2009 a new definition was used referring to "the use of surgical treatment in new respiratory TB patients with <TB diagnosis established for the first time in patient's life". Therefore, the currently used registration form does not specify the period after diagnosis within which surgical treatment should be performed in this patient group, by limiting this definition to "new cases detected during the reporting year". This may lead to underestimation of this indicator.

[84] The 2009 data from Kostroma oblast according to which over 46% (!) of RTB patients received surgery (7.9% in 2008) erroneously included patients with endobronchial methods of treatment.

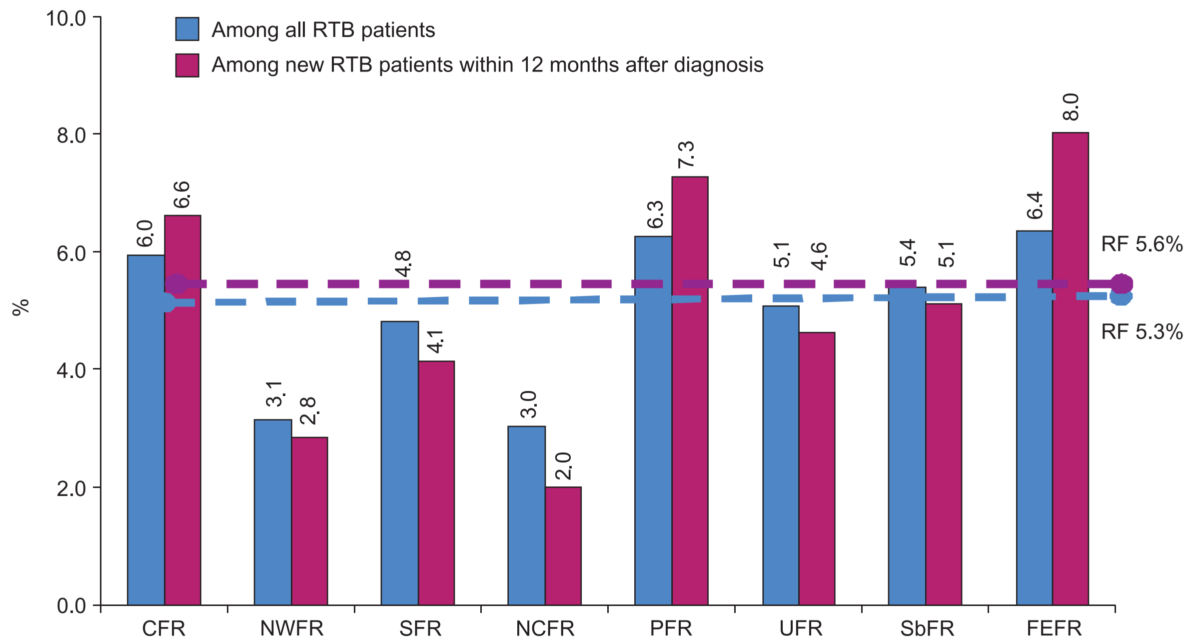


Fig. 7.4. Proportion of respiratory TB cases (RTB) and new respiratory TB cases receiving surgical treatment by Federal Regions of the Russian Federation, 2009 (Source: Form No. 33)

It is advisable to develop and implement at the regional level indicators for sentinel monitoring in some selected territories of surgical treatment effectiveness, which should include the following basic evaluations:

- assessment of the portion of TB patients who need surgical treatment;
- coverage of TB patients who need surgical treatment;
- review and analysis of the reasons for inadequate coverage of TB patients who need surgical treatment;
- post-operative mortality rate;
- rates of post-operative complications;
- effectiveness of surgical interventions as measured by indicators of bacteriological conversion and closure of cavernous lesions;
- descriptive indicators by types of surgical interventions performed.

It would be appropriate to process these data applying the cohort principle (with annual cohorts) and separately for different patient groups (new cases, relapses, MDR-TB, etc.)

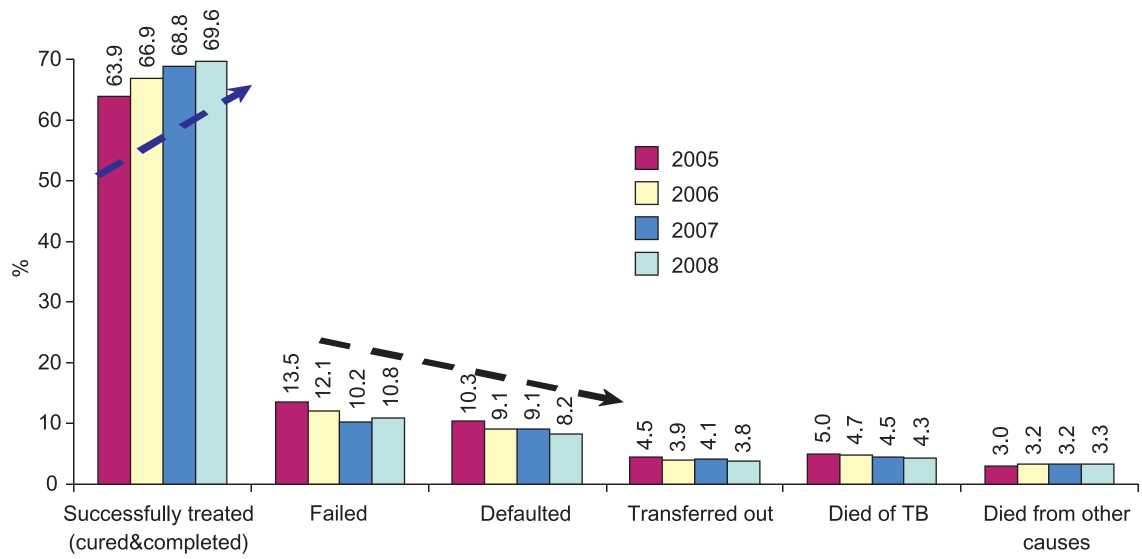
The analysis of such information from a representative part of RF regions will substantially increase the effectiveness of monitoring and evaluation of surgical methods of TB treatment in the Russia and will facilitate managerial decision-making to enhance the effectiveness of surgical treatment of TB patients.

7.4. Evaluation of chemotherapy effectiveness for patient cohorts registered in 2005–2008

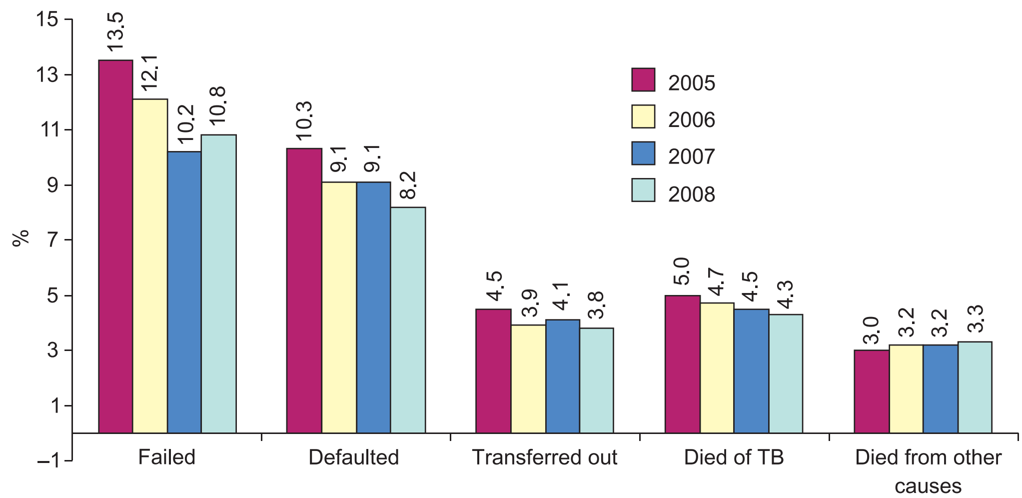
In 2005–2008, a new methodology and statistical system of treatment monitoring based on cohort analysis was introduced throughout the country [26]. Overall, these changes are fully consistent with the system of centralized control of treatment of TB patients that was earlier developed in the Russian Federation [25].

The implementation of the new system of treatment monitoring in the country was provided under control of the research institutes of phthisiopulmonology and tuberculosis (Research Institute of Phthisiopulmonology of I.M. Sechenov First Moscow State Medical University, Novosibirsk TB Research Institute, St. Petersburg Research Institute of Phthisiopulmonology, Central TB Research Institute, Russian Academy of Medical Sciences, and the Urals Research Institute of Phthisiopulmonology). The WHO TB Control Program in the RF provided consultative and technical support to the implementation of the new system.

According to data [21] referring to the 2008 cohort in TB control facilities (MoH&SD report), the main chemotherapy course for **all new PTB cases** (regardless of MbT status) was recognized effective in 69.9% of cases (see Figure 7.5). This indicator has statistically significantly increased from the 63.9% level ($p < 0.05$) registered for the 2005 cohort. The higher rate of successful chemotherapy outcomes was attained both through a smaller proportion of treatment failures and decreased default and death rates among people with TB (Fig. 7.5). For ex-



A) All treatment courses outcomes



B) Trends in unsuccessful treatment outcomes

Fig. 7.5. Chemotherapy outcomes in the cohorts of new pulmonary TB patients registered in 2005–2008. The sizes of cohorts in 2004–2008 were 17,880, 74,078, 85,322, 88,011 and 91,805 patients, respectively. The arrows indicate trends in the main changes of treatment outcomes (Source: RF MoH&SD Form No. 8-TB)

ample, in the 2008 cohort treatment was ineffective in 10.8% of new TB cases (13.5% in 2005). The proportion of new TB patients who died of PTB was 4.3% in comparison with 5% in 2005, and TB was shown as the cause of death in 55.8% of the fatal cases. Also, in the 2008 cohort there were 8.2% of defaults (compared with 10.3% in 2005), and 3.8% patients transferred out with whereabouts unknown (compared with 4.5% in 2005). Over 1/3 of patients (35.5%) from those two groups were smear-positive by the time of registration. Compared with 2005, statistically significant decreased rates were reported for all unfavorable (unsuccessful) treatment outcomes.

Successful treatment rate above 80% was registered in 11 subjects of the Russian Federation (St. Petersburg city, Orel, Astrakhan, Belgorod, Lipetsk, Kirov, Tomsk, Samara oblasts, Stavropol Krai, and in the republics of Dagestan and Mordovia), and from 70% to 80% – in 32 of 82 subjects of the Russian Federation. Successful treatment rate below 50% (46%–48%) was reported in 3 territories only (Murmansk Oblast, Republic of Tyva and Kamchatka Krai).

Effectiveness of treatment of **TB relapses** (including both Mbt+ and MbT– TB cases) also decreased in 2007–2008 compared with 2006 (55.9%, 54.3%, and 52.9% of successfully treated patients in 2006, 2007 and 2008, respectively, $p < 0.05$ for 2007 and 2008). A similar trend was observed in cohorts of ‘other re-treatment MbT+ patients’ (25.4%, 29.7%, 31.0% and 33.6% in 2005, 2006, 2007 and 2008, respectively, $p < 0.05$ for 2007–2008).

In the **new ss+ pulmonary cohort of 2008,** the main course of treatment, defined in the MoH&SD report based on all clinical, laboratory and radiological features, was effective in 57.6% of cases (57.8% in 2007, Table 7.2 and Fig. 7.6).

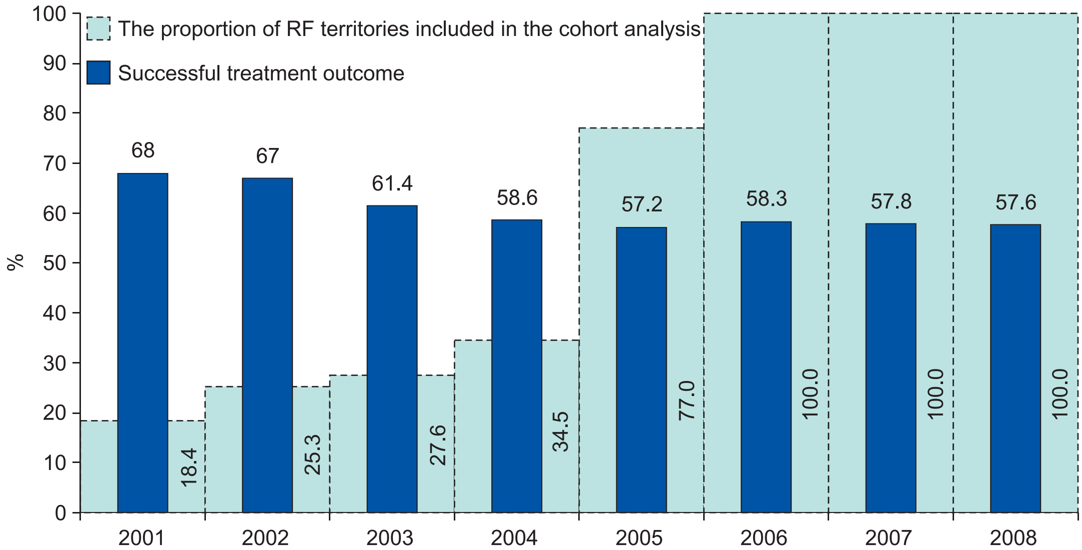


Fig. 7.6. Successful treatment outcome in the subjects of the Russian Federation that used cohort analysis of treatment effectiveness. 2001–2008 cohorts of new ss+ pulmonary TB cases. The green columns indicate territories implementing cohort analysis (source: Form No. 8-TB)

It should be noted that treatment effectiveness of patients in this cohort of ss+ pulmonary TB cases, is considered in world practice to be the most important indicator of effective treatment. This is because the cessation of bacillary excretion in this group of TB patients substantially contributes to curbing the disease spread. According to the WHO recommendation, an 85% successful treatment rate is the main target for national TB control programmes (see Section 7.5).

Overall, in the past eight years, first there was a rather fast decline followed by a slower decrease in the successful treatment rate, as an effective treatment indicator, which in recent years has stabilized at 57%–58%. Anyhow, it also should be noted that prior to 2006 the deterioration of effective treatment rates in new M+ PTB cohorts was caused by the inclusion of additional RF territories in the implementation of MoH Executive Order No. 50 [26]. These territories did not have enough experience in patient treatment with standard regimens and in cohort analysis as opposed to the pilot project territories that had been implementing the methodology since 2005 (Fig. 7.6).

According to the MoH&SD report, treatment failures in the cohort of new M+ pulmonary TB patients were registered in 17.3% (15.5% in 2007) of cases and confirmed with laboratory methods in 14.6% of patients, including 6.3% of MDR patients. Only 2.7% of treatment failures were confirmed by clinical and X-ray examinations. Treatment was interrupted in 8.9% (10.0% in 2007) of cases, 8.3% (8.8%) of patients died of TB and 4.2% of patients died from other causes of death.

Overall in the Russian Federation, according to the summarized report of MoH&SD and FSIN, successful treatment rate in the 2008 cohort of ss+ TB patients was low (57.4%) – see Table 7.1. In the civilian sector this was due to the high proportion of chemotherapy failures (17.3%), defaults (8.3%) and high death rates among TB patients (8.9%). Chemotherapy courses failed in 17.3% of new M+ pulmonary TB patients, including 6.3% MDR-TB diagnosed cases in the cohort. Therefore, MDR contributed 32.7% of registered chemotherapy failures.

Table 7.1

Treatment effectiveness in the cohort of new ss+ PTB cases registered in 2008

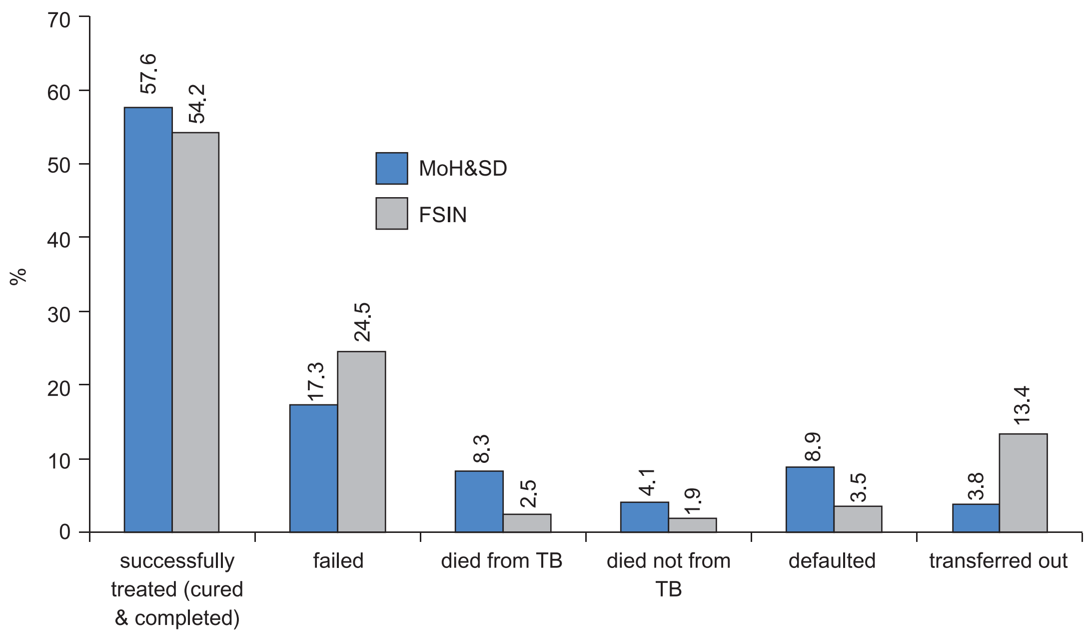
Sector	Cohort size (n)	Successfully treated (%)	Failed (%)	Died of TB (%)	Died from not TB (%)	Defaulted (%)	Transferred out (%)
MoH&SD	30,104	57.6	17.3	8.3	4.2	8.9	3.8
FSIN (penitentiary system)*	2,280	54.2	24.5	2.5	1.9	3.5	13.4
The Russian Federation overall	32,384	57.4	17.8	7.9	4.0	8.5	4.4

*Data from 47 subjects of the Russian Federation.

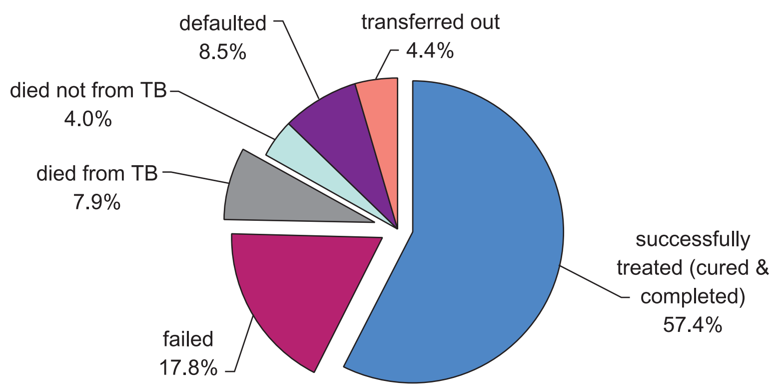
The low treatment effectiveness indicator in the penitentiary sector was mainly caused by a high proportion of transferred-out TB patients (13.4%) and treatment failures (24.5%). It should be noted that the treatment effectiveness indicator in the penitentiary sector does not influence significantly the treatment indicatory value across the country due to a relatively small proportion of TB patients registered in the FSIN system[85].

[85] FSIN data from only 47 subjects of the Russian Federation had been received in FPHI by the time this review was prepared.

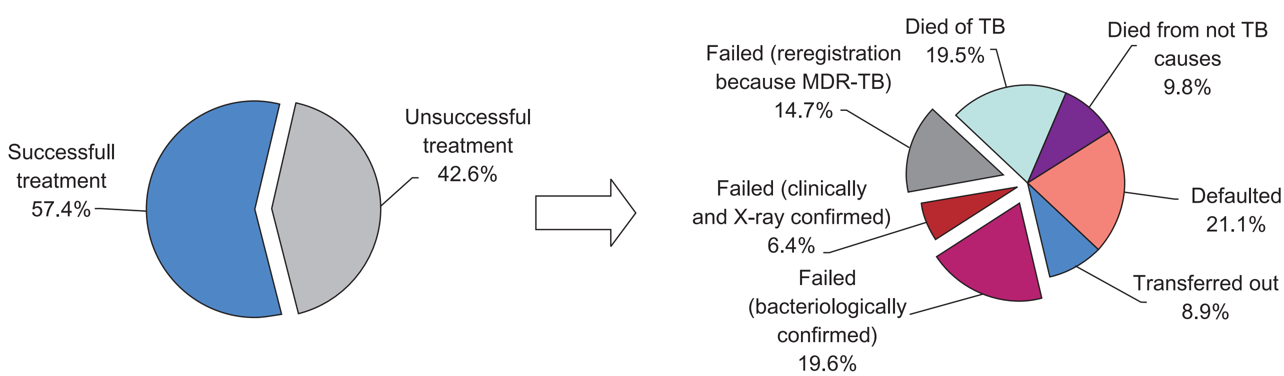
Noteworthy that according to the MoH&SD report, the unsuccessful treatment outcomes caused by clinical and organizational factors (which was 43% among all outcomes) included slightly above 40% of treatment failure cases (Fig. 7.7B), while 30% of unsuccessful outcomes were merely connected with default (treatment interruptions), patient transfer-out, and almost 20% – with patient death. Fatal outcomes are currently mostly caused by late case-finding and/or delay of start of treatment. Therefore, along with the necessity to provide effective chemotherapy by using adequate treatment regimens, it is no less important to reinforce the organizational measures targeted at improved patient compliance, timely case-finding and chemotherapy coverage.



A) Treatment outcomes (MoH&SD and FSIN reports)



B) In the Russian Federation



C) Distribution of unsuccessful treatment outcomes (MoH&SD report)

Fig. 7.7. Chemotherapy treatment outcomes in new pulmonary ss+ TB cases, 2008 cohort. MoH&SD report – 30,104 patients, FSIN – 1.918 patients (Source: Form No. 8-TB)

The current chemotherapy effectiveness indicators are uneven both in the federal regions (okrugs) and in the subjects of the Russian Federation (Fig. 7.8 and 7.9).

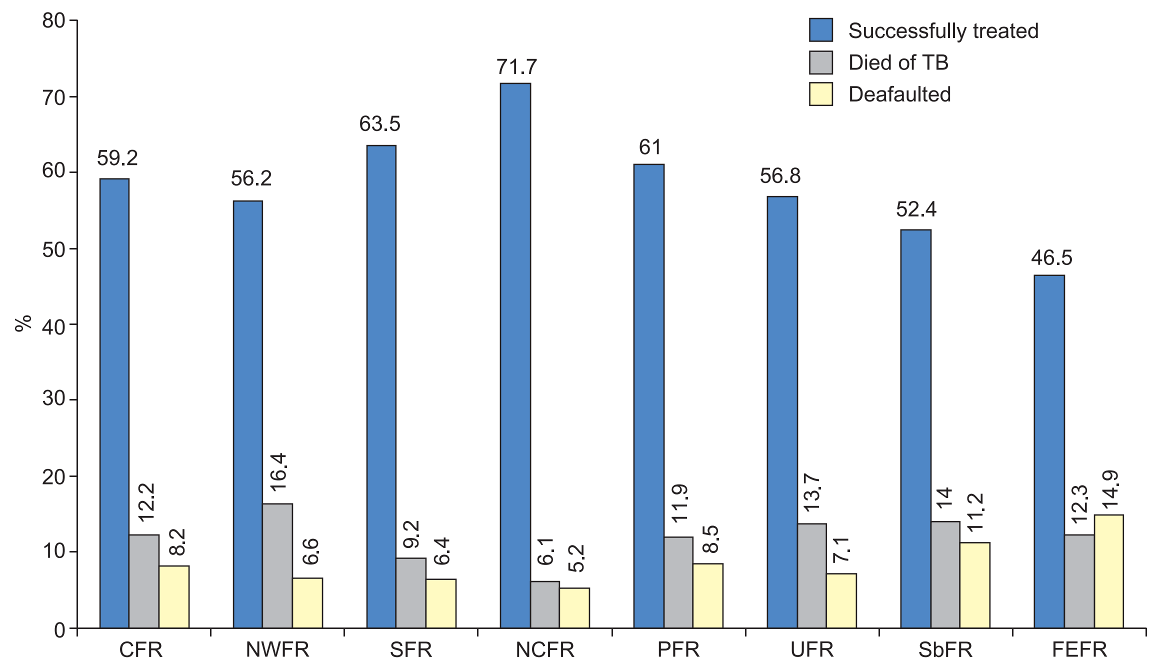


Fig. 7.8. Treatment effectiveness by federal region, 2008 cohort of new ss+ pulmonary TB patients. MoH&SD report – 30,104 patients (Source: Form No. 8-TB)

According to the MoH&SD report [21], the uppermost levels of successful chemotherapy rates were registered in NCFR (71.1%), SFR (63.5%) and PFR (61%). The lowest indicators were registered in SFR and FEFR (52.4% and 46.5%, respectively). The highest proportions of patients with failed treatment outcomes were registered in FEFR (23.9%), SFR (18.5%) and NWFR (18.7%). In North-West Russia, treatment failure outcomes were mainly caused by high levels of MDR-TB (65% of failures because of re-registration of MDR-TB cases as treatment failures). In the Far East and Siberia, treatment effectiveness deteriorated mainly because of treatment interruptions (14.9% and 11.2%, respectively).

Fig. 7.9 presents data by subject of the Russian Federation, indicating highest and lowest rates of successful treatment, failures, defaulters and TB deaths in the cohort of new M+ pulmonary TB patients[86].

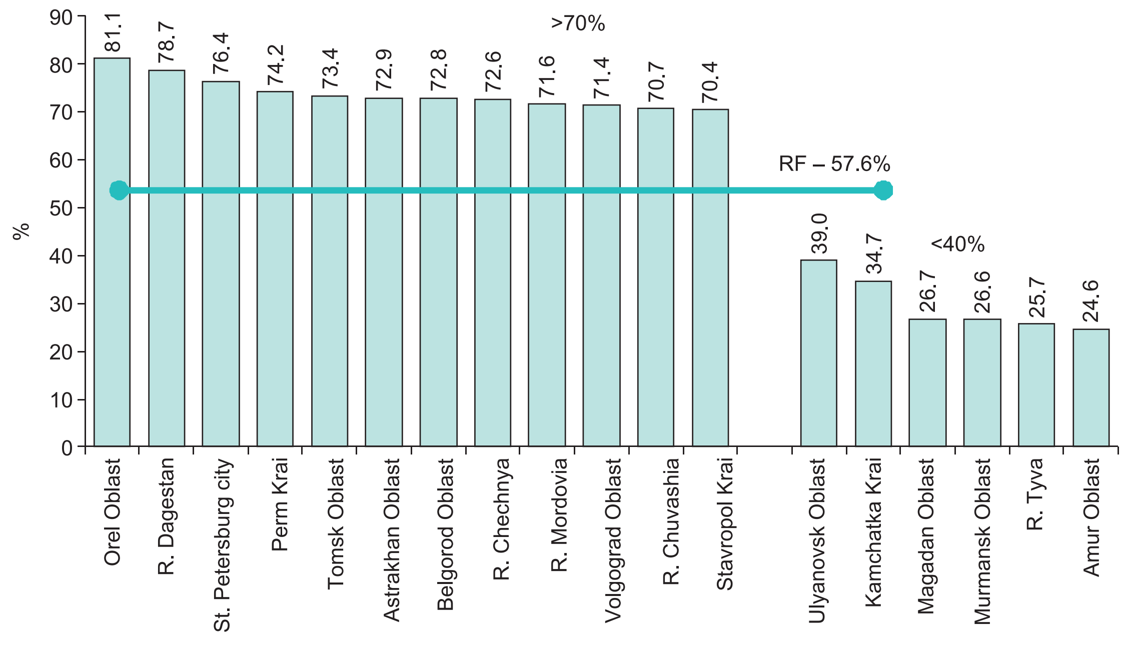
As seen from the data presented in the graphs, successful treatment rate exceeded 80% in only one territory (Orel Oblast, 81.1%), which was close to the international target indicators. In 2006, there were four such territories, in 2007 – one (also Orel Oblast).

In 15 subjects of the Russian Federation, the proportions of patients with chemotherapy failures were over 25% of cases included in the cohorts, in almost 1/3 of which the failure were attributed to MDR-TB detection (Fig. 7.9B).

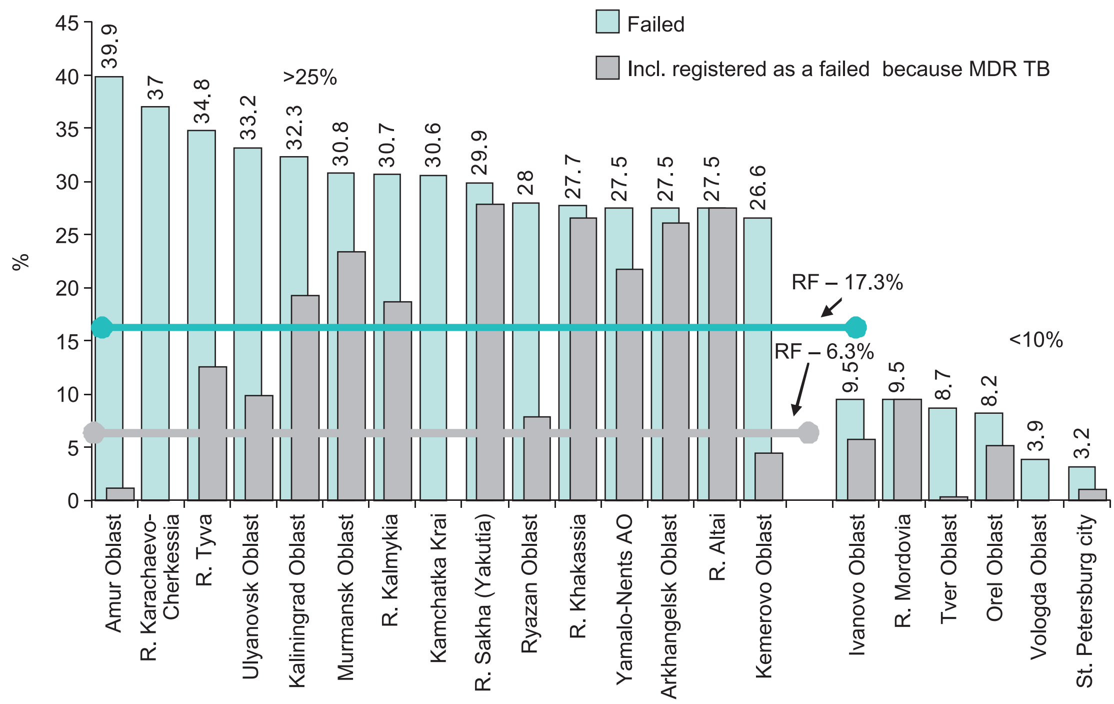
In 5 subjects of the Russian Federation, the proportions of defaulted new M+ pulmonary TB cases were over 20% of all patients enrolled for treatment (Bryansk Oblast – 20.9%, Murmansk Oblast – 21.3%, Amur Oblast – 21.0%, Magadan Oblast – 20.0%, and the Republic of Tyva – 23.4%). In 2007, there were 6 such territories, 2006 – 11. In the 2008 cohort, the proportions of patients with defaults were less than 5% in 26 federal territories (compared with 17 in 2007 and 14 in 2006).

In 11 subjects of the Russian Federation, at least one of 8 patients and in some territories even one of 6 patients died in the cohort of new M+ pulmonary TB patients compared with 13 territories in 2007 (Fig. 7.9D). The uppermost indicators of death from TB were registered in Leningrad Oblast (18.8%), Vologda Oblast (14.9%), Pskov Oblast (14.5%), republics of Altai (17.6%) and Karelia (15.5%), and in Altai Krai (14.5%). In the 2008 cohort, in only 13 federal territories the percentage of deaths was below 5%. Overall, in the Russian Federation the total number of deaths from other reasons (not TB) is approximately one third of deaths in the cohort. On the other hand, in some regions the proportion of patients who died from other reasons exceeds deaths of TB. This ratio may reflect both high quality treatment (in territories with high rates of effectively treated patients) and incorrect defining causes of death (e.i. in territories with low treatment effectiveness).

86 This analysis includes only territories with annual cohorts exceeding 50 cases.



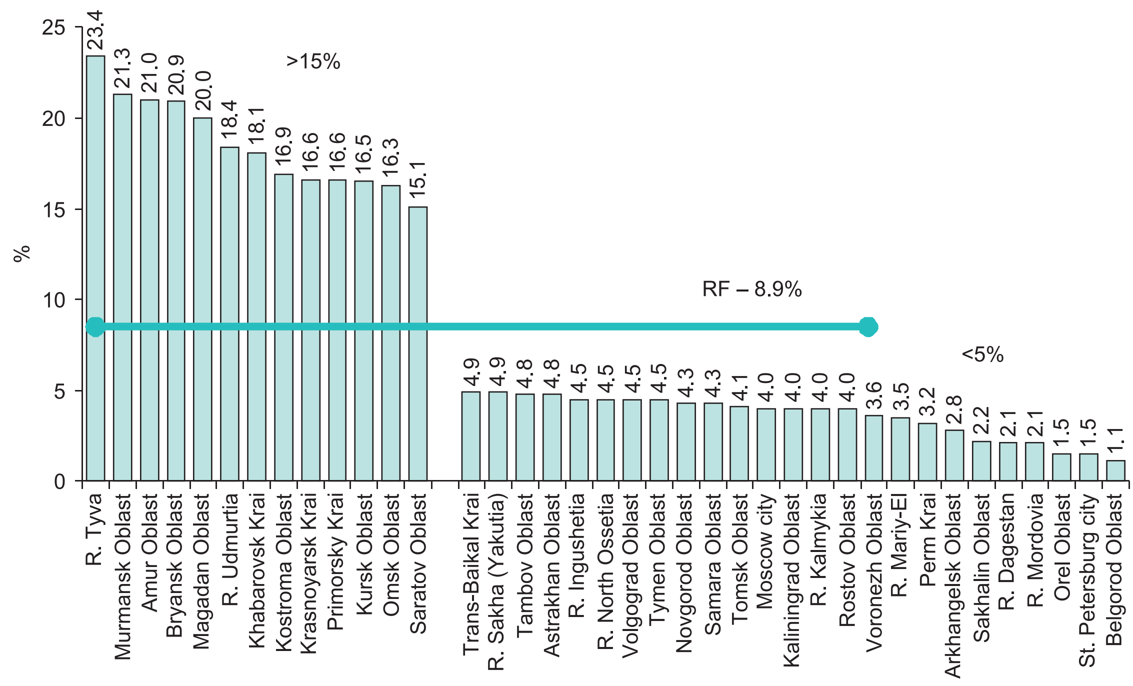
A) Subjects of the Russian Federation with successful treatment rate over 70% and below 40%



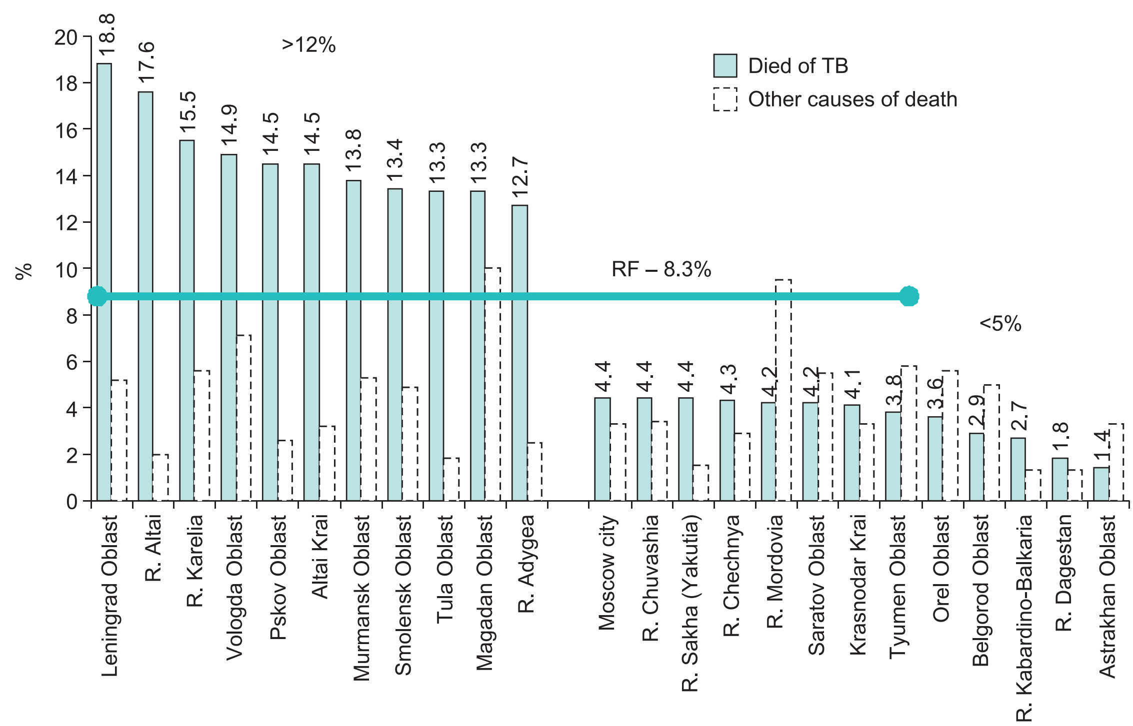
B) Subjects of the Russian Federation with failure rates above 25% and below 10%;
the grey columns show proportions of treatment failures defined by MDR-TB detection

Fig. 7.9*. Subjects of the Russian Federation with highest and lowest indicators of chemotherapy effectiveness in the 2008 cohort of new ss+ pulmonary TB patients. Territories with annual cohorts exceeding 50 cases (Source: MoH&SD report, Form No. 8-TB)

* Continued on next page.



C) Subjects of the Russian Federation with default rates over 15% and less than 5%



D) Subjects of the Russian Federation with TB death rate over 12% and less than 5%, and default rate over 15% and less than 5%. Columns with dotted lines indicate other causes of death

Fig. 7.9. Subjects of the Russian Federation with highest and lowest indicators of chemotherapy effectiveness in the 2008 cohort of new ss+ pulmonary TB patients. Territories with annual cohorts exceeding 50 cases (Source: MoH&SD report, Form No. 8-TB)

According to the MoH&SD report, bacillary excretion cessation (cure rate) was obtained in 60% of **new cu+ pulmonary TB patients** (2007 – 60.3%), and in federal regions from 52.9% in FEFR to 65.1% in NCFR.

Successful treatment rates **in re-treatment TB cases** is much lower than that among new TB patients (Fig. 7.2). It was 53.3% in relapse TB cases, and 43.0% for ss+ TB relapses. Successful outcomes were received in 32.9% of re-treatment ss+ TB cases. In addition to a substantial proportion of treatment failures (29.3%), patients enrolled for re-treatment also had higher rates of defaults (15.5%) and deaths from TB (9.7%).

Table 7.2

Chemotherapy effectiveness in the 2008 cohorts of re-treatment TB patients, MoH&SD and FSIN data

Cohorts	Cohort size Number of patients abs	Successful treatment %	Failed %	Died of TB %	Died from not TB %	Defaulted %	Trans-ferred out %
Relapses (total)	17,383	53.3	21.0	5.2	3.3	10.3	6.8
ss+ TB relapses	6,026	43.0	29.1	9.5	3.7	10.2	4.5
Other ss+ re-treatment TB cases	12,065	32.9	29.3	9.7	3.7	15.5	9.0

Finally, it should be noted that the insufficient effectiveness of TB chemotherapy in the Russian Federation is connected not only with the high rates of defaults and MDR-TB incidence, but also results from insufficient compliance by phthisiatrists with the standards of TB treatment and poor organization of treatment under direct observation[87].

7.5. Effectiveness of TB treatment in other countries compared with respective indicators in the Russian Federation

The WHO reports [53, 54], as well as other international statistical data, contain information on the results of treatment of cohorts of ss+ and/or cu+ new pulmonary TB cases and of ss+ re-treatment TB cases. Like in the Russian Federation, in some countries the cohorts of re-treatment TB cases are also subdivided into relapse cases and other groups of re-treatment patients. Treatment outcomes in 2008 cohorts in the WHO regions and individual countries are shown in Tables 7.3–7.5.

Table 7.3

Treatment outcomes in cohorts of ss+ new pulmonary TB cases in the Russian Federation, worldwide and in selected countries (2007) [54]

Cohorts	Notified/registered		Treatment outcomes in cohorts					TB burden assessment		
	New TB cases in 2007*	Cohort for treat-ment**	Suc-cessful treatment outcome (%)	Died (all causes of death) (%)	Treat-ment failures (%)	De-faults (%)	Treat-ment outcome unknown (%)	TB in-cidence rate per 100,000	TB mor-tality rate per 100,000	Relation of mor-tality to incidence rate (%)
All countries worldwide	2,580,700	2,433,984	86	4	2	5	2	140	21	15
Africa	561,149	550,348	79	6	1	8	4	350	51	15
South-East Asia	972,441	929,575	88	4	2	5	1	180	28	16
Western Pacific	666,412	655,496	92	2	1	1	3	110	15	14
America	119,838	73,192	82	5	1	6	5	31	3	11
Eastern Medi-terranean	155,572	150,438	88	2	1	5	2	110	19	17
Europe	105,288	74,935	67	9	12	8	4	48	7	14
China	465,877	463,877	94	1	1	1	3	98	12	12
Bangladesh	104,296	104,296	92	3	1	2	14	220	50	23
Peru	17,796	14,056	92	2	2	4	0	130	10	8
USA	4,864	3,717	85	9	0	2	4	5	0.3	6
Belarus	1,051	1,987	74	9	10	2	5	48	6	12
Moldavia	1,610	1,599	62	10	16	11	1	170	21	12
Ukraine	14,296	11,068	59	13	12	10	6	100	14	14
Russia	33,103	31,857	58	12	16	10	4	110	16	15
Japan	9,433	9,421	46	18	1	5	30	22	2	8

Hereinafter in tables: * Notified. ** Registered.

[87] According to evaluation of data of independent monitoring visits provided by authors to more than 40 subjects of Russian Federation.

Table 7.4

Treatment outcomes in re-treatment ss+ pulmonary TB cases registered in WHO regions, selected countries and in the Russian Federation (2007) [54]

Cohorts	Registered for treatment** (patients)	Treatment outcomes in the cohort				
		Successfully treated (%)	Died (all causes of death) (%)	Failed (%)	Defaulted (%)	Not evaluated (%)
All countries	500,122	68	7	7	11	3
Africa	105,399	66	6	5	11	4
America	7.980	64	5	3	12	6
Eastern Mediterranean	13,902	77	4	3	10	3
South-East Asia	86,826	86	3	3	2	5
Europe	63,558	50	11	21	13	5
Russia	18,527	36	14	28	15	7

Table 7.5

Treatment outcomes in cu+ pulmonary TB cases registered in some countries of the WHO European Region and in the Russian Federation (2007) [54]

Countries	Registered and enrolled for treatment** (persons)	Treatment outcomes in the cohort				
		Successfully treated (%)	Died (all causes of death) (%)	Failed (%)	Defaulted (%)	Not evaluated (%)
New cu+ TB cases						
Romania	11,245	85	4	4	5	0
Latvia	772	82	7	0.1	4	7
Poland	4,510	76	6	0.3	10	7
Germany	2,416	77	11	0.1	1	11
UK	2,266	77	7	0	1	15
Sweden	237	66	7	0	1	26
Russia[88]	39,706	60	9	18	9	4
Hungary	612	51	12	14	6	17

The 2010 Update of the WHO Global Report [54] indicates that, on the average for all countries, the indicators of effective treatment outcomes (including the indicators of sputum conversion, cured and completed treatment) in the 2007 cohort of new ss+ pulmonary TB cases reached 86%, which meets the goal targeted by the World Health Assembly in 1991.

On average in the world, the proportion of patients who interrupted treatment (defaulted) did not exceed 5% and the percentage of patients who died (all causes of death included) did not exceed 4%. The highest levels of effective treatment were shown in the WHO Western Pacific Region (92%), with a proportion of treatment failures in only 2% and fatal outcomes from all causes in 1% of TB cases.

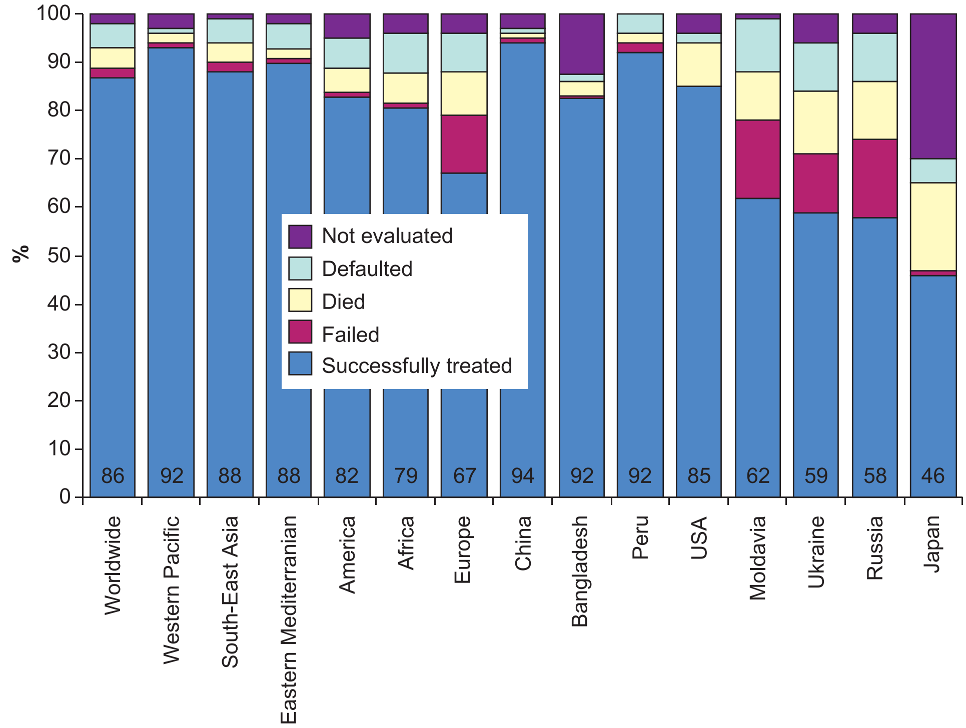
In the world, successful treatment in cohorts including ss+ re-treatment courses were in 68% of TB cases, with 7% of treatment failures, 7% of deaths and 11% of defaults.

Compared to other countries, TB chemotherapy effectiveness in the Russian Federation is among the lowest in the world (Fig. 7.10). Even when taking into account the high coverage of new TB cases with cohort analysis in Russia compared to other countries (i.e. a high proportion of registered patients enrolled for treatment and a low proportion of patients with not evaluated outcomes of treatment), the current results are inadequate although not the lowest in comparison with other countries.

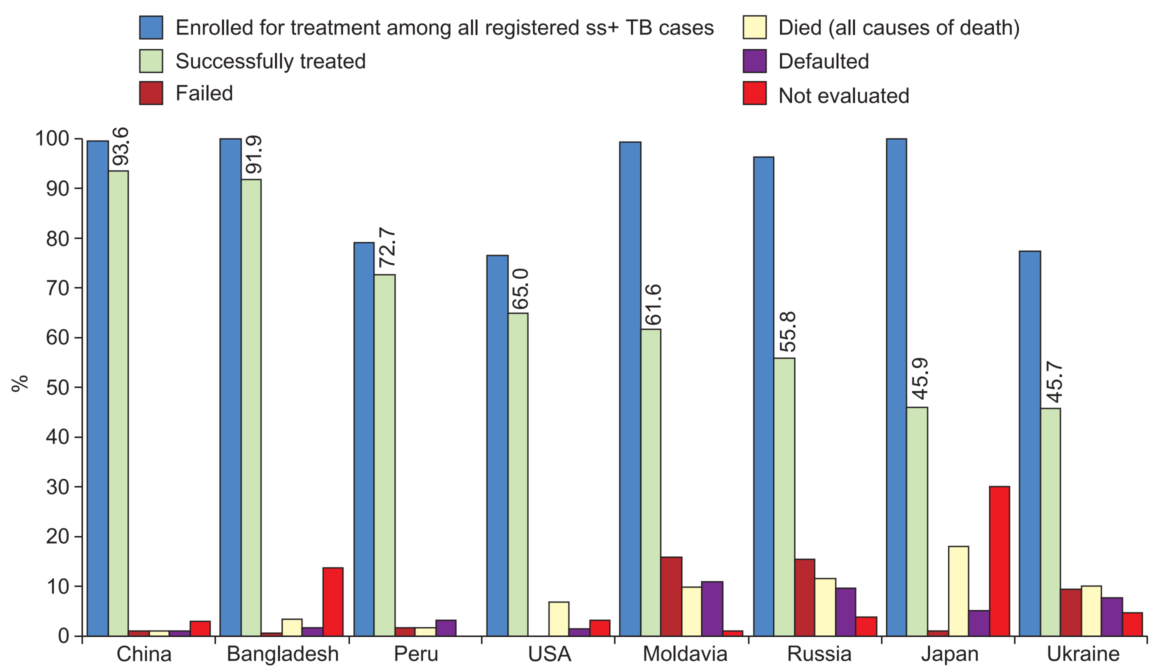
As shown above, this is primarily caused by significant rates of default cases, deaths and a substantial proportion of TB patients with treatment failures. The latter, in its turn, is connected with high rates of MDR-TB cases detected among new TB patients.

In most regions of the Russian Federation, the re-registration of TB cases as ‘ineffective for treatment with first-line anti-tuberculosis drugs’ is performed timely upon receiving information on multi-drug resistance. The proportion of new ss+ pulmonary TB cases re-registered for retreatment after MDR detection was 6.3% (Fig. 7.7B).

[88] For Russia, data is presented according Form No. 8-TB for MoH&SD and FSIN.



A) Treatment outcomes in the cohort of new ss+ pulmonary TB patients (2007)



B) Treatment outcomes in relation to all notified new TB cases in 2007 with indication of the proportion of patients enrolled for treatment

Fig. 7.10. Effectiveness of treatment in WHO regions and some countries [54]

At the same time, the relatively low effectiveness of TB chemotherapy in the Russian Federation as compared to other countries can be explained not only by shortcomings in patient management in Russia, but also by differences in approaches used in other countries.

First, as indicated above, in compliance with the RF MoH&SD executive orders, the cohort of new TB patients in the Russian Federation (i.e. TB cases not registered before) includes all patients irrespective whether or not they will be enrolled for chemotherapy.

Apart from this, it may also be assumed that the high proportion of treatment failures in this country can be explained by the current practice in the Russian Federation according to which more often than in other countries

TB cases with established sputum conversion (by microscopy or culture methods) are considered as treatment failures if clinico-radiological dynamics remains unsatisfactory. This approach ‘formally’ worsens the treatment effectiveness indicators compared to other countries. Anyhow, the proportion of TB cases when the treatment failure outcome is established in patients with sputum conversion and unsatisfactory clinico-radiological signs is relatively small. For example, in the cohort of new ss+ TB cases registered in the RF MoH&SD report (2008), treatment failure outcomes were shown basing on clinico-radiological signs (with sputum conversion) in only 3% of outcomes with the overall indicator of ineffective treatment 17.8%. If these cases are included in the number of successful treatment patients basing on the results of laboratory tests only, the successful treatment indicator in Russia would increase from 57.4% to 60.4%, which is still below the levels registered in many other countries.

On the other hand, when comparing treatment effectiveness in the Russian Federation with respective data in other countries, it seems appropriate to clarify why in many countries with high death rates (when TB death rate indicator in relation to the notification rate is or above 15%–20%) the death rate among TB patients with positive bacterioscopy and 100% DOTS coverage does not exceed 1–4% for new TB cases and 5–7% for re-treatment cases[89]. For example, in the South-East Asia countries, TB mortality rate is 28 per 100,000 or 16% of TB incidence rate, while the death rate as treatment outcome (could be named as a “TB lethality”) is registered in only 4% in the treatment cohort. In Bangladesh these ratios are 23% and 3%, respectively, with corresponding rates in the Russian Federation 15% and 12%, respectively (Table 7.3). It is evident that these two indicators (TB lethality and relation of TB mortality to notification rates) correspond to each other in the former USSR states, USA, Japan and some other countries, but in the African region, China and some other countries they are substantially different. Therefore, it is important to clarify why the TB death rate indicator is so high when successful treatment rate has high values.

In Russia, these indicators seem quite compatible even with a high rate of chronic TB cases. This may indicate a sufficiently high reliability of the statistical data received and notified in the Russian Federation.

In the Update to the 2009 Global Report [54], WHO published for the first time country-specific data on TB treatment outcomes for countries, which provide information on treatment effectiveness basing separately on culture and microscopy testing. 32 countries of the WHO European Region provided such information. Table 7.5 contains data on treatment outcomes in cu+ pulmonary TB patients for selected countries. Such data for the Russian Federation was not published in the WHO Report, providing only information on sputum microscopy results. This information was received from the RF annual report based on Form No. 8-TB.

Conclusion

The data obtained from reporting forms on monitoring TB treatment outcomes show that in spite of some success achieved in the development of treatment monitoring, there are still significant problems in the organization and management of anti-tuberculosis chemotherapy in all subjects of the Russian Federation, which contribute to the persistent low level of chemotherapy effectiveness in the country. There are still high levels of defaults and treatment failure outcomes among ss+ TB patients. The presented data stress the need for reinforced monitoring of chemotherapy treatment of TB patients, in particular, for strengthening patient compliance to prescribed treatment regimens and a broad involvement of other methods of treatment as well as for ensuring a complex approach to the organization of treatment. The statistical data received from different sectors and departments in compliance with the MoH Executive Order No. 50 provide a solid basis for managerial decision-making and for improving targeted interventions to increase the effectiveness of treatment of TB patients in the country.

[89] The relation of mortality to notification rate is calculated for deaths from TB and lethality from all causes of death. Therefore, the difference will be still more if mortality – incidence ratio is compared with lethality from TB only (died from TB treatment outcomes rate).

8. TB control in the penitentiary system (FSIN)

Baryshev S.N., Odintsov V.E., Safonova S.G., Belilovsky E.M., Danilova I.D., Sterlikov S.A.

In spite of a relative stabilization, tuberculosis still remains a serious problem in the penitentiary system facilities (hereinafter – FSIN).

The health status indicators for accused, suspects and convict persons held in the penitentiary facilities of Russia, as well as for persons in correctional facilities around the world, differ considerably from the respective countrywide rates [A3].

TB control activities in FSIN are performed in close collaboration between the RF Ministry of Health and Social Development, the federal research institutes and the World Health Organization (Fig. 8.1).

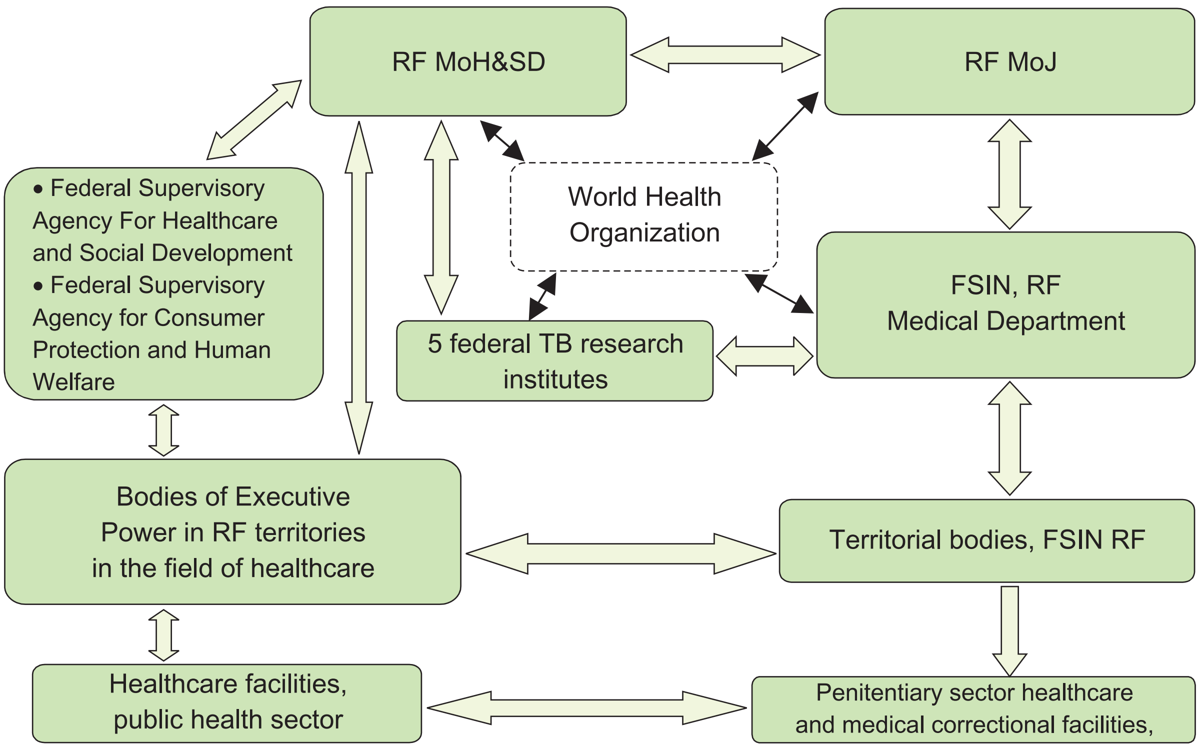


Fig. 8.1. Structure of interdepartmental interaction

Statistical reports on TB in FSIN system facilities are generated on the basis of the relevant MoH&SD and MoJ Executive Orders ([25], [26]; MoH&SD/MoJ Executive Order No. 640/190 of October 17, 2005). The main TB epidemiological data in the penitentiary facilities and data pertaining to measuring the outcomes of TB activities performed by FSIN medical services are contained in the annual aggregated Reporting Form 4-TUB, and starting 2004, in the reporting cohort analysis forms (No. 7-TB, No. 8-TB, No. 2-TB and No. 10-TB) in accordance with the MoH&SD Executive Order No. 50 [26].

Basing on the data received from FSIN medical departments in each territory, the surveillance departments of the head territorial TB dispensaries complete Reporting Form No. 8 for all new TB cases. This Form contains summary data from FSIN, civilian services and other departments involved in TB control activities. The data go to the MoH&SD and FPHI for processing and analysis of the TB notification rate in the territory.

In 1999, new TB cases detected in FSIN facilities accounted for 30% of all new TB patients in the Russian Federation. In 2009, the proportion of new TB patients diagnosed in FSIN facilities was 12% of all new TB cases nationwide.

It should be noted that notification rates in correctional colonies (CC) and SIZO (pre-trial detention centers) are estimated and analyzed separately due to the fact, as indicated below, that TB spread in these facilities is affected by different factors and approaches are being used when calculating notification rates in detention centers and colonies[90].

[90] In correctional colonies, the calculation of notification and mortality rates are performed per annual average number of inmates; the calculation of prevalence rates is made per number of inmates at the end of the year. In the pre-trial detention centers, the notification rate is calculated per number of new individuals detained in SIZO in the current year.

According to FSIN reporting forms, over the last eight years there has been a more than three-fold decrease in the number and notification rates of new TB cases in penitentiary facilities (Fig. 8.2, Table 8.1) – from 4,347 in 1999 to 1,306 per 100,000 prisoners and detained persons in 2009 (14,236 new TB cases, including 5,347 cases in SIZO detention centers and 8,889 cases in correctional colonies).

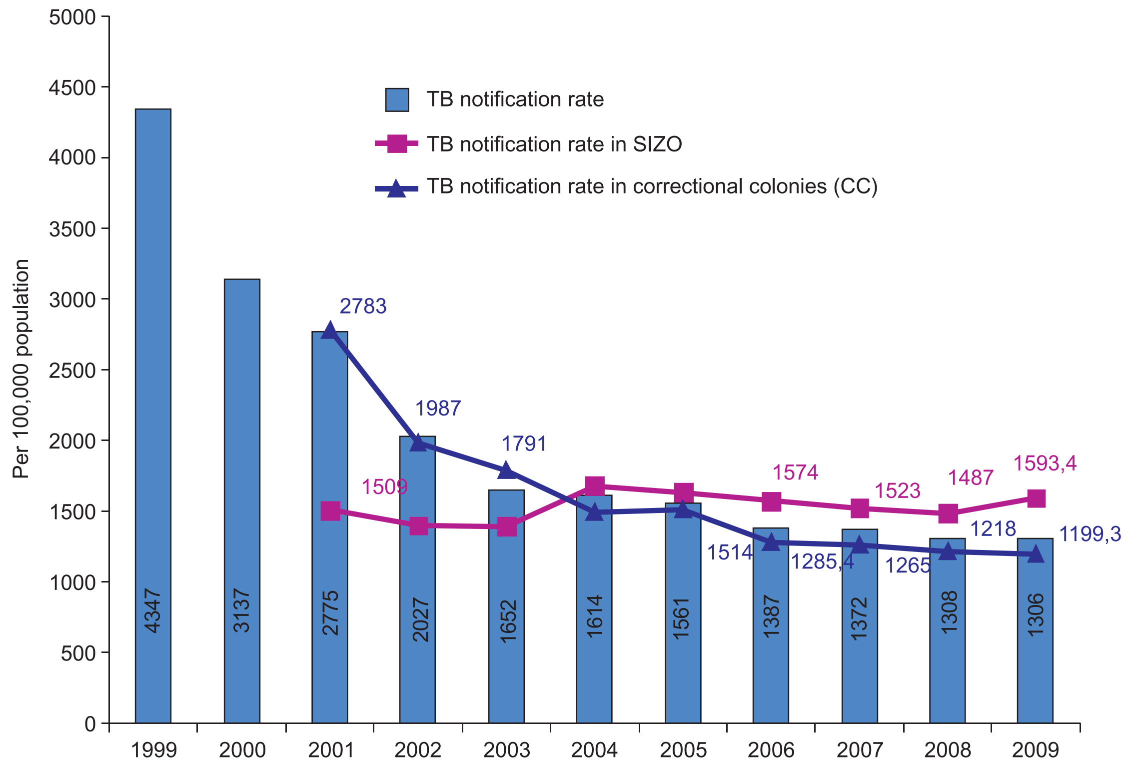


Fig. 8.2. TB notification rates in FSIN facilities: total, in SIZO (pre-trial detention centers) and CC (correctional colonies). Russian Federation (Source: Forms No. 1-MED and No. 4-tub.)

Table 8.1

New TB cases in FSIN facilities (Source: Form No. 1-MED and No. 4-tub)

FSIN facility	Years								
	2001	2002	2003	2004	2005	2006	2007	2008	2009
SIZO			5,201	5,344	6,229	6,092	5,863	5,636	5,347
CC			12,361	10,887	9,248	9,131	9,564	9,217	8,889
Total in FSIN	24,500	21,718	17,562	16,231	15,477	15,223	15,427	14,853	14,236

The number of TB cases in SIZO detention centers is largely determined by the TB epidemic among the civil population. The percentage of TB cases detected at the time of incarceration at detention facilities is quite high. A considerable part of cases diagnosed in SIZO detention centers are persons who developed the disease prior to detention.

In the early 2000s, the number of diagnosed TB cases among persons incarcerated in SIZO detention centers was increasing from 25.8% in 1999 to 40.0% in 2006 (Fig. 8.3) compared with that of TB patients transferred to FSIN correctional colonies. In the past five years this indicator stabilized at 37–38%.

As indicated above, the TB situation in the FSIN system may be regarded as a marker of TB spread in the civil sector [A3]. The highest TB notification rates in SIZO were registered in FEFR and SbFR (1,875 and 2,466 per 100,000 population, respectively – Fig. 8.4.), with highest notification rates among permanent residents in these regions (See Chapter 2). On the other hand, a high TB notification rate among SIZO inmates in SFR (1744.3) against a relatively low TB notification rate in the permanent population (Fig. 2.7) may indicate inadequate effectiveness of TB detection by the regional TB control service. FEFR and SbFR also have the highest TB notification rates in correctional facilities (1,312 and 1,858 per 100,000 population, respectively).

The proportion of RTB patients with destructive processes in the lungs was relatively low (Fig. 8.5). In 2009, 25.1% of patients were registered with lung tissue destruction among patients with respiratory TB. There were

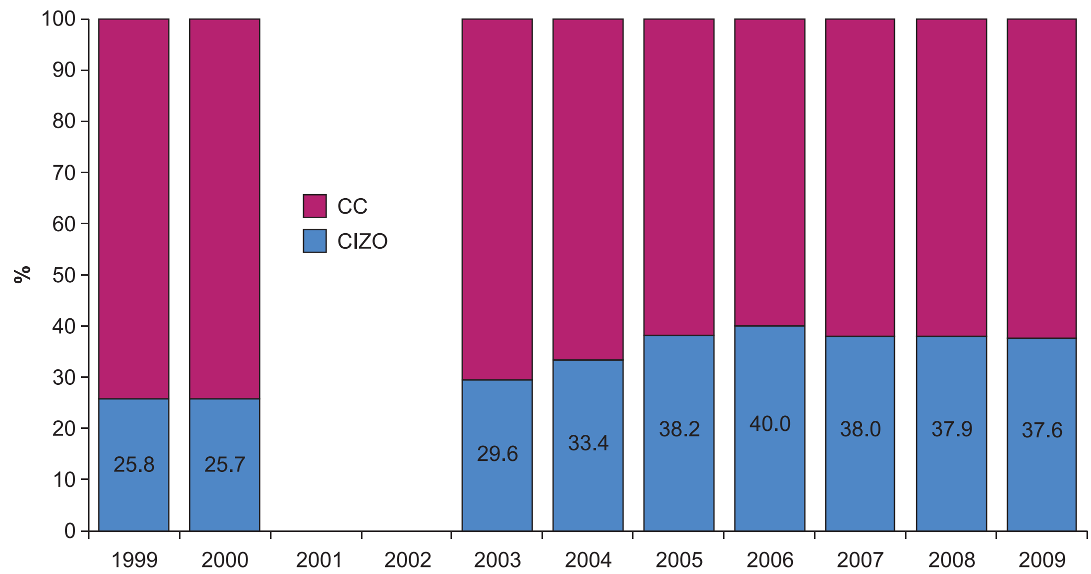


Fig. 8.3. Proportion of new TB cases diagnosed in SIZO among all TB cases detected in FSIN facilities (Source: Form No. 4-tub)

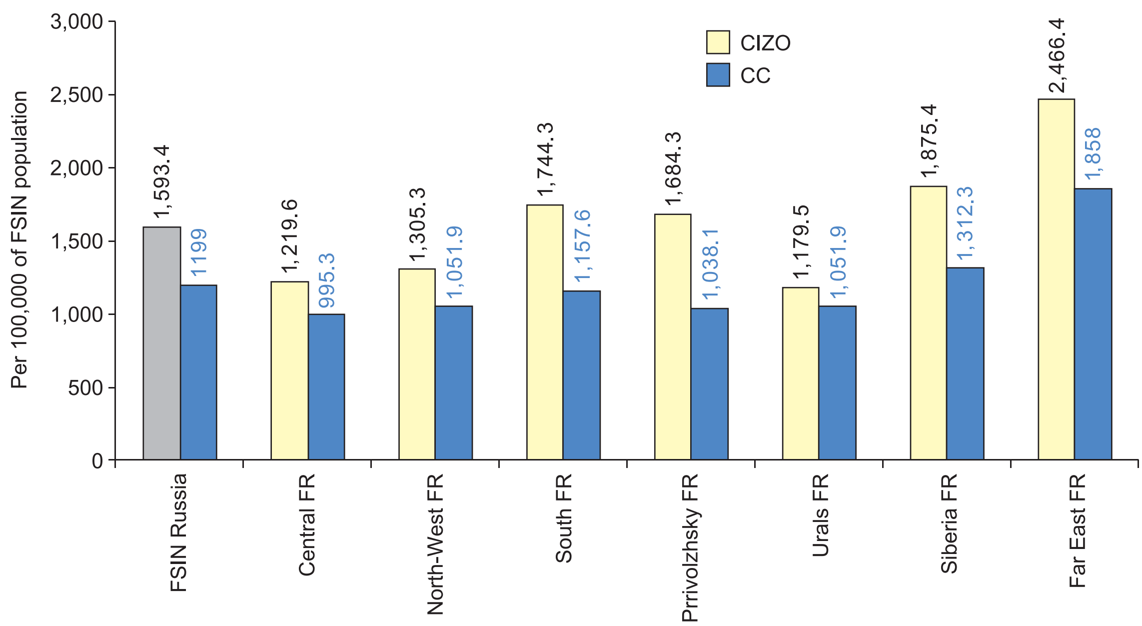


Fig. 8.4. TB notification rates registered in SIZO and correctional colonies (CC) in the federal regions of the Russian Federation, 2009 (Source: Forms No. 1-MED and 4-tub, and data on the number of FSIN population)

less CV+ cases in SIZO in comparison with CC inmates (23.1% and 26.4%, respectively, $p < 0.01$). Overall, this indicator has been decreasing both among SIZO and CC populations. It should be noted that the decrease in the proportion of patients with destructive forms of respiratory TB in FSIN facilities is primarily due to earlier detection of the disease. Chest fluorography is performed once in 6 months among convicts in prisons and among persons on trial – upon admission to SIZO and every 6 months thereafter.

In 2009, the proportion of extra-pulmonary TB among new TB cases increased to 0.9% from 0.7% in 2008, although the percentage remains low.

Improvements in laboratory service performance in Russian FSIN facilities allowed for increased coverage by testing of active TB patients by bacteriological methods from 58% in 2004 to 96.4% in 2009. Among new TB cases, 55.7% were tested in 2004 and 97.1% in 2009 (See Table 8.2 and Fig. 8.6[91]). These results were achieved, in particular, due to the equipment provided through the IBRD loan, which allowed equipping of 518 clinical-diagnostic laboratories in correctional colonies and SIZOs, and additional equipping of 65 regional bacteriologi-

[91] Information on FSIN laboratory services performance is collected by the FSIN, Russia, Chief Bacteriologist in compliance with approved Guidelines and Recommendations [17].

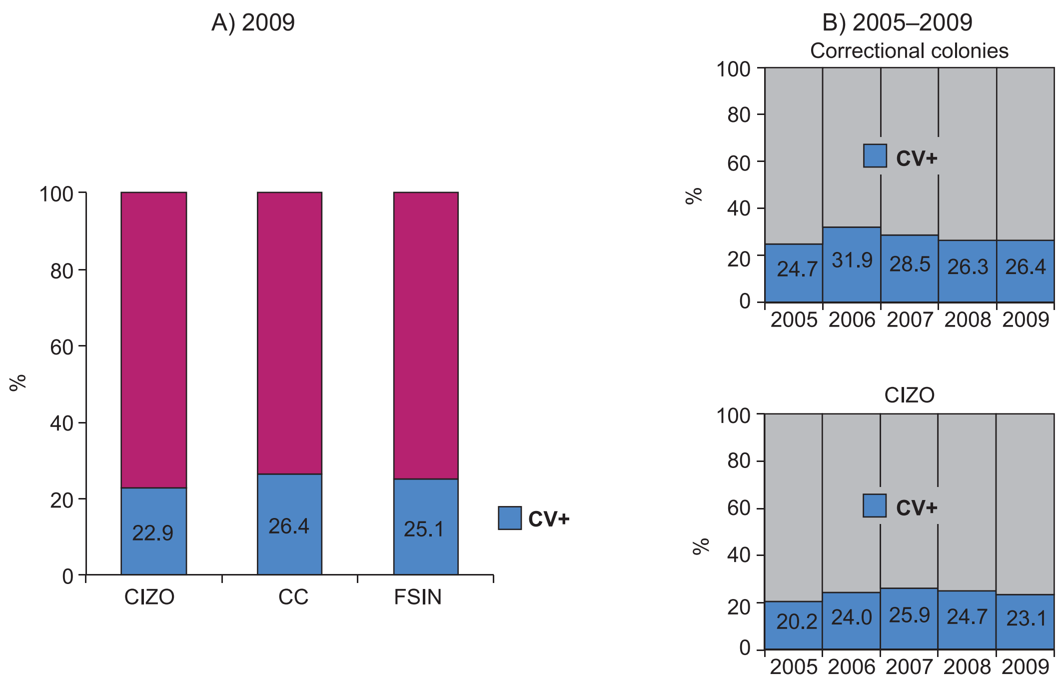


Fig. 8.5. Proportion of destructive forms of pulmonary TB (TB with cavity in the lung or "CV+") among new respiratory TB cases in FSIN facilities, the Russian Federation (Source: Form 4-tub)

Table 8.2

Bacteriological testing of TB patients in the FSIN facilities
(Source: Inner FSIN approved reports for laboratory tests)

	2005	2006	2007	2008	2009
Proportion of TB patients tested by microbiological methods (%)	75.3	94.0	96.8	97.8	96.4
Proportion of new TB cases tested by microbiological methods (%)	62.7	91.5	90.8	91.1	97.6
Diagnosis confirmed by bacteriological methods (MbT+, % of patients tested)	42.2	51.8	40	37.7	37.6
Drug resistance to any first-line drug among all TB patients (number of patients)	9,978	11,720	11,023	12,557	14,968
Diagnosis confirmed by bacteriological methods among new TB cases (MbT+, % patients of tested)	37	44	35.5	38.1	32.8
Drug resistance to any first-line drug among new TB cases (%)	51	49.6	52.7	51.0	54.4
MDR TB among new TB cases (abs. number)	755	875	879	807	958
MDR TB among new TB cases (%)	17.8	20.3	21.2	18.6	21.9
MDR TB among all TB patients (abs. number)	4,243	5,720	5,229	6,801	7,817
MDR TB among all MbT+ TB patients (%)	42.5	48.8	47.4	37.6	41.2

cal laboratories for TB diagnosis. Global Fund grants were also used for additional equipping 25 bacteriological laboratories in correctional medical facilities and in public health facilities. Therefore, it is expected that by the end of 2010, the FSIN TB control system will be equipped with 90 bacteriological laboratories for TB diagnosis.

Of TB patients evaluated by bacteriological methods, 37.6% of cases were bacteriologically positive in 2009. Among new TB cases, 32.8% were bacteriologically positive in 2009 (38.1% in 2008). The decrease in the indicator of bacteriological confirmation of TB diagnosis in 2009 compared to 2008 was related to the current reconstruction of bacteriological laboratories.

According to Form 7-TB data, the proportion of new ss+ TB patients in the FSIN facilities is relatively small. In 2009, it was 18.3% (17.9% in 2008, $p > 0.05$), which was much lower the level registered in permanent residents (33.5% in 2009, according to MoH&SD report, see Chapter 2).

TB spread in the FSIN system demonstrates high level drug resistance to the main anti-tuberculosis drugs. Drug resistance among new MbT+ cases in 2009 was at 54.4%, with MDR in this group of patients at 21.9% (958 new

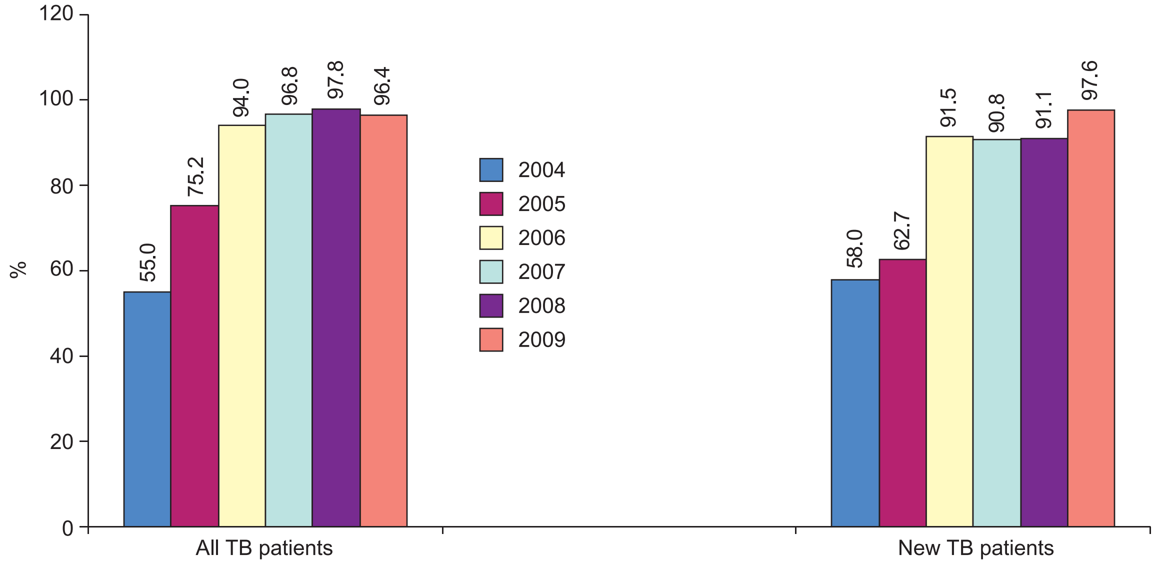


Fig. 8.6. Coverage of TB patients by bacteriological testing in FSIN facilities, the Russian Federation, 2004–2009 (Source: see the text)

TB patients) against 18.6% (807 new MbT+ TB patients) in 2008. Among all patients, drug resistance was found in 14,968 TB patients in 2009; of them, 41.2% of patients had MDR TB (7,814 TB patients) against 37.6% in 2008.

A rapid decrease in mortality rates was reported in FSIN facilities (both SIZO and CC). Following a threefold mortality rate decrease after 1999, it reached the level of 79.1 in 2006 and remained relatively stabilized up to 2008 (80.0 in 2008 per 100,000 convicted, suspected and persons on trial). In 2009, TB-induced mortality rate in the FSIN system increased to 85 per 100,000 (Fig. 8.7), which was primarily connected with the increase of MDR TB and TB-HIV co-infection rates. Death rate of TB in correctional colonies (without SIZO) is 119.2 per 100,000 convicted persons.

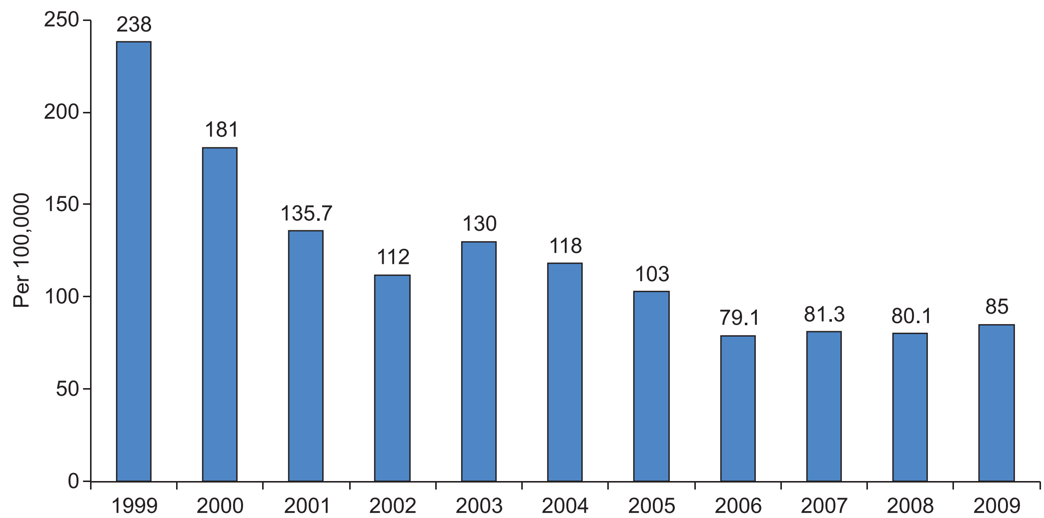


Fig. 8.7. TB mortality rates in FSIN facilities, the Russian Federation (Source: Form No. 1-MED)

In 2009, the highest TB mortality rates in FSIN facilities were registered in SFR and FEFR. Over the last few years, TB prevalence in the FSIN system has decreased from 8,408 per 100,000 FSIN population in 2002 to 4,666 in 2009. The number of patients with active TB in the FSIN system decreased by more than half from 98,767 in 2001 to 40,765 in 2009 (Fig. 8.9, Table 8.3).

Noteworthy is the spread of TB-HIV co-infection among TB patients in the FSIN system facilities. The number of TB-HIV cases increased by 1.7 times since 2005. It is evident from Figure 8.10 that in recent years, while the total number of TB patients has decreased, the number of HIV-infected individuals has been increasing, and the proportion of co-infection cases among TB patients rose from 3.7% in 2002 to 11.9% in 2009.

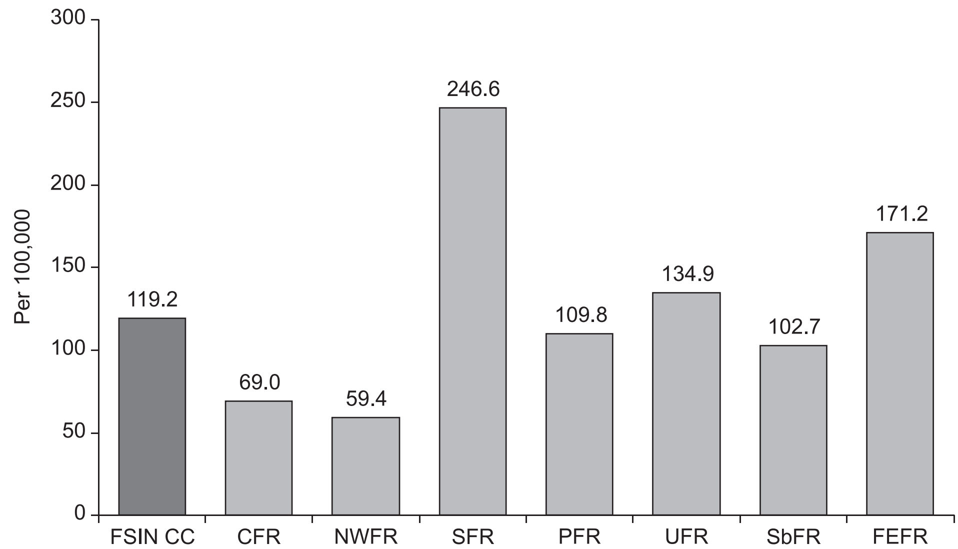


Fig. 8.8. TB mortality rates in correctional colonies, FSIN RF, total, and in federal regions, 2009 (Source: Form No. 1-MED)

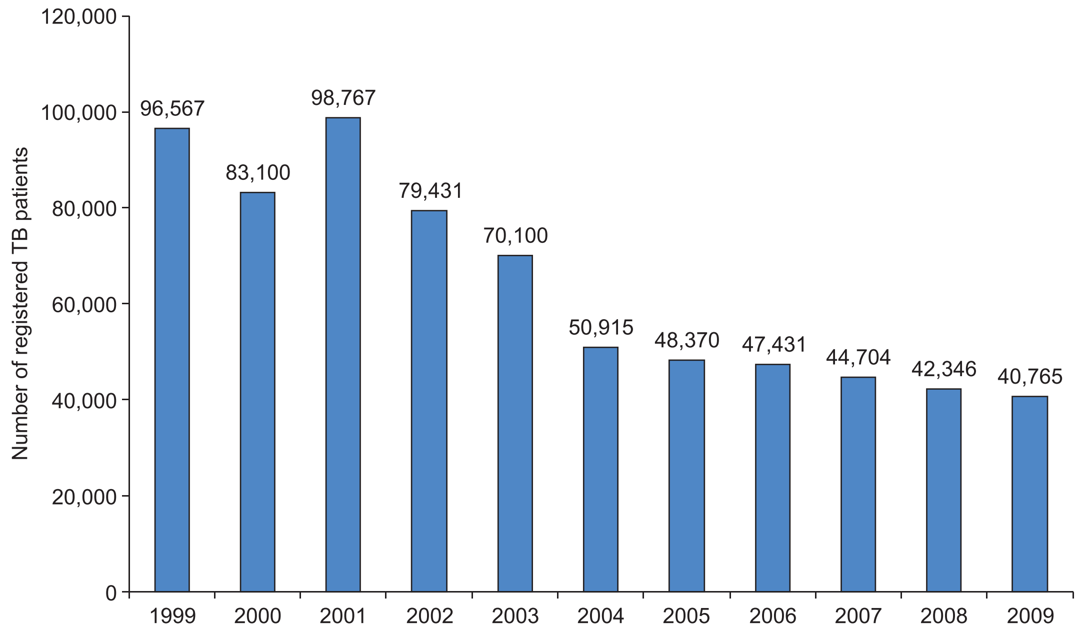


Fig. 8.9. The number of TB patients registered in FSIN facilities (Source: Form No. 1-MED)

Table 8.3

The number of TB patients registered in FSIN facilities (Sources: Form No. 4-tub and No. 1-MED)

FSIN facilities	Years								
	2001	2002	2003	2004	2005	2006	2007	2008	2009
SIZO	12,138	6,072	6,011	5,392	5,061	4,969	4,830	3,762	3,706
Correctional colonies	86,629	79,068	64,089	45,523	43,309	42,462	39,874	38,584	37,059
Total in FSIN	98,767	85,140	70,100	50,915	48,370	47,431	44,704	42,346	40,765

Another important factor of TB control activities is the continuity of work performed by different services. This is most relevant to the interaction between civilian (MoH&SD TB services in the subjects of the Russian Federation) and the penitentiary (FSIN) services, due to the substantial number of TB patient flow between MoH&SD and FSIN services.

Every year over 15,000 of TB patients are coming to pre-trial detention centers (in 2009, 15,441 cases were transferred to FSIN facilities). Thus, according to MoH&SD and FSIN reporting forms, SIZO detention centers

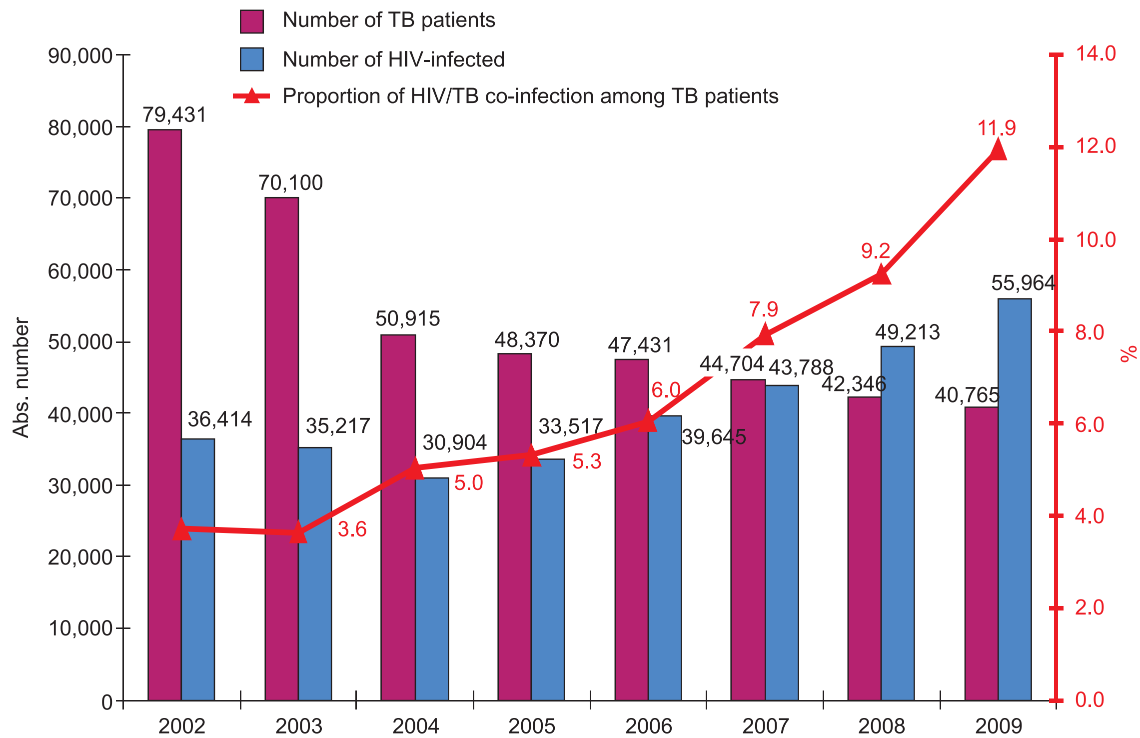


Fig. 8.10. The number of TB cases, HIV infection cases, and the percentage of patients with HIV/TB co-infection in FSIN facilities, the Russian Federation (Source: Forms No. 4-tub and No. 1-MED)

admit three or four times as many TB patients than get officially transferred from MoH&SD TB control facilities in the subjects of the Russian Federation (4,139 TB patients). Apart from this, according to FSIN data, 90% out of 5,400 new TB cases detected in SIZO detention centers were diagnosed either at the time of coming to SIZO facilities or within 1 month after coming to SIZO from the civilian sector [A3]. This means that over 5,000 patients diagnosed in FSIN facilities got TB before being arrested, but those TB cases had not been timely detected in the civilian sector.

On the other hand, about 34% of almost 15,000 persons with TB released from detention centers and correctional colonies (14,955 patients in 2009) do not get registered at TB dispensaries in the MoH&SD system (Fig. 8.11).

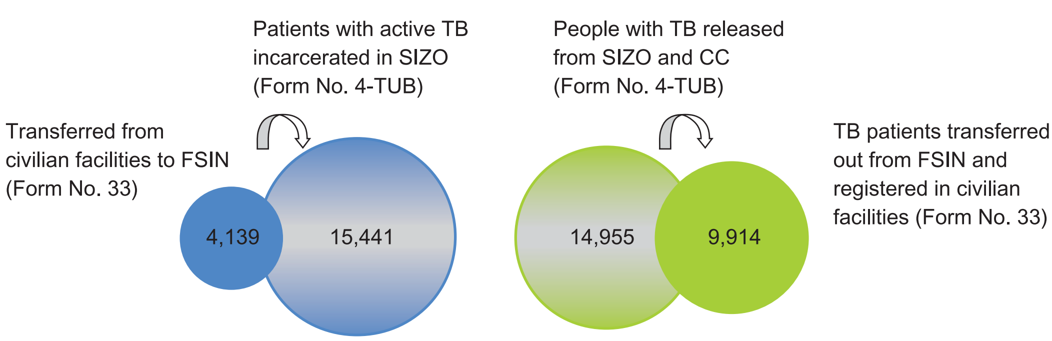


Fig. 8.11. TB patient flow between MoH&SD and FSIN facilities, 2009 (Sources: Forms No. 33 and No. 4-tub)

To assess the range of important indicators pertaining to TB cases detection, diagnosis and treatment, several departmental statistical forms are used in compliance with RF MoH executive order [26] – forms No. 2-TB, No. 7-TB and No. 8-TB. These forms are now being used to facilitate TB patient cohorts' surveillance, analysis of effectiveness of the main stages of diagnosis and treatment with decision making purposes.

In 2009, according to Form No. 7-TB data, 13,224 TB patients were enrolled for treatment, which was almost 900 (6.4%) less than the number of new TB cases (14,072 cases) diagnosed and registered in FSIN facilities according to Form No. 8-GSN.

In the cohort of 2,301 new ss+ pulmonary TB patients registered in 2008, successful treatment outcomes were registered in 53.7% of cases (57.6% in the MoH&SD report). On the other hand, FSIN facilities had a relatively low default rate – 3.4% compared with 8.9% in the subjects of the Russian Federation, and low mortality rates both of TB (2.5%) and from other causes of death (1.9% compared with 8.3% and 4.2%, respectively, according to the MoH&SD data, see Chapter 7).

In the FSIN[92] 2008 cohort of all new pulmonary TB patients (excluding cases with TB diagnosis dismissed), effective treatment outcomes were in 64.9% of cases (compared with 69.6% in the MoH&SD sector, $p < 0.01$).

The main cause of low treatment effectiveness among new TB patients is a high level of transferred-out patients (Fig. 8.12). At present, treatment failures are registered not only for TB patients released from prisons, but also for patients transferred out for treatment to penitentiary facilities in other subjects of the Russian Federation.

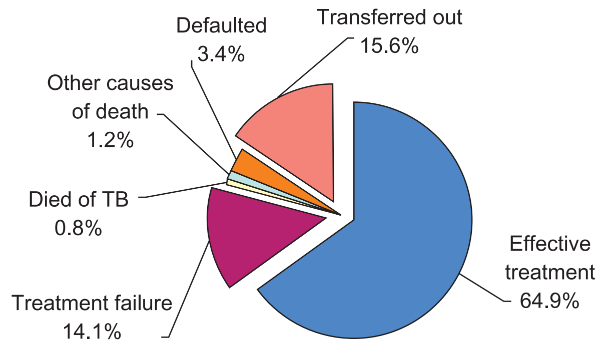


Fig. 8.12. Chemotherapy effectiveness among new pulmonary TB patients in FSIN facilities, % (Source: Form No, 7-TB)

The proportion of new pulmonary TB patients who died of TB in FSIN facilities is also relatively low. Overall, it does not differ significantly from the mortality rate from other causes of death (0.8% and 1.2%, respectively, $p > 0.05$). Above all, no deaths of TB were registered in FSIN facilities located in 35 subjects of the Russian Federation, and the level of this indicator was significantly low compared with the TB mortality rate among civilian population (4.3%, $p < 0.01$).

A major cause of a relatively low TB mortality rate in FSIN facilities is the availability of a system of effective early case-finding. New ss+ pulmonary TB patients die of TB 5.6 times more often compared with TB patients with smear-negative or unknown microscopy results (2.5% and 0.5%, respectively). Apart from this, a relatively high level of treatment under direct observation in FSIN facilities also helps to reduce TB mortality rate.

Therefore, the data prove major improvements in the TB situation in the penitentiary system. The obtained results also indicate that in FSIN facilities, it is critical to continue efforts to improve diagnostic methods and case recording, increase treatment effectiveness, and strengthen interaction with the civilian health services.

92 According to data from 47 subjects of the Russian Federation.

9. HIV infection in the Russian Federation and its effect on TB spread

Frolova O.P., Belilovsky E.M., Shinkareva I.G., Yurasova E.D.

9.1. The recording and reporting system of TB-HIV co-infection in the Russian Federation

HIV infection was first recorded in Russia in 1987. Information on TB-HIV cases started to be reported in national statistics since 1999 when the national statistical reporting form No. 61 "Data on patients with HIV infection" was introduced (hereinafter – Form No. 61).

Basic information for analysis of the epidemiological situation for TB-HIV co-infection (tuberculosis associated with HIV-infection) can be obtained from Form No. 61, in which the following types of information are available (values for 2009 are indicated in brackets):

1. The number of patients **included in dispensary HIV infection follow-up registries** during reporting year. This section contains information on followed-up persons with HIV infection including those who left the territory or died in the reporting year (332,913); on patients registered for follow-up in the reporting year (50,722); and on followed-up patients who died during the reporting year (10,938) including those who died from HIV infection (4,254). The reporting form also provides information on the number of HIV-infected patients who were on follow-up register at the end of the reporting year (315,514).

2. The total number of people living with HIV, which includes persons with HIV **enrolled for follow-up in public health facilities (MoH&SD system) and people from other population groups** in an administrative territory (subject) of the Russian Federation. These include homeless, persons followed up in other health facilities (beyond the MoH&SD system) including FSIN, residents from other territories, and foreigners. This section provides information on the total number of persons in an administrative territory (subject) of the Russian Federation with identified antibodies to HIV by immunoblotting (469,412 persons), the number of new cases of HIV infection notified during the reporting year (62,345), and on the number of deaths among patients with HIV infection during the reporting year (14,599).

Therefore, hereinafter the data will be presented in this chapter according to "the total number of patients" and "the number of patients enrolled for follow-up for HIV by infectious diseases specialists".

It should be noted that prior to 2008, the data and analysis presented in Russian publications on the evaluation of HIV and co-infections spread involved the total number of patients who were on register or had been registered during the reporting year, i.e. those who were on register at the beginning of the reporting year plus those who were registered during the reporting year, i.e. this number included patients who died and those who were transferred out during the reporting year (until December 31)[93]. Starting 2008, the HIV prevalence rate calculation uses data at the end of the year on alive TB patients with identified antibodies to HIV by immunoblotting.

Since 2005 data on the coverage of TB patients screened for HIV and results of screening TB patients for HIV infection were included in Form No. 33 "Data on TB patients".

To assess the significance of the problem of HIV-associated tuberculosis in Russia, a uniform system of registration of cases of tuberculosis in patients with positive HIV status was established in 2004 [8]. Since then, in accordance with the RF Ministry of Health Executive Order No. 547 (13/11/2003), a new registration form "Personal registration card of patients with tuberculosis associated with HIV infection" has been used in the country (RF MoH registration form No. 263/u-TB). This form is completed for all TB-HIV co-infection cases (regardless of place where diagnosis was made) and submitted to the responsible TB physician in respective subject of the Russian Federation for coordinating TB management of patients with HIV infection. These cards are also completed for death cases among patients with TB-HIV co-infection (Fig. 9.1).The responsible TB physician is mostly an employee of respective TB control service (in other cases – employee of the AIDS Center). Typically, a TB physician is appointed with responsibilities by regional executive order.

In compliance with MoH&SD Executive Order No. 547, responsible TB physicians send copies of cards (registration cards of TB-HIV co-infection cases with codes instead of patients' names) to the Center for TB Care of HIV patients, RF MoH&SD (FCTB-HIV). FCTB-HIV is responsible for keeping the unified register of TB-HIV co-infection cases. Data received after processing the cards is used for evaluation and correction of TB-HIV control

[93] Epidemiological statistics uses two types of prevalence: (a) number of patients registered at specific time (i.e. at the end of the year), and (b) number of patients who were registered (or ill) at least once during the reporting period (i.e. reporting year). The former indicator shows the epidemiological pattern of disease prevalence in the population at a point of time, while the latter indicator includes transferred patients, defaulters and patients who died during the reporting year, i.e. the total number of sources of infection in the territory during the reporting period.

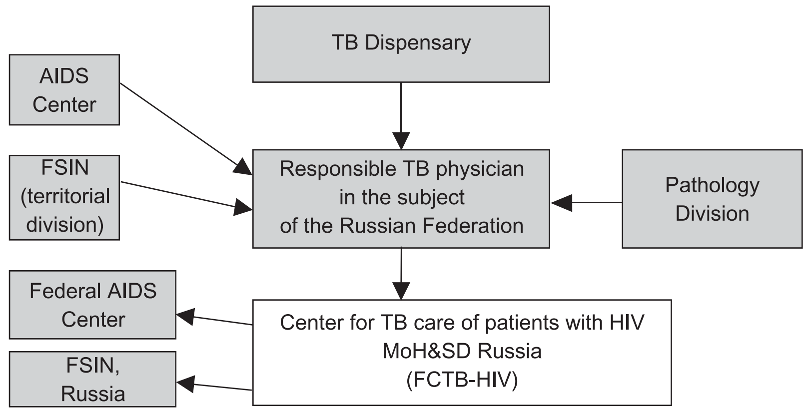


Fig. 9.1. The scheme of registration forms flow on patients with tuberculosis associated with HIV infection in the Russian Federation

activities in the territories, analysis of patient groups with TB-HIV co-infection, emerging trends and necessary changes.

Since 2005, sections referred to TB-HIV in regional AIDS centers' annual reports are compiled according to Form No. 61 in the subjects of the Russian Federation, based on the data received from regional TB physicians responsible for coordination of care provided for TB-HIV patients. In 2006, the FSIN administration sent instruction to institutions within its jurisdiction (No. 1022-471 of February 22, 2006), which obligated regional facilities to fill in and submit registration form 263/u-TB (on TB cases associated with HIV infection) to the unified registration system via regional TB physicians responsible for coordination of care provided for TB-HIV patients. The introduction of the unified system of registration and coordination of TB care for HIV-infected patients revealed increased numbers of TB-HIV of co-infection (Fig. 9.3).

9.2. Problems relating to data collection on TB-HIV prevalence

Ways and means to obtain information on the number of TB cases associated with HIV infection are quite complex worldwide, and do not fully reflect the true situation of TB-HIV prevalence. This is due to the fact that such cases are being registered independently and without coordination by respective institutions responsible for prevention, detection and treatment of TB and institutions dealing with HIV infection. Respectively, these institutions notify co-infection cases independently of each other. Such situation is observed in almost all countries because of the need to ensure confidentiality of data referring to persons living with HIV, in particular, any information pertaining to HIV testing and its results.

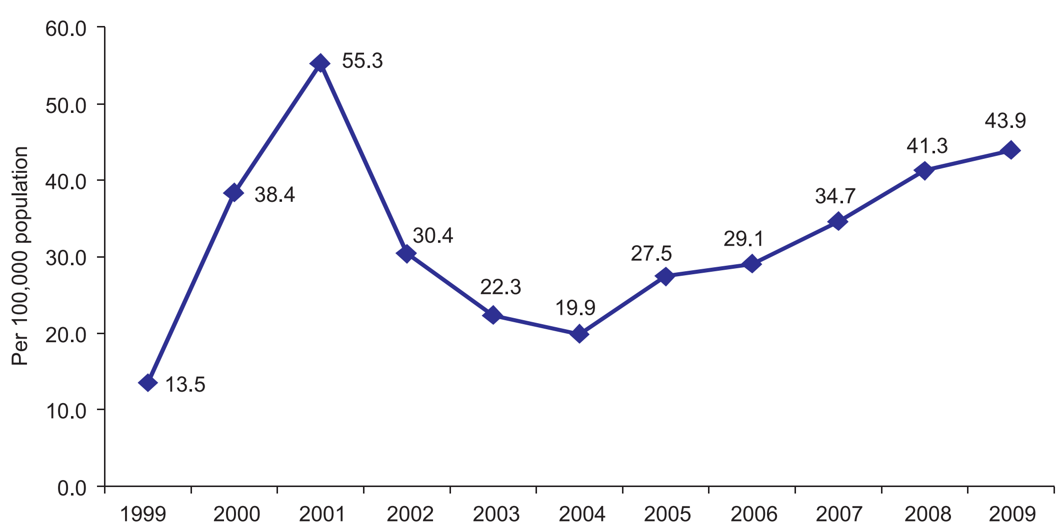


Fig. 9.2. Notification rate of HIV infection in the Russian Federation, 1999–2009 (Source: Form No. 61)

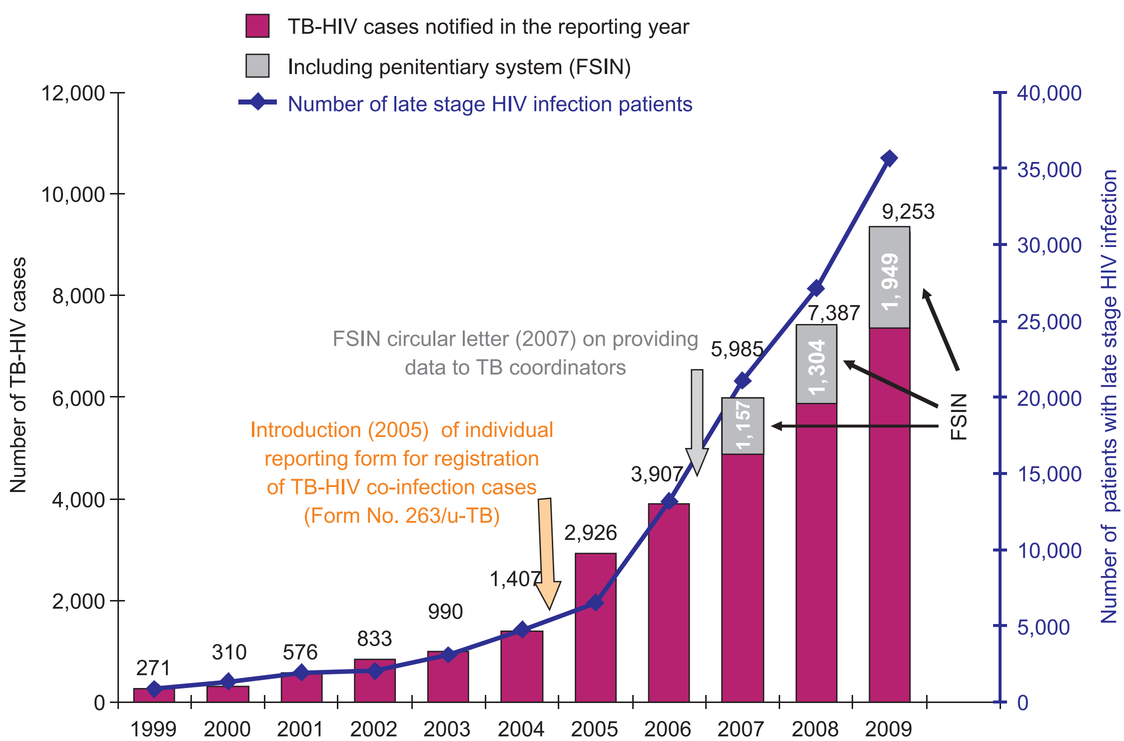


Fig. 9.3. Comparison of trends in detection of new TB cases associated with HIV infection, and the number of patients in late stages of HIV infection in the Russian Federation. Data for 2007–2009 show the portion of co-infection cases registered in FSIN (Source: Form No. 61)

Therefore, presently more information is available on results of patient tests for TB than for HIV infection, and data from TB control facilities is mostly used for assessment of TB-HIV prevalence in other countries. Although, as will be shown below, the total number of TB-HIV co-infection cases registered in Russian TB control institutions account for only 46% of all TB-HIV cases registered among the permanent population.

Besides, the difficulty with registration of TB-HIV co-infection patients is partly caused by the lack of clear definitions for cases of HIV infection. In some countries only patients with immunodeficiency caused by HIV infection are taken into account. On the other hand, "AIDS" and "HIV/AIDS" are not included as nosological units in ICD-10, and do not have clear definitions in clinical classifications proposed by WHO and RF MoH&SD. Therefore, data on TB morbidity among people living with HIV and HIV prevalence among TB patients are incomplete both in Russia and other countries (see below).

9.3. General information on the spread of tuberculosis associated with HIV infection in the Russian Federation

According to Form No. 61, 469,412 HIV-infected persons – as defined by immunoblotting with antibodies to HIV in the blood – were registered in Russia in 2009 (ICD-10 code Z21, B20-B24), with 14,599 fatal cases during the year. HIV-infection was newly diagnosed in 62,345 persons (43.9 per 100,000 population).

Figure 9.2 demonstrates trends in HIV infection notification rates from 1999 to 2009 ([8], Form No. 61 for 2007–2009).

Analysis of the data contained in reporting form No. 61 shows that the number of TB patients with positive HIV status has been steadily growing in Russia (Figure 9.3). In 2009, 9,253 new cases of TB-HIV co-infection were registered (2007 – 5,985, 2008 – 7,387 cases, respectively), of which 1,949 (21.1%) cases were diagnosed in the FSIN system[94]. The total number of patients with TB-HIV co-infection reached 20,775 persons in 2009, and among the civilian population – 16,405 (79.0%)[95].

Consequently, in 2009, in the total number of TB patients registered in TB control facilities in the subjects of the Russian Federation (262,718 cases according to Form No. 33), the proportion of TB patients with TB-HIV co-infection was 6.2% (Fig. 9.4) with the overall indicator at 6.8% including the prison system.

[94] Information about TB-HIV co-infection in the prison system is given in Chapter 8.
[95] See section 7.1 about the approach used in calculating the prevalence of HIV infection.

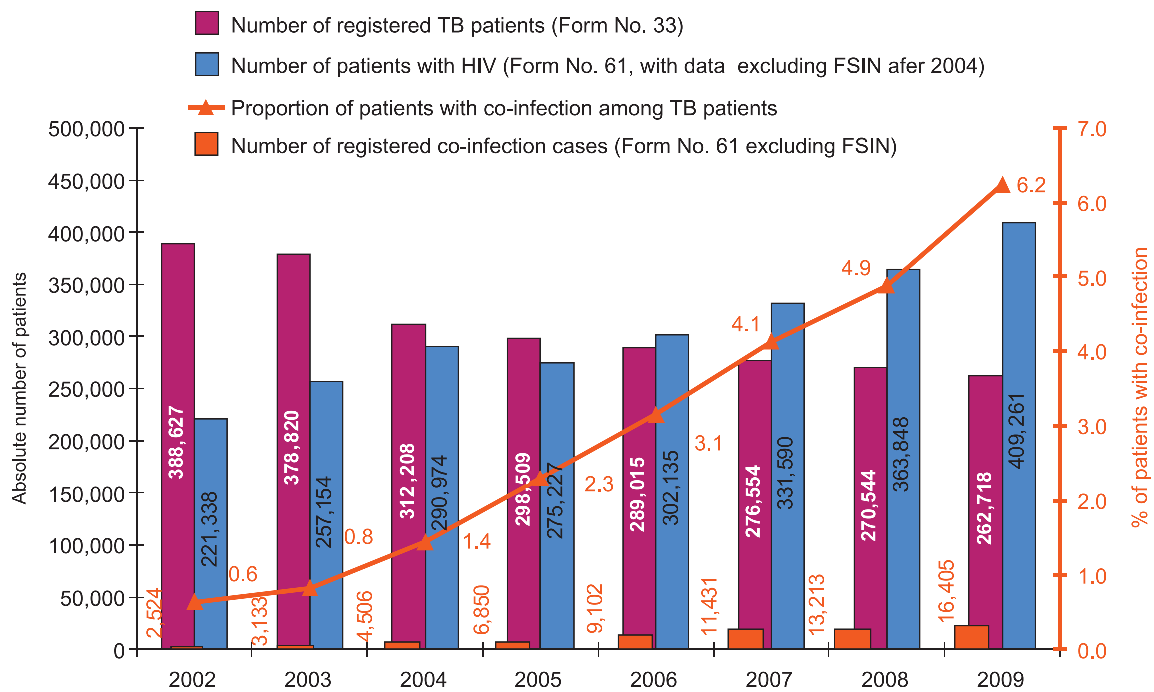


Fig. 9.4. Tuberculosis and HIV infection in the Russian Federation among the civilian population excluding FSIN facilities (Source: Forms No. 61 and No. 33)

The most important factor influencing TB incidence among patients with positive HIV status is the growing number of people with late stages of HIV-infection (stages 4Б, 4B and 5 [27]) – Fig. 9.3. The proportion of people in late stages of HIV-infection followed-up in AIDS centers progressively increased from 3.5% in 2005 to 10.8% in 2009. In relation to HIV infection, TB is a most prevalent secondary disease [12]. It was registered in 35.6% of all late stage HIV-infection patients (12.701 cases in 2009). It should be noted that the proportion of late stage HIV infection among TB-HIV patients amounts to over 60% (61.2% in 2009).

On the other hand it should be noted that almost half in 2007, 1/3 in 2008 and almost 1/4 in 2009 (1,435 of 6,181 cases, 23.2%) of cases in late stages of HIV infection were diagnosed during medical examinations and treatment of TB.

The increased number of registered TB-HIV co-infection cases was also influenced by another factor – the improvement of registration and reporting system through coordinated efforts of the civilian and penitentiary systems.

Nevertheless, it should be mentioned that there is still insufficient coordination in submitting data on TB-HIV co-infection cases. The data provided by penitentiary system facilities in Form No. 61 and the information presented in departmental registration forms No. 1-MED and No. 4-TB are slightly incoherent.

In Russia, as shown in Fig. 9.5, the majority of patients with HIV die from causes other than HIV infection (in 2009 – 61.1%, or 6,684 patients), mainly from injuries and drugs overdosing, which indirectly confirms the fact

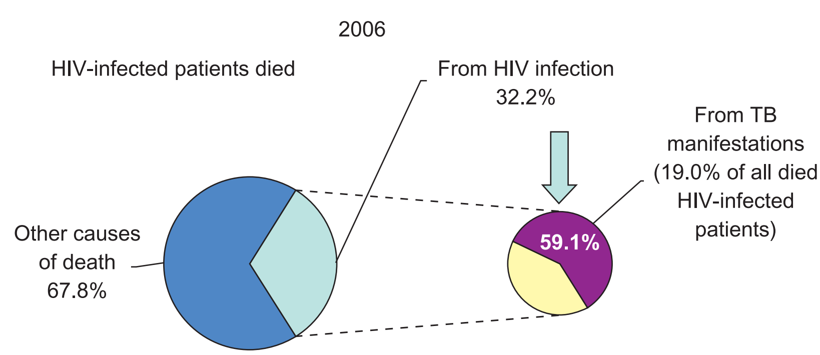


Fig. 9.5. Causes of death in patients with HIV infection in the Russian Federation, 2006. Figures in white (in the violet sector of the right circle) show the proportion of patients who died of TB manifestations among all HIV-infected patients (Source: Form No. 61)

that one of the main routes of HIV transmission is injection drug use. In turn, according to 2006 data[96], among patients who died because of HIV infection, TB was the direct cause of death in 59.1% of cases [12][97].

In 2009, 4,169 TB-HIV co-infection patients died in the civilian population (i.e. excluding FSIN facilities data), which accounts for almost a quarter of all notified TB-HIV co-infection cases (in 2008, 2,950 deaths – 22.3%). Of these, TB was the cause of death in 65% of cases. Consequently, among patients with TB-HIV co-infection, tuberculosis is also the leading cause of death. All this confirms once again the significance of TB-HIV co-infection problem in Russia.

In assessing the epidemiological situation of TB, it is important to bear in mind that the TB mortality data provided by Rosstat – 23,363 cases in 2009 (with ICD-10 code A15-A19) – do not include deaths indicated with B20.0 code in ICD-10 (3,069 cases including FSIN). So, the total number of deaths due to "only tuberculosis" and "tuberculosis in combination with HIV infection" is thought to be about 14% more (see Chapter 3).

Russia demonstrates an annual increase of coverage of people living with HIV with regular examinations for TB. This indicator increased from 38% to 71% in 2005 to 2009. Since 2005, information on screening of TB patients for HIV was included in reporting form No 33 completed by TB control facilities. In 2009, coverage of new TB patients with HIV screening was at 93.3% (92.4% in 2008). Of these, presence of antibodies to HIV was confirmed by the immunoblotting in 3.9% of cases (3,440 patients), compared with 3.1% in 2008. Consequently, the overall situation In Russia indicates a thorough coverage of both new TB patients with screenings for HIV[98] and persons living with HIV with screenings for TB.

Form No. 33 also contains data on the coverage of all registered TB patients with HIV screening (77.9%, see Table 9.1). Presently, Form No. 33 provides only data on the coverage of TB patients with tests for HIV detection, and may not be used to show the TB-HIV co-infection notification rate. This is due to the fact that patients with HIV applying to TB facilities commonly do not inform health personnel about their registration in AIDS centers. So, the detection of HIV in a TB patient very often cannot be considered as a new co-infection case. Therefore, the indicated above new system of registration of individual TB-HIV patients has been implemented and TB doctors have been appointed responsible for coordination of care for TB-HIV patients in close contact with respective AIDS centers. Consequently, when assessing TB-HIV co-infection notification and prevalence rates, it should be more appropriate to use data from national statistical reporting form No. 61 ("Data on HIV-infected patients", table 2002) completed and submitted by TB doctors responsible for coordination of care for HIV-infected patients.

Key indicators of co-infection based on national statistical reporting forms No. 61 and No. 33 are shown in Table 9.1.

9.4. The prevalence of tuberculosis with HIV co-infection in the Russian Federation

Russian nationwide indicators of the prevalence of TB associated with HIV infection reflect only the situation in the country on the whole, while respective data in individual subjects of the Russian Federation may significantly differ from each other as well from the nationwide data. Table 9.1 shows the variation of basic indicators between the territories.

Fig. 9.6 shows 21 territories that accumulate 80% of TB-HIV cases registered in the country. This list should be taken into account during planning of federal and regional programs of TB-HIV control.

Fig. 9.6B demonstrates a significant growth of TB-HIV notification rates in some territories over the past two years, particularly in SbFR and FEFR. In Irkutsk Oblast, the number of TB-HIV patients increased by 2.2 times (from 422 to 932 cases), and almost two-fold in Tula Oblast (from 198 to 371), Primorsky Krai (from 284 to 499 cases), Novosibirsk Oblast (from 276 to 464 cases), and by half in Altai Krai (from 541 to 792) and in Saint-Petersburg city (938 and 1,405 cases, respectively).

Fig. 9.7 shows data from 24 territories with the highest proportion of TB-HIV co-infection cases (more than 5%) of among TB patients registered by TB control facilities in the subjects of the Russian Federation. In these territories, TB-HIV co-infection has the greatest impact on the spread of tuberculosis, and respective regional TB services should pay special attention to the problem of TB-HIV co-infection in the territories.

Analysis of the epidemiological situation in the federal regions shows that the highest notification rates of TB-HIV co-infection were registered in the North-West (10.9% of TB patients) and Urals (11.5%) Federal Regions.

[96] After 2006, Form No.61 did not include data on "patients who died of HIV-infection, including manifestations of mycobacterial infection" for patients enrolled for follow-up. So, graph 9.5 could not be used after 2006.

[97] In Form No. 61, this data is presented in section "died of HIV-associated disease with manifestations of mycobacterial infection" (stages 4Б, В, 5) – (ICD-10 code B20.0). In compliance with the regulations and requirements for completing this form, this section shows only cases of death from TB infection.

[98] In the WHO global reports, this information is provided in section "Collaborative TB-HIV activities" [53].

Table 9.1

Basic data on TB-HIV co-infection in the Russian Federation in 2005–2009

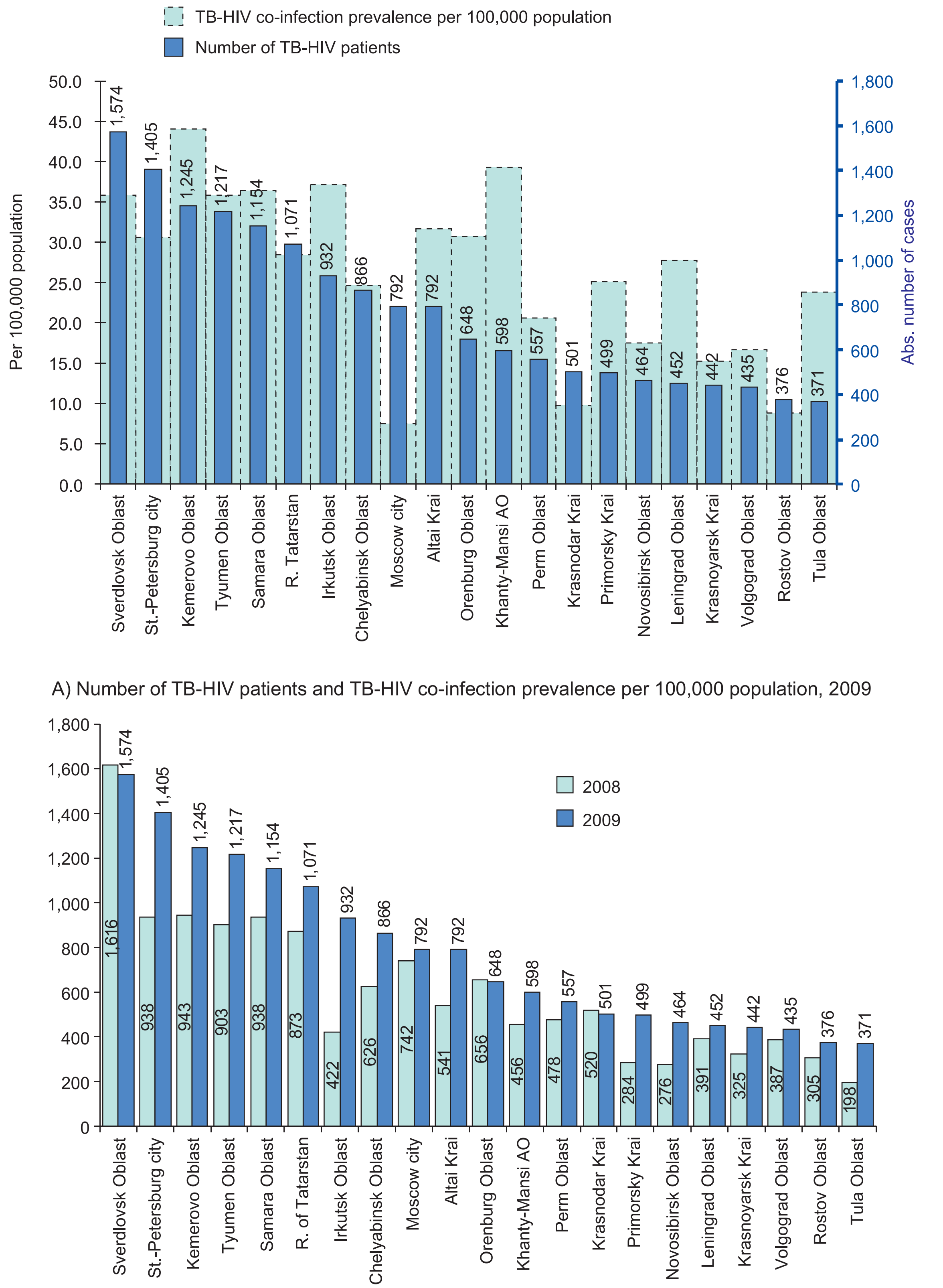
Indicators	Years					
	2005	2006	2007	2008	2009	
	The Russian Federation					Ranges by territory, 25% и 75% quartiles*
Form No. 61						
Total number of active TB cases associated with HIV infection, excluding FSIN facilities)	6,850	9,102	14,293 11,431	16,813 13,213	20,755 16,385	
Proportion (%) of cases of TB associated with HIV infection among all of registered TB patients (excluding FSIN facilities)	2,3%	3,2%	4,1%	4,9%	6,2	(1.1%; 5.9%)
Cases of TB associated with HIV infection notified in reporting year	2,926	3,907	5,985	7,387	9,253	
excluding FSIN facilities	–	–	4,828	6,083	7,304	
Cases of TB associated with HIV infection notified in reporting year, per 100,000 population	2.1	2.7	4.2	5.2	6.5	(1.2; 7.6)
HIV-infected patients tested for TB	88,742	111,162	146,105	185,858	235,753	
Proportion (%) of registered HIV-infected patients tested for TB by all methods among all registered HIV-infected patients	37.8	46.9	54.6	61.7	70.8	(59.1%; 86.5%)
Form No. 33						
TB patients registered by the end of reporting year tested for antibodies to HIV	218,481	220,634	218,866	221,889	204,624	
including cases with positive test results to HIV antibodies by immunoblotting method	3,533	3,804	4,792	6,061	7,442	
Proportion (%) of tested for antibodies to HIV among all registered TB patients	73,2	76,3	79,1	82,0	77.9	(69.8%; 91.5%)
Proportion (%) of cases with positive test results to HIV antibodies by immunoblotting method among all tested TB patients	1.6	1.7	2.2	2.7	3.6	(0.4%; 3.7%)
New TB patients tested for antibodies to HIV	85,537	87,041	87,448	90,461	88,452	
including new TB patients with positive results to HIV antibodies by immunoblotting method	1,544	1,979	2,401	2,845	3,440	
Proportion (%) of new TB patients tested for antibodies to HIV among all new TB patients	88.5%	89.9%	90.9%	92.4%	93,3	(92.2%; 99.4%)
Proportion (%) of patients with positive test results to HIV antibodies by immunoblotting method among all new TB patients	1.8	2.3	2.7	3.15	3.9	

* According to the statistical definitions of "25% quartile" и "75% quartile", 25% and, correspondingly, 75% of territories have indicator values less than those indicated by quartile values. Therefore, the data shown in brackets (25% and 75% quartiles) indicate the ranges that include indicators' values for half of all subjects of the Russian Federation.

Four of six subjects of the Russian Federation in the Ural FR are among 21 territories (Fig. 9.6) that make the most significant contribution to the total number of patients with TB-HIV co-infection in the country. Among these territories, the Ural Federal Region is responsible for more than 25% of all TB-HIV co-infection cases.

Fig. 9.8 shows that the highest rates of new TB-HIV co-infection patients per 100,000 population are generally observed in territories with the highest levels of late stage HIV infection. Consequently, it is important for TB specialists in territories, in which HIV infection started to spread at a later time, to bear in mind that this problem will also become significant with the growing numbers of people with HIV stages 4б, 4в and 5 in the coming years.

In addition, the graphs presented in Fig. 9.8 show significant differences in frequency of TB-HIV co-infection in territories with similar epidemiological situation for HIV infection. In some regions, relatively low prevalence



A) Number of TB-HIV patients and TB-HIV co-infection prevalence per 100,000 population, 2009

B) Comparison of the numbers of TB-HIV patients registered in 2008–2009

Fig. 9.6. Subjects of the Russian Federation with the highest numbers of TB-HIV co-infection patients (over 350) registered in 2009: a) 2009 only; b) 2008 and 2009 (Source: Form No. 61)

rates of TB-HIV co-infection against high levels of late stage HIV infection may indicate low effectiveness of TB case-finding. On the other hand, it is necessary to take in account the specificity of HIV infection spread in such territories. For example, in the Republic of Kalmykia, a relatively low prevalence of TB among HIV-infected persons is due to the fact that HIV infection transmission occurred in most cases in early childhood as a result of in-hospital transmission of HIV infection in the city of Elista. As a result, the patients were kept in a fairly

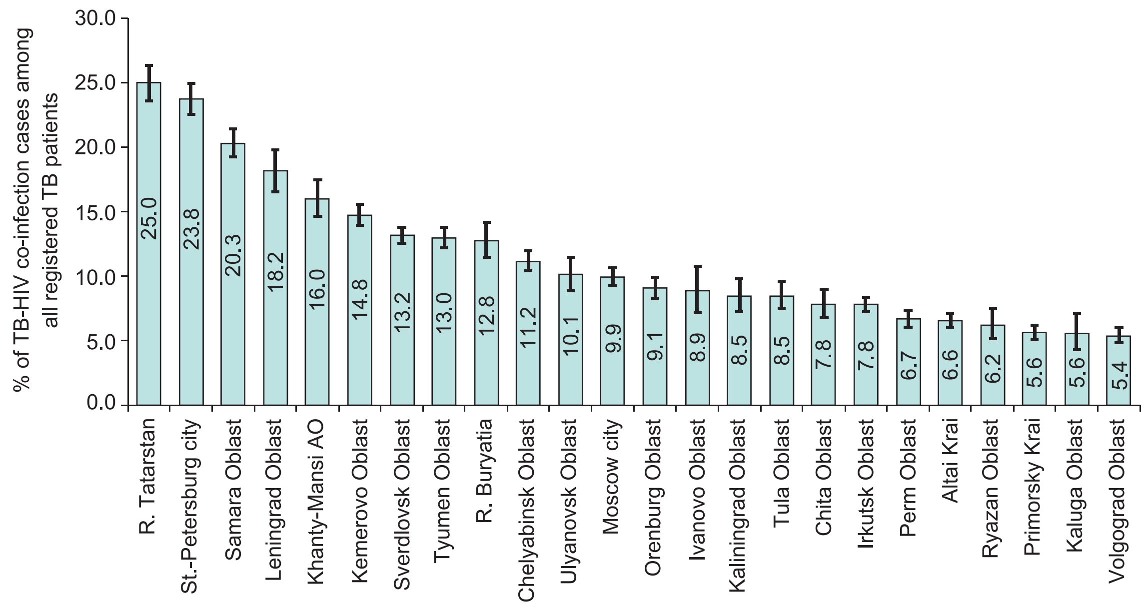


Fig 9.7. Territories with the highest rates of TB-HIV co-infection rates (more than 5%) among all TB patients registered in TB control facilities in the subjects of the Russian Federation (excluding FSIN). 2009. The error bars indicate 95% CI (Sources: Form No. 61 and Form No. 33)

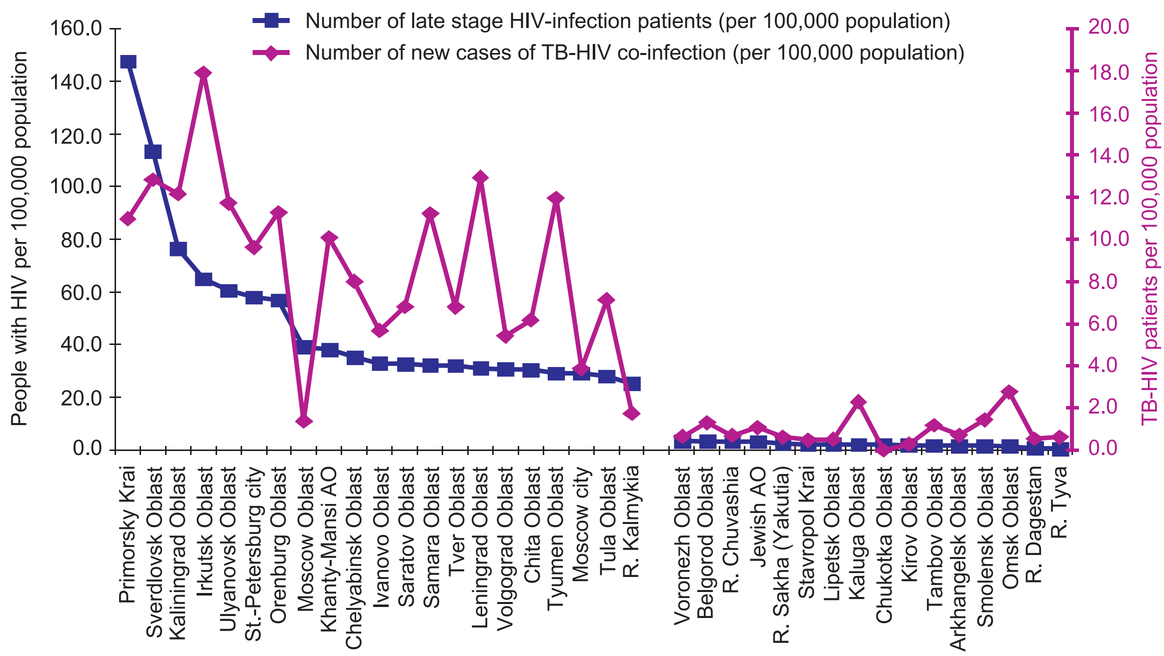


Fig. 9.8. Distribution of territories according to the notification rate of late stage HIV infection (stages 4б, 4в and 5) per 100,000 population. MoH&SD data (excluding FSIN). The graph shows subjects of the Russian Federation with HIV infection notification rates >25 and <3.5 per 100,000 population. 2009 (Source: Form No. 61; population – Form No. 4)

isolated environment from childhood, reducing the likelihood of exposure to TB infection. The development of immunosuppression in these patients prevented from the development of tuberculosis disease.

In 2008–2009, significant (from 2 to 5 times) increases in new TB-HIV co-infection cases in the permanent (civil) population were observed in 14 subjects of the Russian Federation)[99] – Belgorod, Vladimir, Tambov, Arkhangelsk, Pskov, Orenburg, Novosibirsk oblasts, in the republics of Komi, Mariy-El, Mordovia, Khakassia, and in Stavropol and Primorsky Krais. Besides, Saint-Petersburg city and Kemerovo oblast demonstrated, increasing of TB-HIV cases number by at least 100 cases in 2009 in comparison with the 2008 data.

In six territories of those indicated above (Vladimir, Tambov, Pskov oblasts, republics of Karelia, Komi, and in Stavropol Krai), the increase was due to the growth of TB-HIV spread in the penitentiary system facilities.

[99] Territories are shown with an increase by at least 10 cases of TB-HIV co-infection.

The substantial increase in TB-HIV cases in these territories was likely to be associated with the significantly growing number of HIV-infected patients with late stages of HIV infection.

Figure 9.9 shows the territories in which at least 17% of all patients with TB-HIV co-infection died because of manifestations of mycobacterial infection (code B20.0 in ICD-10). The high percentages of deaths may indicate delayed detection of TB in patients with immunosuppression. The number of autopsies of patients who died of HIV infection did not influence significantly the value of this indicator.

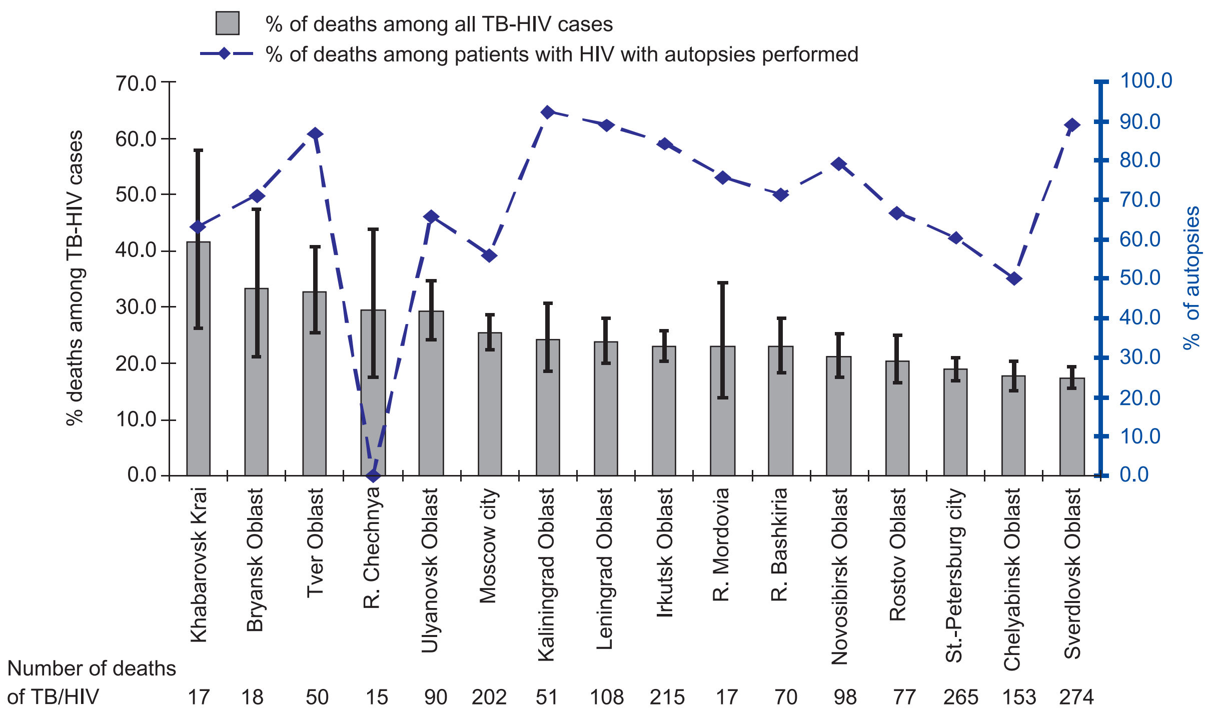


Fig. 9.9. The proportion of deaths from HIV infection with manifestations of mycobacterial infection (ICD-10 code B20.0) among all reported TB-HIV co-infection cases (only territories with the indicator at least 17% and the number of deaths more than 15 patients are indicated), and the proportion of deaths of patients with HIV infection with autopsies performed. 2009. Error bars indicate 95%CI (Source: Form No. 61)

Given the significant scattering of indicators of TB-HIV in the subjects of the Russian Federation, it is appropriate to provide a differentiated approach to the organization of outpatient and inpatient care for such patients. It is important to take into account the prevalence of HIV infection in the territory, the duration of its registration in the region, and the prevalence of *M. tuberculosis* infection in the population. Such recommendations are given in the manual for TB doctors entitled: "Organization of TB care to patients with HIV" developed by the MoH&SD/WHO thematic working group in 2006 [19].

9.5. Comparison of definitions and systems for registration of TB-HIV co-infection patients in Russia and other countries

In international studies on the spread of TB-HIV co-infection, estimated and notified indicators are used. Most commonly these indicators include [53, 54]:

- indicators related to estimates and registration of the total number and proportions of HIV-infected patients among new and relapse TB cases (i.e. among the so-called "HIV in incident TB cases");
- reports on the number of TB patients with known results of HIV tests and on the number of positive test results among all TB patients tested for HIV;
- the number of TB-HIV patients receiving antiretroviral therapy (ART) and cotrimoxazole preventive therapy (CPT);
- TB-HIV treatment effectiveness (both new and relapse TB patients).

The latter three indicators are considered in WHO reports [53] in the section on issues related to collaboration between TB and HIV infection control services.

These indicators (2008) for the Russian Federation, selected countries and regions are shown in Table 9.2.

Table 9.2

TB-HIV co-infection in the world, 2008 [54]

Region / country	Estimates of the number of incident TB cases with HIV co-infection	Estimates of the proportion of patients with HIV-infection among new TB cases (%)	TB patients tested for HIV infection[a]		Number of positive results of testing of TB patients for HIV infection	% of registered TB-HIV cases in relation to estimates	Proportion of positive results of testing of TB patients for HIV infection (%)	Number and proportion of ART coverage among all TB-HIV patients (%)		Number and proportion of CPT coverage among all TB-HIV patients (%)		Number and proportion of coverage with IPT among TB-HIV patients (%)	
			n	%				n	%	n	%	n	%
Global	1,400,000	15	1,373,750	22	352,266	25	26	108,448	32	228,927	71	48,120	13.7
Africa	1,100,000	38	635,961	45	295,401	27	46	88,670	30	213,633	73	25,553	8.7
SAR	340,000	71	150,542	39	89,950	26.5	59.8	22,107	24.6	64,348	71.5	7,359	8.2
USA	1,500	10.8	8,010	62	820	55	10.2	–	–	–	–	–	–
WHO European Region	24,000	5.6	357,473	79	11,410	48	3.2	2,190	20	617	6.0	9,240	81
Russian Federation	9,000	6	221,889	103[b]	6,083[c]	67,5	3.0[c]	1,403[d]	23	NDA	NDA	6,933[c]	–

[a] In the Global Report, these data are considered for patients with known HIV status.

[b] The percentage of TB patients tested for HIV infection calculated for the Russian Federation exceeds 100% because of different approaches used by WHO and in the RF system of statistical recording of the total number of TB patients. According to the reporting form No. 33, in 2008 the coverage of HIV infection testing of new TB cases in Russia was 93% and the coverage of all registered TB patients was 78%.

[c] The RF data forwarded to WHO included the number of new TB-HIV cases as presented in Form No. 61 and excluding FSIN, but not all TB-HIV co-infection cases. The number of new TB-HIV cases registered in RF in 2008 as per Form No. 61 was 7,387, with the total number of registered TB-HIV cases amounting to 16,813 (13,213 excluding FSIN). Therefore, adjustments will be needed in the information provided from RF to WHO with due account of the specificity of the RF statistical reporting system.

[d] The data include only new HIV cases. For all TB-HIV cases, ART was provided for 6,679 of 16,813 patients, i.e. 40%.

NDA – no data available.

According to estimates, average 15% of all new and relapse TB cases notified throughout the world were associated with HIV infection. In African countries, this indicator reached 38%, in Europe – 5.6%. In the world, approximately 1.4 million TB patients (22% of all registered TB cases) had known results of HIV tests, of which 350,000 (26%) were HIV-positive. The highest indicators of coverage with HIV testing were registered in the European, American and African Regions of the WHO (79%, 49% and 45%, respectively). The proportions of notified HIV-positive cases were 3%, 15% and 46%, respectively.

Unfortunately, the calculation of this indicator for the Russian Federation based on the data submitted to WHO is incorrect (see note *b* to Table 9.2) because of the specifics pertaining to the Russian reporting system.

In the world, the estimates of HIV-infection prevalence among new registered TB patients are based on (a) the UNAIDS[100] estimated indicator of HIV-infection prevalence in a country, and (b) assessment of the indicator showing to what extent TB incidence among HIV-infected patients is greater than that among people with negative HIV-status. In other words, this approach involves the incidence rate ratio (IRR) between these two population groups. It is considered that in countries with high HIV-infection prevalence (above 1% of the population according to UNAIDS estimate), TB incidence among HIV-infected people is 20.6 times (CI 95% 15.4–27.5) higher than that among people with negative HIV-status. In countries with HIV-infection prevalence from 0.1% to 1% (including the Russian Federation) this ratio is equal to 26.7 (CI 95% 20.4–34.9). Finally, in countries with low HIV-infection prevalence (less than 0.1%) TB incidence among HIV-infected people is 36.7 times higher than that among people with negative HIV status (CI 95% 11.6–116).

[100] UNAIDS – The Joint United Nations Programme on HIV/AIDS.

The internationally used indicators of TB prevalence among HIV-infected population need some special comments.

First, the registered number of co-infection cases reflects only the information that has been reported by TB control services. According to the Russian data, this number is less than half of really diagnosed number of TB-HIV co-infection cases. This is why the Russian Federation has established a system that allows for coordination of information flow on cases of co-infection from TB physicians, infectious disease physicians, pathologists, and FSIN physicians into a single database.

Secondly, with the most common indicator – proportion of HIV-infected people among new r TB patients – it is impossible to assess the severity of TB-HIV co-infection problem in a territory in terms of risk factors for the population and for HIV-infected people in the region. For example, when analyzing the data from Table 9.2 (column 6), it seems that the problem of TB-HIV co-infection in Russia is not as serious (3%) as in the U.S.A. (10%). But in reality it is much more severe particularly for Russia, since the proportion of cases of TB-HIV co-infection in the United States is calculated basing on a substantially lower absolute number of TB patients compared with the number of TB patients in Russia. In the U.S., the number of new TB cases is about 13,000 per year, and in Russia – about 120,000. Therefore, the TB-HIV co-infection rate per 100,000 population in Russia was 4.2 in 2007 (5.2 in 2008), that is much more than that in the U.S. – 0.3[101] [47a].

Conclusion

Therefore, tuberculosis co-infected with HIV infection is a problem of great importance for Russia. In the absence of adequate interventions, TB-HIV co-infection increase may cause serious harm to the health of the country's population.

In order to improve the monitoring of TB associated with HIV infection, it is necessary to implement a uniform system of registration of TB-HIV co-infection cases. The system should be based on the universal definition of a HIV infection case used for statistical purposes and take into account updated information in the field of HIV infection and tuberculosis.

[101] 884 new cases of TB associated with HIV infection were registered in the United States in 2007 [47a]. The data included all states, except California and Vermont.

10. Multidrug-resistant tuberculosis

Son I.M., Belilovsky E.M., Skachkova E.I., Popov S.A., Danilova I.D.

10.1. The indicators used in the Russian Federation to evaluate the spread of multidrug-resistant TB

The spread of multidrug-resistant tuberculosis (MDR TB) – when *M. tuberculosis* is resistant to at least two main anti-TB drugs – isoniazid and rifampicin) – attracts serious attention in recent years both in the Russian Federation and worldwide. MDR TB patients need substantially more expensive and long-term treatment with anti-TB drugs that may cause serious adverse effects. Moreover, MDR TB patients need a significantly more thorough and prolonged monitoring, as well as social and financial support. The lethality rate among MDR TB patients is high. High levels of MDR TB have serious impact on the transmission of tuberculosis in the community through accumulation of TB infection in the population because of decreased effectiveness of treatment.

In compliance with the regulatory documents currently used in the Russian Federation, drug resistance is classified into primary and acquired drug resistance [25]. Conditionally, primary drug resistance (drug resistance among new TB patients) is defined as the resistance of *M. tuberculosis* isolated from a patient who never used anti-TB drugs or received TB treatment for less than one month. In this case, it is considered that the patient has been infected with drug-resistant strain of *M. tuberculosis*. Primary drug resistance is characteristic of part of the mycobacterial population circulating in the territory, and this indicator is important for the assessment of the epidemiological situation of TB. Acquired (secondary) resistance is defined as the resistance of *M. tuberculosis* acquired by a patient during course of anti-TB treatment. In Russia, as in other countries, secondary drug resistance is considered as an indirect indicator of ineffectiveness of ongoing treatment if the patient received anti-TB drugs for more than one month [45].

In recent years, in international statistical materials and guidelines on issues related to epidemiological surveillance, the classification and definitions of primary and acquired drug resistance are used only for theoretical purposes [45, 51, 61] (see more in detail in Section 10.5). These definitions are used in scientific and training materials and publications, and for special research purposes, e.g. involving molecular fingerprinting.

As indicated above, two indicators are considered for epidemiological surveillance purposes: MDR TB diagnosed in TB patients who never received treatment or received treatment for less than one month, and among patients who received treatment for more than one month (see the recent Global Reports of the World Health Organization [61, 58]).

This approach is used due to difficulties in identifying inherent MbT drug resistance in patients who have been on treatment from TB for more than one month, because such patients may have already been infected with MDR TB strains earlier. In practice, acquired drug resistance can be determined based on two conditions: (1) registration of onset of resistance to anti-TB drugs during and after treatment compared to the beginning of the treatment course, and (2) re-infection has been excluded with molecular fingerprinting methods (i.e. infecting with drug resistant strains from other patients, which may be associated with inadequate infection control during treatment). It was the methodological difficulty in confirmation of acquired drug resistance that led to the exclusion of the concept from WHO and THE UNION guidelines and statistical reports (namely, from the reports of the WHO/THE UNION Global Project on anti-tuberculosis drug resistance surveillance in the world [51, 58, 61], see Section 10.4).

Nevertheless, any treatment, particularly ineffective one, leads to increased drug resistance. Therefore, MDR TB in re-treatment patients and patients receiving treatment for more than one month is conditionally called secondary resistance in Russia, which is important from the epidemiological and organizational viewpoints.

The Russian national statistics data on MDR TB among the civilian population started to be registered since 1999. In addition, MDR TB data were included in FSIN institutions four years ago. Initially, the reliability of these data on the national level was unsatisfactory, and information on the MDR TB rate in the Russian Federation for 1999–2005 only approximately reflected the real level and rate changes from year to year and by region. The measures conducted in 2005–2007 to improve the quality of laboratory tests and registration of MDR TB cases to correlate them with the international standards of laboratory techniques, correctness and accuracy, improved the quality and content of reported data. More recent data contained in the reporting forms reflect more accurately the prevalence of MDR TB, and this information may be used not only for assessment of the quality and completeness of MDR TB registration, but also, under certain assumptions, for performing estimates of MDR TB prevalence in the population. Nevertheless, registered rates of MDR TB may significantly differ from the actual proportion of patients with MDR TB in the population.

As a rule, a set of extensive indicators is currently being used for TB control both in Russia and worldwide, which reflects the proportion of registered TB patients with MDR among different groups of TB patients. As will be shown below, four indicators are currently being used in the Russian Federation:

- the proportion of MDR TB patients among all new registered MbT+ RTB cases (based on Form No. 33);
- the proportion of MDR TB patients among new PTB cases, with MDR determined prior to the start of treatment, in patients who have been examined by drug susceptibility test (DST) (based Form No. 7-TB);
- the proportion of MDR TB patients among relapse PTB cases, with MDR determined prior to the start of treatment, in patients who have been examined by DST (based on Form No. 7-TB), and finally;
- the proportion of MDR TB cases among all RTB patients registered by the end of the reporting year (from Form No. 33).

Analysis of these indicators is of utmost importance since it allows for identifying shortcomings in the organization of treatment of new and relapse TB patients, and can be effectively used to predict the effectiveness of treatment and facilitate planning of appropriate treatment plan.

The important indicator showing the proportion of MDR TB among all TB patients registered at the end of the year reflects the level of MDR TB spread in the population (based on Form No. 33 data). In the Russian Federation, this extensive indicator can be assessed thanks to the availability of a well developed system of dispensary follow-up of TB patients including patients with MDR TB. This indicator, along with the absolute number of MDR TB cases, is also essential for the assessment of treatment costs of MDR TB in every separate subject of the Russian Federation. This indicator characterizes the burden of MDR TB in the country as a whole.

As distinct from the WHO/THE UNION Global Project on anti-tuberculosis drug resistance surveillance in the world (see Section 10.4), in which this indicator is not calculated being limited to the evaluation of the proportion of MDR TB cases among all TB patients only, the system of TB patients follow up in the Russian Federation allows for a direct calculation of MDR TB prevalence in the country.

Starting 2009, the proportion of MDR TB patients registered at the end of the year can be calculated not only for all MbT+ RTB patients, but also separately for RTB patients with known DST results. Anyhow, the quality of data collected in RF regions remains unsatisfactory. There are still no approved instructions on the periodicity of performing DST for TB patients enrolled for re-treatment both during re-treatment and in follow-up. Particularly this concerns medical evaluation of patients with chronic forms of the disease. Moreover, there are no unified forms for registration of DST results. Moreover, no indicators are being used in Russia in the reporting forms, which would allow for assessing the proportion of MDR TB among patients registered for re-treatment after treatment failures and defaults. MDR TB indicators can be calculated only separately for new and relapse TB cases. However, the choice of adequate empiric treatment regimens prescribed before DST results are available can be made only basing on drug resistance patterns separately for these patient groups [52a]. According to published data, MDR TB levels in re-treatment TB patients after treatment failures, defaults and relapse of the disease are substantially different.

In addition to the intensive indicator calculated per 100,000 population (MDR TB prevalence among all TB patients registered at the end of the year [10]), recent publications in Russia also include the number of patients with MDR TB among new TB cases registered before treatment or within one month after treatment started.

The number of patients with MDR TB among all new TB patients per 100,000 population is an epidemiological indicator showing the rate of occurrence of new cases of MDR TB among the healthy population because of transmission of infection, which may result from TB treatment failures and inadequate measures of infection control.

The degree of applicability and the value of some indicators can be illustrated by scheme shown in Fig. 10.1. The speed of MDR TB spread depends on the adequacy of treatment and infection control effectiveness. At the same time, an increase in the proportion of MDR TB cases can occur not only because of inadequate and ineffective treatment, but – in case with successful treatment of drug-susceptible tuberculosis – as a result of elimination (“washing out”) of drug susceptible *M.tuberculosis* from the TB patient population (see Fig.10.1a and Fig.10.1b). Figure 10.1b shows that, after patients with drug susceptible TB have been cured with first-line drugs, there are some MDR TB cases in the region that emerge as a result of treatment (excluding died and transferred cases), whose number depends on adequacy and efficiency of therapy. Thereafter (see Fig. 10.1c), in the absence of appropriate treatment of MDR TB patients and with poor infection control, new cases of drug susceptible TB emerge, and the proportion of new patients infected with MDR TB is increasing.

The scheme shows that the proportion of MDR TB among TB patients does not always reflect the real change in the situation. This indicator should be considered in combination with such indicators as the absolute number of patients who got MDR TB and the intensive indicator of MDR TB prevalence (per 100,000 population), which reflects the severity of the source of MDR TB infection and influences trends of MDR TB spread.

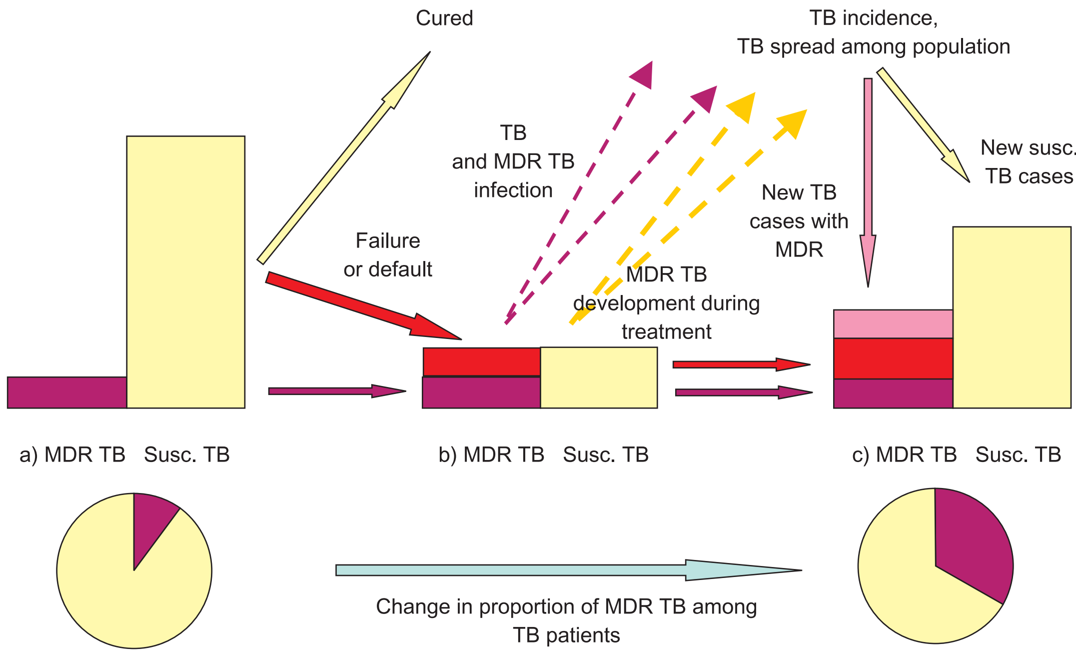


Fig. 10.1. The scheme of epidemic process of MDR TB transmission under conditions of effective treatment with first-line drugs; a) before treatment; b) results of treatment of drug-sensitive TB patients with first-line drugs; c) MDR TB spread in the population; "Susc.TB" = drug susceptible TB

10.2. Reporting forms used in the Russian Federation for MDR TB patients data collection

In Russia, information on MDR TB patients is presented in two reporting forms – Form No. 33 and Form No. 7-TB.

From 1999 to the time when the MoH executive order on cohort analysis [26] was implemented, **Form No. 33** was the major source of MDR TB data. This reporting form has a relatively stable structure and can be used for a long-term analysis of changes in MDR spread among new RTB patients and all RTB patients registered at the end of the year in TB control facilities in the subjects of the Russian Federation. The latter indicator reflects MDR TB spread in the population and can be received only from the data contained in Form No. 33 (see section 10.1).

On the other hand, Form No. 33 is rather limited for making a detailed analysis of MDR TB spread:

1. Before 2009, this reporting allowed for calculating only the proportion of MDR TB cases among RTB patients with bacillary excretion detected by all methods without specifying cases with bacillary excretion determined by culture. But this indicator did not reflect properly the actual level of MDR TB spread because not all RTB patients with bacillary excretion were tested for drug susceptibility.

Since 2009, Form No. 33 has included data on DST coverage, which facilitated correct calculations of MDR TB proportions in relation to patients with known DST results. However, the calculations were made among RTB patients only, not PTB cases as accepted in international practice.

2. Instructions to Form No. 33 do not indicate at what stage of treatment DST should be done; therefore, the reporting form includes information not only on new patients with primary MDR TB (i.e. who had DST performed before treatment or within one month after the beginning of treatment[102]), but also those who had MDR TB diagnosed during the course of treatment more than one month after the treatment started. Therefore, Form No. 33 cannot be used for determining the epidemiologically important indicator of MDR TB rate among new MbT+ TB patients previously not treated or treated with first-line drugs for less than 1 month [25, 61].
3. Another drawback is that Form No. 33 is completed by the end of December of the reporting year and section on MDR TB in the form may not include data on patients with MDR TB registered in the last 3 months of the year. As all DST tests are performed on solid media in Russian, it takes 2–3 months to receive tests results, therefore the DST results for such patients will be received only in the next year after the report has been prepared and submitted.

[102] According to WHO recommendations on drug resistance surveillance [51] as well as some Russian experts, DST should be performed BEFORE the treatment course (episode). The condition that the patient did not receive anti-tuberculosis drugs earlier (i.e. before DST had been performed) or received less than one month should be referred to a possible intake of anti-tuberculosis drugs BEFORE the treatment course (episode). WHO experts are now developing recommendation to the effect that specimens collection for DST should be performed not later than 2 weeks after beginning of treatment.

In addition to Form No. 33, Form No. 7-TB was introduced by MoH executive order in 2005 [26] to estimate MDR spread among new and relapse TB patients, which provides more correct data for calculation of these indicators. Form No. 7-TB includes data on the number of PTB patients who had DST. This information can be used as the denominator to calculate the proportion MDR TB cases among new and relapse TB patients in compliance with international practice.

Besides, Form No. 7-TB includes data on the number of DST tests performed among new and relapse TB patients, and on the number of MDR TB patients detected at zero month, i.e. before treatment, which is required in accordance with the instruction and structure of registration form No. 01-TB that is used as a primary data source for the report. Therefore, the data presented in this form indicate correctly the actual levels of primary MDR in respective territories.

And finally, the annual reporting chart in Form No. 7-TB that includes MDR TB data (No. 2000) is submitted, in compliance with the instruction, in the second quarter of the year following the reporting year. Therefore, Form No. 7-TB, contrary to Form No. 33, must include data on all patients throughout the reporting year who had MDR TB at the time of case registration.

Consequently, Form No. 7-TB, as compared to Form No. 33, provides more reliable and correct information for calculation of MDR TB spread among new TB patients in compliance with internationally accepted requirements.

At the same time, in contrast to Form No. 33, the information contained in Form No. 7-TB can be used only for the last three years for the calculation of MDR TB related indicators. This form was approved by RF MoH executive order [26] in 2004 and actually began to work correctly in 2006–2007.

Form No. 7-TB is completed both in TB control facilities in the subjects (territories) of the Russian Federation and in FSIN institutions (see Chapter 1); however, below this chapter information is provided based only data from territorial TB institutions, i.e. for the civilian population (without FSIN). This is due to the fact that this form was introduced in FSIN facilities only recently for collection of DST data and information on MDR TB cases is collected in FSIN institutions basing on separate internally approved forms (see Chapter 8).

Overall, to collect reliable and correct drug resistance data, it is essential that proper statistical service should be established both for dispensary follow-up of TB patients (registration form No. 30-4/y and reporting form No. 33), and for TB treatment monitoring purposes based on cohort analysis (registration forms No. 01-TB, No. 03-TB and reporting form No. 7-TB).

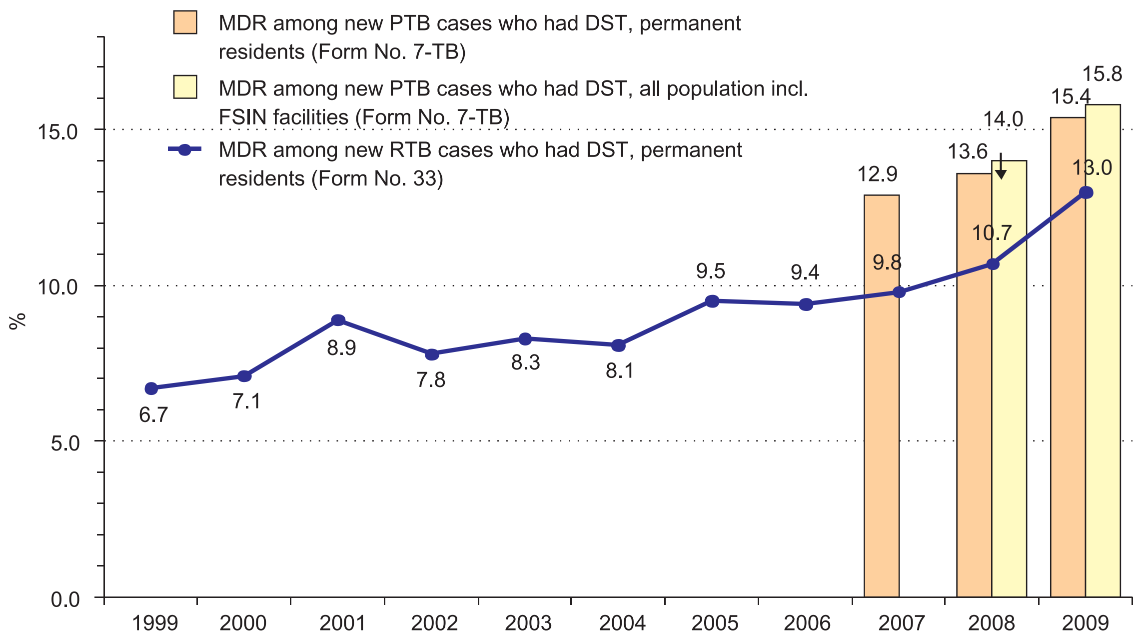
10.3. MDR TB among new TB cases

From 1999 to 2009, in the Russian Federation there was a marked increase in the proportion of MDR TB among all reported new MbT+ RTB cases (from 6.7% in 1999 to 13.0% in 2009, Form No. 33, see Fig. 10.2). According Form No. 33, 5,671 new MDR TB cases were reported among new registered RTB patients in 2009 (4,700 cases in 2008). The growth of this indicator can reflect not only an increase in the proportion of TB resistant to the main anti-TB drugs, but also improvements in the quality of laboratories' work and in registration of cases of MDR TB, i.e. improvement in the detection of patients with MDR TB[103].

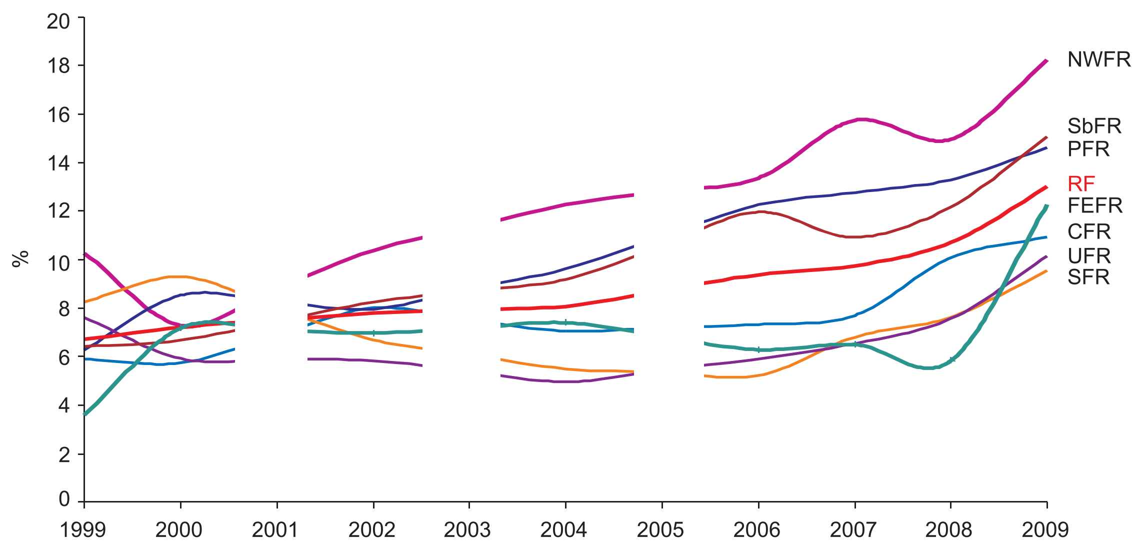
Primary MDR TB rates calculated for new registered PTB cases in 2009 based on reporting form No. 7-TB shows that 15.8% of new PTB patients with known DST results had MDR TB in 2009, with 15.4% among permanent residents (5,260 cases per 34,125 patients who had DST according to MoH&SD report) and 20.1% in FSIN facilities[104] (see Fig. 10.2).

It should be noted, although the overall DST coverage of MbT+ TB patients was high on the national level (91.4%), it was insufficient in FEFR (80.2%) and low in NCFR (64.2%) – see Fig. 10.4. Less than 50% of TB patients with MbT+ confirmed by culture had DST in republics of Dagestan (33%), Karachaevo-Cherkessia (23.2%), and in Leningrad Oblast (44.5%). Besides, the above-mentioned other 6 territories[105] had DST coverage below 80% (Smolensk, Chelyabinsk, Volgograd oblasts, Primorsky and Kamchatka krais, Republic of Tyva). Another 3 territories (Amur Oblast, republics of Kabardino-Balkaria and Chechya) did not provide any data because DST tests were not done there in 2009. A hundred percent coverage with DST tests was reported from 27 territories, which may cause doubt regarding correctness of this indicator.

103 Calculation of MDR TB cases among new RTB patients with known DST based on form No. 33 (which became possible starting 2009) showed 16.8%. But this proportion cannot be used for the estimation of MDR cases among new TB cases because of the limitations indicated in Section 10.2 of this report.
104 FSIN reports from 47 subjects of the Russian Federation.
105 Hereinafter, the term "territory" means one of 83 administrative units of the Russian Federation known as "subjects of the Russian Federation", which include republics, oblasts, krais and autonomous oblasts. The 83 units form 8 Federal Regions (CFR, NWFR, etc.) on a geographic basis. (Note of the translation editor).



A) MDR TB among new TB cases, Russian Federation (Sources: forms No. 33 and No. 7-TB)



B) MDR TB among new TB cases in federal regions (Source: Form No. 33)

Fig. 10.2. Proportions of patients with MDR TB among new TB cases. The Russian Federation and RF federal regions, 1999–2009[106] (Source: Form No. 33 and No. 7-TB)

The proportion of MDR TB among new TB cases had a significant variation in the regions (Fig. 10.2–10.6). The highest rates of MDR TB among pulmonary TB patients were reported in NWFR, PFR and SbFR. Over the past 5–6 years, the MDR TB indicator in these federal regions exceeded the nationwide rate and caused an increase on the national level (Fig. 10.2B). In 2009, in NWFR, SbFR, FEFR and PFR, the proportions of MDR TB among new pulmonary TB cases were from 17% to 22% (21.8, 17.7, 16.7 and 17.3%, respectively – Fig. 10.3). High rates of MDR TB cases registration among new TB cases per 100K of population were observed in SbFR and FEFR (6.9 and 6.2 per 100,000), and in the territories of NWFR and PFR (4.5 and 4.4 per 100,000, respectively). This suggests a relatively high risk to be infected by MDR TB in these regions.

The proportions of MDR cases among new TB cases who had DST (Form No. 7-TB) was over 20% in 23 territories[107] in 2009. The highest MDR TB rates were reported in Perm Krai (32.1%), Murmansk (28.9%), Pskov

[106] Data for the federal regions for 2001, 2003 and 2005 are not given since the value of the proportion of MDR TB in these regions had a significant impact from inflated figures presented in Form No. 33 in the following territories: in 2001 – Krasnoyarsk Krai (fourfold excess in the usual value of the annual indicator); 2003 – Volgograd and the Chita oblasts (excess of 2.5–4 times), in 2005 – Primorsky and Khabarovsk Krais (excess of 2 and 55 times). The validity of the registration of the above-mentioned values of MDR TB in Form No. 33 requires clarification.

[107] Hereinafter, only federal regions are included which had more than 5 MDR TB cases, 50% DST coverage and at least 35% of culture-confirmed diagnoses in 2009 (WHO criteria for Class B, see below in Section 10.4).

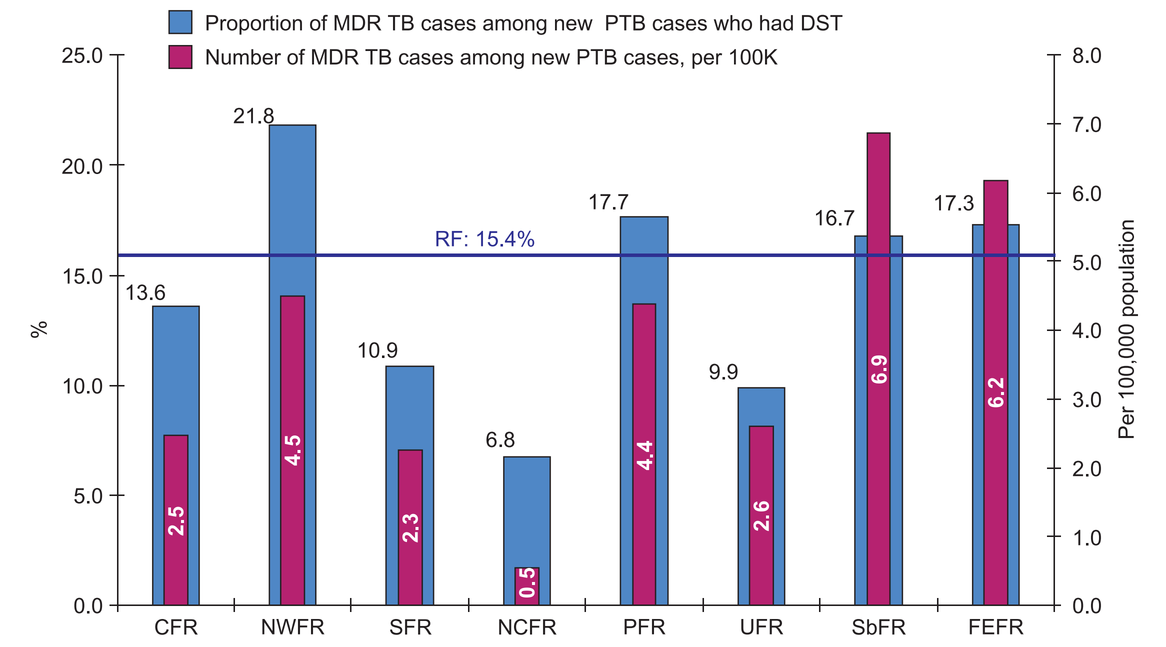


Fig. 10.3. Proportion of MDR TB cases among new PTB cases who had DST and number of MDR TB among new PTB cases per 100,000 population, 2009, Federal Regions of the Russian Federation (Sources: Form No. 7-TB; population: Form No. 4)

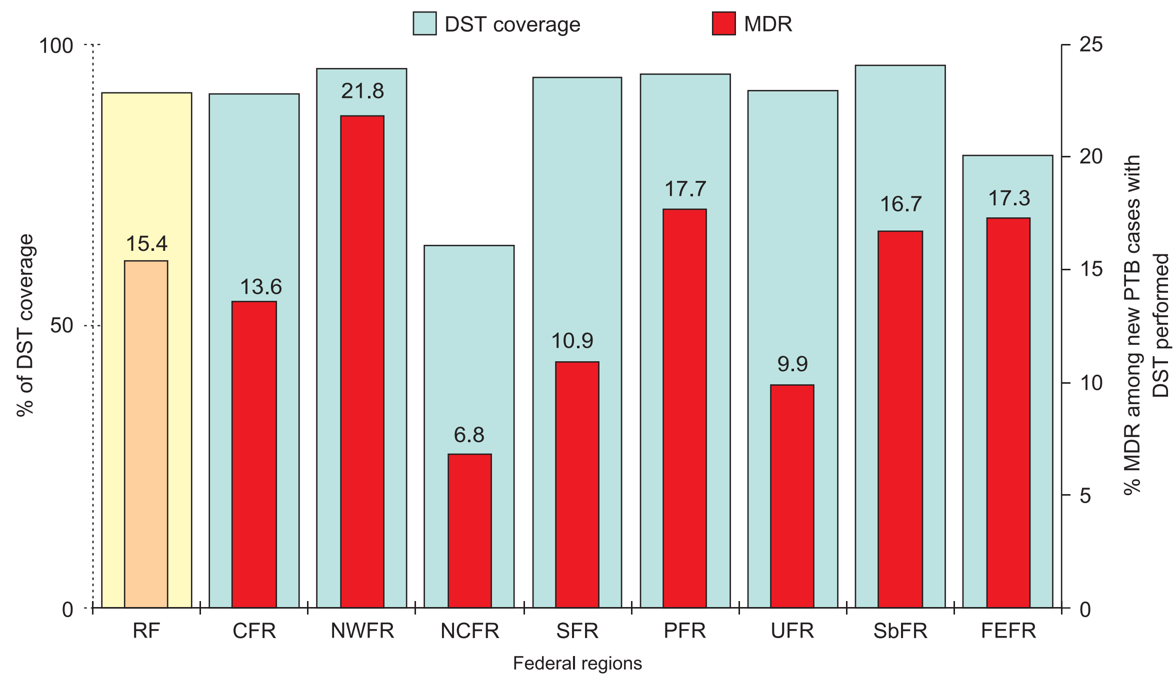


Fig. 10.4. Drug sensitivity tests (DST) coverage of MbT+ patients and MDR TB spread among new PTB cases who had DST, 2009, the Russian Federation and RF Federal Regions (Source: Form No. 7-TB)

(24.3%), Arkhangelsk (25.7%), Leningrad (25.4%), Ulyanovsk (24.3%), Novosibirsk (24.5%), Sakhalin (25.1%) oblasts and in the republics of Karelia (24.6%), Tyva (43.8%) and Sakha-Yakutia (26.8%). Territories in the North-West Federal Region had substantially higher rates of MDR TB among new TB patients. Of 11 subjects of the Russian Federation with the highest MDR TB rates in 2009, five subjects were in the NWFR (this federal region consists of 10 subjects).

Against the general increase of MDR TB spread indicators in the country, in some subjects of the Russian Federation with well developed laboratory services and relatively high quality reporting data on MDR (in Arkhangelsk, Orel, and Tomsk oblasts), there was a relative stabilization of this indicator in 2007–2008 in the range from 15% to 20%. This was reported there after a long period of increasing MDR proportion among new TB cases. Although there was a slight (7–8%) growth of MDR TB in two of these territories (Orel and Arkhangelsk oblasts) in 2009, it is evident that in 2007–2009 there was a trend towards a general decrease in the proportion of MDR TB among new TB cases in these territories, which proves the effectiveness of the current activities in MDR TB control.

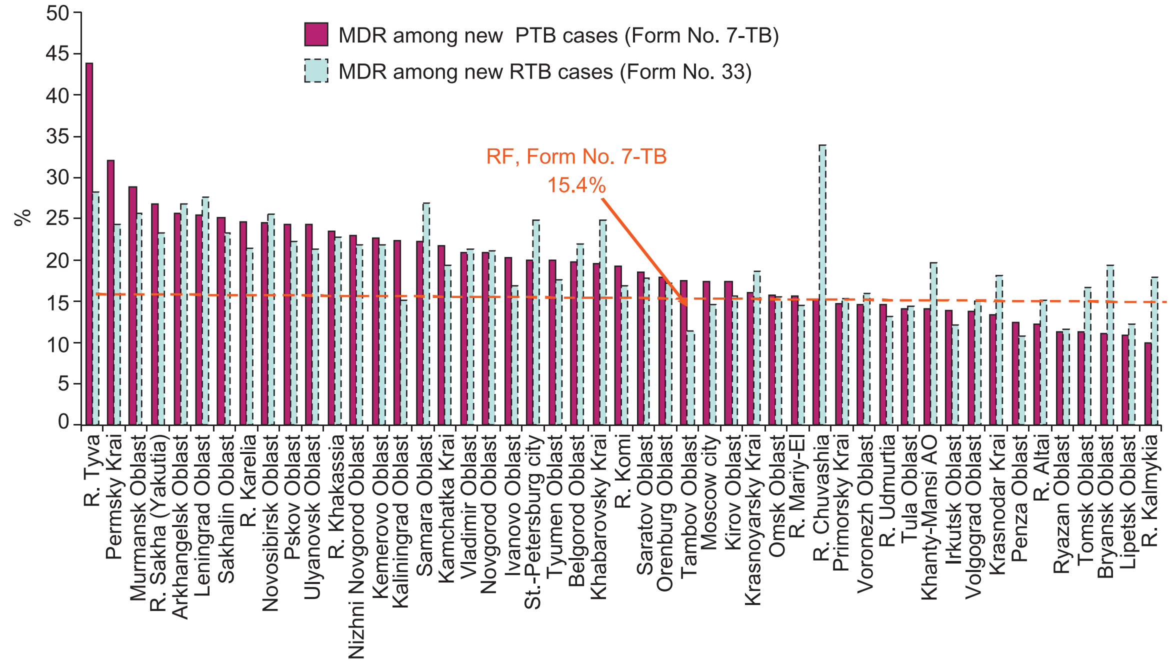


Fig. 10.5. Subjects of the Russian Federation with the highest levels of MDR TB among new PTB cases who had DST (Form No. 7-TB). Territories are shown with MDR TB in this group of TB patients more than 10%[108]. For comparison, data are presented on MDR TB cases among new RTB cases with DST performed (blue columns, Form No. 33), 2009 (Source: Forms No. 33 and No. 7-TB)

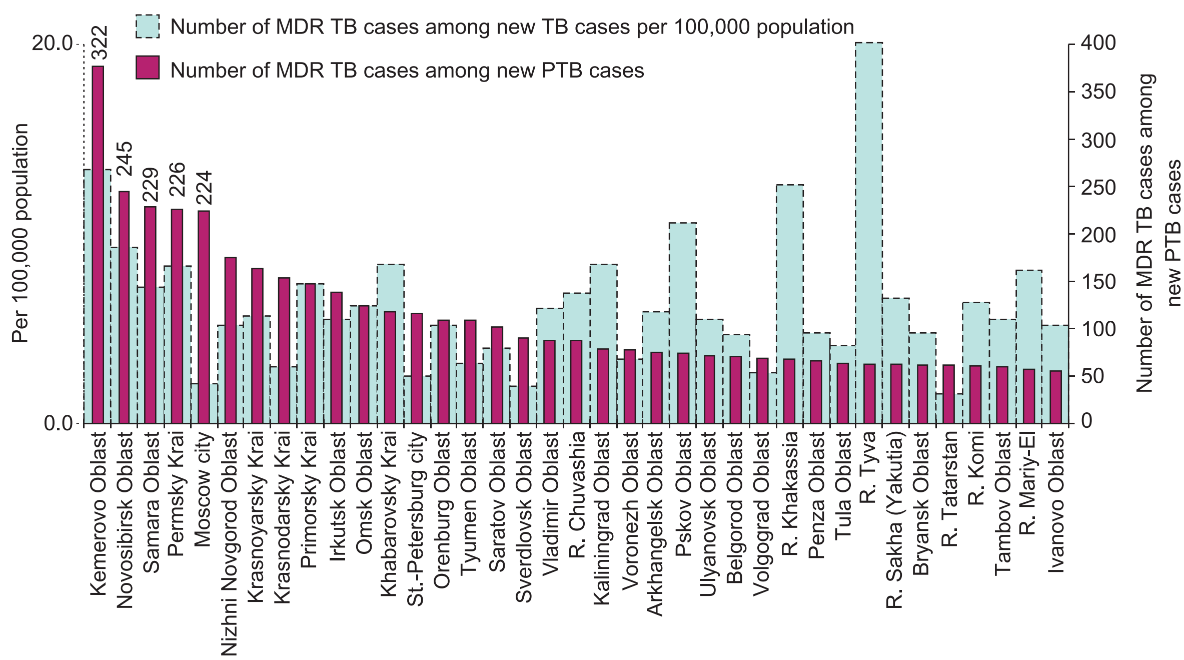


Fig. 10.6. Subjects of the Russian Federation with the highest number of reported MDR TB cases among new PTB cases before treatment (which include 80% of all MDR TB cases among new registered TB cases in the Russian Federation). Blue columns indicate MDR TB levels among new registered MDR TB cases per 100,000 population in these territories. 2009 (Source: Form #7-TB)

[108] This graph includes territories (2007) with >5 MDR TB cases registered, >50% DST coverage of new culture-confirmed PTB patients and >35% MbT+ cases confirmed by culture.

Fig. 10.6 shows the subjects of the Russian Federation where 80% of the total number of MDR TB cases among new TB patients in the country were recorded. Given that treatment of patients with MDR TB requires significant investments in second-line drugs and specific treatment management, this information is important for planning the allocation of adequate financial resources and respective activities in these regions. Five subjects are notable in this list, since more than a quarter of all patients in the Russian Federation with MDR TB at the time of registration – Kemerovo, Samara, Novosibirsk oblasts, Perm Krai and Moscow city.

As indicated above, there were differences in the indicators of MDR TB spread among new registered TB patients as calculated based on reporting forms No. 7-TB and No. 33. But this difference should not be too significant. Therefore, the degree of divergence between the indicators of MDR TB among new TB cases and the absolute number of MDR TB among new TB cases based on these forms may be regarded as an important indicator reflecting possible shortcomings in the registration of MDR TB patients in a territory[109].

Analysis of data partially presented in Fig. 10.5 shows that in some territories the indicators calculated basing on these forms may differ by 1.5 or more times. In Bryansk, Moscow, Sverdlovsk, Rostov, Tver, Kurgan oblasts and in the republics of Kalmykia, Buryatia, Dagestan, Adygea and Chuvashia, the proportion of MDR registered basing on Form No. 33 is significantly higher compared with the indicator calculated basing on Form No. 7-TB. On the contrary, the proportion of MDR calculated according to Form No. 7-TB is substantially higher compared to that registered in Form No. 33 in the republics of Tyva, North Ossetia and Karachaevo-Cherkessia. Further analysis is needed to understand causes underlying these differences.

10.4. MDR TB prevalence among relapse TB and all TB patients in the Russian Federation

In addition to the spread of MDR TB among new TB cases, the reporting forms used in Russia allow for the calculation of (a) spread of MDR TB among relapse TB patients at the time of diagnosis and registration for treatment, and (b) MDR TB spread among all TB cases at the end of reporting year.

With a high DST coverage of relapse TB cases (90%), in 2009 the proportion of MDR TB cases in TB control facilities in the subjects of the Russian Federation was 33.5% (1890 MDR TB cases). In the penitentiary system facilities – 36.6% (424 MDR TB cases) – Fig. 10.7.

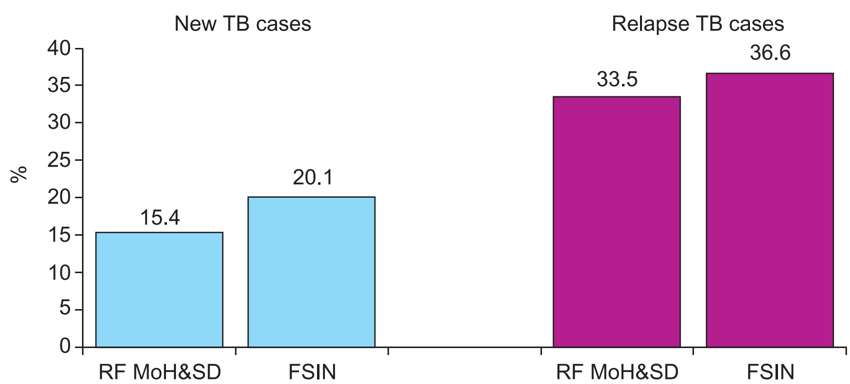


Fig. 10.7. MDR TB proportion among new and relapse PTB cases who had DST, 2009
(Source: Forms No. 7-TB received from MoH&SD and FSIN)

A high level of MDR TB among relapse TB patients in comparison with the MDR TB level among new TB cases may presumably indicate a high rate of reinfection with MDR strains during previous hospitalization caused by inadequate infection control or due to errors in classification of previous treatment outcomes.

As indicated above, in Russia the evaluation of MDR TB spread among all TB patients is based on the extensive indicator (i.e. the proportion of such cases among all RTB patients registered at the end of the year), and with the intensive indicator (MDR TB prevalence per 100,000 population).

According to Form No. 33, the number of all patients with MDR TB and their proportion among RTB patients continued to increase: there were 29,031 (23.4%) MDR TB patients registered in 2009 (Fig. 10.8 and 10.9). There was also a considerable variation by region in the levels MDR TB among RTB patients – from 5.5% in the Republic

[109] For example, that can be caused by an incomplete registration in the forms [26] of data pertaining to drug resistance, or by a significant share of DST tests performed in new TB cases later than 1 month after the beginning of treatment with results included in the MDR section of Form No. 33 relating to new registered cases, etc.

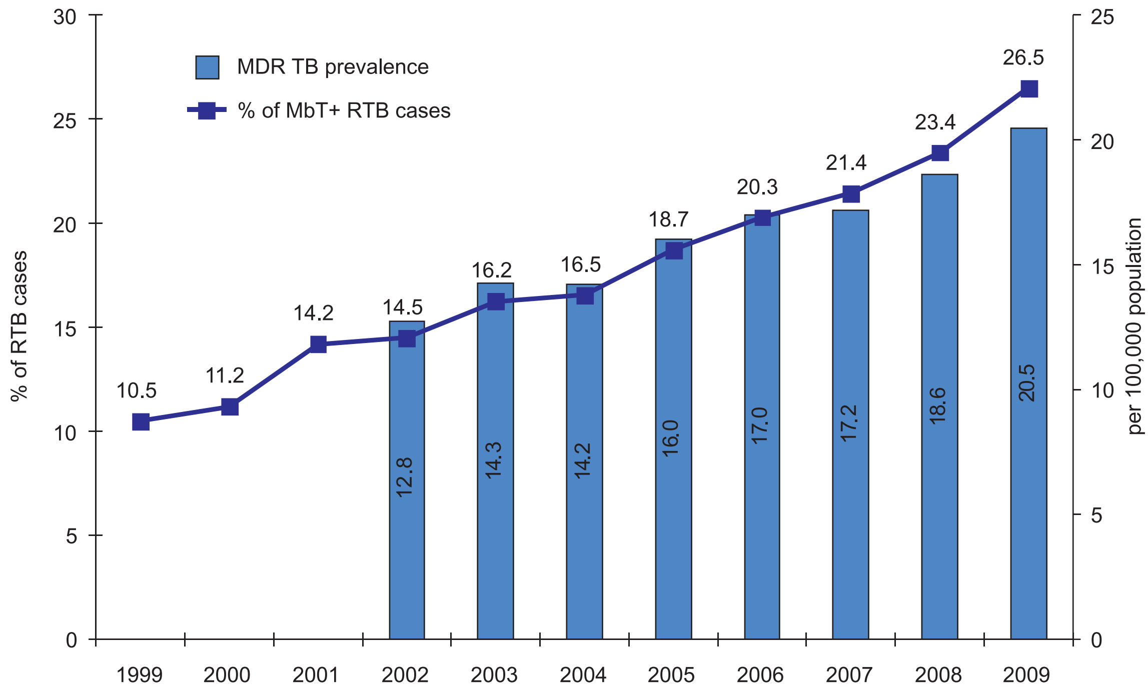


Fig. 10.8. Multi-drug resistance among all MbT+ RTB patients, the proportion among RTB cases and MDR TB prevalence per 100,000 population, the Russian Federation (Source: Form No. 33)

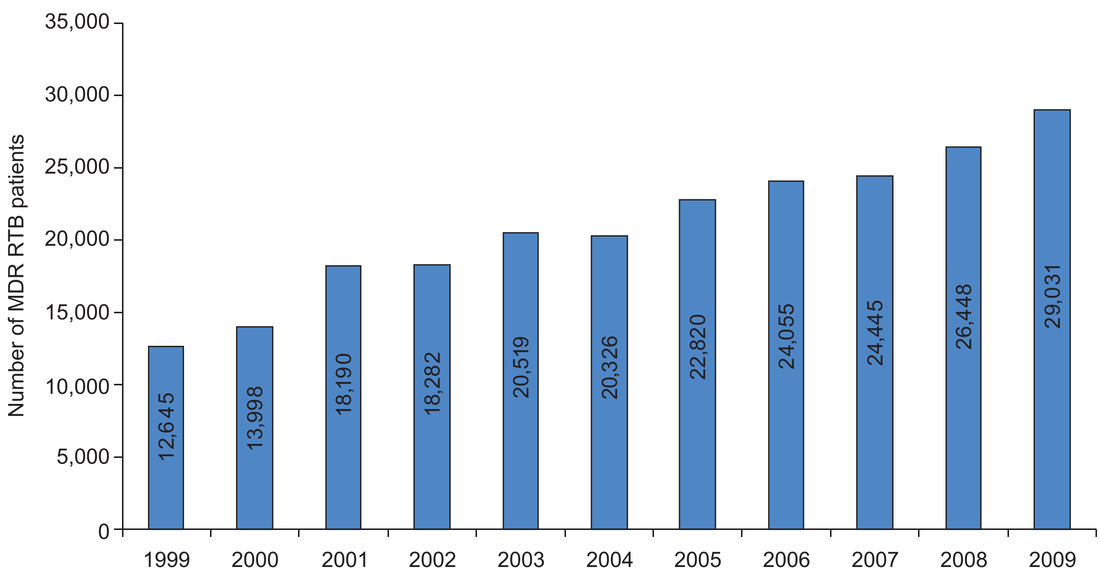


Fig. 10.9. Number of MDR TB patients in the Russian Federation in 1999–2009 (Source: Form No. 33)

of Dagestan to 52.5% in Pskov Oblast. Half the subjects of the Russian Federation had proportions of MDR TB from 20.7% to 35.5% (25% and 75% quartiles[110]). The highest proportions of MDR TB among all registered RTB patients (over 45%) were in Pskov, Belgorod, Arkhangelsk, Ivanovo oblasts and in the Republic of Khakassia.

At the same time it should be noted that the value of this indicator in different territories depends not only on the number of MDR TB patients registered at the end of the year (the numerator), but also on the total number of TB patients including chronic cases (the denominator in the calculation formula). This is why a high value of the indicator (the proportion of MDR TB among all registered Mbt+ RTB patients) may also be observed due to the effective work of laboratory service in detecting MDR TB cases and to successful TB treatment in dispensary facilities resulting in reducing the overall number of registered TB patients. Consequently, the proportion of MDR TB among registered TB patients may increase. In this case it is worthwhile to use the intensive indicator in comparisons of regions, i.e. MDR TB prevalence (rate per 100,000 population).

[110] 25% and 75% quartiles indicate the ranges of smaller values registered in 25% and 75% territories, respectively, i.e. values within 25% and 75% quartiles were registered in half the subjects of the Russian Federation.

For example, if the above-mentioned high proportion of MDR TB among all TB patients in Arkhangelsk Oblast (47.8%) significantly exceeds the countrywide indicator (26.5%), the number of MDR TB cases per 100,000 population in this territory is quite comparable with the nationwide indicator (19.7% and 20.5%, respectively).

It may be also assumed that the significant growth of the proportion of MDR TB cases among RTB patients in 2004–2009 (see Fig. 10.8) may associated be with a considerable decrease of the total number of TB patients during this period, which is denoted in the denominator of the calculation formula for this indicator (see Chapter 4). Anyhow, in Fig. 10.8, there is also a pronounced growth of MDR TB prevalence per 100,000. But this indicator does not depend on the total number of TB patients. The total number of MDR TB patients registered at the end of the year is also steadily growing (Fig. 10.9).

In 2009, the highest proportions of MDR TB among RTB patients were reported in NWFR (33.0%), PFR (29.5%) and SbFR (30.3%), while MDR TB prevalence rates in SbFR and FEFR were 37.9 and 28.9 per 100,000, respectively (Fig. 10.10).

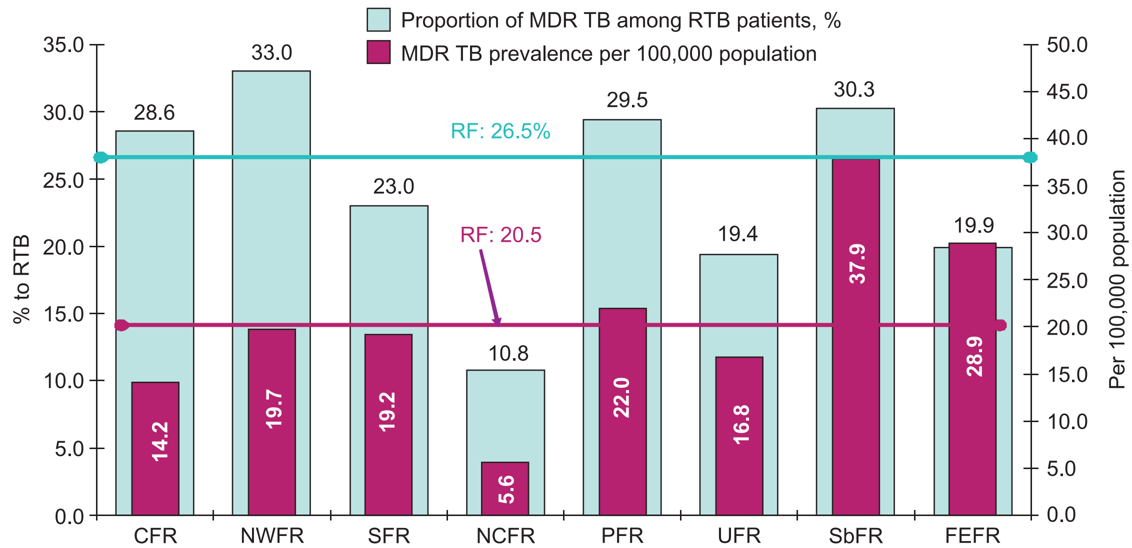


Fig. 10.10. MDR TB proportion among all MbT+ RTB patients and MDR TB prevalence in the Federal Regions of the Russian Federation, 2009 (Source: Form No. 33; population – Form No. 4)

Fig. 10.11 shows data on 42 subjects of the Russian Federation, which account for 80% of all MDR TB patients registered in the country at the end of 2009. This information is important for allocation of resources needed for

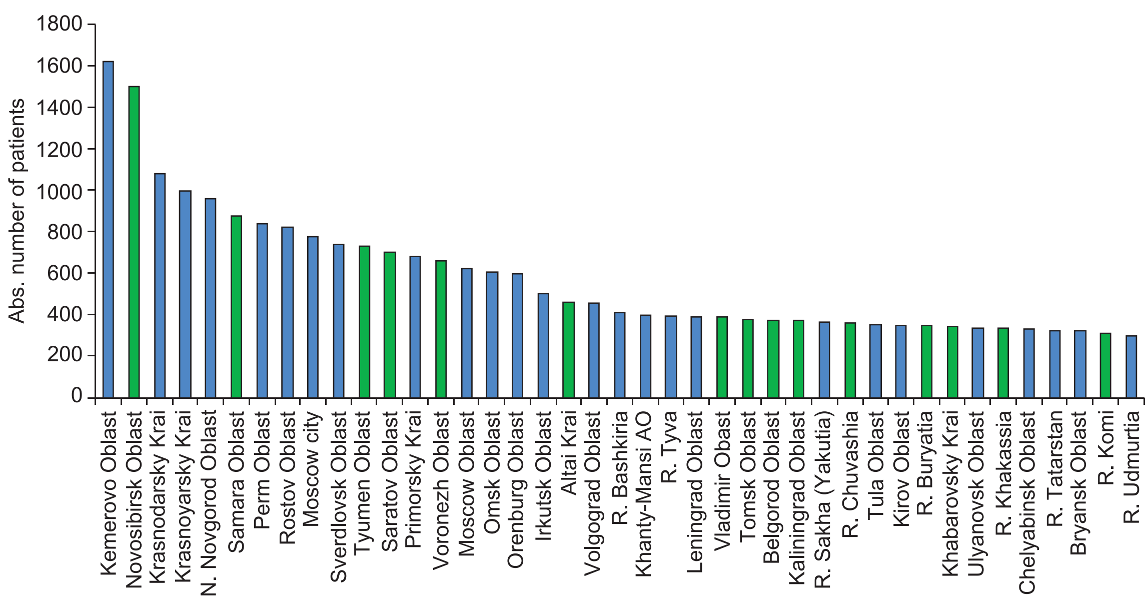


Fig. 10.11. Subjects of the Russian Federation with highest numbers of MDR TB patients registered at the end of 2009 (80% of all patients with MDR TB in the Russian Federation). Territories with applications approved by GLC by the end of 2009 are shown in green (Sources: the number of patients with MDR TB – Form No. 33; GLC application data – WHO TB control program in the Russian Federation)

provision of expensive second-line TB drugs and for the implementation of activities in the organization of treatment for MDR TB patients. The graph shows 15 territories (green columns), whose applications for purchase of medicines of guaranteed quality through international funds have been approved by the Green Light Committee (GLC)[111] (these territories have 8,428 registered cases of MDR TB). In addition to the territories shown in the graph, another 12 areas with 1,932 MDR TB patients will receive second-line drugs through the GLC channels.

10.5. Estimation and notification of MDR TB cases in the world

Monitoring and estimation of indicators related to the spread of drug-resistant TB in different countries, regions and in the world is characterized by more difficulties as compared to the other basic indicators for TB. This problem is primarily connected with the fact, that most countries do not have necessary technical and financial resources for performing DST complying with required quality and quantity standards.

This is why for calculations of MDR TB spread in the world the World Health Organization uses data from a limited number of effective national systems of surveillance of anti-tuberculosis drug resistance, along with special sample surveys of drug resistant TB spread and the estimation of MDR TB spread based on special mathematical models [54, 58].

In 1994, on the initiative of WHO and IUATLD (The UNION), the WHO/UNION Global Project on anti-tuberculosis drug resistance surveillance was started. The Global Project is aimed at the assessment of drug resistant TB spread in the world ("the global burden of drug-resistant TB") with special standardized methodologies, which allows for an adequate comparison of the situation with anti-tuberculosis drug resistance in different countries and regions. The Global Project controls trends in drug-resistant TB spread, evaluates the effectiveness of anti-tuberculosis activities in combating MDR TB and other aspects related to the drug-resistant TB problem. Global Project reports were published approximately every three years. It was assumed that this period of time was required for planning, organization and implementation of studies on drug-resistant TB problem in individual countries. Four Global TB drug resistance reports have been issued since that time (in 1997, 2000, 2004 and 2008), and the "Multidrug and extensively drug-resistant TB (M/XDR-TB). 2010 Global Report On Surveillance And Response" [58], which was an update of "Anti-tuberculosis drug resistance in the world: Report No. 4". The latter included for the first time information on the progress reached in diagnosis and treatment of MDR TB.

Since 1994, within the Global Project, MDR TB data have been received from 114 (59%) countries of the world, including 42 countries with regular systems of routine surveillance of anti-tuberculosis drug resistance and 72 countries with periodic DR TB surveys. The remaining countries (41%) cannot so far provide reliable and representative data on anti-tuberculosis drug resistance spread. The data were included in the Global Report if they meet 3 basis criteria:

- collected data should accurately represent the TB patient population in the country / geographical setting under study;
- reported data should allow for differentiation between new and previously TB treated cases;
- DST methods must be chosen from those that are WHO-recommended and all the laboratories participating in data collection should be involved in the quality assurance system in cooperation with respective supranational reference laboratories.

If the first three reports included data on 35, 58 and 77 countries, respectively, the 4th Global Report presented data received from 81 countries and 2 administrative territories in China. These countries contribute 35% of the total reported number of new ss+ TB cases [61]. The most recent report for 2010 [58] contained, in addition to the 4th Global Report, updated data from 35 countries.

In calculations of MDR TB spread in different countries, the Global Project considers 3 indicators:

- the proportion of MDR TB cases registered before treatment among new TB cases who never received treatment from TB or received treatment for less than 1 month[112];
- the proportion of MDR TB cases registered before treatment among patients who received treatment earlier for more than one month (relapses, patients on treatment after treatment failure, treatment interruption, and other re-treatment cases);
- the summarized indicator calculated from the proportion of MDR TB cases registered before treatment both among new and re-treatment cases.

---

[111] GLC is a group of independent international experts on policy, research and clinical aspects of tuberculosis. One of its activities is to increase the availability of expensive second-line drugs needed to treat MDR TB. Reduced prices for these drugs have been made possible through GLC close cooperation with pharmaceutical companies.

[112] In addition to new TB cases, the data also includes TB patients who were registered earlier in another reporting period but did not start treatment or received treatment for less than 1 month before DST was done.

In all cases the denominator shows the number of respective number of patients who had DST[113].

In should be noted that, according to the WHO guidelines [39, 40], in the calculation of the first indicator (the proportion of MDR TB cases among patients who never received treatment or received treatment for less than 1 month), DST results should be taken into account only if materials for tests were collected before treatment.

It is also important to note that considering the fact that most countries do not have developed systems of dispensary follow-up of TB patients, so the calculations of MDR TB spread among patients on re-treatment include only MDR TB confirmed test results at the time of patient registeration for re-treatment.

This is why the Global Project methodology does not include calculations of drug resistance spread indicator reflecting the total number of MDR TB patients in the population regardless whether drug resistance was diagnosed in the reporting year or earlier, in the beginning of treatment, during treatment or at the end of chemotherapy. The lack of data on the overall number of MDR TB patients at specified (reporting) period does not allow for the direct application of research results to the calculation of requirements in second-line drugs needed for coverage of MDR TB patients.

As mentioned above, for most countries of the world, there are either no data on MDR TB rates obtained nationwide, but only some limited information from some areas, or, the quality of results received from laboratories is very low. This is why the World Health Organization uses the mathematical estimation of MDR TB spread among TB patients [58, 61].

Estimates of the numbers and proportions of MDR TB cases are made among new TB patients (who never received treatment from TB or received treatment for less than one month), and among re-treatment cases (for patients who received treatment for 1 month and more), and in total among all TB cases. MDR TB rates are calculated based on the most recent anti-tuberculosis drug resistance data received from routine surveillance and special surveys performed in 113 countries and territories for new TB cases and from 102 countries and territories for re-treatment cases. Also, with respect to countries where TB drug resistance data are collected in some areas, it is assumed that these data are only partially indicative of the real situation, therefore the data are re-calculated in a way to receive the overall estimate on the national level [54, 58].

According to WHO estimates, in 2008 the global number of MDR TB episodes among new and relapse TB patients ranged from 310,000 to 430,000, with the best estimate at 360,000 cases [58]. The same year, the number of acquired MDR cases was 94,000.[114] Therefore, it was estimated that in 2008, the overall number of MDR TB cases amounted to 440,000 (from 390,000 to 510,000), including primary and secondary drug resistance cases. According to the estimates, in 2008, MDR TB developed in 3.6% of new and relapse TB cases (95% CI 3.0–4.0).

Table 10.1 and Fig. 10.13 contain information on the estimates of the total number of MDR TB cases (both primary and secondary) in the WHO regions and among some countries. In addition to the WHO regions, the table primarily includes data on 27 countries with high burden of MDR TB. These countries contribute to 85% of the worldwide MDR TB rate, and have been defined by the World Health Organization as priority countries, i.e. requiring improvements in the diagnosis and treatment of MDR TB.

According to the WHO estimates, India and China have almost half (45%) of the global number of MDR TB cases, which amounts to almost 200,000 (Fig. 10.12). The Russian Federation ranks third in the list of countries with significant numbers of MDR TB patients (8.6% of all cases in the world). Obviously, this is connected not only with high levels of MDR TB, but also with the population size in these countries.

In the Russian Federation, the MDR TB indicator per the total number of TB patients is estimated at 15.8% and 42.4% of re-treatment TB cases. According to estimates, the highest levels of MDR TB among new TB patients were in Azerbaijan (22.3%) and Republic of Moldova (19.4%), and among re-treatment TB cases – in Lebanon (62.5%), Tajikistan (61.6%), Kazakhstan (56.4%), Azerbaijan (55.8%), Republic of Moldova (50.8%) and Greece (50.0%).

As indicated above, considering from the viewpoint of the local hazard for the population, the influence of MDR TB ("local MDR TB burden") is better expressed in the intensive indicators, namely, through the number of MDR TB cases per 100,000 population (Fig. 10.12). The prevalence indicator calculated based on the WHO estimate of the total number of people with MDR TB has high rates in Tajikistan (58.5 per 100,000 population, Republic of Moldova (57.8), Kazakhstan (52.2) and Azerbaijan (45.8).

The data presented in Table 10.2 indicate low registration coverage of MDR TB cases in many countries. Among new TB cases, only 3% of estimated MDR TB cases are registered in the world. In India and China, only 100–300 cases of almost hundreds of thousands of estimated annual MDR TB cases were registered and submit-

113 Initially, in compliance with the protocol [46], ss+ patients were included in the study of anti-tuberculosis drug resistance.

114 The estimates take into account that previously treated TB patients may have MDR acquired during treatment or be infected with MDR strains from external sources of infection. Therefore, MDR TB episodes are calculated as episodes among new and relapse TB cases and are not included again among re-treatment cases.

Table 10.1

MDR TB cases number and proportion, 2008 – WHO estimate

Region/ country	Source of data used for estimate	% of MDR TB among new TB patients (95% CI)	% of MDR TB among previously treated TB patients (95% CI)	Number of MDR TB cases among new and relapse TB patients (95% CI)	Number of acquired MDR TB cases (95% CI)	Total number of MDR among TB cases (95% CI)
All countries					440,000 (390,000 – 510,000)	440,000 (390,000 – 510,000)
Europe					81,000 (73,000 – 90,000)	81,000 (73,000 – 90,000)
America					8,200 (7,300 – 9,300)	8,200 (7,300 – 9,300)
Africa						69,000 (53,000 – 110,000)
India#	DRS*, 2005	2.3 (1.8–2.8)	17.2 (14.9–19.5)	55,000 (40,000–74,000)	43,000 (33,000–56,000)	99,000 (79,000–120,000)
China#	DRS, 2007	5.7 (5.0–6.6)	25.6 (22.6–28.3)	84,000 (65,000–106,000)	1,5000 (12,000–20,000)	100,000 (79,000–120,000)
RF#	DRS*, 2008	15.8 (11.9–19.7)	42.4 (38.1–46.7)	26,000 (20,000–34,000)	12,000 (8,700–15,000)	38,000 (30,000–45,000)
South Africa#	DRS, 2002	1.8 (1.5–2.3)	6.7 (5.5–8.1)	10,000 (7,500–13,000)	2,800 (1,900–3,900)	13,000 (10,000–16,000)
Kazakhstan#	DRS, 2001	14.2 (11.0–18.2)	56.4 (50.9–61.8)	5,300 (3,900–6,900)	2700 (2,100–3,500)	8,100 (6,400–9,700)
Ukraine#	DRS*, 2002	16.0 (13.8–18.3)	44.3 (40.0–48.7)	8,200 (6,500–10,000)	440 (340–570)	8,700 (6,800–11,000)
Uzbekistan#	DRS*, 2005	14.2 (10.4–18.1)	49.8 (35.8–63.8)	5,700 (4,000–7,700)	3,000 (1,700–4,400)	8,700 (6,500–11,000)
Azerbaijan#	DRS, 2007	22.3 (19.0–26.0)	55.8 (51.6–59.9)	2,800 (2,200–3,500)	1,200 (940–1,600)	4,000 (3,300–4,700)
R. Moldova#	DRS, 2006	19.4 (16.8–22.2)	50.8 (48.7–53.0)	1,500 (1,200–1,800)	620 (490–770)	2,100 (1,700–2,400)
Kyrgyzstan#	model	12.5 (0.0–25.3)	42.1 (11.9–72.2)	1,200 (230–2,300)	140 (13–310)	1,400 (350–2,400)
Belarus#	model	12.5 (0.0–25.3)	42.1 (11.9–72.2)	660 (130–1,200)	140 (12–300)	800 (260–1,300)
Georgia#	DRS, 2006	6.8 (5.2–8.7)	27.4 (23.7–31.4)	360 (270–460)	310 (240–380)	670 (550–780)
Armenia	DRS, 2007	9.4 (7.3–12.1)	43.2 (38.1–48.5)	260 (180–350)	220 (160–290)	480 (380–580)
Lithuania#	DRS, 2008	9.0 (7.5–10.7)	47.5 (42.9–52.2)	270 (210–330)	68 (55–83)	330 (270–390)
Latvia#	DRS, 2008	12.1 (9.9–14.8)	31.9 (24.9–39.9)	160 (130–200)	4 (2–6)	170 (140–200)
Estonia#	DRS, 2008	15.4 (11.6–20.1)	42.7 (32.1–53.9)	85 (64–110)	9 (5–13)	94 (71–120)
Peru	DRS, 2006	5.3 (4.3–6.4)	23.6 (19.5–28.3)	2,300 (1,800–2,800)	300 (220–390)	2,600 (2,000–3,100)
USA	DRS, 2007	1.1 (0.9–1.3)	3.8 (2.5–5.9)	180 (140–220)	14 (6–24)	190 (150–230)
Germany	DRS, 2008	0.7 (0.4–1.1)	11.0 (7.5–15.8)	31 (17–48)	25 (15–37)	56 (37–74)
United Kingdom	DRS, 2007	1.0 (0.7–1.3)	6.4 (3.3–12.1)	72 (48–100)	26 (9–51)	98 (66–130)
Israel	DRS, 2005	3.6 (1.8–6.9)	33.3 (1.7–79.2)	16 (7–28)	1 (0–2)	16 (6–27)
Czech R.	DRS, 2008	2.1 (1.1–3.8)	2.7 (0.1–13.8)	19 (9–33)	1 (0–5)	20 (8–33)

[#] Among 27 counties with high burden of MDR TB. The list of high MDR TB burden countries also includes Bangladesh, Pakistan, Indonesia, Philippines, Nigeria, DR Congo, Vietnam, Ethiopia, Bulgaria, Tajikistan, and Myanmar.

* Estimates are based on data received from some sub-national territories.

DRS – drug resistance studies or routine drug resistance surveillance system data.

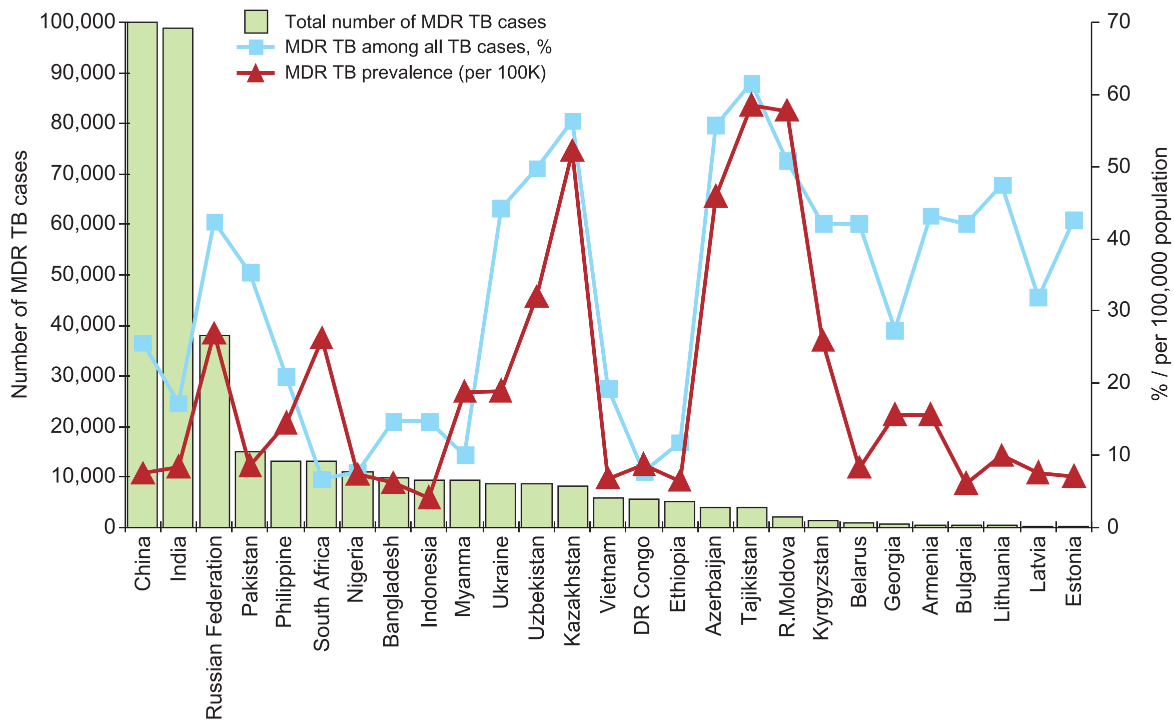


Fig. 10.12. MDR among all (new and re-treatment) TB cases in different countries according to WHO estimate, 2008. The number and proportion of MDR TB patients among all TB cases and the number of MDR TB per 100,000 population (Sources: [58]; population – WHO data [54])

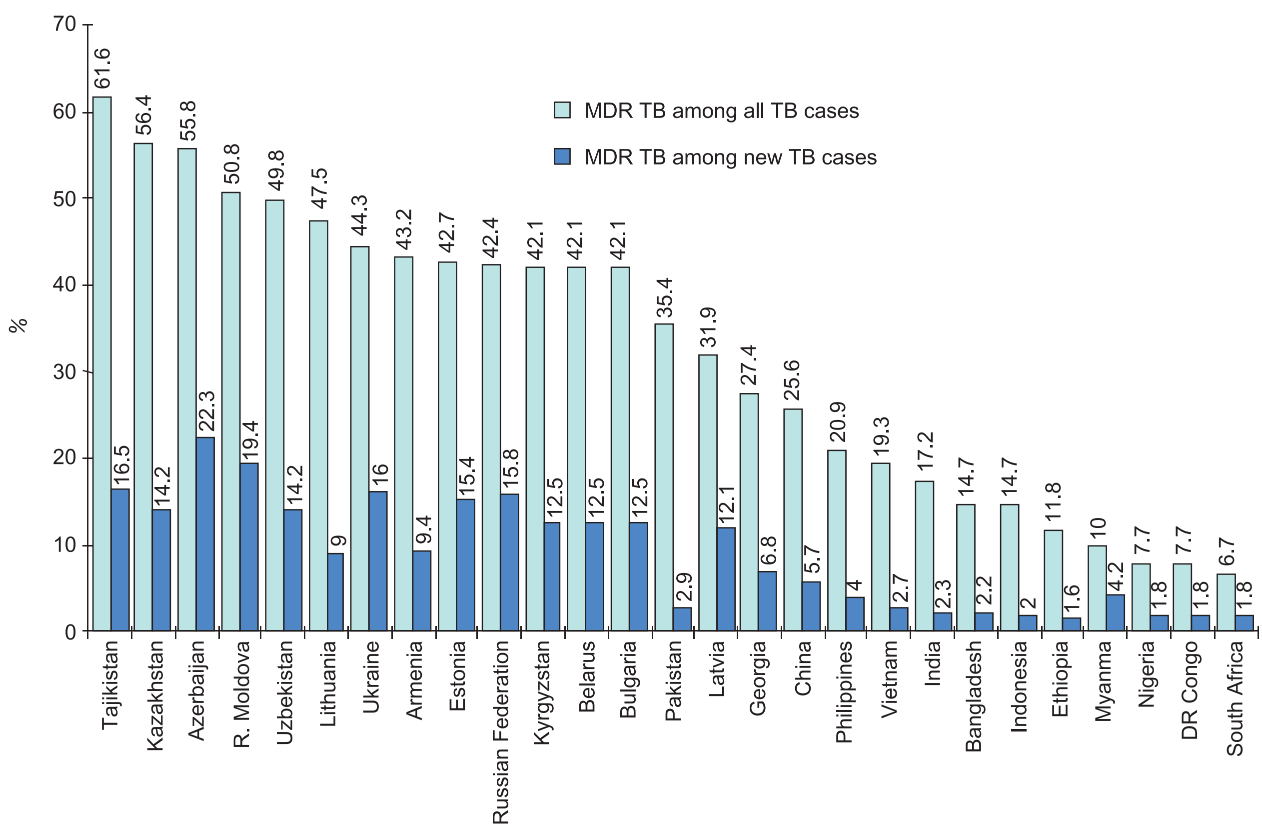


Fig. 10.13. Proportions of MDR TB cases among new and re-treatment TB cases in different countries according to WHO estimate, 2008 (Source: [58])

ted to the Global Report in recent years (e.g. 146 and 79 cases, respectively, were reported in 2007). It should be noted that the Russian Federation has the most compete registration of MDR TB cases in the world in relation to the estimate (among 20% of all estimated new TB cases). At the end of 2009, there were about 37,000 MDR TB patients registered in RF regional TB facilities and FSIN institutions, which was slightly less the WHO estimate (38,000).[115]

The difficulties arising in the implementation of effective drug resistance control impelled the WHO Global Task Force on TB Impact Measurement to consider the improvement of anti-tuberculosis drug resistance control as a priority in combating the disease. The 2010 Global Report on surveillance and response to multidrug and extensively drug-resistant TB [58] stressed the need for the development and improvement of national systems of drug-resistant TB surveillance. This goal was also set in a resolution adopted by the 62th World Health Assembly (WHO 62.15) in 2009. Therefore, in the WHO Global Report [58], particular attention was given to data relating to the spread of drug-resistant TB based on the information received from national systems of continuous surveillance of drug-resistant TB. It should be noted that only data were considered which complied with the WHO established criteria of representativeness and quality. As compared with the previous year, the Global Report contained updated information received from 30 countries and 3 territories with systems of continuous surveillance and 6 countries which had performed special surveys. Overall, the Global Report [58] included information on MDR-TB cases registered in almost 50 countries that had presented national surveillance data complying with the established quality and representativeness requirements (Fig. 10.14). Some countries provided data from selected territories. All the countries presented in the report had high or medium levels of national income. The selected countries and territories were divided into two classes based on the WHO established criteria. Class A (a high degree of representativeness and accuracy) included countries and territories that have continuous drug resistance surveillance systems with the following criteria met [58]:

– new case detection rate or new smear positive case detection rate over 50%;
– positive culture available in at least 50% of all notified cases;
– DST results available in at least 75% of all cases with positive culture;
– accuracy of at least 95% for isoniazid and rifampicin in the most recent DST proficiency testing exercise with a supranational reference laboratory.

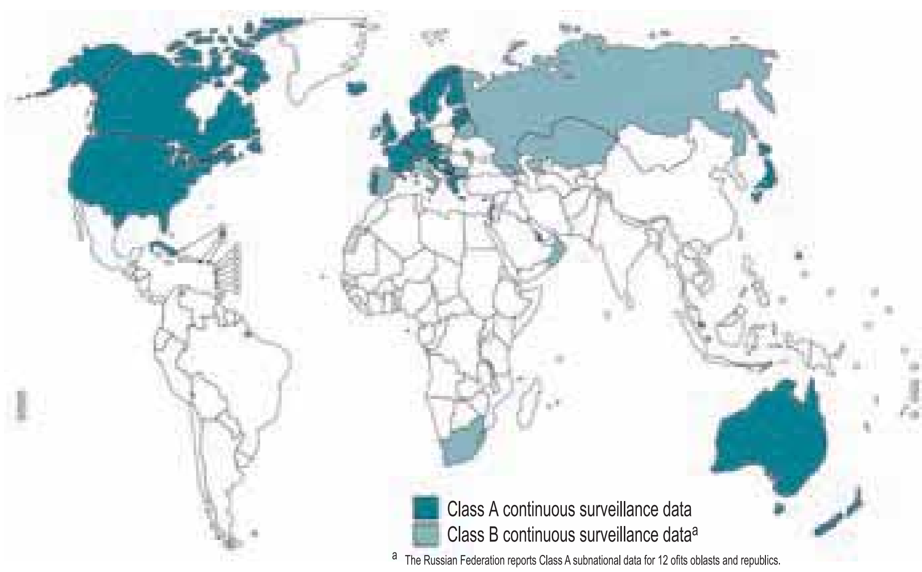


Fig. 10.14. Countries included in the 2010 DR Global Report [58]. Distribution of countries with Class A and Class B continuous drug resistance surveillance data

Class B (a moderately high degree of representativeness) included countries with continuous drug resistance surveillance systems data available on drug susceptibility from routine testing not meeting the criteria for Class A data, but meeting the following criteria:

– positive culture available in at least 35% of all notified cases;
– DST results available in at least 50% of all cases.

[115] This comparison is not entirely correct and may be regarded as approximate. 37,000 MDR TB patients were registered in the Russian Federation as at the end of the year irrespective of the year when they were notified as MDR TB cases and whether or not the patients were on treatment. According to the WHO estimate, in 2008, 38,000 MDR cases should have been registered as patients on primary and secondary treatment courses.

Class A included 30 countries, 2 territories in China, and 12 subjects of the Russian Federation. Class B – 17 countries, including the Russian Federation as a whole and 8 subjects of the Russian Federation.[116]

It should be noted that the 4th Global Report [46] included data from only 4 subjects of the Russian Federation (Orel, Pskov, Tomsk oblasts and Republic of Mari-El), whereas the 2010 DR Report [58] provided data from 20 subjects of the Russian Federation (Class A: Belgorod, Bryansk, Vladimir, Ivanovo, Orel, Arkhangelsk, Kaliningrad, Murmansk, Pskov, Tomsk oblasts, republics of Mari-El and Chuvashia; Class B: Ryazan, Vologda, Tyumen, Novosibirsk, Omsk oblasts, republics of Altai and Karelia, Yamal-Nenets AO).

The substantial increase in the number of subjects of the Russian Federation with the data complying with the WHO criteria was noted in the DR Global report as a success in the development of the national system of drug resistance surveillance.

The national surveillance systems data included in Classes A and B are shown in Table 10.3 and Fig. 10.15.

Table 10.2

Estimated numbers of MDR TB cases, notified MDR TB cases and DST coverage in 27 countries with high burden of MDR TB [54]

Country	Estimated total number of MDR TB cases	Total number of notified MDR TB cases	DST coverage and MDR TB among new TB cases		DST coverage and MDR TB among previously treated TB patients	
			% of notified new TB cases covered with DST	Number of MDR TB cases among new TB cases	% of registered previously treated patients covered with DST	Number of MDR TB cases among previously treated patients
Armenia	480	128	28	60	31	68
Azerbaijan	4,000	—	—	—	—	—
Bangladesh	9,800	147	—	—	7.3	147
Belarus	800	923	39	301	—	516
Bulgaria	460	32	29	14	66	18
China	100,000	—	—	—	—	—
DR Congo	5,600	128	0.0	3	2.4	125
Estonia	94	74	77	42	100	32
Ethiopia	5,200	130	—	—	—	—
Georgia	670	481	41	190	43	290
India	99,000	308	—	—	0.5	308
Indonesia	9,300	446	—	—	—	—
Kazakhstan	8,100	3,676	28	1,384	37	1,950
Kyrgyzstan	1,400	269	7.8	97	36	172
Latvia	170	129	75	83	98	46
Lithuania	330	276	67	113	100	162
Myanmar	9,300	508	—	—	7.5	508
Nigeria	11,000	23	0.2	9	0.3	14
Pakistan	15,000	40	0.0	2	0.5	38
Philippines	13,000	929	0.1	14	15	729
R. Moldova	2,100	1,048	31	300	65	748
Russian Federation	38,000	6,960*	30*	5,061	86	1,899
South Africa	13,000	6,219	—	—	—	—
Tajikistan	4,000	—	—	—	—	—
Ukraine	8,700	—	—	—	—	—
Uzbekistan	8,700	342	0.3	52	5.6	290
Vietnam	5,900	—	—	—	—	—
27 countries with high burden of MDR TB	380,000	23,216	1.3	7,725	3.3	8,060

* Data for the Russian Federation reported to the World Health Organization include only information on MDR TB cases and cases detected among new and relapse TB patients registered according to cohort analysis forms in the beginning of treatment.

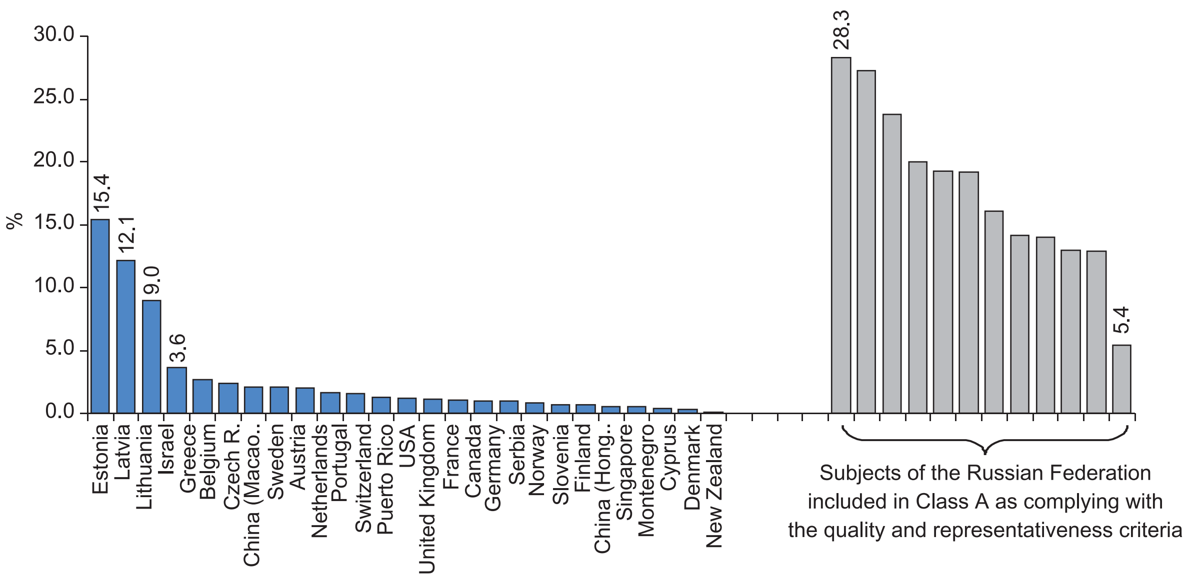
[116] Initially, the selection criteria for Class B were more strict requiring limitations related to the degree of accuracy of tests for isonizid and rifampicin in DST proficiency testing with a national reference laboratory, therefore, limiting to 8 the number of the Russian Federation territories included in Class B. Much more subjects of the Russian Federation meet the criteria used in the Global Report.

Table 10.3

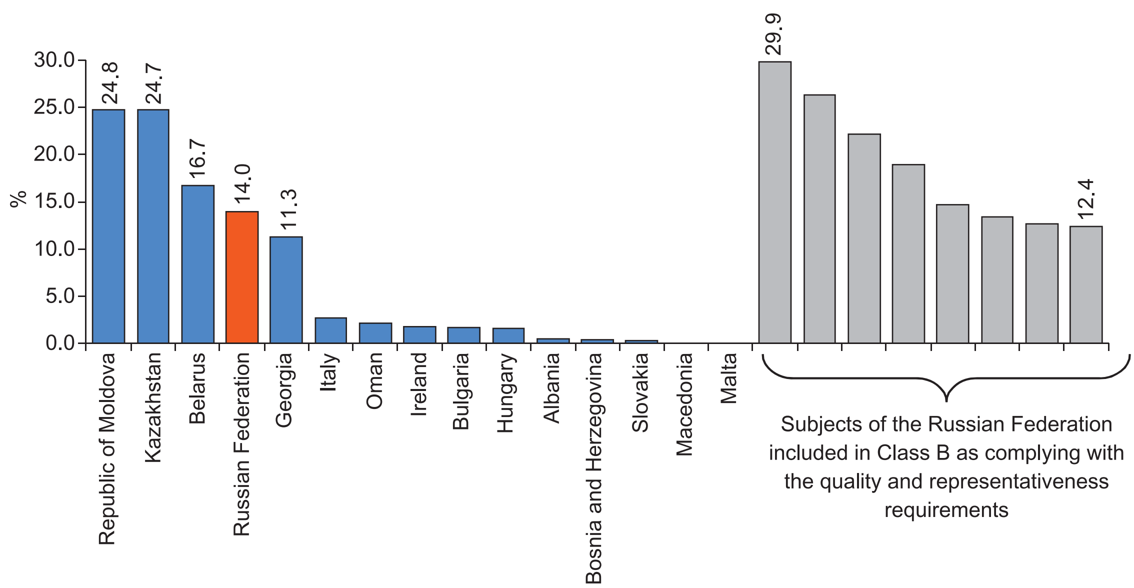
Selected countries and territories indicated in the Global Report [58] with national surveillance data on drug resistance that meet the WHO criteria for Class A and Class B, 2007–2008

Country/territory	Year	New TB cases			Re-treatment TB cases			All TB cases		
		DST tested cases (n)	MDR TB		DST tested cases (n)	MDR TB		DST tested cases (n)	MDR TB	
			n	%		n	%		n	%
CLASS A										
Latvia	2008	684	83	12.1	144	46	31.9	828	129	15.6
Lithuania	2008	1,259	113	9.0	356	162	45.5	1,616	276	17.1
Serbia	2008	923	6	0.7	130	10	7.7	1 058	16	1.5
Austria	2007	481	8	1.7	8	1	12.5	513	9	1.8
Belgium	2008	630	15	2.4	48	6	12.5	773	22	2.8
Canada	2008	1,098	9	0.8	91	4	4.4	1,249	14	1.1
China, Hong Cong SAR	2008	2,443	8	0.3	310	10	3.2	2,753	18	0.7
China, Macao SAR	2008	243	5	2.1	25	2	8.0	283	7	2.5
Czech R.	2008	483	10	2.1	37	1	2.7	520	11	2.1
Denmark	2008	253	0	0.0	28	0	0.0	281	0	0.0
Estonia	2008	272	42	15.4	75	32	42.7	347	74	21.3
Finland	2008	238	1	0.4	9	0	0.0	247	1	0.4
France	2007	1,255	12	1.0	102	7	6.9	526	20	1.3
Germany	2008	2,360	16	0.7	219	24	11.0	2,854	45	1.6
Israel	2008	222	8	3.6	3	1	33.3	225	9	4.0
Portugal	2008	1,496	19	1.3	145	9	6.2	1,641	28	1.7
United Kingdom	2007	3,441	34	1.0	251	14	5.6	4,715	56	1.2
USA	2007	9,608	104	1.1	496	19	3.8	10,196	125	1.2
Subjects of the Russian Federation										
Arkhangelsk Oblast	2008	290	69	23.8	68	40	58.8	358	109	30.4
Belgorod Oblast	2008	442	85	19.2	91	47	51.6	533	132	24.8
Bryansk Oblast	2008	549	71	12.9	54	15	27.8	603	86	14.3
Ivanovo Oblasts	2008	275	55	20.0	52	30	57.7	327	85	26.0
Kaliningrad Oblast	2008	436	84	19.3	51	22	43.1	487	106	21.8
R. Mari-El	2008	267	43	16.1	53	20	37.7	320	63	19.7
Murmansk Oblast	2008	173	49	28.3	14	5	35.7	187	54	28.9
Orel Oblast	2008	296	16	5.4	29	14	48.3	325	30	9.2
Pskov Oblast	2008	370	101	27.3	44	22	50.0	414	123	29.7
R. Chuvashia	2008	613	87	14.2	92	42	45.7	705	129	18.3
Tomsk Oblast	2008	424	55	13.0	80	43	53.8	504	98	19.4
Vladimir Oblast	2008	422	59	14.0	55	18	32.7	477	77	16.1
CLASS B										
Belarus	2008	1,802	301	16.7	1 230	516	42.0	3,237	923	28.5
Bulgaria	2008	833	14	1.7	105	18	17.1	938	32	3.4
Georgia	2008	1,685	190	11.3	720	290	40.3	2,409	481	20.0
Kazakhstan	2008	5,605	1 384	24.7	4,474	1,950	43.6	10,776	3,676	34.1
R. Moldova	2008	1,212	300	24.8	1 227	748	61.0	2,439	1,048	43.0
Russian Federation*	2008	36,249	5,061	14.0	6 404	1,899	29.7	42,653	6,960	16.3
South Africa	2008	–	–	–	–	–	–	84,012	8,026	9.6
Hungary	2008	509	8	1.6	102	8	7.8	611	16	2.6
Ireland	2008	114	2	1.8	8	0	0.0	146	3	2.1
Italy	2008	1,018	27	2.7	165	24	14.5	1,932	71	3.7

* In addition to national aggregate data, Class B also includes data from 8 subjects of the Russian Federation.



A) Class A – countries complying with data quality and representativeness criteria



B) Class B – countries complying with data representativeness criteria

Fig. 10.15. Registration of MDR TB among new TB cases by surveillance systems in different countries and territories, 2008 (Source: [58])

Overall, 29,423 MDR TB cases were notified in 127 countries in 2008, which was only 7% of the estimated number of MDR TB cases emerging in these countries. The date proves a low use of DST in many countries of the world, which can be explained by inadequate capacities of laboratory services and by the fact that in many countries MDR case-detection and diagnosis are performed in private sector facilities (e.g. in India) or public facilities are not adequately supervised by national TB control services (e.g. in China), which causes problems in data reporting. In 27 high-burden countries, only 1% of new TB cases and 3% of previously treated cases are covered with DST testing, and just a few countries, including Russia, have a relatively high DST coverage.

The national drug resistance surveillance systems and special surveys of drug resistance produced the following results. Proportions of MDR TB cases among new TB patients exceeding 12%[117] were registered in Azerbaijan (Baku city, 22.3%, 2007), Estonia (15.4%, 2008), Kazakhstan (14,2%, 2001), Latvia (12.1%, 2008), R. Moldova (19.4%, 2006), Tajikistan (Dushanbe city and Rudaki District, 16.5%, 2009), Ukraine (Donetsk Oblast, 16.0%, 2006), Uzbekistan (Karakalpak District, 13.2%, 2002, and Tashkent city, 14.8%, 2005), and in 11 oblasts of the Russian Federation (from 12.9% to 28.3%, 2008).

[117] Here and in the next paragraph, only countries with more than 10 MDR TB cases in a year are indicated.

Proportions of MDR TB cases among previously treated patients equal to or exceeding 50% were registered in Azerbaijan (Baku city, 55.8%, 2007), Kazakhstan (56.4%, 2001), R. Moldova (50.8%, 2006), Tajikistan (Dushanbe city, Rudaki District, 61.6%, 2009), Uzbekistan (Tashkent city, 60.0%, 2005), and in five oblasts of the Russian Federation (from 50.0% to 58.8%).

In recent years, more attention has been paid to the emergence of another dangerous form of drug resistant TB – extremely drug-resistant tuberculosis (XDR-TB). XDR TB is caused by *M.tuberculosis*, which, in addition to the anti-tuberculosis drug resistance of MDR TB, are also resistant to any of fluoroquinolones and at least to one of injectable second-line anti-tuberculosis drugs (Capreomycin, Kanamycin and Amikacin) [6]. Unfortunately, data about XDR-TB spread are now very limited. By November 2009, 57 countries reported at least one XDR-TB case. The Russian Federation has not yet included XDR-TB in the reporting forms.

Conclusion

The Russian Federation uses several different indicators, reflecting the spread of MDR TB in the country. The available information on drug-resistant TB indicates that more effort is needed to improve bacteriological laboratories performance, quality of statistical registration of and data collection on MDR TB data in different territories throughout the country. Still more important is the implementation of a national system of continuous monitoring of laboratory tests quality, epidemiological data collection and TB patient groups surveillance. The implementation of new statistical tools in 2006–2007 – particularly those based on cohort analysis methods – have improved the quality of epidemiological data.

In spite of differences in formulating the indicators, they show a year-to-year growth in the proportion and number of drug-resistant TB cases in the Russian Federation. It may be assumed that the major causes underlying the high levels of MDR-TB in Russia include:

- problems in TB patient management and organization of treatment, particularly, in the previous years (see Chapter 5), including high rates of defaults and non-compliance with the standard treatment regimens;
- substantial numbers of TB patients with chronic forms of the disease registered in RF territories (see Chapter 4) resulting from ineffective treatment;
- inadequate infection control in health facilities and during TB control activities on the local level;
- lack of effective policies directed at accessibility of anti-tuberculosis drugs and use of drugs of guaranteed quality.

Nevertheless, some subjects of the Russian Federation have shown a decrease in the proportion of MDR TB cases, which indicated a potential for a more effective MDR TB control programme on the national level.

11. External quality assurance of *M. tuberculosis* detection and DST in the Russian Federation

Shulgina M.V., Zaikin E.V., Belilovsky E.M., Malakhov V.N.

Laboratory tests for detection of the TB-causing agent and investigation of its properties are in the basis of TB diagnosis and clinical decision making. The quality of laboratory tests directly influences the indicators used for assessment of the epidemiological situation for TB and for planning of TB control programmes. For that purpose, this section of the analytical review includes data on the assessment of laboratory tests quality by the Federal Service of External Quality Assessment of Clinical Laboratory Tests (FSEQA)

11.1. Organization of external quality assurance

The system of external quality assurance (EQA) of clinical laboratory examinations has been established in Russia since 1995 under FSEQA. The system currently consists of 141 sections, which are being implemented unilaterally or in collaboration with international systems of external quality assurance, and cover all types of clinical and laboratory testing. There are currently seven sections of FSEQA that focus on microbiological and molecular-genetic tests for diagnosis of tuberculosis. In 2007–2009, with the support of the Russian Health Care Foundation and financial support from the Global Fund, FSEQA was assessing the quality of laboratory tests with direct Ziehl-Neelsen (ZN) smear microscopy, fluorescent microscopy and culture methods, along with drug susceptibility tests (DST) for M. tuberculosis. The support received from the Russian Health Care Foundation and the Global Fund contributed to increased number of laboratories participating in the implementation of the respective section of FSEQA activities, and to tracing trends in assessing laboratory performance throughout the country.

11.2. Quality of direct smear ZN microscopy

In 2009, control panels within the framework of FSEQA sections "Microscopic identification of *Mycobacteria* by Ziehl-Neelsen stain" and "Identification of *Mycobacteria* by fluorescent microscopy" were distributed among 1,500 and 160 laboratories, respectively.

In each of two assessment rounds within section "Microscopic identification of *Mycobacteria* by Ziehl-Neelsen stain", each laboratory received a set of eight control panels (smears), consisting of non-stained negative smears and smears with high acid fast bacilli (AFB) concentrations (62-263 AFB in 100 visual fields), along with stained and non-stained smears with low AFB concentrations (4-51 AFB in 100 visual fields) prepared from homogenized sputum collected from patients with non-specific lung diseases (in case with negative samples), and from MbT+ patients (in case with positive samples). As distinct from 2008, the number of non-stained smears with low AFB concentrations was increased in two sets (rounds) from 4 to 8 with a lower number of negative smears and smears with high AFB concentrations. In sets for identification of *Mycobacteria* by fluorescent microscopy, only non-stained smears were included.

Basing on the results received from laboratories, the following characteristics were identified:

- Sensitivity of laboratory tests (the percentage of detected positive smears) separately for samples with low and high AFB concentrations;
- Specificity of laboratory tests (percentage of samples not containing AFB and identified as negative);
- The quality of laboratory staining (based on difference in sensitivity of mycobacteria detection in samples stained in the expert laboratory in FSEQA and samples stained in the tested laboratory for samples containing ABF – in section "Microscopic identification of *Mycobacteria* by Ziehl-Neelsen stain").

Microscopic identification of acid-fast mycobacteria with Ziehl-Neelsen stain

Of 1,500 laboratories, to which the sets of control samples for two rounds were sent, 1,462 (97.5%) of laboratories provided results of testing of control samples for at least one round, including 1,024 laboratories in general health care (GHC) institutions, 52 laboratories in regional TB control centers (leading regional TB control centers in the subjects of the Russian Federation), and 143 laboratories in local ("rayon") TB control facilities including sanatoriums in addition to municipal, rayon (district) and inter-rayon TB dispensaries (TBD) and TB hospitals.

These also included 48 laboratories in the FSIN system institutions. But not all the laboratories participated in two rounds of testing in 2009: in two rounds participated 893 (87%) GHC laboratories, 52 (100%) laboratories of regional TB institutions and 119 (83%) laboratories in rayon TB services.

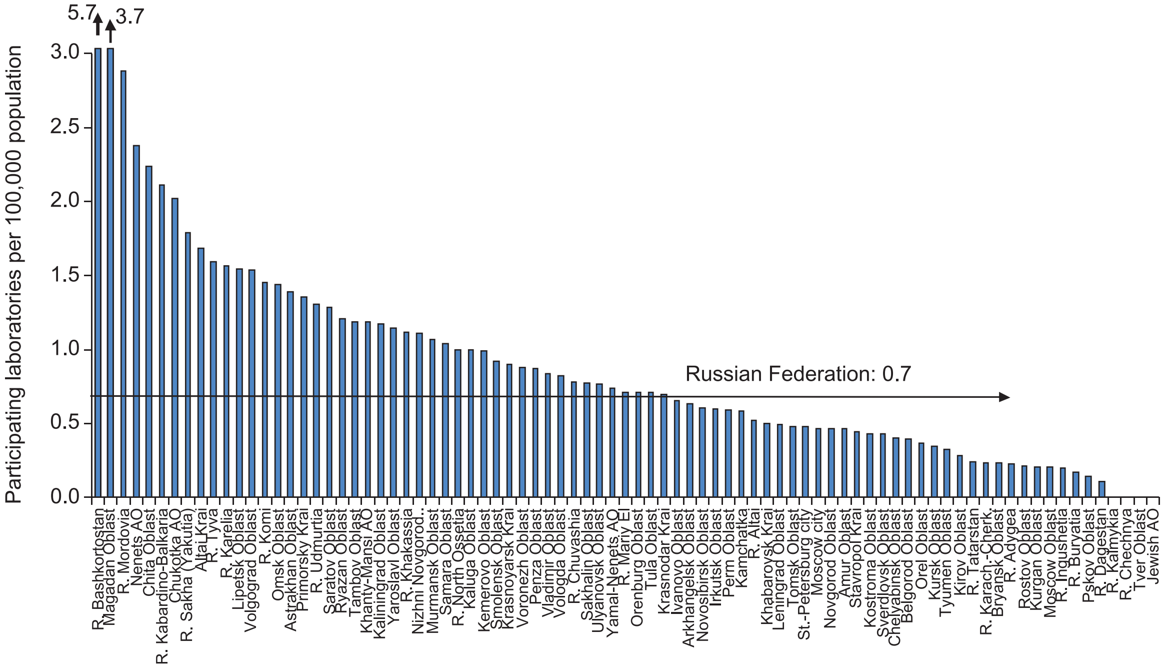


Fig. 11.1. EQA coverage of laboratories at GHC facilities in the subjects of the Russian Federation, the number of participating laboratories per 100,000 population, 2009

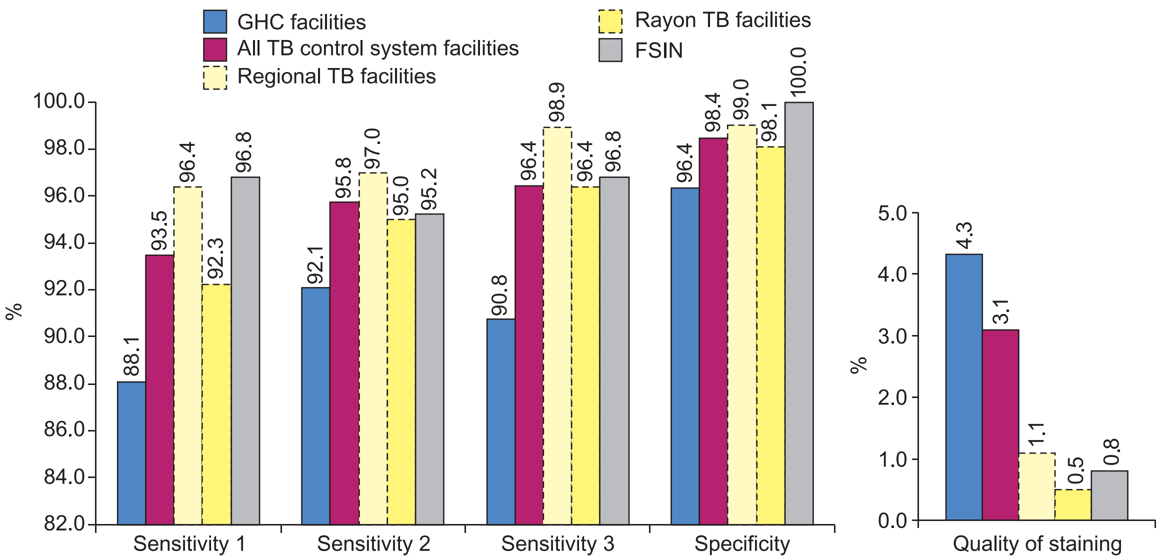
Analysis of test results received from laboratories showed that, overall, specificity of tests performed in laboratories of all types was considerably high – 96.9% compared to 94.6% $p < 0.01$ in 2008.

The average sensitivity of AFB detection in samples with low AFB concentrations was 89.2% in smears stained in the laboratories (86.2% in 2008) and 94.2% in smears stained in the expert laboratory (93.1% in 2008). The average sensitivity of AFB detection in samples with high AFB concentrations was 91.9% (compared to 94.1% and 92.8% in 2008 and 2007, respectively).

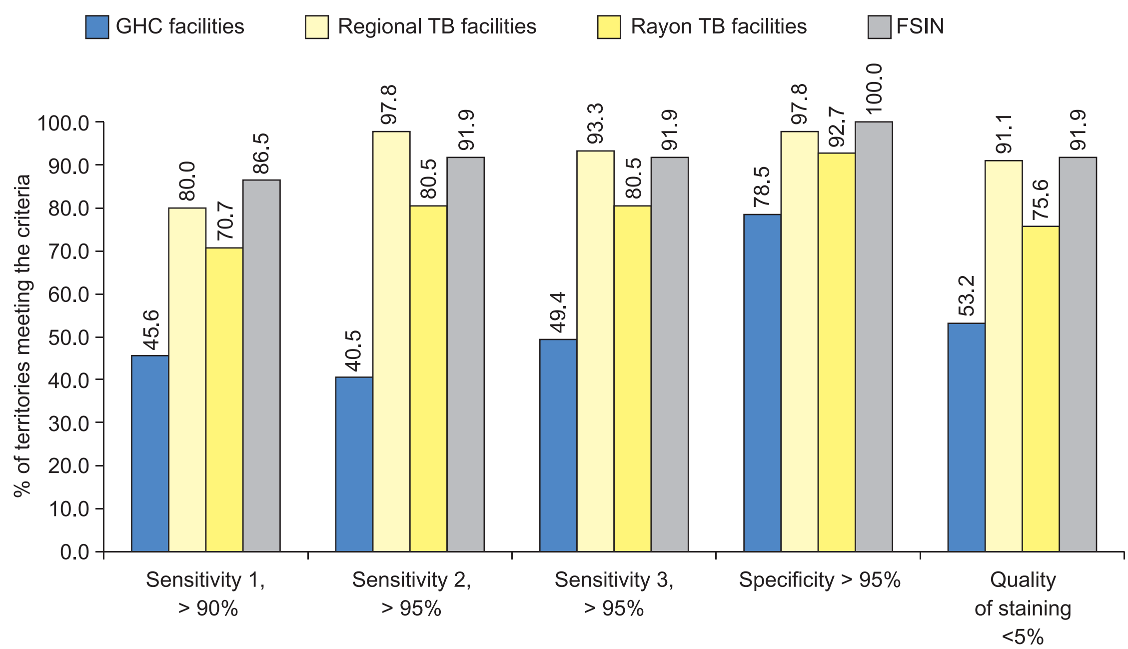
As in 2008 [A3], GHC laboratories in 2009 (Fig. 11.2a) demonstrated a lower sensitivity for AFB detection in laboratory-stained smears with low AFB concentrations as compared with TB service laboratories (88.1% and 93.5%, respectively, $p < 0,01$). This indicator was higher in regional TBD laboratories as compared with those at the rayon level labs (96.4% and 92.3%, $p < 0.01$). In FSIN laboratories, the average sensitivity of AFB detection in smears with low AFB concentrations for smears stained in the laboratories was 96.8% (93.4% in 2008). It should be noted that, as compared with 2007, the sensitivity levels of AFB detection in smears with low AFB concentrations stained in the tested laboratories increased in laboratories of all types (GHC, TB control facilities and FSIN), with the exception of regional TBD laboratories, which remained on the same level as in 2007.

Differences in AFB detection sensitivity in smears stained in the tested laboratories and in the FSEQA expert laboratory are indicative of the quality of smear staining in the tested laboratories: the lower is the sensitivity of AFB detection in smears stained in the tested laboratories, as compared with the sensitivity detection in the samples stained in the expert laboratory, the lower is the quality of smear staining. To evaluate the quality of staining, the FSEQA samples consisted of four pairs (two pairs in each round) of stained and non-stained smears, and each pair was prepared from the same sputum pool. In 2009 test rounds, the difference in the sensitivity of stained and non-stained smear pairs for GHC laboratories was 4.3%. At the same time, in regional TB laboratories this difference was only 1.1%. The value of this indicator in the rayon laboratories at TB control facilities (3.1%) was lower than that in GHC laboratories (4.3%) and higher than in the regional laboratories (0.5%). In the FSIN laboratories this indicator was 0.8%.

On the national level, effectiveness of AFB detection with ZN microscopy method depends on the proportion of laboratories with satisfactory test results. According to FSEQA data for 2009, 68% of all participating laboratories showed equal and over 90% sensitivity in AFB detection for laboratory-stained smears with low AFB concentrations; 78% of all participating laboratories had 100% sensitivity for smears with high AFB concentrations and



A) Summary data on all EQA participating laboratories in the territories



B) Assessment of testing results by territory; proportions of territories with laboratories meeting the criteria.

Fig. 11.2 Results of evaluation of microscopy testing with Ziehl-Neelsen stain method, 2009. Laboratories of GHC and TB services meeting the established criteria in the territories of the Russian Federation and FSIN:
Sensitivity 1 – sensitivity of detecting smears with low AFB concentrations; Sensitivity 2 – sensitivity of detecting smears with low AFB concentrations with staining in FSEQA expert laboratory; Sensitivity 3 – sensitivity of detecting smears with high AFB concentrations stained in tested laboratories. Quality of staining of smears defined as sensitivity differences in testing results of stained and non-stained smears from the same sputum pools: “sensitivity 2” – “sensitivity 1”

95% laboratories had 100% specificity. In 78% of the tested laboratories there was no difference in the assessment of participating laboratory-stained smears and smears stained in the expert laboratory.

Among FSIN laboratories, sensitivity for smears with low AFB concentrations was over 90% in 94% of participating laboratories, all of which had satisfactory test results for all smears with high AFB concentrations and AFB-negative smears (100% specificity), and 74% of participating laboratories did not show differences between participating laboratory-stained smears and smears stained in the expert laboratory.

The proportion of laboratories in TB control facilities complying with the above criteria was higher than GHC laboratories; respectively, 77% and 65% of participating laboratories demonstrated 90% or higher sensitivity in AFB detection in participating laboratory-stained smears with low AFB concentrations; 91% and 94% of all participating laboratories had 100% specificity. Differences in the assessment of participating laboratory-stained smears and smears stained in the expert laboratory were not present in 87% of laboratories in TB control facilities and 76% of GHC laboratories. The proportion of rayon TB control laboratories with 90% and above specificity for smears with low AFB concentrations was statistically significantly lower compared with regional GHC laboratories (76% and 81%, respectively), as well as the proportion of laboratories with no differences in testing participating laboratory-stained smears and smears stained in the expert laboratory (84% and 92%, respectively).

On the national level, the overall summarized results of external quality assurance received from laboratories depend mostly on the data received from the territories, from which the biggest number of laboratories participated in EQA. These indicators do not allow for assessing EQA results by territory, i.e. to determine the number of territories that have more laboratories with inadequate EQA testing results. Anyhow, this information may be worthwhile for assessing effectiveness of regional TB services and for improving laboratory diagnosis of TB.

To compare the work of GHC, regional and rayon TB services on the level of territories and not selected laboratories, EQA experts defined the proportions of subjects of the Russian Federation with laboratories showing quality of a specific level, i.e. the territories whose laboratories showed summarized test results meeting the defined criteria established by experts.

Therefore, with respect to the sensitivity criteria of AFB detection in smears with low AFB concentrations stained in the tested laboratories (“sensitivity 1”), the proportion of territories with labs showing average sensitivity over 90% were indentified (here and thereafter the sensitivity parameters are indicated as defined by the FSEQA experts as satisfactory results).

The group of territories with satisfactory average levels of AFB detection sensitivity for smears with high AFB concentrations (“sensitivity 2”) stained in the tested laboratories included territories whose laboratories provided this parameter exceeding 95%.

The group of territories with satisfactory staining of smears included territories, in which laboratories demonstrated difference between sensitivity of smears stained in participating laboratories and in the expert laboratory on average below 5%.

The group of territories with satisfactory specificity included territories with laboratories providing average specificity over 95%.

The FSEQA results (Fig. 11.2b) show that the proportion of subjects of the Russian Federation, in which GHC laboratories’ average indicators were higher than the established criteria, was not that large and much smaller than the number of subjects in which regional TB control services laboratories showed satisfactory results. At the same time, the EQA results for GHC laboratories significantly improved in 2009 in all the indicators (sensitivity, specificity and quality of staining). For example, the proportion of regions in which GHC laboratories has specificity over 95% increased from 51.9% to 78.5%, and the proportion of regions in which GHC laboratories reached the average sensitivity of AFB detection in non-stained smears with low AFB concentrations increased from 39.5% to 45.6%. The proportion of territories with TB control facilities’ laboratories exceeding this criterion was significantly higher – 75.0% ($p < 0.01$) (with 70.7% in tested rayon TB dispensary labs and 80.0% in regional TB dispensary labs).

The proportion of subjects of the Russian Federation, in which GHC laboratories demonstrated satisfactory quality of staining, was only 53.2% (40.7% in 2008). Rayon TB control laboratories showed satisfactory results in more RF subjects – 75.6% ($p < 0.01$) (68.8% in 2008). Still more regional TB control laboratories demonstrated satisfactory results of staining – 91.1% ($p < 0.05$) of RF subjects (84.0% in 2008). The proportions of RF subjects with satisfactory levels of specificity were 92.7% for rayon TB facilities (81.3% in 2008) and 97.8% of regional TB facilities (90.0% in 2008).

It goes without saying that these results only approximately reflect the real picture of laboratory tests quality distribution in the subjects of the Russian Federation, particularly due to substantial differences in the numbers of laboratories in the territories (from 1 to 49 GHC laboratories and from 1 to 9 rayon TB services laboratories). Nevertheless, if consider 46 subjects of the Russian Federation which presented more than 0.7 GHC laboratories per 100,000 population, the regularities will be similar.

Detection of AFB by fluorescent microscopy method

In accordance with FSEQA section “Identification of AFB by fluorescent microscopy method”, control samples were sent to 160 laboratories. Testing results for at least one sample kit were received from 136 laboratories (85.0%). Among them, there were 18 GHC laboratories from 10 subjects of the Russian Federation, and 88 laboratories were laboratories of TB Services in 45 subjects of the Russian Federation, among which 40 were from regional, and 48 – from rayon TB laboratories.

Overall, the rate of AFB detection sensitivity by fluorescent microscopy in control samples with both low and high AFB concentrations was higher than that determined by Ziehl-Neelsen stain method (92.9% versus 89.2% by

ZN method for samples with low AFB concentrations stained in the tested laboratories, and 95.8% versus 91.9% ($p < 0.01$) by ZN method for samples with high AFB concentrations). Similar ratios were observed for GHC laboratories (92.8% versus 88.1%, and 96.0% versus 90.8%, respectively, $p < 0.05$). No significant differences were observed in sensitivity in TB services laboratories.

The average specificity of testing by fluorescent microscopy was lower as compared with the specificity of testing by Ziehl-Neelsen stain method (94.4% and 96.9% respectively ($p < 0.01$). Lower specificity for fluorescent microscopy tests performed in TB services laboratory (93.3% versus 98.4%, $p < 0.01$) were determined by the worst results. No significant differences were observed in specificity in laboratories at TB control facilities.

11.3. Quality of culture examinations of *M. tuberculosis*

The assessments of laboratory tests in this FSEQA section were aimed at the detection of errors in culturing samples potentially containing *M.tuberculosis*. A set of control samples allowed for assessing the quality of media used and the culturing techniques applied in the tested laboratories. For this purpose, the distributed sets included samples with *M. tuberculosis* in two concentrations – with low concentrations of MbT (10^5 CFU) – 4 samples and high concentrations of MbT (10^6 CFU) – 2 samples.

The control panel also allowed for assessing the correctness of bacterial growth control in culture tubes (control of cultures on a weekly basis), and for preliminary identification of the *Mycobacterium tuberculosis* complex. For this purpose, the set included samples of fast growing non-tuberculosis *Mycobacteria*, similar to *M. tuberculosis* with regard to acid-fast staining and the morphology of colonies. To control the correctness of the algorithm used in the laboratory for identifying the resulting culture as AFB, the set also included samples of *E. coli* bacteria. The results were considered satisfactory if in no sample not containing *M. tuberculosis* the conclusion was made "*M. tuberculosis detected*".

In 2009, sets of control samples were distributed among 250 laboratories and the results of testing were received from 188 laboratories (75%). TB services laboratories, FSIN health facilities, the research institutes of tuberculosis or phthisiopulmonology, and other institutions participated in the FSEQA testing (Table 11.1). In 2009, laboratories of 60% of leading regional TB institutions (TB dispensaries) in the subjects of the Russian Federation participated in this section of the FSEQA activities.

Table 11.1

Participants of FSEQA section "Culture Identification of MbT"

Type of facility	Participating facilities (n)
Regional TBD[118]	49
Rayon TBD	87
FSIN	48
Other	4
Total	188

Of 136 laboratories of TB services, only 19 (13.9%; in 2008 – 14.2%), and of 48 FSIN laboratories only 8 (16.6%; in 2008 – 8.9%) correctly identified the contents of all 10 samples. The average sensitivity of *M. tuberculosis* detection for samples with low concentrations of *M. tuberculosis* was 65.3% in regional TBD laboratories and 54.3% in rayon TBD laboratories. This indicator for FSIN laboratories was 62.5%. The sensitivity of detection in samples with high concentrations of the agent was 89.8% and 77.6% in regional and rayon TBD laboratories, respectively. In FSIN laboratories, the sensitivity indicator was 79.2%. The ability of laboratories to correctly identify fast growing non-tuberculosis *Mycobacteria* – *M. smegmatis* and *E. coli* (specificity) was 82.7% and 81.0% for laboratories of regional and rayon TBD respectively. In 2009, in FSIN laboratories this indicator was 84.4%.

For purposes of this review, MbT non-detection in $\geq$50% samples with low MbT concentrations (i.e. in 2, 3 and all 4 samples) and in at least one of two samples with high MbT concentrations (less than 100%) is considered as an unsatisfactory result of MbT detection with culture-based method.

In 2009, the proportion of regional TB service laboratories with satisfactory results of MbT detection in samples with 10^5 CFU[119] was 65% ("sensitivity 1", Fig. 11.3), and among rayon TB facilities and FSIN – 67% and 77%, respectively. The proportion of laboratories with satisfactory results of MbT detection in samples with 10^6 CFU

[118] TBD – TB Dispensary.
[119] CFU – colony forming units.

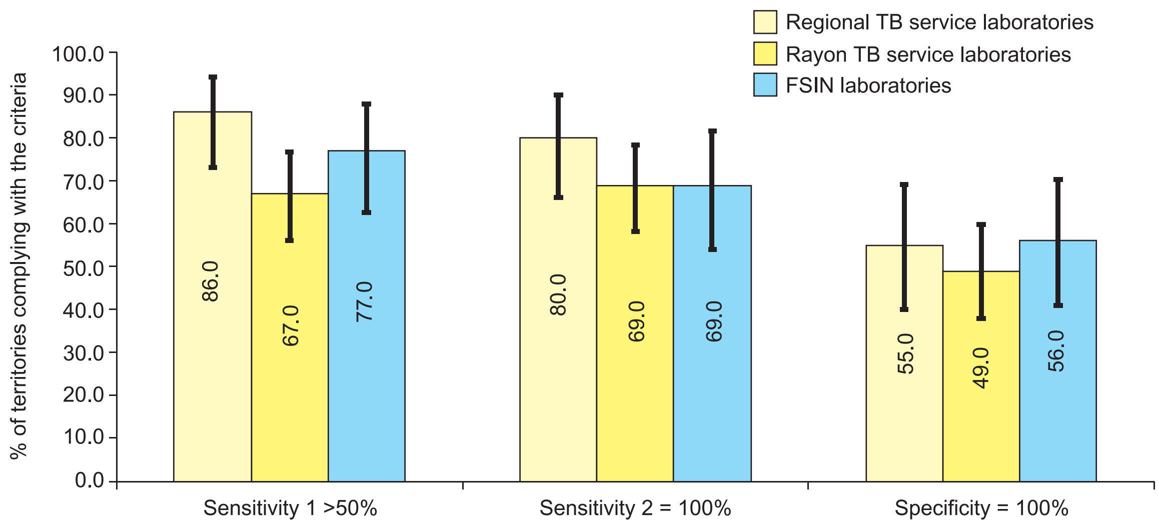


Fig. 11.3 Proportion of laboratories with satisfactory results of culture tests by the results of FSEQA. The Russian Federation, 2009. 188 laboratories of TB Services at rayon and regional levels, and FSIN laboratories. The error bars indicate 95% confidence intervals: "Sensitivity 1" – correct detection of *M. tuberculosis* in two or more of four samples with low MbT concentrations; "Sensitivity 2" – correct detection of *M. tuberculosis* in each of two samples with high MbT concentrations; the "Specificity" – correct identification of samples (%) that did not contain *MbT*

was 80%, 69% and 70% respectively for these groups of laboratories ("sensitivity 2", Fig. 11.3). Only 55% and 49%, respectively, of regional and rayon TB laboratories did not detect MbT in all samples that contained non-tuberculosis *Mycobacteria* and/or bacteria *E. coli* (in 2008, the percentage of such laboratories was 63% and 43%, respectively). The proportion of FSIN laboratories that avoided errors in testing samples not containing MbT was 58% (51% in 2008).

In 2009, as in the previous year, within the framework EQA of culture tests, questionnaires were distributed among the participating laboratories to assess the completeness and adequacy of internal control of culture tests performed. An analysis of completed questionnaires received form 162 laboratories about media quality control showed that only 45% (46% in 2008) of tested laboratories performed quality control of both media sterility and growing properties. 33% of participating laboratories (30% in 2008) did not provide excerpts from their quality control registers or indicated that the quality control of media was not performed.

Also, the questionnaires showed that 18 laboratories (11%; 17% in 2008) indicated in the graph on the control of media contamination levels that contamination was below 2% (the permissible level of solid media contamination is 2–5% [7, 56]), which indicates excessive decontamination of the media resulting in a reduced detection of mycobacterial culture from diagnostic materials. In 36 laboratories or 22% (12% in 2008), the decontamination control was not performed.

11.4 Quality of drug susceptibility tests of *M. tuberculosis*

Since 2005, FSEQA has been coordinating the external quality assurance of *M. tuberculosis* drug susceptibility testing activities in close cooperation with the WHO supranational laboratories.

In 2009, sets of control samples for external quality assessment of DST consisting of 20 strains of *M. tuberculosis* were distributed among 175 laboratories participating in FSEQA. Results of control samples testing were received from 163 laboratories, including 49 laboratories at regional TB service facilities (61% of regional TB Dispensaries), 67 – from rayon TB service laboratories, 42 – from FSIN laboratories, 3 – from three laboratories at research institutes of phthisiopulmonogy, and 1 – from the Federal Medical-Biological Agency. Six rayon level laboratories and one FSIN laboratory performed DST tests of all strains not based on the criteria established for the absolute concentrations method. Therefore, those results were considered unreliable and were not included in the analysis.

In 2009, analysis of the results of control samples testing showed that 15 laboratories at regional TB control services (31% of all regional level laboratories) and 11 laboratories in rayon TB services (18%) demonstrated excellent results. These laboratories correctly identified the susceptibility patterns of all the control strains to all the first-line drugs (isoniazid, rifampicin, ethambutol and streptomycin). Another 18 laboratories of regional TB services and 18 laboratories of rayon TB services demonstrated good results in testing susceptibility to at least isoniazid (H) and rifampicin (R)[120] – 95–100% (in total, not more than one error in determining resistance to isoniazid and/or rifampicin were received in 20 control strains). Overall, the proportion of laboratories with EQA results to H and R from 95% and more was 68% among all participating regional laboratories and 48% among rayon level laboratories.

The FSIN laboratories' testing results were close to the results obtained at the rayon level, i.e. 95% and above effectiveness of testing drug susceptibility to H and R was shown in 26 laboratories (63%), including 10 laboratories that correctly identified the susceptibility of control strains to all the four anti-tuberculosis drugs.

Satisfactory results of susceptibility tests to isoniazid and rifampicin (at least 90% of correct results for isoniazid and/or rifampicin and not 95% and more to each of them) were demonstrated in 24% of regional laboratories, 16% of rayon laboratories and 1 FSIN laboratory (2%). At the same time, unsatisfactory results of MbT susceptibility testing to H and R (less than 90% of correct results for any of the two drugs) were shown in 8% of regional laboratories, 36% of rayon laboratories and 34% of FSIN laboratories (Fig. 11.4).

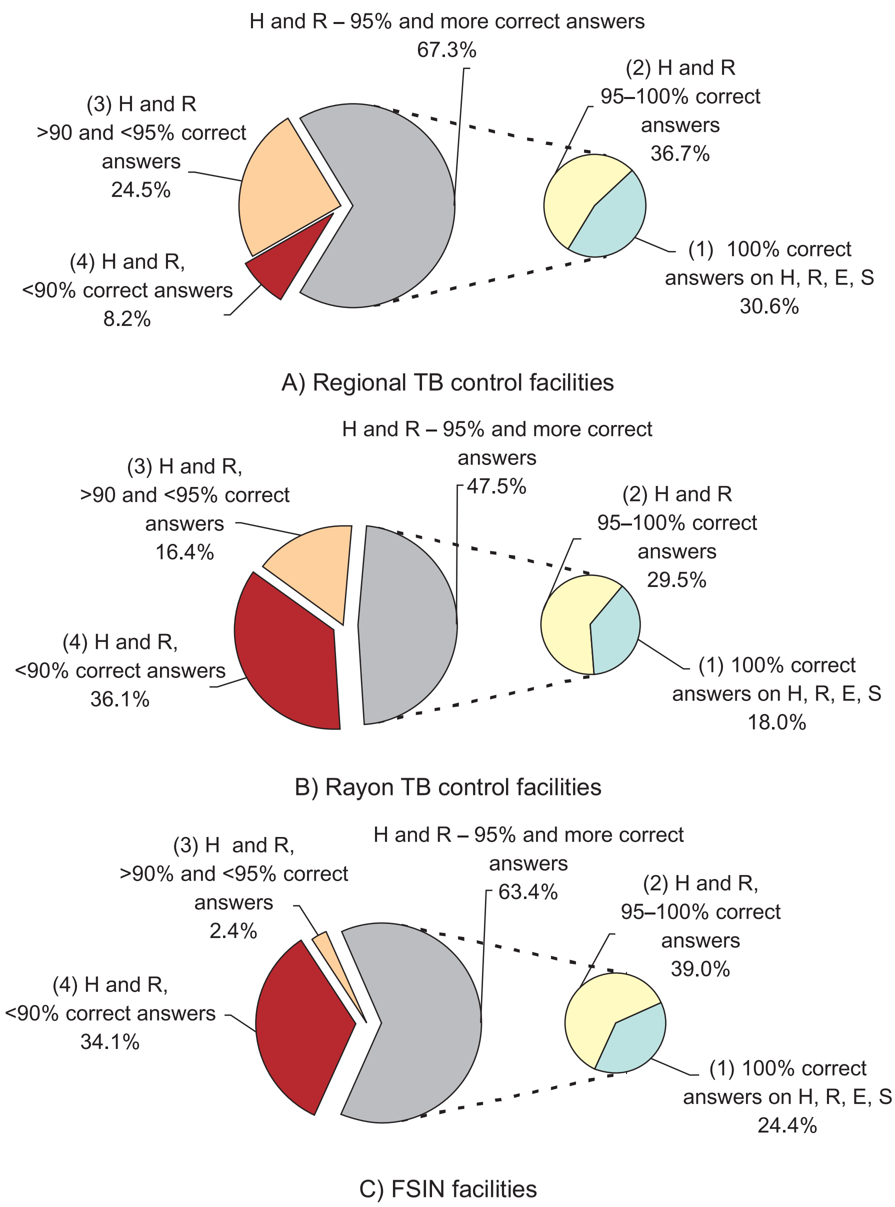


Fig. 11.4. Results of EQA drug susceptibility tests of *M. tuberculosis* in 116 TB control laboratories in the civilian sector and 42 laboratories in the penitentiary sector (FSIN); the Russian Federation, 2009. Legend: (1) All results are correct in determining susceptibility to all 4 first-line anti-TB drugs; (2) At least 95% of answers were correct in determining susceptibility to H and R (not more than 1 error for isoniazid and/or rifampicin obtained form 20 control strains), with less than 100% of correct results for any of two other drugs (streptomycin and ethambutol); (3) At least 90% of correct results in determining susceptibility to H and/or R (excluding the EQA results referred to groups 1–2); (4) Less than 90% of correct results in determining susceptibility to H or R

[120] Calculated as the proportion of strains with correctly identified susceptibility to all tested strains.

Conclusion

The external quality assessment of laboratory tests for TB diagnosis have been used in a significant number of laboratories in the last three decades, which provided a solid bases for the assessment of both the quality of laboratory testing techniques and the current trends in their development.

It should be noted that correct identification of AFB in smears with low concentrations increased in comparison with 2007 in all types of laboratories (GHC, TB control facilities, FSIN), with the exception of laboratories at regional TB facilities, which remained on the same level. As compared with 2008, the proportion of laboratories with satisfactory results of microscopy by the Ziehl-Neelsen method has increased. Particularly, the quality of laboratory tests has been improved in TB control services laboratories at the rayon level. At the same time, presently there are a significant number of regions in the country with unsatisfactory results of such laboratory tests for TB diagnosis.

In 2008, analysis of the FSEQA results in assessment of the quality of laboratory tests revealed unsatisfactory quality of using culture-based method, which may be related to the low quality of the culturing techniques used in these laboratories (high contamination and cross-contamination rates), as well as to the low quality of the media used. A significant number of laboratories that made errors in testing samples with non-TB mycobacteria or *E.coli* may be indicative of both insutisfactory sterility in culturing techniques and non-compliance with the proper culturing techniques in the laboratory, as well as with the absence of preliminary identification of the cultures obtained.

The questionnaires used in the participating laboratories in 2009 within the FSEQA section on using culture-based methods for detection of *M.tuberculosis* showed that measures to ensure the quality of culture tests were unsatisfactory in a significant number of laboratories, which resulted in numerous errors detected during external quality assurance activities.

The external quality assurance of drug susceptibility tests in 2009, as well as in 2008, showed that along with laboratories demonstrating good results in the FSEQA rounds, from 30% to 50% of laboratories of different levels and jurisdiction showed sensitivity to isoniazid and rifampicin below 90%, which is regarded unsatisfactory [48].

In 2008, the FSIN laboratories intensified their participation in all the sections of FSEQA on issues related to TB diagnosis, which contributed to the activities in the overall assessment of the quality of work in these laboratories. The analysis performed showed that, on average, the quality of work in the FSIN laboratories is on the level comparable with the work of laboratories in the civilian sector.

12. The network of TB service facilities in the Russian Federation. Resources

Skachkova E.I., Son I.M.

Changes in the TB epidemiological situation are directly related to the capacities of TB services to perform effective and comprehensive TB control activities. Therefore, it is important to know to what extent the TB services are able to meet their targets.

12.1. In-patient and sanatorium care

The TB control service in the Russian Federation includes 2 research and practical centers located in Moscow and in the Republic of Sakha (Yakutia), 341 TB dispensaries, 78 TB hospitals, 44 sanatoriums for adult and 123 TB sanatoriums for children patients with tuberculosis, and 2,430 phthisiatric offices. Also, in the Russian Federation there are 5 TB research institutes serving as research, organizational, consultative, clinical and training centers in the subjects of the Russian Federation. These include 2 research institutes in Moscow and one research institute in each of St.-Petersburg city, Sverdlovsk and Novosibirsk oblasts.

Mostly insufficient material and technical basis is in the TB control services of the following subjects of the Russian Federation – Republic of Ingushetia, Altai Krai, Primorsky Krai, Jewish AO, and in Irkutsk, Kurgan, Leningrad, Sverdlovsk, Smolensk and Tver oblasts.

As of December 31, 2009, in the Russian Federation there were 68,601 in-patient beds for adult TB patients (3.685 beds less than in 2005 and 1,733 beds less than in 2008), and 6,810 in-patient beds for children. In addition, there were 7,104 sanatorium beds for adults and 14,633 sanatorium beds for children (Table 12.1).

The average in-patient bed occupancy for TB patients is 3.5 TB patients per bed, including 1.4 new and relapse TB patients and, in average, 2.1 TB patients followed up in TB services for more than 1 year. Also, there are, in average, 1.5 MbT+ patients and 2.1 MbT– patients per one in-patient bed in TB facilities.

The average number of TB patients per in-patient bed varies from 1.2 (Ivanovo Oblast) to 10.7 (Republic of Chechnya). There are less than 2.5 TB patients per in-patient bed in 13 subjects of the Russian Federation – Republic of Sakha (Yakutia), Chukotka AO, Moscow city, St.-Petersbutg city, and in Belgorod, Vologda, Voronezh, Ivanovo, Kaluga, Kostroma, Magadan, Tambov and Chelyabinsk oblasts. More than 5.0 TB patients per in-patient bed are in 12 subjects of the Russian Federation, including Republics of Ingushetia, Karachaevo-Cherkessia, Khakassia, Chechnya, Karelia, Altai Krai, Primorsky Krai, Jewish AO, and in Amursk, Irkutsk, Moscow, and Murmansk oblasts.

The average in-patient bed occupancy rate for adult TB patients is 3.7, including, in average, 1.5 new and relapse TB patients (with intensive therapy during hospitalization of 3–6 month duration) and, in average, 1.6 TB patients with diagnosed basillary excretion. The average in-patient bed for children is 0.9 per bed for children aged 0–17, including 0.7 child patients with newly diagnosed and relapse TB (in-patient intensive therapy is performed for 5–8 motnhs) and, in average, 0.1 child patients with bacillary excretion. In-patient beds are used both for treatment and rehabilitation of children with TB. In addition, the Russian TB control system also has 14.633 beds for children and 7.104 beds for adult TB patients in sanatoriums.

In 2009, 68.7% of TB patients with active forms of the disease were hospitalized (67.7% in 2008), including 83.6% of MbT+ patients and 85.4% of new TB patients. Hospital treatment substituting technologies and treatment in sanatoria are insufficiently used in the country, which hampers possibilities of treatment under observation. 4.3% of TB patients received treatment in day care facilities in 2009 (3.4% in 2008) and 6.1% of TB patients received treatment in sanatoriums (6.6% in 2008). Only 5.4% of new registered TB patients received treatment in day care facilities and 3.5% in sanatoriums.

No treatment in day-care facilities was provided in Vologda, Kursk, Leningrad, Magadan, Penza, Sakhalin, Tyumen, Ulyanosk oblasts, in Khanty-Mansi AO, Chukotka AO, Kamchatka Krai, in the republics of Dagestan, Kabardino-Balkaria, Karachaevo-Cherkessia, Mordovia, North Ossetia-Alania, Udmurtia, and in the Republic of Chechnya.

No cases of lung destructions and bacillary excretion registered at the end of the year were diagnosed in 42.3% of TB patients and among 40.0% of new TB cases. Patients with such clinical forms of the disease can receive treatment at day-care facilities and with home-care arrangements.

Hospital treatment substituting technologies are being introduced basing on the most costly approaches, i.e. in round-the-clock in-patient facilities with hospital beds used for day-care purposes.

Table 12.1

The number of TB dispensaries and the number of beds in the Russian Federation TB facilities, 2005–2009 as of 1 January of respective years (Source: the state statistical reporting form No. 47)

	2005	2006	2007	2008	2009
Number of TB dispensaries	466	386	354	343	341
including those with in-patient beds	393	332	306	297	295
Number of TB hospitals	105	98	87	81	78
including those with dispensary departments	27	28	28	24	24
Number of in-patient beds for adults TB patients	72,286	71,994	71,358	70,334	68,601
per 1,000 adult population (18 years and more)	0.51	0.51	0.50	0.50	0.48
average bed occupancy by adult TB patients (days)	320.8	321.1	316.4	320.3	323.7
number of TB patients per bed	4.0	3.9	3.8	3.8	3.7
number of beds per TB patient	0.25	0.26	0.26	0.27	0.27
Number of in-patient beds for TB children (0–17 years)	6,424	6,781	6,771	6,655	6,810
per 1,000 children TB patients (0–17 years)	0.22	0.25	0.25	0.25	0.26
average bed occupancy by children TB patients	309.9	313.0	307.2	308.3	316.5
number of TB patients per bed	1.2	1.1	1.1	1.0	0.9
number of beds per 1 TB patient	0.81	0.88	0.94	1.02	1.07
Number of in-patient beds for all TB patients –	78 710	78 775	78 129	76 989	75,411
per 1,000 population	0.55	0.55	0.55	0.54	0.53
number of TB patients per bed	3.8	3.7	3.5	3.5	3.5
number of beds per TB patient	0.26	0.27	0.28	0.28	0.29
Number of beds for TB patients (sanatoriums for adult TB patients)	8,697	8,070	7,980	7,557	7,104
per 1,000 adult population	0.06	0.06	0.06	0.05	0.05
average bed occupancy per year (days)	241.7	259.4	258.3	269.2	264.6
Number of beds for TB patients (in-patient + sanatoriums for adults)	80,983	80,064	79,338	77,891	75,705
per 1000 adult population	56.6	56.2	55.8	54.9	53.3
Number of TB sanatorium beds for children (0–17 years)	16,306	16,130	15,555	14,901	14.663
per 1,000 children (0–17 years)	0.57	0.59	0.58	0.57	0.56
average bed occupancy per year (days)	267.6	267.4	263.7	262.6	257.8
Number of TB sanatorium beds, total	25,003	24,200	23,535	22,483	21.737
per 1000 population	0.17	0.17	0.17	0.16	0.15
Number of day-care beds for adults		2,827	2,736	2,725	2,720
average occupancy per year (days)		301.5	298.0	294.2	311.2
Number of day-care beds at hospitals for children (0–17 years)		288	253	220	188
average occupancy per year (days)		260.0	255.4	255.0	257.1
Capacity of day-care departments at policlinics for adults		1,906	2,300	2,372	
average occupancy per year (days)		300.4	300.7	292.9	
Capacity of day-care departments at policlinics for children (0–17 years)		40	45	58	
average occupancy per year (days)		416.4	370.5	353.5	
Home care		332	349	434	

With the adoption of the Federal Law of 06.10.2003 No. 131-FZ "On General Principles of Local Self-Government Organization in the Russian Federation", local authorities refer to the level of the subject of the Russian Federation all specialized agencies of health, including the TB service. The process of building relationships between municipal (local) and regional levels of health care is in the formative stage and requires the development of such a mechanism of interaction on all health management levels, where the availability and quality of care will be improved. At the same time, the TB service operates as part of the health care system, which for 20 years have had serious ideological and structural changes.

Currently, in the Russian Federation is in a process of transition from a decentralized model to a centralized service (zonal) model, where the manager and the sole financier of anti-TB institutions is the Government of the subject (administrative unit) of the Russian Federation. In the process of transfering ownership to the subjects of the Russian Federation from the municipal jurisdiction, part of local TB dispensaries have lost legal independence and have become a branch of zonal or regional TB dispensaries (see Table 12.1). At the same time, Federal Law No. 131-FZ has so far not been implemented in some subjects of the Russian Federation (Moscow Oblast and the Republic of Sakha (Yakutia). Also, some specialized TB institutions and in-patient TB facilities are still being operated on the municipal level in other subjects of the Russian Federation (Lipetsk, Sverdlovsk oblast, and others).

As a matter of fact, it could be expected that following the decrease in the number of hospital beds, the average bed occupancy rate and the turnover of beds per year should have increased, while the average length of patient stay should have reduced. However, this did not happen. With the normative bed occupancy 340 day per year, in 2009 the average bed occupancy for adult TB patients was 323.7 days per year and for children 316.5 days per year. The average patient stay in bed was 85 days for adults and 93 days for children.

The fact that the average bed occupancy rate has not increased and the average length of patient's stay in hospital has not dropped down cannot be explained by a reduced number of TB patients who needed care or by ineffectiveness of measures addressed at TB patients' involvement for treatment and persuading them to continue treatment. In some regions that can be linked with the fact that some regions have surplus of hospital beds (Table 12.2).

Table 12.2

Distribution of TB beds in the subjects of the Russian Federation (per 1 patient with active TB), 2009

RUSSIAN FEDERATION – 0.3 beds per 1 patient with active TB							
Central FR	**0.4**	Nenets AO	1.8	**Privolzhsky FR**	**0.3**	**Siberian FR**	**0.2**
Belgorod Oblast	0.5	Vologda Oblast.	0.4	R. Bashkortostan	0.4	R. Altai	0.2
Bryansk Oblast	0.3	Kaliningrad Oblast	0.2	R. Maryi El	0.4	R. Buryatia	0.3
Vladimir Oblast	0.2	Leningrad Oblast	0.4	R. Mordovia	0.3	R. Tyva	0.3
Voronezh Oblast	0.5	Murmansk Oblast	0.2	R. Tatarstan	0.3	R. Khakassia	0.2
Ivanovo Oblast	0.8	Novgorod Oblast	0.3	R. Udmurtia	0.3	Altai Krai	0.2
Kaluga Oblast	0.5	Pskov Oblast	0.3	R. Chuvashia	0.3	Trans-Baikal Krai	0.2
Kostroma Oblast	0.5	St. Petersburg city	0.4	Perm Krai	0.2	Krasnoyarsk Krai	0.3
Kursk Oblast	0.3	**Southern FR**	**0.2**	Kirov Oblast	0.3	Irkutsk Oblast	0.2
Lipetsk Oblast	0.4	R. Adygea	0.3	Nizhniy Novgorod Oblast	0.3	Kemerovo Oblast	0.3
Moscow Oblast.	0.2	R. Kalmykia	0.3	Orenburg Oblast	0.3	Novosibirsk Oblast	0.3
Orel Oblast	0.4	Krasnodar Krai	0.3	Penza Oblast	0.3	Omsk Oblast	0.2
Ryazan Oblast	0.3	Astrakhan Oblast	0.3	Samara Oblast	0.2	Tomsk Oblast	0.4
Smolensk Oblast	0.2	Volgograd Oblast	0.3	Saratov Oblast	0.2	**Far-East FR**	**0.3**
Tambov Oblast	0.5	Rostov Oblast	0.2	Ulyanovsk Oblast	0.3	R. Sakha (Yakutia)	0.6
Tver Oblast	0.3	**North-Caucasus FR**	**0.3**	**Ural FR**	**0.3**	Kamchatka Krai	0.3
Tula Oblast	0.4	R. Dagestan	0.2	Kurgan Oblast	0.2	Primorsky Krai	0.2
Yaroslavl Oblast	0.4	R. Ingushetia	0.2	Sverdlovsk Oblast	0.2	Khabarovsk Krai	0.4
Moscow city	0.6	R. Kabardino-Balkaria	0.4	Tyumen Oblast	0.3	Amursk Oblast	0.2
North-West FR	**0.3**	R. Karachaevo-Cherkessia	0.2	Khanty-Mansi AO	0.2	Magadan Oblast	0.8
R. Karelia	0.2	R. North Ossetia – Alania	0.3	Yamalo-Nenets AO	0.3	Sakhalin Oblast	0.2
R. Komi	0.4	R. Chechnya	0.1	Chelyabinsk Oblast	0.5	Jewish AO	0.2
Arkhangelsk Oblast	0.4	Stavropol Krai	0.2			Chukotka AO	0.6

This consideration may be proved by the fact that if the RF has in average 0.3 beds for TB patients, in some regions this indicator is much higher,up to 0.8 (Ivanovo, Magadan oblasts), 0.6 (in Moscow city and Republic of Sakha-Yakutia, Chukotka AO), 0.5 (Belgorod, Vologda, Voronezh, Kaluga, Kostroma, Tambov, and Chelyabinsk oblasts). At the same time, in the Republic of Chechnya this indicator is exceedingly low – 0.1.

The Central Federal Region has 0.4 hospital beds per 1 TB patient, whereas in the North-Caucasus and Siberian Federal Regions the rate is twice as less (0.2). Provision of in-patient beds for TB patients may also be different within one federal region, For example, in the Ural Federal Region, the number of in-patient beds per patient in the Chelyabinsk Oblast is 2.5 times higher than in the adjacent Kurgan and Sverdlovsk oblasts.

Following the transition to the uniform system of financing with per patient payment and with the implementation of independent control of in-patient services in compliance with the established standards, TB control services in some subjects of the Russian Federation will have to reduce the number of in-patient beds and develop less costly day-care services at out-patient TB departments (policlinics).

Overall total, in the Russian Federation there are 44 tuberculosis sanatoriums for adults. Tuberculosis sanatoriums for adult TB patients operate in 32 of 83 subjects of the Russian Federation. Most TB sanatoriums are located in CFR (12) and PFR (15). There are no TB sanatoriums in FEFR and only 1 TB sanatorium for adult patients in each of NCFR and UFR. The are also 123 tuberculosis sanatoriums for children – 26 in each of CFR and PFR, 5 sanatoriums in NCFR and 6 in UFR.

12.2. Laboratory services

Unfortunately, the state statistics reporting forms do not provide separate data on the number of laboratories engaged in performing direct microscopy, culture and drug susceptibility tests. Form No. 30 contains only information of the number of tests performed with each of these methods.

The data submitted for the WHO Global Report [53] contains information on the number of laboratories in 2007 (4048, 965 and 280 laboratories performing microscopy, culture and drug susceptibility tests, respectively), but this information only partially reflects the real situation. For example, in 2008 in 3.999 clinical-diagnostic laboratories engaged in performing microbiological tests and 970 bacteriological laboratories only 6,6% of bacteriological tests were performed for *M.tuberculosis* detection (about 9.3 million tests), and 6.6% of culture tests (9.3 million tests). This means that it is far from being that all the laboratories reported to WHO Global Report are involved in investigations for TB detection.

In 2009, bacteriological tests for MbT detection were not performed in laboratories in the republics of Chechnya and Kabardino-Balkaria, because the republican TBD there were not equipped with bacteriological laboratories.

12.3. Human resources

The Russian Federation TB services have 5.9 TB physicians per 100,000 population (6.3 in 2005). 64.8% of TB physicians have qualification categories (34.9% with highest qualification category – Table 12.3). 93.7% of TB physicians have certificates.

Table 12.3

Human resource capacity of TB Services, the Russian Federation, 2005–2009
(Source: Form No. 17 "Information on medical and pharmaceutical personnel")

	2005	2006	2007	2008	2009
Number of TB physicians per 100,000 population	9,027 6.3	8,813 6.2	8,565 6.0	8,517 6.0	8,302 5.9
Have qualification categories, total % of TB physicians	5,521 61.2	5,542 62.9	5,451 63.6	5,492 64.5	5,379 64.8
Including TB physicians with highest category % of TB physicians % of TB physicians with qualification categories	2,647 29.3 47.9	2,712 30.8 48.9	2,773 32.4 50.9	2,838 33.3 51.7	2,901 34.9 53.9
First category % of TB physicians with this category	2,117 38.3	2,075 37.4	2,037 37.4	2,062 37.5	1,935 36.0
Second category % of TB physicians with this category	757 13.7	755 13.6	641 11.8	592 10.8	543 10.1

At present, the mean age of TB physicians is about 50 years. The inflow of younger personnel is extremely scarce; only 4% of TB physicians are under 30 years and 15% are above 70. TB services are mostly staffed with female personnel (78.5%).

Based on the statistical reporting form No. 30, as of December 31, 2009, TB control services in the Russian Federation had 17,650 physician posts, including 12,553 TB physician posts (among them 7,909 in policlinics), and 40,412 mid-level medical worker posts. Almost two-thirds of TB physician posts (63%) are in policlinics. 94% of TB physician posts are actually staffed – 92% in policlinics and 96% in in-patient facilities.

Currently, the national TB service employs 9,769 physicians of all specialties, including 7,088 phthisiatrists (4.685 in policlinics). Among physicians of all specialties, including phthisiatrists, multiple jobholding coefficient is 1.7 (coefficient above 1.3 afflicts service performance).

The structure of TB service organization can be presented as a scheme presenting the distribution of functions among health facilities participating in TB control activities.

12.4. Financing

According to the State statistical reporting form No. 62 "The provision and financing of health care for the population", the analytical report on the implementation of the Federal Target Programme "Prevention and Control of Socially Significant Diseases (2007–2011)" and the Russian Health Care Foundation reports, 30.3 billion rubles was allocated from different financial sources in 2009 for TB control programmes in Russia, including budgets of the subjects of the Russian Federation and local budgets (23.5 and 3.6 billion rubles, respectively, or 88.4%), 3.3 billion rubles from the federal budget (10.8%), and from international support projects 0.8% of all allocated resources in 2009[121]. As a result, in 2009 about 82,000 rubles was allocated from all sources per one active TB patient.

According to the State statistical reporting form No. 62, the total funds allocated in 2009 from the federal budget for TB control services (basing on data received from 76 subjects of the Russian Federation) amounted to 21,182,495,510 rubles[122]. The distribution of funds among the federal regions was as follows (in rubles): Privolzhsky FR – 4,220 mln, Siberian FR – 3.730 mln, Central FR – 3,640 mln, Ural FR – 2,530 mln, South FR – 2,380 mln, Far-East FR – 2,140 mln, North-West FR – 1,580 mln, and North-Caucasus FR – 965,350,000 rubles.

As per subject of the Russian Federation, the most significant funds were allocated to TB control services in Rostov Oblast (1,150 mln rubles), Moscow Oblast (1,051 mln), Krasnodar Krai (971 mln), Sverdlovsk Oblast (797 mln), Irkutsk Oblast (706 mln), Chelyabinsk Oblast (688 mln), Khanty-Mansi AO (688 mln), and the Republic of Bashkortostan (657 mln). Least finance resources were provided to Jewish AO (49 mln), republics of Karachaevo-Cherkessia (37 mln), Altai (41 mln), Kalmykia (51 mln), Adygea (52 mln), Mari El (59 mln), Karelia (67 mln), and Yamalo-Nenets AO (107 mln).

Funds allocated for TB control services per 1 patient with active form of the disease[123] amounted to 80,628.27 rubles. Anyhow, this indicator varied significantly among federal regions and subjects of the Russian Federation. In FEFR, UFR, NWFR, per patient costs amounted to 90–100 thousand rubles (108,000 and 92,000, respectively). In PFR, CFR and SFR – about 80,000 rubles (85,000, 84,000 and 80,000, respectively), and in SbFR and NCFR – less than 70,000 rubles (66,000 and 50,000, respectively) was allocated per 1 TB patient with active form of the disease.

In the subjects of the Russian Federation, the funds used per 1 TB patient were in Magadan Oblast – 534,000, Kamchatka Krai – 272,000, Khanty-Mansi AO – 256,000, Ivanovo Oblast – 232,000, Belgorod Oblast – 202,000, Kostroma Oblast – 198,000, Republic of Komi – 185,000, and Voronezh Oblast – 172,000 rubles. The least funds per patient were allocated in Yamalo-Nenets AO (2,000), Republic of Chechnya (19,000), Kaliningrad Oblast (23,000), Altai Krai (34,000), Irkutsk Oblast (38,000) Republic of Karachaevo-Cherkessia (41,000), Republic of Dagestan (47,000), and Smolensk Oblast (50,000 rubles).

In 2009, the structure of TB control costs was as follows: 63.3% (13,466,784,000 rubles) – salaries of medical and other TB facilities personnel; 21.0% (4,453,869,000 rubles) – non-financial assets accrued, 13.8% (2,928,607,000 rubles) – costs of services received, 1.3% (284,329,000 rubles) – other expenses, and 0.04% (8,829,000 rubles) – social support for TB patients.

In 2009, the overall costs of salaries paid to medical and other personnel of TB control facilities were most significant in the Republic of Kalmykia (80.6%), Sverdlovsk Oblast (83.2%), and Astrakhan Oblast (75.6%). The lowest costs of salary payments to medical and other personnel were in Samara Oblast (48.1%), Pskov Oblast (50.16%) and Sakhalin Oblast (51.1%).

121 In 2009, average exchange rate was 31 RUR for $1 – note of translation editor.

122 Reporting forms were submitted from 76 subjects of the Russian Federation.

123 This calculation is based on data on TB patients with active forms of the disease registered in TB control facilities at the end of 2009 (Form No. 33).

FEDERAL LEVEL

Ministry of Health and Social Development and RAMS

Ministry of Justice
Ministry of Internal Affairs

Federal Research Institutes, FHCOIRI

- Development of draft regulations on TB control
- Control over the implementation of the current regulations on TB
- Training of staff and qualification improvement of TB medical personnel
- Organizational-methodological and consultative assistance to the regions
- Coordination, monitoring, supervision and evaluation of TB control programs at the regional level·
- Highly specialized medical care

Federal Service of Punishment Execution (FSIN) facilities

- Detection of TB cases, TB control, treatment of patients, dispensary follow up
- Work with contacts, TB prevention, health education and prevention measures
- Recording and reporting
- Interdepartmental interaction

REGIONAL LEVEL (subjects of the Russian Federation (territories) level)

Head healthcare facility in a subject (territory) of the Russian Federation – oblast (republic, krai) TB dispensary

- Control over the implementation of the current regulations on TB
- Organizational-methodological and consultative assistance to facilities in the regions
- Coordination, monitoring, supervision and evaluation of TB control programs at the regional level
- TB diagnosis, supervision of TB cases detection
- Highly specialized medical care
- Health education and education of the public on TB prevention measures
- Interdepartmental interaction

TB dispensaries, departments and units

- TB diagnosis, control over the organization of TB detection, treatment of TB patients, dispensary follow up
- Work with contacts, TB prevention among adults and children
- Health education and education of the public on TB prevention measures
- Recording and reporting
- Interdepartmental interaction

TB hospitals

- Differential diagnostics.
- Treatment of TB patients.

LOCAL LEVEL

Primary healthcare facilities

- Detection of TB cases
- Treatment of TB patients in the continuation phase
- TB prevention, health education and education of the public on TB prevention measures
- Recording and reporting
- Interdepartmental interaction

The most significant share of expenses for received services in the overall structure of TB control costs in 2009 were in Moscow Oblast (29.3%), Kamchatka Krai (28.6%), and Amursk Oblast (25.9%). The lowest levels of this indicator were in Sverdlovsk Oblast (5.7%), Republic of Chechnya (6.6%), and in the Republic of Tyva (6.7%).

Only 21 subjects of the Russian Federation allocated financial resources for social support of TB patients (Vladimir, Voronezh, Ivanovo, Kaluga, Kostroma, Arkhangelsk, Penza, Ulyanovsk, Kemerovo, Tomsk, Magadan, Sakhalin oblasts, and republics of Karelia, Kalmykia, Tatarstan, Buryatia, Yamalo-Nenets AO, Jewish AO, and Kamchatka and Khabarovsk Krais).

In 2009, expenses for food supplies for TB patients amounted to 1,685,220,000 rubles (8% of the overall costs of TB services in the Russian Federation). Analysis of this item of expenses shows that it was most significant in Tomsk Oblast (37.6%), republics of Chechya (14.8%), Dagestan (13.5%) and North Ossetia-Alania (13.4%). The lowest share of this item of expenses was in the Republic of Sakha (Yakutia) (0.6%), Sakhalin Oblast (3.7%), Kamchatka Krai (4.2%), Sverdlovsk Oblast (4.4%) and Moscow Oblast (4.4%).

In 2009, the average food supplies costs per 1 patient in TB facilities were 6,400 rubles per year (18 rubles per day)[124], with most significant expenses per 1 TB patient (in thousand rubles per year) in Magadan (51), Tomsk (42), Kostroma (18), Lipetsk (16.6), Belgorod (16.2), Ivanovo (15.5), Novgorod (14.9) oblasts, and in Khanty-Mansi AO (14.3).

According to the WHO Global Report [53, 54], $4.4 billion will be allocated for TB control programmes throughout the world in 2010 (data for 118 countries, which contribute 94% of all TB cases in the world). In this amount, 86% will be provided from government budgets including loans, 9% by Global Fund, and 3% by other donor organizations.

The major part of funds for TB control activities is provided in the European Region ($1.9 billion). The most part of this amount is provided in the Russian Federation, which confirms the Russian Government's strong commitment to solve the problem of TB in the country. Next follow the countries of the African Region ($0.6 billion).

In total, according to the available data [53, 54], to complete the implementation of TB control programmes in 118 countries will require additional $2.1 billion. The major components of TB control programmes requiring financial support have been determined as follows: MDR TB problem; measures for TB-HIV co-infection control; and activities related to strengthening of commitment and advocacy, social mobilization and information for combating TB.

[124] Data on patients in TB control facilities are based on Form No. 33. The indicator value is only approximate, since not all TB patients received in-patient treatment. Nevertheless, considering the high level of hospitalization of people with TB, this indicator seems adequate to reflect the situation with food supplies for TB patients.

Conclusion

The first years of the 21st century in the Russian Federation have been characterized by a certain stabilization of the main epidemiological TB rates and indicators, reflecting the effectiveness of TB control activities. At the same time, the situation remains quite severe.

Numerous factors have an impact on the spread of TB and require thorough assessment. At the same time, the quality of data analysis depends substantially on the effectiveness of statistical system functioning, which includes recording and reporting forms and indicators and ensures adequate measures and evidence based decision-making.

This review has been devoted to the assessment of the TB situation in the Russian Federation with an emphasis on the use of the current statistical reporting data on TB and the main available indicators, which, as we believe, have allowed us to make an adequate analysis of the information.

The facts revealed in this analytical review are just another proof underlining the fact that the TB situation in the Russian Federation is quite complex and that there is still a need for further improvement of TB control activities and implementation of modern strategies to fight the disease. In doing so, it is important to apply both the rich expertise of Russian phthisology and the international experience, including experience of the neighboring European countries.

References

A1. “Туберкулез в Российской Федерации, 2006 год. Аналитический обзор основных статистических показателей по туберкулезу, используемых в Российской Федерации”, Москва, 2007, с.126 / TB in the Russian Federation. An analytical review of the main epidemiological indicators, 2006

A2. “Туберкулез в Российской Федерации, 2007 год. Аналитический обзор основных статистических показателей по туберкулезу, используемых в Российской Федерации”, Москва, 2008, с. 172 / TB in the Russian Federation. An analytical review of the main epidemiological indicators, 2007

A3. “Туберкулез в Российской Федерации, 2008 год. Аналитический обзор основных статистических показателей по туберкулезу, используемых в Российской Федерации”, Москва, 2010, с. 192 / TB in the Russian Federation. An analytical review of the main epidemiological indicators, 2008

1. *Аксенова В.А*. Инфицированность и заболеваемость туберкулезом детей как показатель общей эпидемиологической ситуации по туберкулезу в России / В.А. Аксенова // Проблемы туберкулеза. 2002. № 1. С. 6–9.
2. *Белиловский Е.М., Борисов С.Е., Гордина А.В., Матвеева М.В., Марьина Н.С., Дергачев А.В.* Государственная система мониторинга туберкулеза в России // Новые информационные технологии и мониторинг туберкулеза в России. М.: НИИФП ММА им. И.М. Сеченова, 2000. С. 10–30.
3. *Белиловский Е.М., Борисов С.Е., Дергачев А.В., Гордина А.В., Марьина Н.С., Матвеева М.В.* Заболеваемость туберкулезом в России: ее структура и динамика // Проблемы туберкулеза, 2003. № 7. С. 4–11.
4. *Богородская Е.М.* Организационные принципы при различном отношении больного туберкулезом к лечению // Организация лечения больных туберкулезом: Материалы Всеросс. совещания, 1–2 июля 2008 г. М.: Минздравсоцразвития России, НИИФП ММА им. И.М. Сеченова, РОФ. С. 41.
5. *Богородская Е.М., Пучков К.Г., Перельман М.И.* Сравнение первых результатов мониторинга химиотерапии больных туберкулезом легких в России с традиционными показателями ф. 33 // Туберкулез в России: Материалы VIII Рос. съезда фтизиатров. М., 2007. С. 47.
6. *Богородская Е.М., Пучков К.Г., Борисов С.Е., Перельман М.И.* Первые результаты внедрения Приказа Минздрава Российской Федерации № 50 “О введении в действие учетной и отчетной документации мониторинга туберкулеза” // Проблемы туберкулеза. 2007. № 5. С. 3–7.
7. *Культуральные* методы диагностики туберкулеза. Учебное пособие для проведения базового курса обучения специалистов бактериологических лабораторий учреждений противотуберкулезной службы. М., 2008. 208 с.
8. *Какорина Е.П., Фролова О.П., Мартынов А.А., Шинкарева И.Г.* Эпидемиологическая ситуация по туберкулезу среди больных ВИЧ-инфекцией в России по итогам 2006 года // Проблемы туберкулеза у больных ВИЧ-инфекцией. Бюллетень № 3. М., 2007. С. 2–7.
9. *Левашев Ю.Н., Мушкин А.Ю., Гришко А.Н.* Внелегочный туберкулез в России: официальная статистика и реальность // Пробл. туб. и болезней легких. 2006. № 4. С. 3–6.
10. *Матинян Н.С., Скачкова Е.И.* Множественная лекарственная устойчивость микобактерий туберкулеза как глобальная проблема общественного здоровья // Бюллетень Программы ВОЗ по борьбе с туберкулезом в Российской Федерации. Вып. 8. М., 2008. С. 13–21.
11. *Малахов В.Н., Шульгина М.В.* Результаты внешней оценки качества лабораторных исследований при диагностике туберкулеза // Менеджмент качества в сфере здравоохранения и социального развития. 2008. № 3. С. 33–36.
12. *Материалы* научно-практической конференции с международным участием “Проблемы туберкулеза у больных ВИЧ-инфекцией” 18–19 апреля 2007 г. М., 2007.
13. *Методика* анализа статистических показателей диспансерного наблюдения больных туберкулезом: Методические рекомендации / Сост. Шилова М.В. М., 1982. С. 37.
14. *Медико-демографические* показатели Российской Федерации, 2006 г.: Статистические материалы, официальное издание. М., 2007. Минздравсоцразвития Российской Федерации, ЦНИИОИЗ. С. 188.
15. *Медико-демографические* показатели Российской Федерации, 2007 г.: Статистические материалы, официальное издание. М., 2008. Минздравсоцразвития Российской Федерации, ЦНИИОИЗ. С. 177.
16. *Медико-демографические* показатели Российской Федерации, 2008 год. Статистические материалы, Москва, 2009, 169 с.

16a. *Медико-демографические* показатели Российской Федерации, 2009 год. Статистические материалы, Москва, 2010 (в печати).

17. *Методические* рекомендации по проведению микробиологических исследований на туберкулез (для бактериологических лабораторий УИС Минюста Российской Федерации). ГУИН Минюста России, 2001 г. № 18/22–3002.
18. *Михайлова Ю.В., Сон И.М., Скачкова Е.И., Стерликов С.А.* Распространение туберкулеза среди детей и подростков в Российской Федерации (анализ данных официальной статистики) // Пробл. туб., 2009. № 1. С. 5–10.
19. *Организация* противотуберкулезной помощи больным ВИЧ-инфекцией: Пособие для врачей / Под ред. О.П. Фроловой, А.В. Кравченко, А.А. Мартынова, Ф.А. Батырова. М.–Тверь: Триада, 2007. 120 с.

20. *Отраслевые* показатели противотуберкулезной работы в 2007–2008 гг. Минздравсоцразвития России // Кривонос О.В., Алексеева Г.С., Михайлова Ю.В. и др. Статистические материалы. М., 2009. 52 с.
21. *Отраслевые* показатели противотуберкулезной работы в 2008–2009 гг.: Статистические материалы, ФГУ "ЦНИИОИЗ", НИИФП ММА им. И.М. Сеченова. М., 2010, 58 с. (в печати).
22. *Официальный* сайт Федеральной службы государственной статистики www.gks.ru, раздел "WEB-публикации".
23. *Перельман М.И.* Туберкулез сегодня // Материалы VII Российского съезда фтизиатров. М.: Бином, 2003. 352 с.
24. *Перельман М.И., Наумов В.Н., Добкин В.Г. и др.* Показания к хирургическому лечению больных туберкулезом легких // Проблемы туберкулеза. 2002. № 2. С. 51–55.
25. *Приказ* Министерства здравоохранения Российской Федерации № 109 от 23.03.2003 "О совершенствовании противотуберкулезных мероприятий в Российской Федерации".
26. *Приказ* Министерства здравоохранения Российской Федерации № 50 от 13.02.2004 "О введении в действие учетной и отчетной документации мониторинга туберкулеза".
27. Проблемы туберкулеза у больных ВИЧ-инфекцией. Бюллетень № 4. М., 2007. 48 с.
28. *Презентация* ВОЗ ТБ РФ на региональной конференции ЮФО. Владикавказ, 2008.
29. *Российский* статистический ежегодник: Статистический сборник. ФСГС. М., 2006. 819 с.
30. *Руководство* по легочному и внелегочному туберкулезу / Под ред. Ю.Н. Левашова и Ю.М. Репина. СПб.: ЭЛБИ-СПБ, 2006. 516 с.
31. *Руководство* по лечению туберкулеза у детей, для национальных программ борьбы с туберкулезом, WHO/HTM\TB\2006.371, WHO/FCH/CAH/2006.7.
32. *Ресурсы* и деятельность противотуберкулезных учреждений. Основные эпидемиологические показатели за 2007–2008 годы: Статистические материалы. М.: ЦНИИОИЗ, 2009. 108 с.
33. *Севостьянова Т.А., Стерликов С.А., Пучков К.Г., Саниев М.А.* Гипердиагностика первичного туберкулеза у детей // Туберкулез в России, год 2007. Материалы VIII Российского съезда фтизиатров. М.: Идея, 2007. С. 239–240.
34. *Скачкова Е.И.* Динамика и социально-демографическая структура туберкулеза в Российской Федерации, его зависимость от уровня жизни / Е.И. Скачкова, М.Г. Шестаков, С.Ю. Темирджанова // Туберкулез и болезни легких. М., 2009. № 7. С. 4–8.
35. *Сон И.М., Литвинов В.И., Сельцовский П.П.* Методика оценки эпидемиологических показателей по туберкулезу и эффективности противотуберкулезных мероприятий: Пособие для врачей противотуберкулезных учреждений, врачей-статистиков. М., 2001. 44 с.
36. *Сон И.М.* Значимость показателя заболеваемости для оценки эпидемической ситуации при разных уровнях распространенности туберкулеза: Автореф. дисс. … канд. мед. наук. М., 1997. 22 с.
37. *Сон И.М., Скачкова Е.И., Леонов С.А., Сельцовский П.П., Рыбка Л.Н., Стерликов С.А., Гордина А.В., Кучерявая Д.А., Пономаренко Е.Н., Кочкарев Д.Е., Зайченко Н.М., Сазыкина И.Г.* Оценка эпидемической ситуации по туберкулезу и анализ деятельности противотуберкулезных учреждений. М.: ЦНИИОИЗ, 2009. 20 с.
38. *Социально-значимые* заболевания населения России в 2008 году: Статистические материалы. М., 2009. 66 с.
38а. *Социально-значимые* заболевания населения России в 2009 году: Статистические материалы. М., 2010 (в печати).
39. *Скачкова Е.И.* Оценка влияния социальных факторов на заболеваемость туберкулезом. Характеристика социально-профессионального состава впервые выявленных больных туберкулезом / Е.И. Скачкова, Н.С. Матинян, М.Г. Шестаков, Д.А. Кучерявая, С.К. Владимиров // Проблемы управления здравоохранением. М., 2009. № 3(46). С. 34–39.
40. *Туберкулез* / Под ред. Б.Р. Блума. М.: Медицина, 2002. 696 с.
41. *Филиппов А.В., Борисов С.Е., Сон И.М., Матвеева М.В.* Туберкулез у детей по данным полицевых регистров системы мониторинга туберкулеза: Научные труды / Под ред. В.И. Литвинова. М.: МНПЦБТ. 2010. С. 177–183.
42. *Шилова М.В.* ТБ в России в 2007 году. М., 2008. 152 с.
43. *Шилова М.В.* ТБ в России в 2009 году. М., 2010.
44. *Advocacy T.B.* A Practical Guide 1999, WHO Global Tuberculosis Programme.
45. *Anti-tuberculosis* Drug Resistance in the world. Report № 3. WHO. Geneva, 2004. P. 300.
46. *Dye Ch., Scheele S., Dolin P., Pathania V., Raviglione M.* Global Burden of Tuberculosis. Estimated Incidence. Prevalence. and Mortality by Country. JAMA. August 18, 1999. Vol. 282. № 7. P. 677–686.
47. Dye C. et al. Measuring tuberculosis burden, trends and the impact of control programmes. Lancet Infectious Diseases (published online 16 January 2008; http://infection.thelancet.com).
47a. *CDC* Reported Tuberculosis in the United States. 2007. Atlanta. GA. U. S. Department of Health and Human Services, CDC. September 2008.
48. *Drobniewski F. et al.* And WHO European Laboratory Strengthening Taskforce Group, Recommended standards for modern tuberculosis laboratory services in Europe // Eur. Respir. J. 2006. 28. P. 903–1090.
49. *Estimating* the burden of TB by age and sex: availability of data, gaps and next steps, Ana Bierrenbach, Background paper number 9, Fourth Task Force meeting, 17–18 March 2010, Geneva, Switzerland, http://www.who.int/tb/advisory_bodies/impact_measurement_taskforce/meetings/tf_17march10_bg_9_estimating_tb_by_age_sex.pdf.
50. *Farmer P.* Pathologies of Power. University of California, Berkeley-Los Angeles-London. 2003. 402 p.
51. *Guidelines* for surveillance of drug resistance in tuberculosis. 4th ed. WHO/HTM/TB/2009.422.
52. *Guidelines* for the programmatic management of drug resistance tuberculosis. 4th ed. WHO/HTM/TB/2008.402.

52a. *Guidelines* TB treatment 4th edition.
53. *Global* tuberculosis control: epidemiology, strategy, financing: WHO report 2009. Geneva, World Health Organization (WHO/HTM/TB/2009.411).
54. *Global* tuberculosis control: a short update to the 2009 report. WHO /HTM/TB/2009.426.
55. *Jakubowiak W.M., Bogorodskaya E.M., Borisov S.E., Donilova I.D., Kourbatova E.K.* Risk factors associated with default among new pulmonary TB patients and social support in six Russian regions // Int. J. Tuberc. Lung Dis., 2007. 11 (1). P. 46–53.
56. *Laboratory* services in tuberculosis control. Culture, Part III, 1998, P. 95 (WHO/TB/98/258).
57. *Nelson L.J., Wells C.D.* Global epidemiology of childhood, Tuberculosis and Lung Disease, 2003, 8. P. 636–647.
58. *Multidrug and extensively drug-resistant* TB (M/XDR-TB): 2010 global report on surveillance and response. WHO/HTM/TB/2010.3.
59. *Shulgina M.V., Irtuganova O.A., Smirnova N.S., Malakhov V.N.* 2008, FSEQA- Seven Years of EQA of TB Laboratory Tests' Experience. 39th Union World Conference on Lung Health, 16 to 20 October 2008, Paris, France, Abstracts PS-81347–18.
60. *TB Impact Measurement*: WHO policy and recommendations for how to assess the epidemiological burden of TB and the impact of TB control. Geneva, World Health Organization, 2009 [in press].
61. *World* Health Organization: Anti-tuberculosis drug resistance in the world: Report Number 4. The WHO/IUALTD global project on anti-tuberculosis drug resistance surveillance // WHO/HTM/TB/2008.394. Geneva: WHO. 2008.
62. *WHO* Mortality Database, www.who.int/healthinfo/morttables.
63. *Zignol M., Hosseini M.S., Wright A. et al*. Global incidence of multidrug-resistant tuberculosis // J. Infect. Dis. 2006. Vol. 194 (4). P. 479–485.

Annex 1

Definitions used in the Russian Federation for dispensary groups and patient groups based on registration history and treatment outcomes

Definitions approved by the Russian Ministry of Health Executive Order No. 109 of 23.03.2003 “On the improvement of TB activities in the Russian Federation” [25]

1. Groups of dispensary follow up and TB registration for adult patients in TB facilities

Group Zero (0) – for the follow up of persons with unspecified TB activity (cases suspected of TB) and in need of differential diagnosis of TB of any site; persons in need of specifying TB activity are included in group 0 subgroup A (0-A); persons in need of differential diagnosis of TB and other diseases are included in group 0 subgroup B (0-B).

I-A (MbT+)[125] **–** follow up of new registered MbT+ TB cases.

I-A (MbT–) – follow up of new registered MbT– TB cases.

I-B (MbT+) – follow up of MbT+ TB relapses.

I-B (MbT–) – follow up of MbT– TB relapses.

I-B – follow up of patients with treatment interruptions and patients avoiding evaluation. Patient transfer to group I-B occurs 1 month after a failed contact.

II-A – follow up of patients with chronic TB who need intensive treatment that may result in cure.

II-Б – follow up of patients with chronic TB in need of rehabilitation, symptomatic treatment and in need of TB therapy if indicated .

III – persons with non-active TB indications after clinical cure.

2. Groups of dispensary follow up and registration of children and adolescents in TB facilities

Group Zero (0) – follow up of children and adolescents referred to TB services for specifying the nature of a positive sensitivity to tuberculin and/or for a differential diagnosis for the purpose of confirmation or exclusion of TB of any site.

Group I A – patients with active forms of disseminated and complicated TB of any site.

Group I B – patients with active TB of any site with small and non-complicated TB forms.

Group II – patients with active TB of any site with chronic disease manifestations.

Group III – children and adolescents at risk of TB relapse at any site. It includes 2 subgroups: **III-A –** new cases with residual post-TB changes; **III-B –** persons transferred from groups I and II, as well as from subgroup III-A.

Group IV – children and adolescents in contact with sources of TB infection. It has two subgroups: **IV-A –** persons in contact with MbT+ family members, relatives and household persons, as well as in contact with MbT+ individuals in facilities for children and adolescents; children and adolescents living in the territory of TB facilities; **IV-B –** persons in contact with active MbT– TB patients; from families of livestock farmers working at farms with unfavorable TB situation, as well as from families with livestock having TB.

Group V – children and adolescents with complications after TB vaccinations. It includes 3 subgroups: **V-A –** patients with generalized and extended lesions; **V-B –** patients with local and circumscribed lesions; **V-C –** patients with non-active localized complications, both new cases and transferred from groups V-A and V-B.

Group VI – persons at high risk of localized TB. It includes 3 subgroups: **VI-A –** children and adolescents at early stage of primary TB infection (conversion of tubercular tests); **VI-B –** previously infected children and adolescents with hyperergic reaction to tuberculin; **VI-C –** children and adolescents with increased tuberculin sensitivity.

3. General definitions

Chemotherapy regimen – The combination of TB drugs, duration of their administration, time and scope of follow up evaluations, as well as organizational forms of treatment, based on patient group.

Tuberculosis of uncertain activity – Uncertain changes in TB activity in the lungs and other organs.

Active tuberculosis – a specific inflammatory process caused by TB mycobacteria (MbT) which can be detected by a complex of clinical, laboratory and radiological evidences.

[125] MbT – mycobacteria of tuberculosis, see the list of abbreviations.

Chronic course of active TB – long-term (over 2 year), undulating course of the disease with the alternation of remissions and exacerbations, when the clinical, radiological and bacteriological evidences of TB process activity persist.

Clinical cure – disappearance of any kind of evidence of an active TB process in the result of a basic course of comprehensive treatment. Confirmation of a clinical cure from TB and the moment of completion of the effective course of a comprehensive treatment are defined by the lack of evidence of any TB process developing within 2–3 months.

Criteria of treatment effectiveness are:

- disappearance of clinical and laboratory signs of TB inflammation;
- continued cessation of bacterial excretion confirmed by microscopy and culture tests;
- regression of radiological manifestations of TB (focal, infiltrative, destructive);
- rehabilitation of the patient's functional and working abilities.

Patients with bacterial excretion (bacteriologically positive TB patients) – TB patients who have MbT detected in biological fluids and/or pathological material. Among extra-respiratory TB cases, patients with bacterial excretion are those who have MbT detected in fistula discharge, in urine, menstrual blood and discharges from other organs.

Multi-drug resistance – MbT resistance to both isoniazid and rifampicin, with or without resistance to any other TB drugs.

Polyresistance – MbT resistance to any two or more TB drugs without resistance to both isonizid and rifampicin.

Bacteriological conversion (*syn.* 'abacillation') – disappearance of MbT from bodily fluids and pathological discharges excreted into the external environment. This requires confirmation by two consecutive negative microscopy and culture tests with an interval of 2–3 months after the first negative test result.

Residual post-TB effects – dense calcinated foci and foci of varying size, fibrotic and cirrhotic changes (including residual sanified lesions), plural thickenings, post-surgical changes in the lungs, pleura and other organs, as well as functional deviations after clinical cure. Single (as many as 3) small (up to 1 cm), dense calcinated foci, circumscribed fibrosis (within 2 segments) are considered to be minor residual effects. All other residual effects are considered major.

Destructive TB – an active form of the TB disease with cavitations confirmed by a complex of radiological methods of examination. The main detection method for destructive changes in the organs and tissues is x-ray examination (radiological – radiograms, tomograms).

Exacerbation (progressing) – appearance of new evidence of an active TB process after a period of improvement, and aggravation of the disease during follow up in groups I and II prior to the diagnosis of clinical cure. Exacerbation is an evidence of failing treatment which requires treatment adjustment.

Relapse – appearance of a new evidence of active TB in persons with a previous history of TB and cure from the disease; these are patients from follow up group III or purged from the registry due to cure.

Definitions approved by Russian Ministry of Health Executive Order No. 50 of 13.02.2004 "On the introduction of recording and reporting documentation for TB monitoring" [26]

1. Groups of patients by registration for treatment:

New cases – patients who have never had treatment for TB or have taken TB drugs for less than one month[126].

Relapses – new episodes of the disease in patients with a previous effective course of chemotherapy and new evidence of active TB, including positive results of sputum microscopy or culture tests and/or clear clinical-radiological evidence of TB.

Treatment after failure – treatment after a previous ineffective course of chemotherapy (persistent bacterial excretion or a new episode of bacterial excretion confirmed by any method at month 5 or later during treatment, or clinical and radiological confirmation of a failed course).

Treatment after default – treatment of patients after treatment interruption for 2 months or more.

Transferred out (for treatment continuation) – patients who have arrived from another administrative territory or another department (another registry), where they had initiated a chemotherapy course; these patients are registered for the continuation of treatment and the corresponding information on those patients is available.

Other – patients who do not meet any of the definitions given above, but for whom a decision has been made about provision of a chemotherapy course.

[126] According to Executive Order No. 109 [20], the Central Consultative Committee of Physicians makes decisions concerning registration of new cases and patients' removal from the registry when a TB specialist or another expert from a TB facility (TB ward) presents the case for the Committee's review.

2. Treatment outcomes

Successful course of chemotherapy confirmed by smear microscopy – a treatment outcome, in which a patient had positive sputum smear microscopy results prior to treatment initiation, received all doses of the drugs indicated in the treatment regimen, and by the end of the course had at least two negative sputum microscopy results registered at month 5 and in the end of treatment course.

Successful course of chemotherapy confirmed by culture – a treatment outcome, in which a patient had positive culture results prior to treatment initiation, and by the end of the course had at least two negative sputum culture results registered at month 5 and in the end of treatment course.

Successful course of chemotherapy with clinical and radiological confirmation – a treatment outcome, in which a patient:

- had negative results of sputum smear microscopy and culture before treatment initiation, received all doses of the drugs indicated in the treatment regimen, and had negative sputum microscopy and culture results registered at all stages of treatment;
- had positive sputum microscopy and/or culture results prior to treatment initiation, received all doses of the drugs indicated in the treatment regimen, but did not have the necessary number of negative sputum microscopy and culture results registered at month 5 and later during treatment.

Failed course of chemotherapy – a treatment outcome when a patient had negative results of sputum smear microscopy and culture before and at all stages of treatment, but if he/she remains or becomes smear positive at month 5 or later during treatment.

Failed course of chemotherapy confirmed by culture – a treatment outcome when a patient had positive culture results at the beginning of treatment and the results remain positive at month 5 or later during treatment

Failed course of chemotherapy with clinical and radiological confirmation – a treatment outcome when a patient had negative smear microscopy and culture results at the beginning of treatment, and the results remained negative at all stages of treatment, but there was clear clinical and radiological evidence of progressive TB at month 5 or later during treatment.

Died of TB – a treatment outcome registered in case of patient death from TB during the treatment course.

Other causes of death – a treatment outcome registered in case of patient death during the course of treatment of causes other than TB.

Chemotherapy default (interruption) – a treatment outcome in which a patient has interrupted the course of chemotherapy for 2 or more months.

Transferred out – patients who have left the administrative territory or were transferred from one department to another (e.g.: released from a prison where TB treatment was initiated) and the final treatment outcome is unknown.

Cohort – patients registered during one quarter.

Basic course of chemotherapy of TB patients – a complex of treatment activities, which includes intensive and continuation phases for the achievement of clinical cure of active TB.

Annex 2

Major epidemiological and TB control effectiveness indicators in the Russian Federation, 2005–2009

Table 1

TB notification rate in the Russian Federation, 2005–2009 (notification rate by territory, Form No. 8)

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases (all forms of the disease)										Including respiratory TB cases										Including pulmonary TB cases			
		Number of new TB cases					per 100,000 population					Number of cases					per 100,000 population					Number of cases		per 100,000 pop.	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2008	2009	2008	2009
	RUSSIAN FEDERATION	119226	117646	118367	120835	117227	84	82,6	83,3	85,1	82,6	1E+05	1E+05	1E+05	1E+05	1E+05	81,0	79,7	80,5	82,5	80,0	106663	106282	77,3	74,9
	FEDERAL REGION: Central	22687	22012	23332	23727	22456	60,6	59,0	62,7	63,9	60,5	21719	21125	22482	22859	21611	58,0	56,7	60,5	61,6	58,2	20996	20036	57,2	54,0
1	Oblasts: Belgorod	879	942	879	960	784	58,2	62,3	58,0	63,1	51,4	846	895	832	911	742	56,0	59,2	54,9	59,9	48,7	800	712	57,3	46,7
2	Braynsk	1194	1168	1259	1287	1277	89,2	88,2	95,9	98,7	98,3	1116	1108	1204	1235	1227	83,3	83,7	91,7	94,7	94,4	1131	1137	87	87,5
3	Vladimir	1085	1189	1161	1167	1156	73,3	81,1	79,8	80,8	80,3	1058	1151	1133	1138	1121	71,5	78,5	77,9	78,8	77,9	1037	1037	73,9	72,0
4	Voronezh	1643	1509	1597	1576	1438	70,7	65,5	69,8	69,3	63,3	1566	1440	1512	1507	1347	67,4	62,5	66,1	66,2	59,3	1441	1283	63,2	56,5
5	Ivanovo	647	672	578	610	631	58,4	61,4	53,3	56,7	58,8	612	650	561	583	605	55,3	59,4	51,8	54,2	56,4	525	568	51,4	52,9
6	Kaluga	827	741	721	735	688	81,2	73,2	71,6	73,2	68,6	774	695	681	707	670	76,0	68,7	67,6	70,4	66,8	633	634	66,1	63,2
7	Kostroma	352	327	304	297	365	49,4	46,3	43,5	42,8	52,7	342	312	298	296	357	47,9	44,2	42,6	42,6	51,6	274	311	37,7	44,9
8	Kursk	978	932	892	958	911	82,1	79,2	76,5	82,7	78,8	942	904	866	938	892	79,1	76,8	74,2	80,9	77,2	795	840	76,7	72,7
9	Lipetsk	850	877	943	902	724	71,7	74,5	80,5	77,4	62,2	808	833	904	876	700	68,2	70,8	77,2	75,1	60,2	892	678	73,8	58,3
10	Moscow	3553	3483	3921	3770	3640	53,6	52,5	58,9	56,3	54,2	3433	3368	3814	3656	3546	51,8	50,7	57,3	54,6	52,8	3590	3272	51,2	48,7
11	Orel	500	496	481	472	458	59,7	59,7	58,4	57,6	56,1	478	478	461	455	439	57,0	57,6	55,9	55,5	53,7	435	411	50,9	50,3
12	Ryazan	947	927	971	963	903	79,7	78,7	83,1	82,9	78,0	911	892	944	929	872	76,7	75,8	80,8	80,0	75,3	873	813	75,4	70,2
13	Smolensk	975	1009	899	970	923	96,3	100,9	91,0	99,1	94,8	937	979	876	941	897	92,5	97,9	88,6	96,1	92,1	802	837	89,7	85,9
14	Tambov	792	738	750	727	759	69,6	65,7	67,5	66,0	69,2	754	705	709	692	732	66,3	62,7	63,8	62,8	66,7	670	701	59,7	63,9
15	Tver	1119	1138	1104	1093	1019	79,0	81,4	79,7	79,5	74,4	1102	1118	1089	1075	1001	77,8	79,9	78,6	78,2	73,1	993	914	71,9	66,7
16	Tula	1485	1261	1228	1295	1399	92,2	79,3	78,0	83,0	90,1	1419	1218	1166	1245	1352	88,1	76,6	74,1	79,8	87,0	1070	1272	74,4	81,9
17	Yaroslavl	884	806	819	693	618	66,3	60,9	62,2	52,8	47,2	837	755	788	645	586	62,8	57,0	59,8	49,1	44,7	699	532	44,6	40,6
18	Moscow city	3977	3797	4825	5252	4763	38,2	36,4	46,1	50,1	45,3	3784	3624	4644	5030	4525	36,3	34,7	44,4	48,0	43,1	4336	4084	42,9	38,9
	FEDERAL REGION: North-West	8951	8684	8426	8624	8500	65,4	63,9	62,3	64,0	63,1	8641	8364	8135	8378	8236	63,2	61,5	60,1	62,1	61,2	7257	7479	56,1	55,6
19	Republics: Karelia	527	477	491	437	429	75,3	68,6	71,0	63,4	62,4	500	459	468	424	411	71,4	66,0	67,6	61,5	59,8	435	390	57,3	56,7
20	Komi	862	796	926	882	820	87,0	81,2	95,3	91,6	85,5	817	744	879	835	785	82,5	75,9	90,5	86,7	81,9	827	739	81,3	77,1
21	Oblasts: Arkhangelsk	858	942	756	740	697	66,1	73,3	59,2	58,4	55,2	839	921	740	724	683	64,6	71,6	58,0	57,1	54,1	688	635	53,7	50,3
	Nenets AO	21	23	17	18	18	50,0	54,8	40,5	42,8	42,8	19	23	17	17	18	45,3	54,8	40,5	40,5	42,8	15	18	40,5	42,8
22	Vologda	633	564	575	608	540	51,0	45,8	46,9	49,8	44,3	597	534	552	582	522	48,1	43,4	45,0	47,7	42,8	510	483	44,7	39,6
23	Kaliningrad	1185	1265	1256	1105	941	125,7	134,8	134,0	117,9	100,4	1165	1225	1227	1083	917	123,6	130,5	130,9	115,5	97,8	1088	796	101	84,9
24	Leningrad	1249	1207	1134	1302	1430	75,8	73,6	69,3	79,7	87,6	1225	1180	1104	1278	1392	74,3	71,9	67,5	78,3	85,3	1027	1296	73,4	79,4
25	Murmansk	574	500	497	428	455	66,1	58,1	58,2	50,5	54,0	549	482	490	418	441	63,2	56,0	57,4	49,4	52,3	461	419	38,6	49,7
26	Novgorod	463	451	444	438	432	69,1	68,2	67,8	67,5	66,9	453	430	422	423	424	67,6	65,0	64,4	65,2	65,6	395	404	61,6	62,5
27	Pskov	641	623	642	669	604	87,7	86,6	90,5	95,5	86,7	620	607	631	663	588	84,9	84,4	89,0	94,6	84,4	603	564	91,6	81,0
28	Saint-Petersburg city	1959	1859	1705	2015	2152	42,7	40,6	37,3	44,0	47,0	1876	1782	1622	1948	2073	40,9	38,9	35,5	42,6	45,2	1223	1753	36	38,3

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases (all forms of the disease)										Including respiratory TB cases										Including pulmonary TB cases			
		Number of new TB cases					per 100,000 population					Number of cases					per 100,000 population					Number of cases		per 100,000 pop.	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2008	2009	2008	2009
	FEDERAL REGION: South	16346	16298	17521	17040	10771	75,5	73,4	76,8	74,5	78,5	15696	15621	16855	16472	10524	72,5	70,4	73,9	72,0	76,7	15823	10002	68,3	72,9
	FEDERAL REGION: North-Caucasus					5659					61,6					5300					57,7		4916		53,5
29	Republics: Adygea	340	346	411	375	359	76,6	78,3	93,2	84,8	81,1	321	336	401	366	348	72,4	76,0	90,9	82,8	78,6	382	319	76	72,0
30	Dagestan	1553	1644	1582	1596	1485	59,0	62,0	59,2	59,1	54,8	1463	1539	1485	1513	1392	55,6	58,1	55,6	56,0	51,3	1371	1308	52,3	48,2
31	Ingushetia	246	183	214	157	202	50,8	37,4	43,1	31,2	39,8	236	180	209	151	193	48,7	36,7	42,1	30,0	38,0	192	167	25,8	32,9
32	Kabardino-Balkaria	468	488	491	431	428	52,3	54,7	55,1	48,3	48,0	450	473	473	419	417	50,3	53,0	53,1	47,0	46,7	437	391	42,4	43,8
33	Kalmykia	376	369	365	349	315	130,0	128,2	127,5	122,6	110,9	353	347	348	343	299	122,0	120,5	121,5	120,4	105,3	307	276	111	97,2
34	Karachaevo-Cherkessia	246	212	219	233	205	56,8	49,3	51,2	54,5	48,0	222	189	207	216	189	51,3	43,9	48,4	50,5	44,2	188	171	48,7	40,0
35	North Ossetia-Alania	522	439	512	451	459	74,2	62,5	72,9	64,2	65,4	474	391	479	419	415	67,4	55,7	68,2	59,7	59,1	333	358	51,8	51,0
36	Chechnya		912	1004	925	958		77,7	83,9	75,6	77,4		864	952	875	906		73,6	79,6	71,5	73,2	870	830	65,5	67,0
37	Krais: Krasnodar	3276	3105	3676	3653	3443	64,3	60,9	71,9	71,2	67,0	3175	3015	3604	3578	3361	62,3	59,1	70,5	69,7	65,4	3483	3256	67,5	63,3
38	Stavropol	1888	1797	1828	1905	1922	69,6	66,4	67,6	70,4	71,0	1749	1645	1682	1759	1788	64,4	60,8	62,2	65,0	66,0	1572	1691	61,7	62,5
39	Oblasts: Astrakhan	881	875	872	947	913	88,4	88,0	87,4	94,4	90,8	857	854	856	933	900	86,0	85,9	85,8	93,0	89,5	793	830	87,3	82,6
40	Volgograd	3041	2807	3099	2843	2697	115,0	106,8	118,5	109,2	103,8	2939	2735	2985	2778	2623	111,1	104,1	114,2	106,7	100,9	2879	2544	103	97,9
41	Rostov	3509	3121	3248	3175	3044	81,2	72,8	76,2	74,7	71,8	3457	3053	3174	3122	2993	80,0	71,2	74,4	73,5	70,6	3016	2777	70,3	65,5
	FEDERAL REGION: Privolzhsky	23539	23815	22681	23166	22946	76,9	78,3	74,9	76,7	76,1	22555	22853	21774	22348	22216	73,7	75,1	71,9	74,0	73,7	20494	20955	69,8	69,5
42	Republics: Bashkortostan	2300	2231	2114	1972	1940	56,5	55,0	52,2	48,6	47,8	2199	2109	2004	1856	1830	54,0	52,0	49,5	45,8	45,1	1883	1712	43,3	42,2
43	Mariy El	480	469	582	577	635	67,2	66,1	82,6	82,2	90,7	467	454	565	558	621	65,4	64,0	80,1	79,5	88,7	522	579	74,3	82,7
44	Mordovia	598	588	583	614	668	69,4	69,0	69,1	73,4	80,2	572	574	564	605	660	66,4	67,4	66,8	72,3	79,2	533	635	67,6	76,2
45	Tatarstan	2308	2298	2207	2221	2203	61,3	61,1	58,7	59,0	58,5	2165	2171	2088	2119	2109	57,5	57,7	55,5	56,3	56,0	1953	1987	53,1	52,7
46	Udmurtia	1317	1269	1254	1251	1097	85,0	82,3	81,7	81,7	71,8	1277	1221	1222	1221	1074	82,5	79,2	79,6	79,8	70,3	1152	1013	75,8	66,3
47	Chuvashia	1054	1052	994	1087	1032	81,3	81,6	77,4	84,9	80,7	1017	1028	965	1068	1014	78,5	79,7	75,1	83,4	79,3	931	989	81	77,3
48	Krai: Perm	3048	3200	2827	2953	2757	110,5	116,8	103,8	108,8	101,8	2923	3075	2723	2870	2671	105,9	112,2	99,9	105,8	98,6	2535	2483	99	91,7
49	Oblasts: Kirov	906	1014	911	1003	945	62,4	70,7	64,2	71,3	67,4	853	968	864	945	903	58,7	67,5	60,8	67,2	64,4	806	852	63,5	60,8
50	Nizhni Novgorod	2918	2844	2512	2503	2613	85,1	83,7	74,5	74,7	78,2	2826	2754	2446	2453	2547	82,4	81,1	72,6	73,2	76,2	2325	2368	68,7	70,9
51	Orenburg	2124	2371	2312	2405	2237	99,1	111,2	108,9	113,7	105,9	2042	2297	2233	2344	2182	95,2	107,8	105,2	110,8	103,3	2035	2011	101	95,2
52	Penza	1056	1026	985	1070	1053	74,6	73,2	70,8	77,3	76,3	1009	972	938	1039	1025	71,3	69,3	67,4	75,1	74,3	886	998	71,2	72,3
53	Samara	2421	2535	2518	2647	2754	75,8	79,6	79,3	83,4	86,8	2327	2441	2395	2512	2676	72,8	76,7	75,4	79,2	84,4	2290	2579	76,2	81,3
54	Saratov	2019	1902	1771	1758	1926	77,1	73,1	68,4	68,2	74,9	1934	1819	1716	1701	1871	73,9	69,9	66,3	66,0	72,7	1646	1776	63	69,0
55	Ulyanovsk	990	1016	1111	1105	1086	73,7	76,5	84,4	84,4	83,2	944	970	1051	1057	1033	70,3	73,0	79,8	80,8	79,2	997	973	75,9	74,6
	FEDERAL REGION: Ural	12656	12574	12717	12840	12068	103,2	102,8	103,9	104,8	98,5	12234	12149	12297	12431	11702	99,8	99,3	100,5	101,5	95,5	11295	10747	93,7	87,7
56	Oblasts: Kurgan	1252	1347	1320	1436	1279	127,0	138,2	136,8	150,1	134,3	1199	1291	1273	1381	1238	121,6	132,5	131,9	144,4	130,0	1018	1069	126	112,2
57	Sverdlovsk	4606	4620	4913	5270	4682	104,2	104,9	111,7	119,9	106,5	4470	4487	4789	5117	4558	101,2	101,9	108,9	116,4	103,7	4461	4207	110	95,7

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases (all forms of the disease)										Including respiratory TB cases										Including pulmonary TB cases			
		Number of new TB cases					per 100,000 population					Number of cases					per 100,000 population					Number of cases		per 100,000 pop.	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2008	2009	2008	2009
58	Tyumen	3918	3949	3404	3184	3167	118,2	118,4	101,3	94,0	93,2	3835	3845	3290	3102	3083	115,7	115,3	97,9	91,6	90,7	3060	2821	84,4	83,0
	Khanty-Mansi AO	1389	1423	1299	1302	1238	94,3	95,9	86,8	86,1	81,4	1371	1400	1267	1281	1217	93,0	94,4	84,6	84,7	80,1	1161	1133	78,7	74,5
	Yamalo-Nenets AO	514	439	400	389	435	97,5	82,1	74,0	71,6	80,0	505	422	390	377	423	95,8	78,9	72,1	69,4	77,8	359	383	64,6	70,4
59	Chelyabinsk	2880	2658	3080	2950	2940	81,3	75,4	87,7	84,0	83,8	2730	2526	2945	2831	2823	77,1	71,7	83,8	80,7	80,5	2756	2650	74	75,5
FEDERAL REGION: Siberian		26371	25888	25067	25988	25247	133,6	131,9	128,1	132,9	129,2	25617	25229	24429	25301	24535	129,8	128,5	124,8	129,4	125,5	22817	23185	122	118,6
60	Republics: Altai	298	260	237	250	253	145,9	126,9	114,9	120,1	120,9	290	246	224	241	241	142,0	120,0	108,6	115,8	115,2	204	224	99,9	107,1
61	Buryatia	1531	1672	1397	1527	1617	158,5	173,9	145,5	159,0	168,3	1490	1631	1362	1497	1577	154,2	169,6	141,9	155,9	164,1	1269	1465	146	152,5
62	Tyva	769	759	731	751	720	249,6	245,7	235,4	240,1	229,3	715	703	690	701	663	232,1	227,5	222,2	224,1	211,2	653	639	216	203,5
63	Khakassia	736	637	548	605	634	136,4	118,5	102,1	112,5	117,8	714	625	544	591	630	132,3	116,3	101,3	109,9	117,1	513	604	105	112,3
64	Krais: Altai	3716	3605	3317	3352	3248	145,5	142,3	131,8	133,9	130,1	3639	3546	3229	3265	3168	142,5	140,0	128,3	130,5	126,9	3064	2994	124	119,9
65	Trans-Baikal (Chita Oblast)	1227	1198	1206	1380	1170	108,4	106,5	107,6	123,4	104,7	1191	1164	1179	1352	1145	105,2	103,5	105,2	120,9	102,5	974	1095	116	98,0
66	Krasnoyarsk	3199	3021	3009	3092	3008	109,7	104,2	104,0	107,0	104,1	3089	2926	2925	3005	2904	105,9	100,9	101,1	104,0	100,5	2789	2767	99,2	95,8
67	Oblasts: Irkutsk	3126	3159	3439	3576	3351	123,3	125,3	137,0	142,7	133,7	3033	3077	3336	3465	3218	119,6	122,1	132,9	138,2	128,4	3122	3001	131	119,8
68	Kemerovo	4478	4349	4041	4164	4151	157,3	153,5	143,0	147,5	147,1	4390	4242	3948	4079	4040	154,2	149,8	139,8	144,5	143,2	3579	3730	133	132,2
69	Novosibirsk	3774	3647	3501	3599	3508	142,1	137,9	132,7	136,4	132,9	3689	3572	3439	3511	3449	138,9	135,0	130,4	133,1	130,7	3288	3368	129	127,6
70	Omsk	2406	2466	2582	2642	2638	117,9	121,5	127,7	131,0	131,0	2301	2408	2520	2573	2577	112,8	118,6	124,6	127,6	127,9	2383	2444	121	121,3
71	Tomsk	1111	1115	1059	1050	949	107,3	107,9	102,4	101,3	91,4	1076	1089	1033	1021	923	103,9	105,4	99,9	98,5	88,9	979	854	92,1	82,2
FEDERAL REGION: Far-East		8670	8366	8614	9434	9568	132,0	128,2	132,6	145,7	148,1	8473	8162	8416	9262	9395	129,0	125,0	129,5	143,1	145,4	7974	8951	136	138,6
72	Republic: Sakha (Yakutia)	798	782	736	859	780	84,0	82,3	77,4	90,4	82,1	767	734	697	822	750	80,7	77,3	73,3	86,5	79,0	633	702	82,3	73,9
73	Krais: Kamchatka	342	288	281	321	337	97,5	82,7	81,1	93,2	98,1	335	284	279	316	336	95,5	81,6	80,5	91,7	97,8	240	295	83	85,9
74	Primorsky	3354	3325	3586	3819	4142	165,4	165,2	179,2	191,7	208,3	3298	3267	3534	3766	4085	162,7	162,3	176,6	189,1	205,5	3358	3901	179	196,2
75	Khabarovsk	1838	1721	1806	1947	2012	129,8	122,2	128,6	138,8	143,5	1807	1701	1792	1927	1997	127,6	120,7	127,6	137,4	142,4	1708	1921	132	137,0
76	Oblasts: Amursk	1303	1251	1233	1363	1245	147,3	142,5	141,4	157,2	144,0	1264	1223	1208	1335	1202	142,9	139,3	138,5	154,0	139,0	1171	1151	148	133,1
77	Magadan	143	138	130	142	141	82,6	81,2	77,8	86,4	86,5	140	130	124	140	136	80,9	76,4	74,2	85,2	83,5	108	119	77,3	73,0
78	Sakhalin	555	584	503	589	553	104,9	111,5	96,8	114,0	107,5	527	550	448	567	538	99,6	105,0	86,2	109,8	104,6	427	527	103	102,4
79	Jewish Aut. Oblast	298	245	310	352	314	158,8	131,7	167,0	189,8	169,4	296	244	306	348	312	157,7	131,1	164,9	187,6	168,3	301	299	183	161,3
80	Chukotka Aut. Region	39	32	29	42	44	77,0	63,4	57,6	84,2	88,9	39	29	28	41	39	77,0	57,4	55,6	82,2	78,8	28	36	82,2	72,7

Table 2

Notification rate of extrarespiratory TB in the Russian Federation, 2006–2009 (notification rate by territory, Form No. 8)

№	Federal regions (okrugs) and subjects of the Russian Federation	All forms of extrarespiratory TB								CNS and brain membrains				Bones and joints				Urogenital			
		Number of cases				per 100,000 population				Number of cases		per 100,000		Number of cases		per 100,000		Number of cases		per 100,000	
		2006	2007	2008	2009	2006	2007	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
	RUSSIAN FEDERATION	4137	3971	3769	3696	2,9	2,8	2,7	2,6	205	200	0,1	0,1	1121	1242	0,8	0,9	1339	1138	0,9	0,8
	FEDERAL REGION: Central	887	850	868	845	2,4	2,3	2,3	2,3	45	47	0,1	0,1	287	331	0,8	0,9	296	228	0,8	0,6
1	Oblasts: Belgorod	47	47	49	42	3,1	3,1	3,2	2,8	1	0	0,1	0,0	22	21	1,4	1,4	16	7	1,1	0,5
2	Braynsk	60	55	52	50	4,5	4,2	4,0	3,8	0	0	0,0	0,0	11	16	0,8	1,2	36	30	2,8	2,3
3	Vladimir	38	28	29	35	2,6	1,9	2,0	2,4	0	1	0,0	0,1	13	21	0,9	1,5	9	8	0,6	0,6
4	Voronezh	69	85	69	91	3,0	3,7	3,0	4,0	0	1	0,0	0,0	18	23	0,8	1,0	42	48	1,8	2,1
5	Ivanovo	22	17	27	26	2,0	1,6	2,5	2,4	1	0	0,1	0,0	11	6	1,0	0,6	8	7	0,7	0,7
6	Kaluga	46	40	28	18	4,5	4,0	2,8	1,8	0	0	0,0	0,0	1	7	0,1	0,7	19	1	1,9	0,1
7	Kostroma	15	6	1	8	2,1	0,9	0,1	1,2	0	1	0,0	0,1	0	4	0,0	0,6	0	2	0,0	0,3
8	Kursk	28	26	20	19	2,4	2,2	1,7	1,6	1	2	0,1	0,2	6	5	0,5	0,4	6	3	0,5	0,3
9	Lipetsk	44	39	26	24	3,7	3,3	2,2	2,1	1	0	0,1	0,0	12	12	1,0	1,0	5	5	0,4	0,4
10	Moscow	115	107	114	94	1,7	1,6	1,7	1,4	13	12	0,2	0,2	45	45	0,7	0,7	24	6	0,4	0,1
11	Orel	18	20	17	19	2,2	2,4	2,1	2,3	0	1	0,0	0,1	10	9	1,2	1,1	2	4	0,2	0,5
12	Ryazan	35	27	34	31	3,0	2,3	2,9	2,7	2	6	0,2	0,5	16	15	1,4	1,3	9	6	0,8	0,5
13	Smolensk	30	23	29	26	3,0	2,3	3,0	2,7	0	2	0,0	0,2	7	8	0,7	0,8	3	2	0,3	0,2
14	Tambov	33	41	35	27	2,9	3,7	3,2	2,5	0	0	0,0	0,0	5	2	0,5	0,2	22	24	2,0	2,2
15	Tver	20	15	18	18	1,4	1,1	1,3	1,3	1	3	0,1	0,2	9	11	0,7	0,8	4	2	0,3	0,1
16	Tula	43	62	50	47	2,7	3,9	3,2	3,0	0	1	0,0	0,1	12	12	0,8	0,8	29	28	1,9	1,8
17	Yaroslavl	51	31	48	32	3,8	2,3	3,7	2,4	3	5	0,2	0,4	4	5	0,3	0,4	12	6	0,9	0,5
18	Moscow city	173	181	222	238	1,7	1,7	2,1	2,3	22	12	0,2	0,1	85	109	0,8	1,0	50	39	0,5	0,4
	FEDERAL REGION: North-West	320	291	246	264	2,3	2,1	1,8	2,0	22	17	0,2	0,1	61	88	0,5	0,7	70	68	0,5	0,5
19	Republics: Karelia	18	23	13	18	2,6	3,3	1,9	2,6	0	0	0,0	0,0	1	9	0,1	1,3	3	1	0,4	0,1
20	Komi	52	47	47	35	5,3	4,8	4,9	3,7	1	0	0,1	0,0	11	10	1,1	1,0	21	14	2,2	1,5
21	Oblasts: Arkhangelsk	21	16	16	14	1,6	1,2	1,3	1,1	0	0	0,0	0,0	6	6	0,5	0,5	4	5	0,3	0,4
	Nenets AO	0	0	1	0	0,0	0,0	2,4	0,0		0	0,0	0,0		0	0,0	0,0	0	0	0,0	0,0
22	Vologda	30	23	26	18	2,4	1,9	2,1	1,5	1	1	0,1	0,1	7	6	0,6	0,5	5	3	0,4	0,2
23	Kaliningrad	40	29	22	24	4,3	3,1	2,3	2,6	1	1	0,1	0,1	12	10	1,3	1,1	7	5	0,7	0,5
24	Leningrad	27	30	24	38	1,6	1,8	1,5	2,3	5	6	0,3	0,4	6	12	0,4	0,7	2	8	0,1	0,5
25	Murmansk	18	7	10	14	2,1	0,8	1,2	1,7	1	1	0,1	0,1	1	3	0,1	0,4	2	4	0,2	0,5
26	Novgorod	21	22	15	8	3,2	3,3	2,3	1,2	2	4	0,3	0,6	2	1	0,3	0,2	4	2	0,6	0,3
27	Pskov	16	11	6	16	2,2	1,5	0,9	2,3	0	0	0,0	0,0	3	10	0,4	1,4	1	1	0,1	0,1
28	Saint-Petersburg city	77	83	67	79	1,7	1,8	1,5	1,7	11	4	0,2	0,1	12	21	0,3	0,5	21	25	0,5	0,5
	FEDERAL REGION: South	677	666	568	247	3,1	2,9	2,5	1,8	20	9	0,1	0,1	208	107	0,9	0,8	179	63	0,8	0,5

№	Federal regions (okrugs) and subjects of the Russian Federation	All forms of extrarespiratory TB								CNS and brain membrains				Bones and joints				Urogenital			
		Number of cases				per 100,000 population				Number of cases		per 100,000		Number of cases		per 100,000		Number of cases		per 100,000	
		2006	2007	2008	2009	2006	2007	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
	FEDERAL REGION: North-Caucasus				359				3,9		6		0,1		126		1,4		87		0,9
29	Republics: Adygea	10	10	9	11	2,3	2,3	2,0	2,5	0	0	0,0	0,0	3	3	0,7	0,7	5	3	1,1	0,7
30	Dagestan	105	97	83	93	4,0	3,6	3,1	3,4	6	3	0,2	0,1	33	42	1,2	1,5	12	12	0,4	0,4
31	Ingushetia	3	5	6	9	0,6	1,0	1,2	1,8	0	0	0,0	0,0	1	6	0,2	1,2	0	1	0,0	0,2
32	Kabardino-Balkaria	15	18	12	11	1,7	2,0	1,3	1,2	1	0	0,1	0,0	6	4	0,7	0,4	2	0	0,2	0,0
33	Kalmykia	22	17	6	16	7,6	5,9	2,1	5,6	1	1	0,4	0,4	1	5	0,4	1,8	3	7	1,1	2,5
34	Karachaevo-Cherkessia	23	12	17	16	5,3	2,8	4,0	3,7	0	0	0,0	0,0	3	8	0,7	1,9	5	0	1,2	0,0
35	North Ossetia-Alania	48	33	32	44	6,8	4,7	4,6	6,3	1	1	0,1	0,1	7	15	1,0	2,1	11	9	1,6	1,3
36	Chechnya	48	52	50	52	4,1	4,4	4,1	4,2	1	1	0,1	0,1	28	26	2,3	2,1	3	3	0,2	0,2
37	Krais: Krasnodar	90	72	75	82	1,8	1,4	1,5	1,6	8	6	0,2	0,1	26	20	0,5	0,4	27	21	0,5	0,4
38	Stavropol	152	146	146	134	5,6	5,4	5,4	4,9	0	1	0,0	0,0	27	25	1,0	0,9	73	62	2,7	2,3
39	Oblasts: Astrakhan	21	16	14	13	2,1	1,6	1,4	1,3	0	2	0,0	0,2	6	6	0,6	0,6	5	2	0,5	0,2
40	Volgograd	72	114	65	74	2,7	4,4	2,5	2,8	1	0	0,0	0,0	47	50	1,8	1,9	12	15	0,5	0,6
41	Rostov	68	74	53	51	1,6	1,7	1,2	1,2	1	0	0,0	0,0	20	23	0,5	0,5	21	15	0,5	0,4
	FEDERAL REGION: Privolzhsky	962	907	818	730	3,2	3,0	2,7	2,4	23	22	0,1	0,1	225	228	0,7	0,8	366	301	1,2	1,0
42	Republics: Bashkortostan	122	110	116	110	3,0	2,7	2,9	2,7	0	1	0,0	0,0	39	38	1,0	0,9	36	36	0,9	0,9
43	Mariy El	15	17	19	14	2,1	2,4	2,7	2,0	0	0	0,0	0,0	6	5	0,9	0,7	5	3	0,7	0,4
44	Mordovia	14	19	9	8	1,6	2,2	1,1	1,0	0	0	0,0	0,0	2	4	0,2	0,5	6	2	0,7	0,2
45	Tatarstan	127	119	102	94	3,4	3,2	2,7	2,5	2	1	0,1	0,0	32	52	0,8	1,4	35	29	0,9	0,8
46	Udmurtia	48	32	30	23	3,1	2,1	2,0	1,5	1	1	0,1	0,1	8	8	0,5	0,5	13	5	0,8	0,3
47	Chuvashia	24	29	19	18	1,9	2,3	1,5	1,4	1	1	0,1	0,1	2	4	0,2	0,3	10	7	0,8	0,5
48	Krai: Perm	125	104	83	86	4,5	3,8	3,1	3,2	2	1	0,1	0,0	13	12	0,5	0,4	48	56	1,8	2,1
49	Oblasts: Kirov	46	47	58	42	3,2	3,3	4,1	3,0	1	0	0,1	0,0	14	9	1,0	0,6	26	18	1,8	1,3
50	Nizhni Novgorod	90	66	50	66	2,6	2,0	1,5	2,0	1	2	0,0	0,1	8	8	0,2	0,2	28	37	0,8	1,1
51	Orenburg	74	79	61	55	3,5	3,7	2,9	2,6	6	6	0,3	0,3	18	15	0,9	0,7	15	14	0,7	0,7
52	Penza	54	47	31	28	3,8	3,4	2,2	2,0	0	0	0,0	0,0	12	14	0,9	1,0	15	11	1,1	0,8
53	Samara	94	123	135	78	2,9	3,9	4,3	2,5	3	4	0,1	0,1	37	21	1,2	0,7	79	42	2,5	1,3
54	Saratov	83	55	57	55	3,2	2,1	2,2	2,1	2	0	0,1	0,0	16	20	0,6	0,8	35	26	1,4	1,0
55	Ulyanovsk	46	60	48	53	3,4	4,5	3,7	4,1	4	5	0,3	0,4	18	18	1,4	1,4	15	15	1,1	1,1
	FEDERAL REGON: Ural	425	420	409	366	3,5	3,4	3,3	3,0	29	24	0,2	0,2	83	89	0,7	0,7	129	91	1,1	0,7
56	Oblasts: Kurgan	56	47	55	41	5,7	4,8	5,7	4,3	0	0	0,0	0,0	10	8	1,0	0,8	40	21	4,2	2,2
57	Sverdlovsk	133	124	153	124	3,0	2,8	3,5	2,8	3	6	0,1	0,1	29	26	0,7	0,6	54	42	1,2	1,0
58	Tyumen	104	114	82	84	3,1	3,4	2,4	2,5	19	17	0,6	0,5	12	18	0,4	0,5	16	13	0,5	0,4
	Khanty-Mansi AO	23	32	21	21	1,6	2,2	1,4	1,4	1	1	0,1	0,1	5	6	0,3	0,4	3	3	0,2	0,2
	Yamalo-Nenets AO	17	10	12	12	3,2	1,9	2,2	2,2	3	2	0,6	0,4	1	1	0,2	0,2	3	3	0,6	0,6
59	Chelyabinsk	132	135	119	117	3,7	3,8	3,4	3,3	7	1	0,2	0,0	32	37	0,9	1,1	19	15	0,5	0,4

№	Federal regions (okrugs) and subjects of the Russian Federation	All forms of extrarespiratory TB								CNS and brain membrains				Bones and joints				Urogenital			
		Number of cases				per 100,000 population				Number of cases		per 100,000		Number of cases		per 100,000		Number of cases		per 100,000	
		2006	2007	2008	2009	2006	2007	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
FEDERAL REGION: Siberian		659	638	687	712	3,3	3,3	3,5	3,6	58	70	0,3	0,4	204	205	1,0	1,0	234	237	1,2	1,2
60	Republics: Altai	14	13	9	12	6,8	6,3	4,3	5,7	0	1	0,0	0,5	3	2	1,4	1,0	1	6	0,5	2,9
61	Buryatia	41	35	30	40	4,3	3,6	3,1	4,2	1	0	0,1	0,0	9	9	0,9	0,9	13	14	1,4	1,5
62	Tyva	56	41	50	57	18,2	13,2	16,0	18,2	3	6	1,0	1,9	23	27	7,4	8,6	4	4	1,3	1,3
63	Khakassia	12	4	14	4	2,2	0,7	2,6	0,7	1	0	0,2	0,0	7	1	1,3	0,2	2	1	0,4	0,2
64	Krais: Altai	59	88	87	80	2,3	3,5	3,5	3,2	2	0	0,1	0,0	49	43	2,0	1,7	19	24	0,8	1,0
65	Trans-Baikal (Chita Oblast)	34	27	28	25	3,0	2,4	2,5	2,2	1	0	0,1	0,0	8	5	0,7	0,4	11	14	1,0	1,3
66	Krasnoyarsk	95	84	87	104	3,3	2,9	3,0	3,6	2	2	0,1	0,1	26	33	0,9	1,1	36	42	1,2	1,5
67	Oblasts: Irkutsk	82	103	111	133	3,2	4,1	4,4	5,3	27	41	1,1	1,6	24	32	1,0	1,3	33	33	1,3	1,3
68	Kemerovo	107	93	85	111	3,8	3,3	3,0	3,9	3	5	0,1	0,2	10	25	0,4	0,9	41	40	1,5	1,4
69	Novosibirsk	75	62	88	59	2,8	2,3	3,3	2,2	9	6	0,3	0,2	26	13	1,0	0,5	21	16	0,8	0,6
70	Omsk	58	62	69	61	2,9	3,1	3,4	3,0	7	9	0,3	0,4	8	6	0,4	0,3	47	34	2,3	1,7
71	Tomsk	26	26	29	26	2,5	2,5	2,8	2,5	2	0	0,2	0,0	11	9	1,1	0,9	6	9	0,6	0,9
FEDERAL REGION: Far-East		204	198	172	173	3,1	3,0	2,7	2,7	8	5	0,1	0,1	53	68	0,8	1,1	65	63	1,0	1,0
72	Republic: Sakha (Yakutia)	48	39	37	30	5,1	4,1	3,9	3,2	1	0	0,1	0,0	15	13	1,6	1,4	6	7	0,6	0,7
73	Krais: Kamchatka	4	2	5	1	1,1	0,6	1,5	0,3	0	1	0,0	0,3	1	0	0,3	0,0	0	0	0,0	0,0
74	Primorsky	58	52	53	57	2,9	2,6	2,7	2,9	0	1	0,0	0,1	22	39	1,1	2,0	24	15	1,2	0,8
75	Khabarovsk	20	14	20	15	1,4	1,0	1,4	1,1	1	1	0,1	0,1	3	5	0,2	0,4	7	1	0,5	0,1
76	Oblasts: Amursk	28	25	28	43	3,2	2,9	3,2	5,0	3	2	0,3	0,2	10	7	1,2	0,8	10	23	1,2	2,7
77	Magadan	8	6	2	5	4,7	3,6	1,2	3,1	0	0	0,0	0,0	0	0	0,0	0,0	2	4	1,2	2,5
78	Sakhalin	34	55	22	15	6,5	10,6	4,3	2,9	1	0	0,2	0,0	2	2	0,4	0,4	16	12	3,1	2,3
79	Jewish Aut.Oblast	1	4	4	2	0,5	2,2	2,2	1,1	1	0	0,5	0,0	0	0	0,0	0,0	0	0	0,0	0,0
80	Chukotka Aut. Region	3	1	1	5	5,9	2,0	2,0	10,1	1	0	2,0	0,0	0	2	0,0	4,0	0	1	0,0	2,0

Table 3

TB notification and prevalence rates among children in the Russian Federation, 2005–2009 (notification rate by territory, Form No. 8; prevalence – Form No. 33)

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases among children (0–14)										Children (0–14) with TB paients registered at the end of the year									
		Number of cases					per 100,000 population					Number of cases					per 100,000 population				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
	RUSSIAN FEDERATION	3530	3423	3422	3203	3111	16,66	16,4	16,39	15,28	14,75	4758	4653	4457	4164	4106	22,1	22,3	21,3	20,0	19,5
	FEDERAL REGION: Central	560	559	544	536	514	11,7	11,9	11,6	11,4	10,8	683	670	677	646	635	14,1	14,2	14,5	13,8	13,4
1	Oblasts: Belgorod	17	16	17	11	11	8,0	7,7	8,2	5,3	5,3	20	20	17	15	15	9,2	9,5	8,2	7,3	7,2
2	Braynsk	38	56	33	53	45	19,3	29,5	17,9	29,0	24,7	53	76	52	53	49	26,4	39,4	27,9	29,0	26,9
3	Vladimir	32	45	38	31	37	16,3	23,5	20,0	16,3	19,3	41	64	61	44	51	20,6	33,2	32,1	23,2	26,6
4	Voronezh	23	12	18	15	20	7,5	4,0	6,2	5,2	6,9	38	20	17	18	18	12,2	6,7	5,8	6,2	6,2
5	Ivanovo	13	20	11	9	22	9,1	14,4	8,0	6,6	15,9	18	26	20	15	27	12,3	18,5	14,5	11,0	19,6
6	Kaluga	28	17	32	27	16	20,4	12,7	24,3	20,4	12,0	37	24	32	39	22	26,6	17,8	24,2	29,6	16,5
7	Kostroma	14	6	16	19	14	13,9	6,1	16,6	19,6	14,4	8	4	14	20	16	7,8	4,0	14,5	20,7	16,4
8	Kursk	8	3	11	9	10	4,8	1,8	6,9	5,7	6,3	14	9	14	11	12	8,2	5,5	8,7	6,9	7,6
9	Lipetsk	20	16	7	10	10	12,1	10,0	4,4	6,3	6,3	26	23	13	14	15	15,5	14,2	8,2	8,9	9,4
10	Moscow	84	98	68	81	67	9,9	11,7	8,1	9,5	7,7	101	126	103	108	100	11,8	15,0	12,3	12,8	11,5
11	Orel	11	12	11	15	11	9,4	10,6	9,9	13,6	9,9	9	15	14	10	8	7,6	13,1	12,5	9,0	7,2
12	Ryazan	22	18	23	8	17	14,3	12,1	15,7	5,5	11,5	32	16	26	15	26	20,4	10,6	17,6	10,2	17,7
13	Smolensk	38	38	33	33	36	28,5	29,5	26,2	26,3	28,6	43	39	46	45	51	31,7	29,9	36,3	35,9	40,5
14	Tambov	8	6	7	9	5	5,1	4,0	4,8	6,3	3,5	10	9	7	10	7	6,3	5,9	4,8	6,9	4,9
15	Tver	12	26	19	17	14	6,3	14,0	10,4	9,2	7,6	19	27	28	29	26	9,8	14,4	15,2	15,8	14,1
16	Tula	24	32	39	37	37	12,0	16,5	20,5	19,5	19,5	69	50	58	63	65	33,9	25,5	30,3	33,3	34,3
17	Yaroslavl	36	26	31	25	28	20,7	15,3	18,3	14,6	16,3	39	29	33	22	22	22,2	16,9	19,5	13,0	12,8
18	Moscow city	132	112	130	127	114	11,1	9,4	10,8	10,3	9,1	106	93	122	115	105	8,9	7,8	10,2	9,5	8,4
	FEDERAL REGION: North-West	371	343	315	281	288	20,2	19,1	17,7	15,7	16,0	450	367	330	282	292	24,1	20,3	18,6	15,9	16,2
19	Republics: Karelia	12	15	13	8	6	11,7	15,0	13,2	8,1	6,0	24	30	22	17	13	23,0	29,8	22,3	17,3	13,1
20	Komi	37	34	27	23	23	22,7	21,5	17,3	14,8	14,8	44	38	34	33	30	26,6	23,7	21,7	21,3	19,4
21	Oblasts: Arkhangelsk	45	27	24	18	23	22,6	13,9	12,5	9,4	11,9	47	31	31	22	26	23,2	15,8	16,1	11,5	13,5
	Nenets AO	2	0	1	0	0	22,5	0,0	11,6	0,0	0,0	3	1	1	0	0	33,3	11,4	11,6	0,0	0,0
22	Vologda	21	21	23	12	17	11,4	11,6	12,9	6,7	9,4	31	28	22	9	16	16,6	15,4	12,3	5,0	8,8
23	Kaliningrad	101	105	91	83	56	76,0	81,2	71,2	64,5	43,2	80	68	61	49	36	59,3	52,0	47,7	38,4	27,8
24	Leningrad	40	32	39	26	25	19,2	15,8	19,6	13,1	12,5	54	30	38	28	32	25,4	14,6	19,0	14,2	16,0
25	Murmansk	7	4	11	4	8	5,4	3,2	8,9	3,3	6,5	11	6	12	10	9	8,4	4,7	9,7	8,2	7,3
26	Novgorod	8	6	10	8	7	8,7	6,7	11,4	9,1	7,9	15	12	14	13	14	16,1	13,3	15,9	14,8	15,8
27	Pskov	5	7	4	5	10	5,1	7,5	4,3	5,5	10,9	13	14	8	7	11	13,1	14,7	8,6	7,7	12,0
28	Saint-Petersburg city	95	92	73	94	113	18,0	17,7	14,0	17,7	20,9	131	110	88	94	105	24,6	21,1	17,0	17,9	19,5
	FEDERAL REGION:South	524	510	579	505	223	14,1	13,4	14,7	12,8	12,1	764	891	882	791	259	20,3	24,4	22,4	20,2	0,0

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases among children (0–14)										Children (0–14) with TB paients registered at the end of the year									
		Number of cases					per 100,000 population					Number of cases					per 100,000 population				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
	FEDERAL REGION: North-Caucasus					254										513					0,0
29	Republics: Adygea	3	2	5	5	4	4,2	2,8	7,2	7,2	5,7	2	0	3	4	4	2,7	0,0	4,3	5,8	5,7
30	Dagestan	133	105	99	81	78	19,4	15,7	15,1	12,5	12,0	213	173	155	125	125	30,7	25,7	23,5	19,2	19,2
31	Ingushetia	23	13	22	17	19	15,6	9,1	15,8	12,4	14,0	41	40	42	44	49	27,3	27,7	29,7	32,0	36,0
32	Kabardino-Balkaria	16	11	10	10	12	9,2	6,6	6,2	6,3	7,6	33	30	14	15	19	18,5	17,7	8,6	9,5	12,1
33	Kalmykia	27	31	32	14	8	45,8	54,3	57,4	25,4	14,6	36	42	39	18	14	60,0	72,5	69,4	32,6	25,5
34	Karachaevo-Cherkessia	11	12	10	9	8	13,4	15,1	12,9	11,7	10,3	26	25	29	22	18	31,0	30,9	37,1	28,6	23,3
35	North Ossetia-Alania	70	45	69	55	40	55,3	36,5	56,9	45,4	32,9	91	74	80	80	51	70,6	59,4	65,6	66,3	42,0
36	Chechnya		38	64	72	57		10,4	17,3	19,0	14,8		183	182	185	185		50,4	49,7	49,7	48,1
37	Krais: Krasnodar	45	37	56	45	45	5,8	4,8	7,4	5,9	5,8	51	37	59	47	41	6,5	4,8	7,8	6,2	5,3
38	Stavropol	45	44	46	43	40	10,5	10,5	11,2	10,5	9,7	77	67	74	75	66	17,7	15,9	17,9	18,3	16,0
39	Oblasts: Astrakhan	43	49	48	46	51	25,8	30,0	29,5	27,9	30,6	46	57	59	49	51	27,3	34,7	36,4	30,0	30,6
40	Volgograd	34	37	39	47	38	8,9	9,9	10,6	12,8	10,4	46	55	45	47	47	11,8	14,6	12,2	12,9	12,8
41	Rostov	74	86	79	61	77	12,1	14,5	13,6	10,5	13,2	102	108	101	80	102	16,5	18,0	17,2	13,8	17,5
	FEDERAL REGION: Privolzhsky	566	542	473	497	485	12,2	12,0	10,6	11,2	10,9	776	729	643	651	657	16,4	16,0	14,4	14,7	14,7
42	Republics: Bashkortostan	46	48	47	44	40	6,6	7,1	7,0	6,6	5,9	87	85	82	76	78	12,2	12,3	12,2	11,4	11,6
43	Mariy El	19	20	20	21	19	17,0	18,5	18,9	19,8	17,9	26	28	21	21	19	22,8	25,6	19,7	19,9	17,9
44	Mordovia	18	11	16	16	18	14,9	9,5	14,2	14,5	16,3	33	21	26	28	26	26,7	17,8	22,8	25,2	23,6
45	Tatarstan	72	62	51	59	45	11,9	10,5	8,8	10,2	7,8	78	58	42	46	39	12,6	9,7	7,2	8,0	6,7
46	Udmurtia	22	29	34	16	30	8,7	11,7	13,9	6,5	12,1	30	39	43	25	42	11,6	15,6	17,5	10,2	17,0
47	Chuvashia	12	16	13	13	17	5,8	8,0	6,6	6,7	8,7	27	27	20	26	20	12,8	13,3	10,2	13,3	10,2
48	Krai: Perm	40	52	23	36	41	9,1	12,1	5,4	8,4	9,5	59	63	34	47	55	13,2	14,5	8,0	11,0	12,7
49	Oblasts: Kirov	29	19	14	23	19	14,3	9,7	7,3	12,0	9,8	36	30	28	33	31	17,4	15,1	14,5	17,2	16,0
50	Nizhni Novgorod	70	63	65	70	74	15,2	14,1	14,7	15,8	16,6	131	115	107	120	125	28,1	25,5	24,1	27,2	28,0
51	Orenburg	49	45	42	42	35	14,0	13,2	12,6	12,6	10,5	63	63	60	56	51	17,7	18,3	17,9	16,9	15,3
52	Penza	26	26	17	17	19	13,7	14,2	9,5	9,5	10,6	23	24	14	13	19	11,8	12,9	7,8	7,3	10,6
53	Samara	90	77	73	73	68	20,2	17,7	16,9	16,8	15,5	97	101	90	87	77	21,5	23,0	20,8	20,1	17,6
54	Saratov	44	48	36	55	35	11,9	13,4	10,2	15,7	9,9	47	49	51	59	49	12,4	13,5	14,4	16,8	13,9
55	Ulyanovsk	29	26	22	12	25	15,3	14,4	12,5	6,9	14,4	39	26	25	14	26	20,1	14,1	14,1	8,0	15,0
	FEDERAL REGON: Ural	267	261	258	257	209	13,9	13,8	13,7	13,5	10,9	420	458	435	396	388	21,6	24,1	23,2	21,0	20,2
56	Oblasts: Kurgan	46	43	28	34	21	30,2	29,2	19,4	23,6	14,6	64	76	52	37	39	41,2	50,9	35,9	25,8	27,0
57	Sverdlovsk	98	93	118	114	89	15,3	14,8	18,7	17,9	13,8	162	177	210	194	195	25,1	28,0	33,5	30,7	30,3
58	Tyumen	78	90	78	76	69	13,1	15,3	13,3	12,7	11,4	114	129	110	99	92	18,9	21,8	18,8	16,8	15,2
	Khanty-Mansi AO	16	15	18	12	5	5,8	5,5	6,6	4,3	1,8	22	22	26	17	7	7,9	8,0	9,5	6,2	2,5
	Yamalo-Nenets AO	26	31	19	25	27	24,1	29,2	18,0	23,6	25,4	37	42	26	24	31	34,0	39,3	24,6	22,7	29,2

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases among children (0–14)										Children (0–14) with TB paients registered at the end of the year									
		Number of cases					per 100,000 population					Number of cases					per 100,000 population				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
59	Chelyabinsk	45	35	34	33	30	8,4	6,7	6,5	6,3	5,7	80	76	63	66	62	14,7	14,4	12,1	12,7	11,7
FEDERAL REGION: Siberian		865	924	941	835	846	27,0	29,5	30,3	26,7	26,8	1176	1136	1137	1050	1021	36,2	35,9	36,6	33,8	32,3
60	Republics: Altai	18	12	14	20	18	39,8	26,7	30,9	43,1	38,2	20	17	14	25	21	44,2	37,7	31,1	54,8	44,5
61	Buryatia	77	94	79	61	81	41,8	52,1	43,8	33,3	43,6	83	83	65	58	75	44,5	45,7	36,2	32,0	40,4
62	Tyva	36	30	33	25	27	42,7	36,2	40,0	29,8	31,8	68	50	52	39	36	79,8	59,9	63,3	46,9	42,5
63	Khakassia	39	21	20	17	26	42,7	23,6	22,6	19,0	28,8	35	19	27	18	22	37,8	21,1	30,6	20,3	24,4
64	Krais: Altai	88	98	80	84	76	23,1	26,3	21,7	22,7	20,4	100	96	76	74	74	25,8	25,5	20,6	20,1	19,9
65	Trans-Baikal (Chita Oblast)	34	39	35	34	31	15,6	18,2	16,5	16,0	14,4	39	32	32	38	30	17,6	14,8	15,1	18,0	14,0
66	Krasnoyarsk	136	126	113	99	82	28,9	27,5	25,0	21,9	18,1	160	165	148	138	102	33,4	35,6	32,7	30,7	22,5
67	Oblasts: Irkutsk	70	126	130	102	114	15,7	29,1	30,3	23,6	26,1	182	185	221	199	221	40,3	42,2	51,5	46,4	50,7
68	Kemerovo	200	214	271	229	210	46,2	50,3	63,9	53,3	48,4	226	238	263	229	199	51,6	55,6	62,1	53,9	45,8
69	Novosibirsk	52	70	49	57	55	13,7	18,7	13,2	15,2	14,5	75	82	61	58	69	19,5	21,8	16,5	15,6	18,1
70	Omsk	79	67	79	76	83	25,0	21,8	26,2	25,2	27,4	135	120	123	114	115	42,1	38,7	40,6	37,9	37,9
71	Tomsk	36	27	38	31	43	23,3	17,8	25,1	20,2	27,7	53	49	55	60	57	34,0	32,1	36,4	39,5	36,7
FEDERAL REGION: Far-East		376	283	311	292	292	34,7	26,8	29,8	28,0	27,9	488	401	352	348	341	44,3	37,5	33,6	33,4	32,6
72	Republic: Sakha (Yakutia)	105	96	65	62	47	49,0	45,8	31,4	30,1	22,8	115	96	72	54	51	53,0	45,4	34,7	26,2	24,8
73	Krais: Kamchatka	54	34	36	30	40	97,7	62,9	67,5	56,3	74,9	79	53	39	39	49	141,1	97,2	72,8	73,4	91,8
74	Primorsky	79	62	83	108	109	26,3	21,2	28,9	37,6	37,9	94	67	78	115	117	30,7	22,7	27,0	40,1	40,6
75	Khabarovsk	43	30	39	32	37	20,2	14,4	18,9	15,5	17,7	42	39	39	24	27	19,5	18,6	18,9	11,7	12,9
76	Oblasts: Amursk	31	12	31	29	31	20,7	8,2	21,5	20,2	21,5	67	49	37	40	38	44,0	33,2	25,6	27,9	26,4
77	Magadan	23	12	16	10	17	82,9	44,8	61,4	38,9	66,5	31	21	14	12	20	109,6	77,2	53,2	46,5	78,2
78	Sakhalin	35	29	37	15	7	42,8	36,3	46,8	18,9	8,7	51	68	69	57	35	61,4	84,4	87,1	72,1	43,7
79	Jewish Aut.Oblast	6	7	4	4	2	18,6	22,3	12,9	12,9	6,4	8	7	3	5	2	24,3	22,1	9,7	16,2	6,4
80	Chukotka Aut. Region	0	1	0	2	2	0,0	9,9	0,0	19,7	19,6	1	1	1	2	2	9,7	9,9	9,9	19,7	19,6

Table 4

Notification rate of MbT+ TB cases in the Russian Federation, 2005–2009 (notification rate by territory, Form No. 8)

№	Federal regions (okrugs) and subjects of the Russian Federation	New MbT+ TB cases										Proportion of MbT+ cases to all new TB cases					New ss+ TB cases									
		Number of cases					per 100,000 population					%					Number of cases				per 100,000 polulation				% of PTB	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009	2008	2009
	RUSSIAN FEDERATION	50116	48938	48567	50168	50096	35,3	34,28	34,17	35,34	35,3	42,0	41,6	41,0	41,5	42,7	32335	33103	33949	33351	22,79	23,29	23,92	23,5	30,94	31,4
	FEDERAL REGION: Central	10336	9916	9770	10306	9928	27,6	26,54	26,27	27,75	26,74	45,6	45,0	41,9	43,4	44,2	6582	6611	6709	6684	17,65	17,78	18,07	18,01	31,6	33,4
1	Oblasts: Belgorod	454	472	460	522	425	30,0	31,23	30,34	34,29	27,87	51,6	50,1	52,3	54,4	54,2	298	293	308	269	19,7	19,32	20,24	17,64	35,32	37,8
2	Braynsk	671	625	623	740	718	50,1	46,94	47,45	56,7	55,2	56,2	53,5	49,5	57,5	56,2	399	410	434	401	30,13	31,23	33,28	30,85	38,24	35,3
3	Vladimir	599	578	473	567	569	40,5	39,25	32,52	39,2	39,5	55,2	48,6	40,7	48,6	49,2	396	383	422	426	27,01	26,33	29,21	29,59	39,55	41,1
4	Voronezh	873	803	817	768	697	37,6	34,71	35,72	33,8	30,7	53,1	53,2	51,2	48,7	48,5	426	456	417	355	18,49	19,93	18,33	15,64	29	27,7
5	Ivanovo	389	424	352	374	377	35,1	38,55	32,48	34,7	35,1	60,1	63,1	60,9	61,3	59,7	275	223	229	204	25,14	20,58	21,28	19,01	41,41	35,9
6	Kaluga	437	393	370	323	345	42,9	38,75	36,73	32,2	34,4	52,8	53,0	51,3	43,9	50,1	305	280	254	264	30,15	27,8	25,29	26,32	38,25	41,6
7	Kostroma	178	180	157	138	160	25,0	25,39	22,44	19,9	23,1	50,6	55,0	51,6	46,5	43,8	111	105	92	115	15,73	15,01	13,24	16,61	35,11	37,0
8	Kursk	404	462	418	481	431	33,9	39,02	35,83	41,5	37,3	41,3	49,6	46,9	50,2	47,3	323	298	310	341	27,44	25,54	26,75	29,51	34,87	40,6
9	Lipetsk	359	367	364	335	295	30,3	31,08	31,08	28,7	25,4	42,2	41,8	38,6	37,1	40,7	187	197	116	107	15,88	16,82	9,948	9,198	13,47	15,8
10	Moscow	1195	1121	1209	1187	1291	18,0	16,91	18,16	17,7	19,2	33,6	32,2	30,8	31,5	35,5	876	976	988	1108	13,2	14,66	14,76	16,51	28,84	33,9
11	Orel	356	361	335	339	288	42,5	43,3	40,64	41,4	35,3	71,2	72,8	69,6	71,8	62,9	265	215	213	182	31,92	26,08	25,99	22,28	51,08	44,3
12	Ryazan	303	295	403	431	366	25,5	24,96	34,49	37,1	31,6	32,0	31,8	41,5	44,8	40,5	265	305	309	246	22,51	26,1	26,61	21,25	35,27	30,3
13	Smolensk	401	385	304	338	350	39,6	38,28	30,76	34,5	35,9	41,1	38,2	33,8	34,8	37,9	196	150	168	179	19,61	15,18	17,17	18,38	19,13	21,4
14	Tambov	445	370	432	392	418	39,1	32,73	38,86	35,6	38,1	56,2	50,1	57,6	53,9	55,1	259	276	253	322	23,05	24,83	22,97	29,36	38,45	45,9
15	Tver	494	431	378	445	435	34,9	30,64	27,29	32,4	31,8	44,1	37,9	34,2	40,7	42,7	344	338	410	325	24,6	24,4	29,83	23,73	41,5	35,6
16	Tula	642	619	603	633	571	39,9	38,69	38,32	40,6	36,8	43,2	49,1	49,1	48,9	40,8	360	386	413	374	22,64	24,53	26,48	24,08	35,57	29,4
17	Yaroslavl	333	272	295	243	224	25,0	20,48	22,39	18,5	17,1	37,7	33,7	36,0	35,1	36,2	152	212	148	138	11,48	16,09	11,27	10,53	25,3	25,9
18	Moscow city	1803	1758	1777	2050	1968	17,3	16,86	16,99	19,5	18,7	45,3	46,3	36,8	39,0	41,3	1145	1108	1225	1328	10,97	10,6	11,68	12,64	27,22	32,5
	FEDERAL REGION: North-West	4050	4000	3945	4085	3932	29,6	29,35	29,17	30,3	29,2	45,2	46,1	46,8	47,4	46,3	2795	2646	2742	2404	20,57	19,56	20,34	17,86	36,25	32,1
19	Republics: Karelia	249	235	241	198	216	35,6	33,69	34,83	28,7	31,4	47,2	49,3	49,1	45,3	50,3	192	174	163	133	27,61	25,15	23,65	19,35	41,27	34,1
20	Komi	388	370	490	458	394	39,2	37,56	50,44	47,5	41,1	45,0	46,5	52,9	51,9	48,0	283	392	352	270	28,88	40,35	36,54	28,17	44,96	36,5
21	Oblasts: Arkhangelsk	415	493	411	397	406	32,0	38,18	32,21	31,3	32,2	48,4	52,3	54,4	53,6	58,2	374	300	288	285	29,09	23,51	22,73	22,58	42,35	44,9
	Nenets AO	11	17	14	6	5	26,2	40,49	33,34	14,3	11,9	52,4	73,9	82,4	33,3	27,8	10	9	1	5	23,82	21,43	2,38	11,9	5,882	27,8
22	Vologda	293	284	263	276	241	23,6	22,99	21,46	22,6	19,8	46,3	50,4	45,7	45,4	44,6	184	174	187	161	14,94	14,2	15,32	13,22	34,31	33,3
23	Kaliningrad	525	595	529	558	480	55,7	63,31	56,43	59,5	51,2	44,3	47,0	42,1	50,5	51,0	377	355	384	332	40,17	37,87	40,97	35,42	40,46	41,7
24	Leningrad	592	525	459	604	589	35,9	31,94	28,06	37,0	36,1	47,4	43,5	40,5	46,4	41,2	309	247	356	324	18,83	15,1	21,81	19,85	29,72	25,0
25	Murmansk	266	232	248	197	206	30,6	26,83	29,04	23,3	24,5	46,3	46,4	49,9	46,0	45,3	160	170	96	132	18,59	19,91	11,34	15,67	29,36	31,5
26	Novgorod	241	229	234	228	199	36,0	34,42	35,72	35,1	30,8	52,1	50,8	52,7	52,1	46,1	190	193	172	199	28,72	29,46	26,49	30,81	43	49,3
27	Pskov	362	353	376	427	349	49,5	48,72	53,01	60,9	50,1	56,5	56,7	58,6	63,8	57,8	257	226	269	225	35,74	31,86	38,38	32,31	41,9	39,9
28	Saint-Petersburg city	719	684	694	742	852	15,7	14,93	15,19	16,2	18,6	36,7	36,8	40,7	36,8	39,6	469	415	475	343	10,25	9,082	10,38	7,486	28,86	19,6

№	Federal regions (okrugs) and subjects of the Russian Federation	New MbT+ TB cases										Proportion of MbT+ cases to all new TB cases					New ss+ TB cases									
		Number of cases					per 100,000 population					%					Number of cases				per 100,000 polulation				% of PTB	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009	2008	2009
FEDERAL REGION: South		6270	6182	6813	6356	4238	29,0	27,11	29,87	27,8	30,9	38,4	37,9	38,9	37,3	39,3	4482	5282	5089	2650	20,19	23,16	22,25	19,32	32,58	26,5
FEDERAL REGION: North-Caucasus						2070				0,0	22,5					36,6				1855				20,19		37,7
29	Republics: Adygea	177	146	162	151	152	39,9	32,98	36,72	34,2	34,3	52,1	42,2	39,4	40,3	42,3	142	160	149	130	32,13	36,27	33,71	29,36	44,35	40,8
30	Dagestan	504	606	634	732	645	19,2	22,95	23,72	27,1	23,8	32,5	36,9	40,1	45,9	43,4	550	627	681	600	20,76	23,45	25,22	22,13	48,26	45,9
31	Ingushetia	144	91	115	71	66	29,7	18,69	23,18	14,1	13,0	58,5	49,7	53,7	45,2	32,7	84	102	67	60	17,15	20,56	13,3	11,81	51,54	35,9
32	Kabardino-Balkaria	149	187	188	149	127	16,6	20,92	21,09	16,7	14,2	31,8	38,3	38,3	34,6	29,7	154	172	145	127	17,25	19,3	16,26	14,23	38,36	32,5
33	Kalmykia	67	90	118	133	130	23,2	31,18	41,21	46,7	45,8	17,8	24,4	32,3	38,1	41,3	35	79	81	84	12,2	27,6	28,4	29,6	25,7	30,4
34	Karachaevo-Cherkessia	59	63	89	81	62	13,6	14,6	20,79	19,0	14,5	24,0	29,7	40,6	34,8	30,2	15	28	28	21	3,5	6,5	6,6	4,9	13,5	12,3
35	North Ossetia-Alania	171	193	171	144	140	24,3	27,48	24,36	20,5	19,9	32,8	44,0	33,4	31,9	30,5	156	150	135	128	22,2	21,4	19,2	18,2	37,1	35,8
36	Chechnya		341	353	350	336		29,33	29,51	28,6	27,1		37,4	35,2	37,8	35,1	341	353	350	336	29,06	29,51	28,6	27,13	43,7	40,5
37	Krais: Krasnodar	1274	1130	1395	1349	1410	25,0	22,17	27,29	26,3	27,4	38,9	36,4	37,9	36,9	41,0	653	975	907	994	12,81	19,07	17,67	19,33	26,17	30,5
38	Stavropol	543	575	723	637	694	20,0	21,22	26,75	23,5	25,6	28,8	32,0	39,6	33,4	36,1	407	588	534	583	15,04	21,75	19,73	21,53	32	34,5
39	Oblasts: Astrakhan	342	320	321	276	292	34,3	32,19	32,18	27,5	29,0	38,8	36,6	36,8	29,1	32,0	266	312	267	276	26,76	31,28	26,62	27,46	30,48	33,3
40	Volgograd	1247	1264	1453	1102	1172	47,1	47,96	55,58	42,3	45,1	41,0	45,0	46,9	38,8	43,5	781	906	835	846	29,72	34,65	32,07	32,55	31,16	33,3
41	Rostov	1593	1176	1091	1181	1082	36,9	27,33	25,58	27,8	25,5	45,4	37,7	33,6	37,2	35,5	898	830	910	320	20,93	19,46	21,42	7,544	30,48	11,5
FEDERAL REGION: Privolzhsky		10068	10127	9856	10148	10208	32,9	33,19	32,53	33,6	33,8	42,8	42,5	43,5	43,8	44,5	6045	6001	6127	6324	19,87	19,81	20,29	20,97	29,08	30,2
42	Republics: Bashkortostan	879	779	661	634	567	21,6	19,17	16,31	15,6	14,0	38,2	34,9	31,3	32,2	29,2	492	452	460	447	12,13	11,16	11,34	11,02	26,23	26,1
43	Mariy El	333	316	377	320	409	46,6	44,41	53,48	45,6	58,4	69,4	67,4	64,8	55,5	64,4	183	225	218	243	25,81	31,92	31,07	34,71	41,84	42,0
44	Mordovia	210	250	208	217	204	24,4	29,18	24,64	25,9	24,5	35,1	42,5	35,7	35,3	30,5	156	129	87	119	18,3	15,28	10,4	14,29	15,37	18,7
45	Tatarstan	905	916	876	847	946	24,0	24,35	23,29	22,5	25,1	39,2	39,9	39,7	38,1	42,9	537	538	480	549	14,28	14,3	12,75	14,57	24,01	27,6
46	Udmurtia	650	576	609	564	457	42,0	37,3	39,67	36,8	29,9	49,4	45,4	48,6	45,1	41,7	355	369	339	332	23,03	24,03	22,15	21,72	29,22	32,8
47	Chuvashia	614	660	674	748	706	47,4	51,07	52,48	58,4	55,2	58,3	62,7	67,8	68,8	68,4	493	492	516	460	38,24	38,31	40,28	35,96	49,71	46,5
48	Krai: Perm	1323	1396	1290	1268	1254	48,0	50,8	47,35	46,7	46,3	43,4	43,6	45,6	42,9	45,5	879	725	584	704	32,09	26,61	21,52	25,99	21,73	28,4
49	Oblasts: Kirov	508	538	507	523	484	35,0	37,29	35,7	37,2	34,5	56,1	53,1	55,7	52,1	51,2	290	306	321	274	20,21	21,55	22,81	19,55	35,91	32,2
50	Nizhni Novgorod	1105	1130	1147	1217	1150	32,2	33,13	34,03	36,3	34,4	37,9	39,7	45,7	48,6	44,0	707	696	821	724	20,82	20,65	24,51	21,67	35,7	30,6
51	Orenburg	809	861	801	842	819	37,7	40,27	37,74	39,8	38,8	38,1	36,3	34,6	35,0	36,6	373	374	482	458	17,5	17,62	22,79	21,69	22,65	22,8
52	Penza	517	474	483	554	597	36,5	33,67	34,7	40,0	43,3	49,0	46,2	49,0	51,8	56,7	308	330	342	310	21,97	23,71	24,71	22,47	34,72	31,1
53	Samara	1213	1166	1111	1238	1371	38,0	36,56	34,98	39,0	43,2	50,1	46,0	44,1	46,8	49,8	625	630	664	853	19,63	19,84	20,93	26,9	27,46	33,1
54	Saratov	633	702	681	736	767	24,2	26,91	26,3	28,5	29,8	31,4	36,9	38,5	41,9	39,8	391	430	474	515	15,03	16,61	18,38	20,02	29,17	29,0
55	Ulyanovsk	369	363	431	440	477	27,5	27,17	32,73	33,6	36,6	37,3	35,7	38,8	39,8	43,9	256	305	339	336	19,27	23,16	25,91	25,75	34,14	34,5
FEDERAL REGON: Ural		4557	4593	4472	4893	4700	37,2	37,51	36,55	40,0	38,4	36,0	36,5	35,2	38,1	38,9	2647	2787	2892	2854	21,63	22,78	23,61	23,29	25,19	26,6
56	Oblasts: Kurgan	514	486	421	647	533	52,1	49,6	43,63	67,6	55,9	41,1	36,1	31,9	45,1	41,7	214	214	309	343	21,96	22,18	32,3	36	25,73	32,1
57	Sverdlovsk	1893	1909	1902	1959	1821	42,8	43,29	43,25	44,6	41,4	41,1	41,3	38,7	37,2	38,9	1053	1029	1058	969	23,91	23,4	24,07	22,05	21,94	23,0
58	Tyumen	1064	1098	1011	1078	1172	32,1	33,04	30,1	31,8	34,5	27,2	27,8	29,7	33,9	37,0	714	679	727	753	21,41	20,21	21,47	22,15	25,44	26,7

№	Federal regions (okrugs) and subjects of the Russian Federation	New MbT+ TB cases										Proportion of MbT+ cases to all new TB cases					New ss+ TB cases									
		Number of cases					per 100,000 population					%					Number of cases				per 100,000 polulation				% of PTB	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009	2008	2009
	Khanty-Mansi AO	462	502	453	484	453	31,4	33,96	30,27	32,0	29,8	33,3	35,3	34,9	37,2	36,6	273	274	302	280	18,41	18,31	19,97	18,42	25,38	24,7
	Yamalo-Nenets AO	138	145	123	144	195	26,2	27,32	22,75	26,5	35,9	26,8	33,0	30,8	37,0	44,8	85	78	98	138	15,9	14,43	18,04	25,38	27,92	36,0
59	Chelyabinsk	1086	1100	1138	1209	1174	30,7	31,15	32,39	34,4	33,5	37,7	41,4	36,9	41,0	39,9	666	865	798	789	18,9	24,62	22,74	22,49	30,72	29,8
FEDERAL REGION: Siberian		11287	10591	10293	10658	10878	57,2	53,83	52,59	54,5	55,7	42,8	40,9	41,1	41,0	43,1	7466	7258	7617	7497	38,03	37,08	38,96	38,36	31,84	32,3
60	Republics: Altai	142	68	82	98	92	69,5	33,26	39,76	47,1	44,0	47,7	26,2	34,6	39,2	36,4	50	35	51	34	24,4	16,97	24,5	16,25	24,52	15,2
61	Buryatia	549	572	579	590	638	56,8	59,38	60,32	61,4	66,4	35,9	34,2	41,4	38,6	39,5	395	487	437	441	41,08	50,73	45,51	45,9	31,1	30,1
62	Tyva	419	373	366	345	345	136,0	120,9	117,9	110,3	109,9	54,5	49,1	50,1	45,9	47,9	241	230	190	210	78	74,07	60,75	66,89	28,11	32,9
63	Khakassia	373	334	303	309	293	69,1	62,06	56,43	57,5	54,5	50,7	52,4	55,3	51,1	46,2	234	199	195	175	43,54	37,06	36,27	32,52	34,64	29,0
64	Krais: Altai	1098	920	766	912	1049	43,0	36,17	30,45	36,4	42,0	29,5	25,5	23,1	27,2	32,3	772	663	718	838	30,47	26,35	28,69	33,56	23,23	28,0
65	Trans-Baikal (Chita Oblast)	493	469	435	517	563	43,6	41,57	38,82	46,2	50,4	40,2	39,1	36,1	37,5	48,1	333	342	401	434	29,6	30,52	35,87	38,85	30,87	39,6
66	Krasnoyarsk	1377	1359	1375	1320	1327	47,2	46,76	47,54	45,7	45,9	43,0	45,0	45,7	42,7	44,1	838	899	902	785	28,9	31,09	31,21	27,16	31,46	28,4
67	Oblasts: Irkutsk	1198	1229	1342	1422	1425	47,2	48,64	53,45	56,7	56,9	38,3	38,9	39,0	39,8	42,5	899	933	1018	979	35,67	37,16	40,61	39,07	31,01	32,6
68	Kemerovo	2281	2204	2006	2028	2067	80,1	77,65	71,01	71,8	73,2	50,9	50,7	49,6	48,7	49,8	1527	1351	1356	1341	53,91	47,82	48,04	47,52	36,25	36,0
69	Novosibirsk	1726	1416	1495	1501	1418	65,0	53,44	56,67	56,9	53,7	45,7	38,8	42,7	41,7	40,4	965	987	1108	1014	36,48	37,41	42,01	38,41	32,63	30,1
70	Omsk	957	963	963	1082	1152	46,9	47,33	47,63	53,7	57,2	39,8	39,1	37,3	41,0	43,7	754	684	850	904	37,14	33,83	42,16	44,88	34,82	37,0
71	Tomsk	674	684	581	534	509	65,1	66,14	56,19	51,5	49,0	60,7	61,3	54,9	50,9	53,6	458	448	391	342	44,31	43,33	37,71	32,93	40,94	40,0
FEDERAL REGION: Far-East		3547	3529	3416	3720	4139	54,0	53,9	52,57	57,5	64,1	40,9	42,2	39,7	39,4	43,3	2318	2518	2773	3080	35,51	38,75	42,84	47,68	31,43	34,4
72	Republic: Sakha (Yakutia)	388	388	330	435	390	40,8	40,84	34,71	45,8	41,1	48,6	49,6	44,8	50,6	50,0	218	217	272	293	22,95	22,83	28,61	30,85	34,78	41,7
73	Krais: Kamchatka	106	102	75	107	122	30,2	29,21	21,65	31,1	35,5	31,0	35,4	26,7	33,3	36,2	78	71	106	89	22,4	20,5	30,8	25,9	37,1	30,2
74	Primorsky	1472	1469	1546	1506	1893	72,6	72,74	77,27	75,6	95,2	43,9	44,2	43,1	39,4	45,7	1039	1084	1173	1476	51,62	54,18	58,89	74,25	32,83	37,8
75	Khabarovsk	659	676	612	782	901	46,5	47,87	43,57	55,7	64,3	35,9	39,3	33,9	40,2	44,8	463	555	612	623	32,9	39,5	43,6	44,4	33,0	32,4
76	Oblasts: Amursk	400	361	346	333	289	45,2	40,97	39,67	38,4	33,4	30,7	28,9	28,1	24,4	23,2	190	263	284	263	21,6	30,2	32,8	30,4	22,1	22,8
77	Magadan	61	65	52	63	66	35,2	37,89	31,11	38,3	40,5	42,7	47,1	40,0	44,4	46,8	26	35	36	33	15,3	20,9	21,9	20,2	28,3	27,7
78	Sakhalin	304	325	288	291	291	57,4	61,76	55,4	56,3	56,6	54,8	55,7	57,3	49,4	52,6	217	198	194	203	41,4	38,1	37,6	39,5	36,5	38,5
79	Jewish Aut. Oblast	137	122	149	180	158	73,0	65,4	80,28	97,0	85,2	46,0	49,8	48,1	51,1	50,3	80	93	88	91	43,0	50,1	47,4	49,1	26,0	30,4
80	Chukotka Aut. Region	20	21	18	23	29	39,5	41,56	35,73	46,1	58,6	51,3	65,6	62,1	54,8	65,9	7	2	8	9	13,86	3,97	16,03	18,17	19,51	25,0

Table 5

TB notification rate in the Russian Federation among permanent residents, 2005–2009 (Form No. 33)

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases – all froms of the disease										with cases detected post mortem	Including respiratory TB cases				Including pulmonary TB cases				Including TB cases of other sites			
		No.of cases					per 100,000 population						No. of cases		% of all forms		No. of cases		% of all forms		No. of cases		% of all forms	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
	RUSSIAN FEDERATION	96646	96867	96251	97886	94755	68,08	68,0	67,7	69,0	66,77	67,9	94312	91266	96,35	96,3	88042	85118	89,9	89,8	3574	3489	3,7	3,7
	FEDERAL REGION: Central	17668	17642	17429	17830	17083	47,2	47,3	46,9	48,0	46,0	47,3	17031	16304	96	95,4	15839	15073	88,8	88,2	799	779	4,5	4,6
1	Oblasts: Belgorod	772	819	778	865	687	51,1	54,1	51,3	56,8	45,0	45,7	816	645	94,34	93,9	778	617	89,9	89,8	49	42	5,7	6,1
2	Braynsk	1051	1044	1110	1164	1130	78,5	78,8	84,5	89,3	86,9	89,2	1112	1081	95,53	95,7	1022	988	87,8	87,4	52	49	4,5	4,3
3	Vladimir	815	898	877	877	876	55,1	61,3	60,3	60,7	60,8	62,1	849	842	96,81	96,1	777	767	88,6	87,6	28	34	3,2	3,9
4	Voronezh	1259	1166	1251	1227	1155	54,2	50,6	54,7	53,9	50,9	51,2	1161	1070	94,62	92,6	1101	1013	89,7	87,7	66	85	5,4	7,4
5	Ivanovo	496	536	455	492	480	44,8	49,0	42,0	45,7	44,7	45,3	471	457	95,73	95,2	447	427	90,9	89,0	21	23	4,3	4,8
6	Kaluga	589	558	534	533	507	57,9	55,2	53,0	53,1	50,6	52,9	507	489	95,12	96,4	485	448	91,0	88,4	26	18	4,9	3,6
7	Kostroma	293	269	242	243	280	41,1	38,1	34,6	35,0	40,4	41,6	242	272	99,59	97,1	214	236	88,1	84,3	1	8	0,4	2,9
8	Kursk	810	779	763	820	811	68,0	66,2	65,4	70,8	70,2	71,4	803	793	97,93	97,8	762	743	92,9	91,6	17	18	2,1	2,2
9	Lipetsk	685	679	738	710	612	57,8	57,7	63,0	60,9	52,6	52,7	684	589	96,34	96,2	672	572	94,6	93,5	26	23	3,7	3,8
10	Moscow	2872	2922	3107	2989	2899	43,3	44,0	46,7	44,7	43,2	45,1	2890	2816	96,69	97,1	2700	2593	90,3	89,4	99	83	3,3	2,9
11	Orel	416	433	400	379	386	49,6	52,2	48,5	46,3	47,3	48,2	362	367	95,51	95,1	332	341	87,6	88,3	17	19	4,5	4,9
12	Ryazan	790	793	737	690	664	66,5	67,4	63,1	59,4	57,4	58,7	657	633	95,22	95,3	612	586	88,7	88,3	33	31	4,8	4,7
13	Smolensk	771	762	686	751	735	76,2	76,2	69,4	76,7	75,5	77,9	723	709	96,27	96,5	673	651	89,6	88,6	28	26	3,7	3,5
14	Tambov	666	626	633	624	636	58,5	55,7	56,9	56,7	58,0	58,6	591	610	94,71	95,9	579	594	92,8	93,4	33	26	5,3	4,1
15	Tver	881	870	859	868	804	62,2	62,2	62,0	63,2	58,7	61,1	853	789	98,27	98,1	770	707	88,7	87,9	15	15	1,7	1,9
16	Tula	1116	978	906	1005	976	69,3	61,5	57,6	64,4	62,8	65,0	955	932	95,02	95,5	887	862	88,3	88,3	50	44	5,0	4,5
17	Yaroslavl	599	594	598	521	468	44,9	44,9	45,4	39,7	35,7	36,8	477	437	91,55	93,4	423	391	81,2	83,5	44	31	8,4	6,6
18	Moscow city	2787	2916	2755	3072	2977	26,8	27,9	26,3	29,3	28,3	29,2	2878	2773	93,68	93,1	2605	2537	84,8	85,2	194	204	6,3	6,9
	FEDERAL REGION: North-West	7094	6885	6698	6727	6538	51,9	50,7	49,5	49,9	48,6	49,8	6508	6308	96,74	96,5	5861	5680	87,1	86,9	219	230	3,3	3,5
19	Republics: Karelia	430	396	422	338	352	61,4	57,0	61,0	49,1	51,2	51,8	325	334	96,15	94,9	298	314	88,2	89,2	13	18	3,8	5,1
20	Komi	623	592	670	653	611	62,9	60,4	69,0	67,8	63,7	65,9	610	579	93,42	94,8	574	543	87,9	88,9	43	32	6,6	5,2
21	Oblasts: Arkhangelsk	630	630	562	555	549	48,5	49,0	44,0	43,8	43,5	45,2	539	536	97,12	97,6	499	496	89,9	90,3	16	13	2,9	2,4
	Nenets AO	20	23	16	18	18	47,7	54,8	38,1	42,8	42,8	42,8	17	18	94,44	100,0	17	18	94,4	100,0	1	0	5,6	0,0
22	Vologda	483	467	450	478	441	38,9	37,9	36,7	39,2	36,2	36,8	456	424	95,4	96,1	429	392	89,7	88,9	22	17	4,6	3,9
23	Kaliningrad	961	1014	999	884	734	102,0	108,0	106,6	94,3	78,3	80,4	863	712	97,62	97,0	746	611	84,4	83,2	21	22	2,4	3,0
24	Leningrad	1085	1011	877	1045	1012	65,8	61,6	53,6	64,0	62,0	64,5	1027	984	98,28	97,2	959	915	91,8	90,4	18	28	1,7	2,8
25	Murmansk	403	376	400	328	357	46,4	43,7	46,8	38,7	42,4	43,2	318	348	96,95	97,5	294	328	89,6	91,9	10	9	3,0	2,5
26	Novgorod	365	360	355	350	343	54,5	54,4	54,2	53,9	53,1	53,7	337	336	96,29	98,0	314	316	89,7	92,1	13	7	3,7	2,0
27	Pskov	490	465	493	488	463	67,1	64,7	69,5	69,6	66,5	68,2	485	449	99,39	97,0	469	425	96,1	91,8	3	14	0,6	3,0
28	Saint-Petersburg city	1624	1574	1470	1608	1676	35,4	34,4	32,2	35,1	36,6	37,3	1548	1606	96,27	95,8	1279	1340	79,5	80,0	60	70	3,7	4,2

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases – all froms of the disease										with cases detected post mortem	Including respiratory TB cases				Including pulmonary TB cases				Including TB cases of other sites			
		No.of cases					per 100,000 population						No. of cases		% of all forms		No. of cases		% of all forms		No. of cases		% of all forms	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
FEDERAL REGION: South		13548	14005	15040	14451	8877	62,6	63,1	65,9	63,2	64,7	65,0	13896	8631	96,16	97,2	13083	8206	90,5	92,4	555	246	3,8	2,8
FEDERAL REGION: North-Caucasus						5058				0,0	55,1	55,2		4705		93,0		4345		85,9		353		7,0
29	Republics: Adygea	278	283	331	314	317	62,7	64,0	75,0	71,0	71,6	73,6	307	306	97,77	96,5	278	277	88,5	87,4	7	11	2,2	3,5
30	Dagestan	1475	1535	1497	1499	1433	56,1	57,9	56,0	55,5	52,8	52,9	1417	1340	94,53	93,5	1325	1257	88,4	87,7	82	93	5,5	6,5
31	Ingushetia	215	182	212	157	175	44,4	37,2	42,7	31,2	34,4	34,4	151	167	96,18	95,4	130	141	82,8	80,6	6	8	3,8	4,6
32	Kabardino-Balkaria	425	437	429	374	367	47,5	49,0	48,1	41,9	41,1	41,3	363	356	97,06	97,0	337	327	90,1	89,1	11	11	2,9	3,0
33	Kalmykia	333	342	336	295	249	115,1	118,8	117,3	103,6	87,7	89,1	289	234	97,97	94,0	261	212	88,5	85,1	6	15	2,0	6,0
34	Karachaevo-Cherkessia	217	196	212	227	193	50,1	45,6	49,5	53,1	45,2	45,2	210	178	92,51	92,2	200	160	88,1	82,9	17	15	7,5	7,8
35	North Ossetia-Alania		902	1001	921	429	154,3	76,9	83,7	58,7	61,1	61,1	871	386	94,57	90,0	797	342	86,5	79,7	50	43	5,4	10,0
36	Chechnya	482	403	437	412	958	68,5	57,4	62,3	75,3	77,4	77,4	383	906	92,96	94,6	329	830	79,9	86,6	29	52	7,0	5,4
37	Krais: Krasnodar	2826	2626	3169	2991	2778	55,4	51,5	62,0	58,3	54,0	54,2	2916	2696	97,49	97,0	2805	2606	93,8	93,8	75	82	2,5	3,0
38	Stavropol	1424	1433	1465	1538	1503	52,5	53,0	54,2	56,8	55,5	55,9	1394	1372	90,64	91,3	1305	1288	84,9	85,7	144	131	9,4	8,7
39	Oblasts: Astrakhan	780	755	755	744	734	78,3	75,9	75,7	74,2	73,0	73,2	730	721	98,12	98,2	667	655	89,7	89,2	14	13	1,9	1,8
40	Volgograd	2107	2084	2302	2146	2124	79,6	79,3	88,1	82,4	81,7	82,2	2085	2050	97,16	96,5	2005	1980	93,4	93,2	61	74	2,8	3,5
41	Rostov	2986	2827	2894	2833	2675	69,1	65,9	67,9	66,7	63,1	63,2	2780	2624	98,13	98,1	2644	2476	93,3	92,6	53	51	1,9	1,9
FEDERAL REGION: Privolzhsky		19310	19399	18294	18754	18534	63,1	63,8	60,4	62,1	61,5	62,3	17958	17838	95,76	96,2	16845	16753	89,8	90,4	796	696	4,2	3,8
42	Republics: Bashkortostan	1884	1868	1752	1673	1628	46,3	46,0	43,2	41,3	40,1	40,2	1558	1520	93,13	93,4	1457	1402	87,1	86,1	115	108	6,9	6,6
43	Mariy El	443	449	541	536	569	62,0	63,3	76,7	76,4	81,3	82,4	517	555	96,46	97,5	480	514	89,6	90,3	19	14	3,5	2,5
44	Mordovia	531	561	543	531	501	61,6	65,8	64,3	63,5	60,1	60,6	522	493	98,31	98,4	486	468	91,5	93,4	9	8	1,7	1,6
45	Tatarstan	2048	2055	1887	1884	1866	54,4	54,6	50,2	50,0	49,5	50,4	1782	1776	94,59	95,2	1667	1670	88,5	89,5	102	90	5,4	4,8
46	Udmurtia	1116	1075	1090	1101	983	72,1	69,8	71,0	71,9	64,3	65,4	1071	960	97,28	97,7	1011	899	91,8	91,5	30	23	2,7	2,3
47	Chuvashia	875	888	865	941	908	67,5	68,9	67,3	73,5	71,0	72,2	922	893	97,98	98,3	897	868	95,3	95,6	19	15	2,0	1,7
48	Krai: Perm	2318	2473	2167	2312	2159	84,0	90,3	79,5	85,2	79,7	81,2	2231	2077	96,5	96,2	2097	1935	90,7	89,6	81	82	3,5	3,8
49	Oblasts: Kirov	831	828	718	796	724	57,2	57,7	50,6	56,6	51,7	54,0	741	684	93,09	94,5	697	635	87,6	87,7	55	40	6,9	5,5
50	Nizhni Novgorod	2217	2066	1868	1880	2030	64,7	60,8	55,4	56,1	60,8	62,1	1831	1967	97,39	96,9	1716	1850	91,3	91,1	49	63	2,6	3,1
51	Orenburg	1745	1847	1772	1817	1755	81,4	86,6	83,5	85,9	83,1	83,3	1757	1701	96,7	96,9	1560	1542	85,9	87,9	60	54	3,3	3,1
52	Penza	939	923	853	849	907	66,3	65,8	61,3	61,3	65,7	65,9	818	880	96,35	97,0	773	853	91,0	94,0	31	27	3,7	3,0
53	Samara	1810	1898	1847	1996	2035	56,6	59,6	58,2	62,9	64,2	65,4	1871	1963	93,74	96,5	1785	1875	89,4	92,1	125	72	6,3	3,5
54	Saratov	1770	1653	1541	1548	1571	67,6	63,5	59,5	60,0	61,1	61,7	1491	1519	96,32	96,7	1417	1442	91,5	91,8	57	52	3,7	3,3
55	Ulyanovsk	783	815	850	890	898	58,3	61,3	64,5	68,0	68,8	68,8	846	850	95,06	94,7	802	800	90,1	89,1	44	48	4,9	5,3
FEDERAL REGON: Ural		10202	10444	10353	10435	9704	83,2	85,3	84,6	85,2	79,2	80,5	10052	9364	96,33	96,5	9272	8604	88,9	88,7	383	340	3,7	3,5
56	Oblasts: Kurgan	1043	1147	1126	1127	1004	105,8	117,7	116,7	117,8	105,4	108,3	1073	965	95,21	96,1	920	925	81,6	92,1	54	39	4,8	3,9
57	Sverdlovsk	3486	3781	3935	4115	3662	78,9	85,8	89,5	93,6	83,3	85,1	3974	3549	96,57	96,9	3704	3225	90,0	88,1	141	113	3,4	3,1

№	Federal regions (okrugs) and subjects of the Russian Federation	New TB cases – all froms of the disease										with cases detected post mortem	Including respiratory TB cases				Including pulmonary TB cases				Including TB cases of other sites			
		No.of cases					per 100,000 population						No. of cases		% of all forms		No. of cases		% of all forms		No. of cases		% of all forms	
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
58	Tyumen	3384	3344	2910	2794	2679	102,1	100,3	86,6	82,5	78,8	79,6	2714	2598	97,14	97,0	2493	2352	89,2	87,8	80	81	2,9	3,0
	Khanty-Mansi AO	1228	1268	1146	1147	1013	83,3	85,5	76,6	75,8	66,6	67,5	1128	993	98,34	98,0	1052	921	91,7	90,9	19	20	1,7	2,0
	Yamalo-Nenets AO	450	369	343	343	366	85,4	69,0	63,4	63,1	67,3	68,8	331	354	96,5	96,7	305	314	88,9	85,8	12	12	3,5	3,3
59	Chelyabinsk	2289	2172	2382	2399	2359	64,6	61,6	67,8	68,4	67,2	68,3	2291	2252	95,5	95,5	2155	2102	89,8	89,1	108	107	4,5	4,5
FEDERAL REGION: Siberian		21718	21546	21371	22008	21407	110,0	109,7	109,2	112,6	109,5	111,5	21352	20726	97,02	96,8	20027	19474	91,0	91,0	656	681	3,0	3,2
60	Republics: Altai	296	257	236	249	224	145,0	125,4	114,4	119,6	107,1	107,1	240	212	96,39	94,6	207	195	83,1	87,1	9	12	3,6	5,4
61	Buryatia	1246	1385	1365	1358	1310	129,0	144,0	142,2	141,4	136,4	138,7	1328	1270	97,79	96,9	1225	1187	90,2	90,6	30	40	2,2	3,1
62	Tyva	655	637	567	578	568	212,6	206,2	182,6	184,8	180,9	188,9	529	512	91,52	90,1	505	488	87,4	85,9	49	56	8,5	9,9
63	Khakassia	642	535	507	560	570	119,0	99,6	94,4	104,2	105,9	107,6	546	566	97,5	99,3	518	541	92,5	94,9	14	4	2,5	0,7
64	Krais: Altai	3074	3102	2891	2963	2868	120,3	122,4	114,9	118,4	114,9	117,2	2879	2789	97,17	97,2	2713	2621	91,6	91,4	84	79	2,8	2,8
65	Trans-Baikal (Chita Oblast)	973	961	1012	1145	1023	86,0	85,4	90,3	102,4	91,6	92,2	1117	999	97,55	97,7	1074	949	93,8	92,8	28	24	2,4	2,3
66	Krasnoyarsk	2620	2491	2446	2559	2420	89,9	85,9	84,6	88,5	83,7	86,0	2481	2329	96,95	96,2	2349	2212	91,8	91,4	78	91	3,0	3,8
67	Oblasts: Irkutsk	2604	2735	3006	3150	2949	102,7	108,5	119,7	125,7	117,7	120,4	3043	2827	96,6	95,9	2866	2622	91,0	88,9	107	122	3,4	4,1
68	Kemerovo	3765	3651	3524	3519	3602	132,3	128,9	124,7	124,7	127,6	129,9	3438	3492	97,7	96,9	3114	3190	88,5	88,6	81	110	2,3	3,1
69	Novosibirsk	2947	2913	2869	2959	2865	111,0	110,1	108,8	112,2	108,5	110,0	2874	2807	97,13	98,0	2763	2726	93,4	95,1	85	58	2,9	2,0
70	Omsk	1996	2003	2097	2099	2160	97,8	98,7	103,7	104,1	107,2	108,6	2037	2101	97,05	97,3	1918	1989	91,4	92,1	62	59	3,0	2,7
71	Tomsk	900	876	851	869	848	86,9	84,8	82,3	83,8	81,7	82,1	840	822	96,66	96,9	775	754	89,2	88,9	29	26	3,3	3,1
FEDERAL REGION: Far-East		7100	6937	7057	7665	7542	108,1	106,3	108,6	118,4	116,7	118,5	7500	7378	97,85	97,8	7101	6972	92,6	92,4	165	164	2,2	2,2
72	Republic: Sakha (Yakutia)	718	692	620	657	634	75,6	72,8	65,2	69,1	66,8	67,2	622	604	94,67	95,3	583	559	88,7	88,2	35	30	5,3	4,7
73	Krais: Kamchatka	291	253	239	278	296	83,0	72,7	69,0	80,7	86,2	87,0	274	296	98,56	100,0	244	255	87,8	86,1	4	0	1,4	0,0
74	Primorsky	2628	2727	2915	3129	3199	129,6	135,5	145,7	157,1	160,9	162,8	3078	3149	98,37	98,4	2901	2991	92,7	93,5	51	50	1,6	1,6
75	Khabarovsk	1521	1405	1470	1559	1540	107,4	99,7	104,7	111,1	109,8	110,2	1540	1526	98,78	99,1	1475	1457	94,6	94,6	19	14	1,2	0,9
76	Oblasts: Amursk	1052	1046	991	1111	1037	119,0	119,2	113,6	128,1	120,0	123,1	1083	994	97,48	95,9	1034	943	93,1	90,9	28	43	2,5	4,1
77	Magadan	119	110	109	99	104	68,7	64,7	65,2	60,2	63,8	65,0	97	99	97,98	95,2	86	82	86,9	78,8	2	5	2,0	4,8
78	Sakhalin	468	447	399	469	407	88,4	85,4	76,7	90,8	79,1	84,7	448	392	95,52	96,3	430	383	91,7	94,1	21	15	4,5	3,7
79	Jewish Aut.Oblast	264	225	286	322	281	140,7	120,9	154,1	173,6	151,6	154,3	318	279	98,76	99,3	312	267	96,9	95,0	4	2	1,2	0,7
80	Chukotka Aut. Region	39	32	28	41	44	77,0	63,4	55,6	82,2	88,9	88,9	40	39	97,56	88,6	36	35	87,8	79,5	1	5	2,4	11,4

Table 6

Laboratory diagnostics of TB in the Russian Federation, 2008–2009
(TB facilities in the subjects of the Russian Federation in 2008–2009; MoH&SD data, Form No. 7-TB)

№	Federal regions (okrugs) and subjects of the Russian Federation	Cohorts of new registered pulmonary TB patients																
		Total		Including ss+ TB cases				Patient coverage by culture tests (%)	Including MtB+ cases confirmed by culture tests (%)				Patient coverage by DST (%)		Including MDR TB			
		No. of cases		No. of cases		%			No. of cases		%_1				No. of cases		% of covered by DST	
		2008	2009	2008	2009	2008	2009	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
	RUSSIAN FEDERATION	91805	89234	30328	29906	33,0	33,5	93	37573	37317	40,9	43,7	91,1	91,4	4656	5260	13,6	15,4
	FEDERAL REGION: Central	17605	16943	5969	5891	33,9	34,8	92	7710	7401	43,8	50,3	94,7	91,2	952	915	13,0	13,6
1	Oblasts: Belgorod	798	636	279	242	35,0	38,1	100	442	358	55,4	56,3	100,0	100,0	85	71	19,2	19,8
2	Braynsk	1056	1050	371	355	35,1	33,8	100	550	560	52,1	53,3	99,8	100,0	71	62	12,9	11,1
3	Vladimir	831	805	389	381	46,8	47,3	92	426	471	51,3	58,5	99,1	89,6	59	88	14,0	20,9
4	Voronezh	1130	1034	334	274	29,6	26,5	100	605	566	53,5	54,7	98,7	94,5	87	78	14,6	14,6
5	Ivanovo	446	450	212	190	47,5	42,2	97	314	321	70,4	71,3	87,6	86,0	55	56	20,0	20,3
6	Kaluga	547	600	224	249	41,0	41,5	98	277	288	50,6	48,0	86,3	82,3	24	15	10,0	6,3
7	Kostroma	216	243	71	91	32,9	37,4	100	119	116	55,1	47,7	100,0	100,0	8	7	6,7	6,0
8	Kursk	816	750	253	288	31,0	38,4	100	365	289	44,7	38,5	100,0	100,0	32	18	8,8	6,2
9	Lipetsk	682	587	105	93	15,4	15,8	99	305	248	44,7	42,2	100,0	100,0	39	27	12,8	10,9
10	Moscow	2812	2735	832	960	29,6	35,1	65	675	522	24,0	19,1	84,3	84,7	49	51	8,6	11,5
11	Orel	368	361	196	174	53,3	48,2	100	297	260	80,7	72,0	99,7	98,5	16	16	5,4	6,3
12	Ryazan	658	612	258	202	39,2	33,0	98	300	250	45,6	40,8	99,7	98,8	37	28	12,4	11,3
13	Smolensk	701	674	145	143	20,7	21,2	88	256	253	36,5	37,5	68,8	76,3	16	18	9,1	9,3
14	Tambov	560	585	229	258	40,9	44,1	98	315	345	56,3	59,0	97,5	99,1	26	60	8,5	17,5
15	Tver	834	767	381	305	45,7	39,8	80	192	350	23,0	45,6	47,4	83,1	1	16	1,1	5,5
16	Tula	989	953	335	320	33,9	33,6	98	511	461	51,7	48,4	95,7	98,7	58	64	11,9	14,1
17	Yaroslavl	479	462	130	127	27,1	27,5	100	223	195	46,6	42,2	100,0	100,0	14	16	6,3	8,2
18	Moscow city	3682	3639	1225	1239	33,3	34,0	100	1538	1548	41,8	42,5	100,0	83,0	275	224	17,9	17,4
	FEDERAL REGION: North-West	6256	6084	2355	2175	37,6	35,7	98	3168	3059	50,6	37,5	97,3	90,8	607	606	19,7	21,8
19	Republics: Karelia	325	340	142	126	43,7	37,1	99	144	195	44,3	57,4	100,0	100,0	43	48	29,9	24,6
20	Komi	574	543	298	224	51,9	41,3	99	305	326	53,1	60,0	100,0	97,5	79	61	25,9	19,2
21	Oblasts: Arkhangelsk	502	499	218	233	43,4	46,7	96	302	303	60,2	60,7	96,0	96,4	69	75	23,8	25,7
	Nenets AO	17	18	1	5	5,9	27,8	100	6	5	35,3	27,8	100,0	100,0	1	1	16,7	20,0
22	Vologda	471	426	154	141	32,7	33,1	100	232	215	49,3	50,5	100,0	100,0	31	21	13,4	9,8
23	Kaliningrad	856	695	379	334	44,3	48,1	95	436	354	50,9	50,9	100,0	100,0	84	79	19,3	22,3
24	Leningrad	1000	1085	290	275	29,0	25,3	100	440	425	44,0	39,2	100,0	44,5	43	48	9,8	25,4
25	Murmansk	325	354	94	125	28,9	35,3	94	179	192	55,1	54,2	96,6	99,0	49	55	28,3	28,9
26	Novgorod	366	322	141	94	38,5	29,2	100	221	164	60,4	50,9	68,8	84,8	30	29	19,7	20,9
27	Pskov	531	480	234	204	44,1	42,5	99	370	304	69,7	63,3	100,0	100,0	101	74	27,3	24,3
28	Saint-Petersburg city	1289	1340	404	419	31,3	31,3	100	533	581	41,3	43,4	100,0	100,0	77	116	14,4	20,0
	FEDERAL REGION: South	13401	8398	4451	2555	33,2	30,4	97	4241	3150	31,6	24,9	85,9	90,4	355	310	9,7	10,9

№	Federal regions (okrugs) and subjects of the Russian Federation	Cohorts of new registered pulmonary TB patients																
		Total		Including ss+ TB cases				Patient coverage by culture tests (%)	Including MtB+ cases confirmed by culture tests (%)				Patient coverage by DST (%)		Including MDR TB			
		No. of cases		No. of cases		%			No. of cases		%_¹				No. of cases		% of covered by DST	
		2008	2009	2008	2009	2008	2009	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
	FEDERAL REGION: North-Caucasus		4423		1758		39,7	79		1102		46,3		67,2		50		6,8
29	Republics: Adygea	316	295	119	94	37,7	31,9	100	151	105	47,8	35,6	100,0	84,8	13	4	8,6	4,5
30	Dagestan	1325	1257	687	619	51,8	49,2	98	341	391	25,7	31,1	24,6	33,0	9	6	10,7	4,7
31	Ingushetia	130	167	67	60	51,5	35,9	73	69	58	53,1	34,7	97,1	93,1	7	2	10,4	3,7
32	Kabardino-Balkaria	493	351	187	115	37,9	32,8	100	107	25	21,7	7,1	9,3	0,0				
33	Kalmykia	261	213	75	73	28,7	34,3	100	121	107	46,4	50,2	72,7	84,1	22	9	25,0	10,0
34	Karachaevo-Cherkessia	200	165	27	21	13,5	12,7	95	74	56	37,0	33,9	100,0	23,2	0	1	0,0	7,7
35	North Ossetia-Alania	797	373	350	132	43,9	35,4	98	0	65	0,0	17,4		84,6	0	2		3,6
36	Chechnya	368	830	134	335	36,4	40,4	0	80	0	21,7	0,0	57,5	0,0	3		6,5	
37	Krais: Krasnodar	2819	2705	828	892	29,4	33,0	95	1173	1186	41,6	43,8	90,2	96,7	158	154	14,9	13,4
38	Stavropol	1324	1280	465	476	35,1	37,2	100	421	507	31,8	39,6	94,3	96,4	26	39	6,5	8,0
39	Oblasts: Astrakhan	663	655	210	219	31,7	33,4	91	132	186	19,9	28,4	100,0	100,0	8	25	6,1	13,4
40	Volgograd	2036	1995	647	671	31,8	33,6	99	706	728	34,7	36,5	95,2	68,5	44	69	6,5	13,8
41	Rostov	2669	2535	655	606	24,5	23,9	100	866	838	32,4	33,1	100,0	100,0	65	49	7,5	5,8
	FEDERAL REGION: Privolzhsky	17117	17028	5438	5507	31,8	32,3	97	7928	7882	46,3	37,8	92,4	94,7	1172	1319	16,0	17,7
42	Republics: Bashkortostan	1509	1434	448	352	29,7	24,5	100	508	444	33,7	31,0	100,0	100,0	25	24	4,9	5,4
43	Mariy El	483	521	202	214	41,8	41,1	100	267	374	55,3	71,8	100,0	97,9	43	57	16,1	15,6
44	Mordovia	489	485	95	114	19,4	23,5	100	190	177	38,9	36,5	100,0	100,0	18	6	9,5	3,4
45	Tatarstan	1667	1746	467	541	28,0	31,0	100	653	771	39,2	44,2	100,0	100,0	43	62	6,6	8,0
46	Udmurtia	1011	913	322	306	31,8	33,5	96	515	368	50,9	40,3	65,2	87,5	35	47	10,4	14,6
47	Chuvashia	897	868	474	434	52,8	50,0	100	628	605	70,0	69,7	97,6	95,7	87	88	14,2	15,2
48	Krai: Perm	2149	1930	593	584	27,6	30,3	100	925	789	43,0	40,9	99,5	89,4	203	226	22,1	32,1
49	Oblasts: Kirov	697	681	285	227	40,9	33,3	100	357	324	51,2	47,6	79,8	99,1	62	56	21,8	17,4
50	Nizhni Novgorod	1829	1907	637	658	34,8	34,5	87	865	881	47,3	46,2	91,0	86,5	136	175	17,3	23,0
51	Orenburg	1606	1546	396	340	24,7	22,0	94	611	614	38,0	39,7	100,0	99,3	96	109	15,7	17,9
52	Penza	782	862	307	277	39,3	32,1	100	457	532	58,4	61,7	100,0	100,0	33	66	7,2	12,4
53	Samara	1748	1870	515	719	29,5	38,4	100	966	1067	55,3	57,1	98,9	96,5	260	229	27,2	22,2
54	Saratov	1440	1462	403	464	28,0	31,7	99	599	597	41,6	40,8	85,6	92,5	86	102	16,8	18,5
55	Ulyanovsk	810	803	294	277	36,3	34,5	77	387	339	47,8	42,2	59,7	87,3	45	72	19,5	24,3
	FEDERAL REGON: Ural	9863	9291	2802	2645	28,4	28,5	97	3816	3509	38,7	41,9	90,1	91,7	316	318	9,2	9,9
56	Oblasts: Kurgan	982	925	271	304	27,6	32,9	99	394	217	40,1	23,5	100,0	100,0	40	3	10,2	1,4
57	Sverdlovsk	4001	3530	1121	947	28,0	26,8	97	1573	1415	39,3	40,1	96,3	94,8	92	90	6,1	6,7
58	Tyumen	1369	1331	294	359	21,5	27,0	91	458	544	33,5	40,9	100,0	100,0	58	109	12,7	20,0
	Khanty-Mansi AO	1052	1035	291	267	27,7	25,8	100	417	388	39,6	37,5	97,1	98,7	58	54	14,3	14,1
	Yamalo-Nenets AO	300	339	87	99	29,0	29,2	88	105	115	35,0	33,9	90,5	94,8	25	27	26,3	24,8
59	Chelyabinsk	2159	2131	738	669	34,2	31,4	99	869	830	40,3	38,9	65,6	75,3	43	35	7,5	5,6

№	Federal regions (okrugs) and subjects of the Russian Federation	Cohorts of new registered pulmonary TB patients																
		Total		Including ss+ TB cases				Patient coverage by culture tests (%)	Including MtB+ cases confirmed by culture tests (%)				Patient coverage by DST (%)		Including MDR TB			
		No. of cases		No. of cases		%			No. of cases		%_[1]				No. of cases		% of covered by DST	
		2008	2009	2008	2009	2008	2009	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
FEDERAL REGION: Siberian		20380	19896	6849	6781	33,6	34,1	93	8153	8339	40,0	40,1	94,5	96,2	1038	1343	13,5	16,7
60	Republics: Altai	211	191	51	32	24,2	16,8	99	96	90	45,5	47,1	99,0	100,0	18	11	18,9	12,2
61	Buryatia	1276	1271	414	385	32,4	30,3	96	362	432	28,4	34,0	97,0	100,0	40	26	11,4	6,0
62	Tyva	518	500	168	149	32,4	29,8	93	223	219	43,1	43,8	74,4	65,8	46	63	27,7	43,8
63	Khakassia	522	549	184	168	35,2	30,6	99	292	289	55,9	52,6	100,0	100,0	71	68	24,3	23,5
64	Krais: Altai	2752	2656	687	783	25,0	29,5	86	593	711	21,5	26,8	93,1	99,4	37	45	6,7	6,4
65	Trans-Baikal (Chita Oblast)	1090	958	368	358	33,8	37,4	99	481	457	44,1	47,7	89,8	98,5	14	32	3,2	7,1
66	Krasnoyarsk	2396	2321	798	728	33,3	31,4	96	1100	1029	45,9	44,3	99,2	99,7	176	164	16,1	16,0
67	Oblasts: Irkutsk	2885	2634	949	927	32,9	35,2	84	1044	1076	36,2	40,9	92,0	92,7	64	139	6,7	13,9
68	Kemerovo	3114	3199	1204	1251	38,7	39,1	93	1570	1662	50,4	52,0	99,7	100,0	280	377	17,9	22,7
69	Novosibirsk	2779	2749	932	873	33,5	31,8	98	1142	1086	41,1	39,5	89,1	92,0	226	245	22,2	24,5
70	Omsk	2099	2112	755	799	36,0	37,8	96	822	849	39,2	40,2	91,7	92,8	111	124	14,7	15,7
71	Tomsk	738	756	339	328	45,9	43,4	97	428	439	58,0	58,1	99,1	99,1	55	49	13,0	11,3
FEDERAL REGION: Far-East		7183	7171	2464	2594	34,3	36,2	77	2557	2875	35,6	41,8	68,4	80,2	216	399	12,3	17,3
72	Republic: Sakha (Yakutia)	580	559	204	238	35,2	42,6	96	295	287	50,9	51,3	86,1	81,9	57	63	22,4	26,8
73	Krais: Kamchatka	249	255	98	83	39,4	32,5	59	14	91	5,6	35,7		75,8		15		21,7
74	Primorsky	2904	2998	1076	1159	37,1	38,7	83	1199	1280	41,3	42,7	68,6	78,7	79	148	9,6	14,7
75	Khabarovsk	1512	1593	530	563	35,1	35,3	87	562	750	37,2	47,1	45,0	80,1	34	118	13,4	19,6
76	Oblasts: Amursk	1039	948	248	235	23,9	24,8	14	47	36	4,5	3,8	19,1	0,0	3		33,3	
77	Magadan	93	92	30	25	32,3	27,2	100	37	46	39,8	50,0	100,0	100,0	5	4	13,5	8,7
78	Sakhalin	430	383	185	194	43,0	50,7	99	239	239	55,6	62,4	88,7	84,9	31	51	14,6	25,1
79	Jewish Aut.Oblast	336	304	85	88	25,3	28,9	96	142	120	42,3	39,5	100,0	100,0	5		3,5	
80	Chukotka Aut. Region	40	39	8	9	20,0	23,1	100	22	26	55,0	66,7	95,5	100,0	2		9,5	

[1] Calculated for the whole cohort of new PTB patients.

Table 7

Notification rate of PTB cases with lung destruction and FCTB in the Russian Federation, 2005–2009 (permanent residents) (Form No. 33)

№	Federal regions (okrugs) and subjects of the Russian Federation	PTB cases with lung destruction										Fibrous-cavernous TB among new registered TB patients												
		Number of cases					% of PTB cases					Number of cases					per 100,000 population					% of PTB cases		
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2007	2008	2009
	RUSSIAN FEDERATION	44077	43166	42438	41663	38968	51,6	50,3	49,4	47,3	45,8	2026	1905	2022	1816	1702	1,4	1,3	1,4	1,3	2,0	2,4	1,3	1,2
	FEDERAL REGION: Central	7678	7610	7354	7138	6558	49,7	49,0	47,9	45,1	43,5	410	435	427	360	321	1,1	1,2	1,1	1,0	2,1	2,8	1,0	0,9
1	Oblasts: Belgorod	359	373	320	354	262	51,9	50,7	45,4	45,5	42,5	24	25	17	13	6	1,6	1,7	1,1	0,9	1,0	2,4	0,9	0,4
2	Braynsk	483	536	553	509	475	54,2	59,0	56,1	49,8	48,1	39	24	18	26	15	2,9	1,8	1,4	2,0	1,5	1,8	2,0	1,2
3	Vladimir	310	338	287	292	281	42,7	42,9	37,7	37,6	36,6	6	8	15	9	12	0,4	0,5	1,0	0,6	1,6	2,0	0,6	0,8
4	Voronezh	531	540	533	573	443	48,2	53,0	47,7	52,0	43,7	8	39	29	40	35	0,3	1,7	1,3	1,7	3,5	2,6	1,8	1,5
5	Ivanovo	204	234	204	207	174	47,2	49,0	49,8	46,3	40,7	2	6	6	7	5	0,2	0,5	0,6	0,6	1,2	1,5	0,7	0,5
6	Kaluga	312	238	226	216	190	61,8	50,0	49,0	44,5	42,4	31	25	21	22	25	3,0	2,5	2,1	2,2	5,6	4,6	2,2	2,5
7	Kostroma	113	97	88	90	81	45,4	41,1	41,5	42,1	34,3	2	4	2	1	0	0,3	0,6	0,3	0,1	0,0	0,9	0,1	0,0
8	Kursk	405	402	386	389	403	57,3	58,5	57,0	51,0	54,2	50	43	57	46	35	4,2	3,7	4,9	3,9	4,7	8,4	4,0	3,0
9	Lipetsk	232	242	255	204	174	37,1	39,2	37,0	30,4	30,4	16	19	25	11	18	1,3	1,6	2,1	0,9	3,1	3,6	0,9	1,5
10	Moscow	1222	1213	1263	1144	1139	47,8	46,7	45,1	42,4	43,9	54	64	79	50	55	0,8	1,0	1,2	0,8	2,1	2,8	0,7	0,8
11	Orel	206	235	193	152	145	56,4	61,8	54,4	45,8	42,5	5	12	6	6	3	0,6	1,4	0,7	0,7	0,9	1,7	0,7	0,4
12	Ryazan	338	368	343	321	280	48,8	52,0	52,8	52,5	47,8	34	37	38	31	32	2,9	3,1	3,3	2,6	5,5	5,8	2,7	2,8
13	Smolensk	381	384	378	374	378	57,3	58,9	63,1	55,6	58,1	6	10	16	13	12	0,6	1,0	1,6	1,3	1,8	2,7	1,3	1,2
14	Tambov	340	302	321	296	313	56,2	53,9	56,8	51,1	52,7	23	16	10	11	8	2,0	1,4	0,9	1,0	1,3	1,8	1,0	0,7
15	Tver	434	426	413	367	330	53,2	54,2	54,7	47,7	46,7	31	31	16	17	19	2,2	2,2	1,2	1,2	2,7	2,1	1,2	1,4
16	Tula	444	339	359	380	318	46,7	39,7	46,4	42,8	36,9	41	23	25	15	14	2,5	1,4	1,6	0,9	1,6	3,2	1,0	0,9
17	Yaroslavl	272	240	256	211	185	56,5	51,7	51,8	49,9	47,3	5	3	7	3	2	0,4	0,2	0,5	0,2	0,5	1,4	0,2	0,2
18	Moscow city	1092	1103	976	1059	987	45,6	42,8	41,5	40,7	38,9	33	46	40	39	25	0,3	0,4	0,4	0,4	1,0	1,7	0,4	0,2
	FEDERAL REGION: North-West	3594	3438	3403	3351	3143	59,3	58,8	58,8	57,2	55,3	60	55	63	41	48	0,4	0,4	0,5	0,3	0,8	1,1	0,3	0,4
19	Republics: Karelia	242	233	231	183	183	68,0	66,6	62,3	61,4	58,3	2	3	2	0	1	0,3	0,4	0,3	0,0	0,3	0,5	0,0	0,1
20	Komi	368	339	389	397	356	67,9	68,3	65,4	69,2	65,6	8	14	15	8	6	0,8	1,4	1,5	0,8	1,1	2,5	0,8	0,6
21	Oblasts: Arkhangelsk	355	355	328	316	317	63,8	62,8	65,1	63,3	63,9	8	5	1	0	3	0,6	0,4	0,1	0,0	0,6	0,2	0,0	0,2
	Nenets AO	11	17	11	4	8	61,1	77,3	78,6	23,5	44,4		1			0		2,4	0,0	0,0	0,0		0,0	0,0
22	Vologda	235	220	217	218	190	57,9	55,1	54,4	50,8	48,5	3	1	5	7	2	0,2	0,1	0,4	0,6	0,5	1,3	0,6	0,2
23	Kaliningrad	447	501	479	375	348	56,4	61,6	56,7	50,3	57,0	11	10	12	4	8	1,2	1,1	1,3	0,4	1,3	1,4	0,4	0,9
24	Leningrad	588	478	406	523	485	58,9	51,8	51,7	54,5	53,0	10	8	9	11	16	0,6	0,5	0,6	0,7	1,7	1,1	0,7	1,0
25	Murmansk	194	192	216	151	189	53,3	57,1	57,6	51,4	57,6	4	6	3	1	1	0,5	0,7	0,4	0,1	0,3	0,8	0,1	0,1
26	Novgorod	162	148	155	128	94	50,0	45,8	50,3	40,8	29,7	3	0	2	0	0	0,4	0,0	0,3	0,0	0,0	0,6	0,0	0,0
27	Pskov	278	253	264	286	235	61,1	58,4	57,9	61,0	55,3	1	0	2	2	2	0,1	0,0	0,3	0,3	0,5	0,4	0,3	0,3
28	Saint-Petersburg city	725	719	718	774	746	57,4	59,7	62,3	60,5	55,7	10	8	12	8	9	0,2	0,2	0,3	0,2	0,7	1,0	0,2	0,2
	FEDERAL REGION: South	6777	6830	7457	6934	4048	57,1	54,9	55,4	53,0	49,3	183	173	229	161	142	0,8	0,8	1,0	0,7	1,7	1,7	0,7	1,0

№	Federal regions (okrugs) and subjects of the Russian Federation	PTB cases with lung destruction										Fibrous-cavernous TB among new registered TB patients												
		Number of cases					% of PTB cases					Number of cases					per 100,000 population					% of PTB cases		
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2007	2008	2009
	FEDERAL REGION: North-Caucasus					2518					58,0					90					2,1		0,0	1,0
29	Republics: Adygea	166	158	171	153	127	68,6	64,5	56,4	55,0	45,8	1	7	7	5	9	0,2	1,6	1,6	1,1	3,2	2,3	1,1	2,0
30	Dagestan	860	916	880	856	828	67,8	69,0	67,7	64,6	65,9	13	15	9	9	10	0,5	0,6	0,3	0,3	0,8	0,7	0,3	0,4
31	Ingushetia	136	111	116	94	80	73,5	73,0	61,1	72,3	56,7	8	5	8	3	5	1,7	1,0	1,6	0,6	3,5	4,2	0,6	1,0
32	Kabardino-Balkaria	266	281	278	252	237	73,9	72,4	73,2	74,8	72,5	13	9	12	7	14	1,5	1,0	1,3	0,8	4,3	3,2	0,8	1,6
33	Kalmykia	107	111	122	111	100	38,2	40,1	43,9	42,5	47,2	9	10	9	0	0	3,1	3,5	3,1	0,0	0,0	3,2	0,0	0,0
34	Karachaevo-Cherkessia	116	97	125	127	93	64,8	60,6	68,7	63,5	58,1	3	2	1	0	4	0,7	0,5	0,2	0,0	2,5	0,5	0,0	0,9
35	North Ossetia-Alania		512	585	554	169		64,4	67,5	69,5	49,4		11	38	22	8		0,9	3,2	1,9	2,3	4,4	0,9	1,1
36	Chechnya	210	164	178	174	540	61,9	54,3	53,6	52,9	65,1	8	9	6	6	36	1,1	1,3	0,9	0,9	4,3	1,8	1,8	2,9
37	Krais: Krasnodar	1643	1483	1865	1571	1515	64,6	60,9	62,6	56,0	58,1	31	35	47	41	82	0,6	0,7	0,9	0,8	3,1	1,6	0,8	1,6
38	Stavropol	600	529	555	558	571	50,6	44,6	45,7	42,8	44,3	23	18	23	18	13	0,8	0,7	0,9	0,7	1,0	1,9	0,7	0,5
39	Oblasts: Astrakhan	284	257	242	222	212	41,0	38,6	35,6	33,3	32,4	18	13	12	8	8	1,8	1,3	1,2	0,8	1,2	1,8	0,8	0,8
40	Volgograd	1061	1136	1276	1220	1095	57,1	59,1	60,7	60,8	55,3	49	30	50	37	36	1,9	1,1	1,9	1,4	1,8	2,4	1,4	1,4
41	Rostov	1328	1075	1064	1042	999	48,7	41,6	40,0	39,4	40,3	7	9	7	5	7	0,2	0,2	0,2	0,1	0,3	0,3	0,1	0,2
	FEDERAL REGION: Privolzhsky	8534	8297	7665	7492	7101	50,0	48,5	47,1	44,5	42,4	302	262	268	266	275	1,0	0,9	0,9	0,9	1,6	1,6	0,9	0,9
42	Republics: Bashkortostan	627	613	519	494	473	37,9	38,0	34,0	33,9	33,7	21	21	18	12	11	0,5	0,5	0,4	0,3	0,8	1,2	0,3	0,3
43	Mariy El	174	196	234	180	176	44,2	49,9	48,2	37,5	34,2	5	2	4	1	0	0,7	0,3	0,6	0,1	0,0	0,8	0,1	0,0
44	Mordovia	276	314	251	211	191	58,0	60,5	50,9	43,4	40,8	16	17	13	13	15	1,9	2,0	1,5	1,5	3,2	2,6	1,6	1,8
45	Tatarstan	751	743	660	645	645	43,0	41,5	39,8	38,7	38,6	10	9	13	14	16	0,3	0,2	0,3	0,4	1,0	0,8	0,4	0,4
46	Udmurtia	670	586	625	534	511	65,4	60,8	63,3	52,8	56,8	11	6	12	12	39	0,7	0,4	0,8	0,8	4,3	1,2	0,8	2,6
47	Chuvashia	504	506	438	412	320	61,6	60,0	54,4	45,9	36,9	13	12	12	14	7	1,0	0,9	0,9	1,1	0,8	1,5	1,1	0,5
48	Krai: Perm	1024	1035	886	909	819	49,3	47,7	45,7	43,3	42,3	10	11	8	8	8	0,4	0,4	0,3	0,3	0,4	0,4	0,3	0,3
49	Oblasts: Kirov	448	393	376	387	348	63,7	55,5	60,5	55,5	54,8	6	5	9	6	3	0,4	0,3	0,6	0,4	0,5	1,4	0,4	0,2
50	Nizhni Novgorod	1194	1065	995	1019	1007	59,6	57,2	58,8	59,4	54,4	124	106	119	113	121	3,6	3,1	3,5	3,3	6,5	7,0	3,4	3,6
51	Orenburg	759	821	745	714	697	51,0	52,3	49,1	45,8	45,2	5	5	1	4	3	0,2	0,2	0,0	0,2	0,2	0,1	0,2	0,1
52	Penza	407	397	372	359	344	50,1	52,3	49,1	46,4	40,3	18	21	12	12	11	1,3	1,5	0,9	0,9	1,3	1,6	0,9	0,8
53	Samara	734	733	707	761	791	45,7	43,0	43,2	42,6	42,2	28	25	20	25	17	0,9	0,8	0,6	0,8	0,9	1,2	0,8	0,5
54	Saratov	590	563	529	497	465	37,3	37,3	37,3	35,1	32,2	11	9	12	10	12	0,4	0,3	0,5	0,4	0,8	0,8	0,4	0,5
55	Ulyanovsk	376	332	328	370	314	54,2	47,6	43,6	46,1	39,3	24	13	15	22	12	1,8	1,0	1,1	1,7	1,5	2,0	1,7	0,9
	FEDERAL REGON: Ural	4003	3930	3746	3742	3310	44,0	42,6	40,7	40,4	38,5	129	125	131	97	72	1,1	1,0	1,1	0,8	0,8	1,4	0,8	0,6
56	Oblasts: Kurgan	494	537	456	496	443	55,6	55,1	45,6	53,9	47,9	23	13	16	18	20	2,3	1,3	1,7	1,9	2,2	1,6	1,9	2,1
57	Sverdlovsk	1324	1389	1373	1352	1060	42,5	41,5	39,0	36,5	32,9	40	43	49	39	22	0,9	1,0	1,1	0,9	0,7	1,4	0,9	0,5
58	Tyumen	1162	1140	997	941	915	38,0	38,0	38,5	37,7	38,9	46	51	43	27	21	1,4	1,5	1,3	0,8	0,9	1,7	0,8	0,6
	Khanty-Mansi AO	422	421	372	339	321	37,8	36,4	36,4	32,2	34,9	6	10	5	2	2	0,4	0,7	0,3	0,1	0,2	0,5	0,1	0,1
	Yamalo-Nenets AO	168	139	117	136	142	41,5	45,1	38,7	44,6	45,2	0	2	0	2	1	0,0	0,4	0,0	0,4	0,3	0,0	0,4	0,2

№	Federal regions (okrugs) and subjects of the Russian Federation	PTB cases with lung destruction										Fibrous-cavernous TB among new registered TB patients												
		Number of cases					% of PTB cases					Number of cases					per 100,000 population					% of PTB cases		
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2007	2008	2009
59	Chelyabinsk	1023	864	920	953	892	50,3	45,2	44,0	44,2	42,4	20	18	23	13	9	0,6	0,5	0,7	0,4	0,4	1,1	0,4	0,3
FEDERAL REGION: Siberian		10318	9858	9632	9516	9113	52,8	50,7	49,7	47,5	46,8	672	560	621	601	540	3,4	2,9	3,2	3,1	2,8	3,2	3,1	2,8
60	Republics: Altai	136	104	104	110	99	52,3	47,3	51,2	53,1	50,8	15	7	5	13	3	7,3	3,4	2,4	6,3	1,5	2,5	6,2	1,4
61	Buryatia	636	621	640	582	547	57,6	50,1	51,4	47,5	46,1	9	11	27	23	11	0,9	1,1	2,8	2,4	0,9	2,2	2,4	1,1
62	Tyva	272	259	254	254	231	47,1	48,1	51,8	50,3	47,3	13	20	14	17	7	4,2	6,5	4,5	5,5	1,4	2,9	5,4	2,2
63	Khakassia	361	335	276	257	269	63,6	67,7	57,0	49,6	49,7	11	13	10	9	5	2,0	2,4	1,9	1,7	0,9	2,1	1,7	0,9
64	Krais: Altai	1563	1522	1291	1307	1325	55,6	53,3	48,7	48,2	50,6	59	45	43	32	47	2,3	1,8	1,7	1,3	1,8	1,6	1,3	1,9
65	Trans-Baikal (Chita Oblast)	409	401	404	434	347	46,0	46,8	44,0	40,4	36,6	27	24	36	38	32	2,4	2,1	3,2	3,4	3,4	3,9	3,4	2,9
66	Krasnoyarsk	1322	1284	1280	1231	1118	56,3	57,0	57,1	52,4	50,5	61	48	45	40	35	2,1	1,7	1,6	1,4	1,6	2,0	1,4	1,2
67	Oblasts: Irkutsk	1345	1305	1491	1522	1382	56,7	53,1	55,3	53,1	52,7	172	138	156	195	174	6,8	5,5	6,2	7,8	6,6	5,8	7,8	6,9
68	Kemerovo	1697	1590	1504	1467	1467	51,7	49,7	48,9	47,1	46,0	95	64	76	87	71	3,3	2,3	2,7	3,1	2,2	2,5	3,1	2,5
69	Novosibirsk	1335	1233	1143	1170	1125	48,7	45,6	42,4	42,3	41,3	62	45	66	64	58	2,3	1,7	2,5	2,4	2,1	2,4	2,4	2,2
70	Omsk	816	798	875	817	840	45,5	43,4	45,7	42,6	42,2	134	132	128	83	86	6,6	6,5	6,3	4,1	4,3	6,7	4,1	4,3
71	Tomsk	426	406	370	365	363	53,1	51,3	48,1	47,1	48,1	14	13	15	0	11	1,4	1,3	1,5	0,0	1,5	1,9	0,0	1,1
FEDERAL REGION: Far-East		3173	3203	3181	3489	3177	50,1	51,8	49,3	49,1	45,6	270	295	282	290	214	4,1	4,5	4,3	4,5	3,1	4,4	4,5	3,3
72	Republic: Sakha (Yakutia)	249	289	240	278	267	43,8	54,6	46,2	47,7	47,8	3	5	10	1	8	0,3	0,5	1,1	0,1	1,4	1,9	0,1	0,8
73	Krais: Kamchatka	130	125	116	163	159	57,0	59,2	58,3	66,8	62,4	14	24	16	29	13	4,0	6,9	4,6	8,4	5,1	8,0	8,4	3,8
74	Primorsky	1192	1256	1241	1330	1186	49,7	51,6	45,6	45,8	39,7	174	188	186	183	147	8,6	9,3	9,3	9,1	4,9	6,8	9,2	7,4
75	Khabarovsk	588	566	620	710	699	42,2	42,9	45,0	48,1	48,0	26	26	26	29	12	1,8	1,8	1,9	2,1	0,8	1,9	2,1	0,9
76	Oblasts: Amursk	541	513	528	536	468	56,1	52,8	56,8	51,8	49,6	23	12	18	10	5	2,6	1,4	2,1	1,1	0,5	1,9	1,2	0,6
77	Magadan	45	52	51	47	45	51,7	56,5	62,2	54,7	54,9	1	0	1	2	2	0,6	0,0	0,6	1,2	2,4	1,2	1,2	1,2
78	Sakhalin	306	275	231	270	213	76,7	70,3	71,3	62,8	55,6	27	30	17	25	16	5,1	5,7	3,3	4,8	4,2	5,2	4,8	3,1
79	Jewish Aut.Oblast	105	107	141	137	117	40,9	50,7	50,9	43,9	43,8	1	7	7	10	10	0,5	3,8	3,8	5,4	3,7	2,5	5,4	5,4
80	Chukotka Aut. Region	17	20	13	18	23	43,6	74,1	48,1	50,0	65,7	1	3	1	1	1	2,0	5,9	2,0	2,0	2,9	3,7	2,0	2,0

Table 8

TB mortality rate in the Russian Federation, 2005–2009

№	Federal regions (okrugs) and subjects of the Russian Federation	TB mortality rates (FSSS)					TB patients died within one year of follow-up (Form No. 33)										TB patients died, unknown to TB dispensary service (territorial Form No. 8)									
		Per 100,000 population					Number of cases					Among new registered TB cases (%) Form No. 33					Number of cases					Among new registered TB patients (Form No. 8), %				
		2005	2006*	2007**	2008***	2009****	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
	RUSSIAN FEDERATION	22,6	20,0	18,4	17,9	16,5	5300#	4443	4103	4042	3593	5,5	4,6	4,3	4,1	3,8	3290	2773	2465	2161	2064	2,8	2,4	2,1	1,8	1,8
	FEDERAL REGION: Central	15,8	13,8	12,6	12,0	10,7	973	910	811	819	699	5,5	5,2	4,7	4,6	4,1	895	822	782	615	619	3,9	3,7	3,4	2,6	2,8
1	Oblasts: Belgorod	9,9	7,6	5,7	5,1	3,1	20	25	16	18	8	2,6	3,1	2,1	2,1	1,2	21	19	7	7	10	2,4	2,0	0,8	0,7	1,3
2	Braynsk	29,1	25,1	20,9	21,4	18,6	105	85	70	93	62	10,0	8,1	6,3	8,0	5,5	46	37	51	29	29	3,9	3,2	4,1	2,3	2,3
3	Vladimir	18,4	18,8	16,3	13,2	11,8	52	47	54	42	50	6,4	5,2	6,2	4,8	5,7	25	42	35	17	18	2,3	3,5	3,0	1,5	1,6
4	Voronezh	14,7	13,2	11,9	11,2	11,9	46	33	31	36	38	3,7	2,8	2,5	2,9	3,3	13	10	9	11	9	0,8	0,7	0,6	0,7	0,6
5	Ivanovo	17,7	13,4	13,1	11,7	11,0	21	23	17	18	15	4,2	4,3	3,7	3,7	3,1	12	11	9	8	6	1,9	1,6	1,6	1,3	1,0
6	Kaluga	22,9	16,6	15,0	16,6	12,4	45	31	27	28	19	7,6	5,6	5,1	5,3	3,7	86	24	31	29	24	10,4	3,2	4,3	3,9	3,5
7	Kostroma	10,5	10,2	7,0	5,9	5,8	26	22	15	11	15	8,9	8,2	6,2	4,5	5,4	10	9	13	12	9	2,8	2,8	4,3	4,0	2,5
8	Kursk	24,2	19,5	18,2	16,2	14,2	42	46	26	30	28	5,2	5,9	3,4	3,7	3,5	31	37	30	27	19	3,2	4,0	3,4	2,8	2,1
9	Lipetsk	11,0	10,4	9,7	9,0	7,0	23	26	26	19	10	3,4	3,8	3,5	2,7	1,6	7	5	9	10	4	0,8	0,6	1,0	1,1	0,6
10	Moscow	17,2	15,4	14,6	13,4	12,3	203	221	212	173	160	7,1	7,6	6,8	5,8	5,5	367	342	307	219	171	10,3	9,8	7,8	5,8	4,7
11	Orel	8,0	6,0	5,1	4,1	3,9	11	22	12	9	8	2,6	5,1	3,0	2,4	2,1	6	7	4	5	8	1,2	1,4	0,8	1,1	1,7
12	Ryazan	18,4	14,4	12,4	14,3	8,4	28	29	17	29	24	3,5	3,7	2,3	4,2	3,6	31	36	29	36	26	3,3	3,9	3,0	3,7	2,9
13	Smolensk	32,3	32,5	32,2	30,2	24,9	35	22	30	45	39	4,5	2,9	4,4	6,0	5,3	31	38	23	35	28	3,2	3,8	2,6	3,6	3,0
14	Tambov	19,3	16,1	13,0	14,1	12,9	22	25	26	23	23	3,3	4,0	4,1	3,7	3,6	1	4	7	8	7	0,1	0,5	0,9	1,1	0,9
15	Tver	21,6	21,8	23,4	22,6	22,3	67	79	72	67	68	7,6	9,1	8,4	7,7	8,5	30	31	41	29	33	2,7	2,7	3,7	2,7	3,2
16	Tula	29,7	25,2	21,7	22,2	18,9	91	65	55	77	41	8,2	6,6	6,1	7,7	4,2	53	49	63	48	36	3,6	3,9	5,1	3,7	2,6
17	Yaroslavl	12,5	12,2	11,7	11,4	9,1	33	34	37	24	21	5,5	5,7	6,2	4,6	4,5	36	32	22	27	23	4,1	4,0	2,7	3,9	3,7
18	Moscow city	8,8	7,3	6,6	6,5	6,2	103	75	68	77	70	3,7	2,6	2,5	2,5	2,4	89	89	92	58	159	2,2	2,3	1,9	1,1	3,3
	FEDERAL REGION: North-West	19,6	17,7	15,7	14,9	12,9	459	499	428	401	400	6,5	7,2	6,4	6,0	6,1	336	316	267	269	231	3,8	3,6	3,2	3,1	2,7
19	Republics: Karelia	20,8	20,6	21,7	18,1	18,1	47	37	30	30	23	10,9	9,3	7,1	8,9	6,5	15	19	12	5	11	2,8	4,0	2,4	1,1	2,6
20	Komi	22,0	19,4	14,2	17,4	17,7	50	40	38	33	40	8,0	6,8	5,7	5,1	6,5	46	26	29	21	27	5,3	3,3	3,1	2,4	3,3
21	Oblasts: Arkhangelsk	19,3	15,1	12,7	9,9	6,6	74	62	66	46	41	11,7	9,8	11,7	8,3	7,5	31	36	16	29	21	3,6	3,8	2,1	3,9	3,0
	Nenets AO	16,7	7,1	9,5	0,0	4,7	0	0	1	0	0	0,0	0,0	6,3	0,0	0,0	0	0	1		0	0,0	0,0	5,9	0,0	0,0
22	Vologda	11,8	10,2	10,0	9,9	8,5	34	54	27	21	30	7,0	11,6	6,0	4,4	6,8	25	9	12	14	9	3,9	1,6	2,1	2,3	1,7
23	Kaliningrad	33,2	28,8	18,3	15,9	16,2	58	71	35	27	39	6,0	7,0	3,5	3,1	5,3	104	91	52	49	40	8,8	7,2	4,1	4,4	4,3
24	Leningrad	33,7	30,2	24,2	24,6	19,9	67	96	106	123	122	6,2	9,5	12,1	11,8	12,1	20	51	75	70	63	1,6	4,2	6,6	5,4	4,4
25	Murmansk	12,1	10,8	10,0	8,3	8,1	37	31	31	21	25	9,2	8,2	7,8	6,4	7,0	30	24	18	14	12	5,2	4,8	3,6	3,3	2,6
26	Novgorod	26,7	27,5	28,2	24,8	17,9	13	21	18	12	8	3,6	5,8	5,1	3,4	2,3	8	5	3	4	4	1,7	1,1	0,7	0,9	0,9
27	Pskov	17,8	17,4	15,4	22,4	17,6	29	29	27	35	25	5,9	6,2	5,5	7,2	5,4	10	12	11	22	12	1,6	1,9	1,7	3,3	2,0
28	Saint-Petersburg city	13,8	12,8	13,1	11,6	10,2	50	58	50	53	47	3,1	3,7	3,4	3,3	2,8	47	43	39	41	32	2,4	2,3	2,3	2,0	1,5
	FEDERAL REGION: South	23,4	21,3	19,1	18,2	20,7	718#	303	315	291	234	5,3	2,2	2,1	2,0	2,6	204	101	91	58	56	1,2	0,6	0,5	0,3	0,5

№	Federal regions (okrugs) and subjects of the Russian Federation	TB mortality rates (FSSS)					TB patients died within one year of follow-up (Form No. 33)										TB patients died, unknown to TB dispensary service (territorial Form No. 8)									
		Per 100,000 population					Number of cases					Among new registered TB cases (%) Form No. 33					Number of cases					Among new registered TB patients (Form No. 8), %				
		2005	2006*	2007**	2008***	2009****	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
	FEDERAL REGION: North-Caucasus					12,8					109					2,2					28					0,5
29	Republics: Adygea	27,1	21,0	24,5	21,0	16,9	15	20	16	16	65	5,4	7,1	4,8	5,1	20,5	31	23	17	19	11	9,1	6,6	4,1	5,1	3,1
30	Dagestan	12,0	14,3	9,8	9,8	9,5	22	20	20	17	16	1,5	1,3	1,3	1,1	1,1	0	0	0	0	1	0,0	0,0	0,0	0,0	0,1
31	Ingushetia	12,2	11,0	7,7	6,9	7,6	8	5	5	2	10	3,7	2,7	2,4	1,3	5,7	4	1	2	0	0	1,6	0,5	0,9	0,0	0,0
32	Kabardino-Balkaria	22,1	15,9	18,4	14,2	15,5	7	10	9	9	5	1,6	2,3	0,0	2,4	1,4	0	0	2	1	6	0,0	0,0	0,4	0,2	1,4
33	Kalmykia	28,7	23,6	21,0	22,1	29,3	9	9	16	8	21	2,7	2,6	4,8	2,7	8,4	21	8	8	3	4	5,6	2,2	2,2	0,9	1,3
34	Karachaevo-Cherkessia	15,0	10,9	10,0	11,0	9,8	5	7	8	5	5	2,3	3,6	3,8	2,2	2,6	0	0	0	0	0	0,0	0,0	0,0	0,0	0,0
35	North Ossetia-Alania	19,6	16,4	17,0	17,9	15,0	4	16	17	11	15	0,8	4,0	3,9	2,7	3,5	0	2	0	1	0	0,0	0,5	0,0	0,2	0,0
36	Chechnya	7,2	7,2	7,4	8,7	19,3	20	19	35	36	29		2,1	0,0	3,9	3,0					0					0,0
37	Krais: Krasnodar	25,6	22,0	20,5	18,5	15,0	103	73	70	81	70	3,6	2,8	2,2	2,7	2,5	41	4	4	1	12	1,3	0,1	0,1	0,0	0,3
38	Stavropol	16,5	12,9	13,6	11,0	12,9	47	42	27	33	29	3,3	2,9	1,8	2,1	1,9	47	14	23	13	21	2,5	0,8	1,3	0,7	1,1
39	Oblasts: Astrakhan	41,7	39,8	37,1	30,2	32,4	9	5	10	6	8	1,2	0,7	1,3	0,8	1,1	0	0	0	0	4	0,0	0,0	0,0	0,0	0,4
40	Volgograd	29,2	25,9	20,8	20,0	19,3	74	57	60	51	55	3,5	2,7	2,6	2,4	2,6	60	42	29	13	14	2,0	1,5	0,9	0,5	0,5
41	Rostov	30,6	30,9	26,8	29,1	25,5	415#	20	22	16	15	13,9	0,7	0,8	0,6	0,6	0	7	6	7	11	0,0	0,2	0,2	0,2	0,4
	FEDERAL REGION: Privolzhsky	18,6	16,8	16,0	15,3	14,2	973	881	742	698	621	5,0	4,5	4,1	3,7	3,4	529	488	427	405	346	2,2	2,0	1,9	1,7	1,5
42	Republics: Bashkortostan	14,7	13,8	13,8	13,2	12,9	76	72	47	28	26	4,0	3,9	2,7	1,7	1,6	10	10	10	8	8	0,4	0,4	0,5	0,4	0,4
43	Mariy El	13,3	11,4	11,9	12,4	11,3	18	19	15	21	20	4,1	4,2	2,8	3,9	3,5	12	6	12	5	8	2,5	1,3	2,1	0,9	1,3
44	Mordovia	13,0	13,3	11,3	9,9	9,8	19	16	7	8	10	3,6	2,9	1,3	1,5	2,0	4	0	2	1	5	0,7	0,0	0,3	0,2	0,7
45	Tatarstan	14,0	10,2	10,4	9,9	9,2	98	73	77	48	55	4,8	3,6	4,1	2,5	2,9	59	35	45	54	44	2,6	1,5	2,0	2,4	2,0
46	Udmurtia	21,2	18,0	20,1	16,1	16,6	92	70	81	69	66	8,2	6,5	7,4	6,3	6,7	35	46	22	19	17	2,7	3,6	1,8	1,5	1,5
47	Chuvashia	14,3	14,3	13,8	13,4	10,8	39	42	31	35	34	4,5	4,7	3,6	3,7	3,7	24	20	29	28	18	2,3	1,9	2,9	2,6	1,7
48	Krai: Perm	28,0	23,8	21,8	20,7	20,6	163	143	94	93	97	7,0	5,8	4,3	4,0	4,5	85	87	64	39	44	2,8	2,7	2,3	1,3	1,6
49	Oblasts: Kirov	13,8	13,5	11,8	12,2	10,4	46	40	35	50	24	5,5	4,8	4,9	6,3	3,3	34	34	21	26	33	3,8	3,4	2,3	2,6	3,5
50	Nizhni Novgorod	25,0	21,8	20,2	19,6	13,7	137	145	105	111	103	6,2	7,0	5,6	5,9	5,1	161	163	127	131	84	5,5	5,7	5,1	5,2	3,2
51	Orenburg	18,8	19,7	17,2	17,2	17,5	51	38	38	35	27	2,9	2,1	2,1	1,9	1,5	3	3	6	5	4	0,1	0,1	0,3	0,2	0,2
52	Penza	15,1	12,6	11,1	10,7	10,6	37	40	33	36	28	3,9	4,3	3,9	4,2	3,1	15	10	5	8	3	1,4	1,0	0,5	0,7	0,3
53	Samara	21,4	21,2	19,7	19,5	20,8	89	94	67	47	49	4,9	5,0	3,6	2,4	2,4	54	50	58	62	59	2,2	2,0	2,3	2,3	2,1
54	Saratov	18,7	16,9	16,7	15,0	12,5	50	31	48	36	20	2,8	1,9	3,1	2,3	1,3	25	17	16	16	16	1,2	0,9	0,9	0,9	0,8
55	Ulyanovsk	17,7	15,7	15,8	16,3	14,8	58	58	64	81	62	7,4	7,1	7,5	9,1	6,9	8	7	10	3	3	0,8	0,7	0,9	0,3	0,3
	FEDERAL REGON: Ural	25,5	36,2	21,6	21,7	19,8	520	454	441	408	334	5,1	4,3	4,3	3,9	3,4	351	212	225	158	205	2,8	1,7	1,8	1,2	1,7
56	Oblasts: Kurgan	43,0	36,2	36,3	37,7	38,7	54	46	56	63	63	5,2	4,0	5,0	5,6	6,3	21	13	9	6	28	1,7	1,0	0,7	0,4	2,2
57	Sverdlovsk	25,8	22,9	21,4	21,0	19,5	209	192	173	155	131	6,0	5,1	4,4	3,8	3,6	242	118	119	93	113	5,3	2,6	2,4	1,8	2,4
58	Tyumen	23,8	22,3	20,2	20,3	18,3	154	111	120	86	70	4,6	3,3	4,1	3,1	2,6	36	28	27	24	28	0,9	0,7	0,8	0,8	0,9
	Khanty-Mansi AO	16,4	15,7	13,0	13,2	13,6	48	42	40	33	22	3,9	3,3	3,5	2,9	2,2	7	14	9	9	14	0,5	1,0	0,7	0,7	1,1
	Yamalo-Nenets AO	15,0	14,6	13,5	13,3	14,7	10	12	9	15	12	2,2	3,3	2,6	4,4	3,3	11	3	2	4	8	2,1	0,7	0,5	1,0	1,8

№	Federal regions (okrugs) and subjects of the Russian Federation	TB mortality rates (FSSS)					TB patients died within one year of follow-up (Form No. 33)										TB patients died, unknown to TB dispensary service (territorial Form No. 8)									
		Per 100,000 population					Number of cases					Among new registered TB cases (%) Form No. 33					Number of cases					Among new registered TB patients (Form No. 8), %				
		2005	2006*	2007**	2008***	2009****	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
59	Chelyabinsk	21,7	19,6	19,0	19,5	16,6	103	105	92	104	70	4,5	4,8	3,9	4,3	3,0	52	53	70	35	36	1,8	2,0	2,3	1,2	1,2
	FEDERAL REGION: Siberian	37,3	32,3	29,1	29,3	26,5	1337	1159	1044	1072	954	6,2	5,4	4,9	4,9	4,5	836	721	554	510	438	3,2	2,8	2,2	2,0	1,7
60	Republics: Altai	30,9	30,7	19,4	17,8	21,0	18	8	7	12	4	6,1	3,1	3,0	4,8	1,8	2	3	1	1	0	0,7	1,2	0,4	0,4	0,0
61	Buryatia	23,0	22,4	19,7	25,1	19,1	39	32	26	34	22	3,1	2,3	1,9	2,5	1,7	43	37	32	24	38	2,8	2,2	2,3	1,6	2,4
62	Tyva	71,4	66,7	79,5	74,5	78,9	22	29	28	34	20	3,4	4,6	4,9	5,9	3,5	22	14	11	29	25	2,9	1,8	1,5	3,9	3,5
63	Khakassia	46,7	28,3	23,5	24,2	22,1	35	29	33	33	21	5,5	5,4	6,5	5,9	3,7	22	24	8	7	9	3,0	3,8	1,5	1,2	1,4
64	Krais: Altai	42,6	35,2	33,2	32,0	27,9	170	156	126	129	117	5,5	5,0	4,4	4,4	4,1	112	82	60	57	58	3,0	2,3	1,8	1,7	1,8
65	Trans-Baikal (Chita Oblast)	27,6	25,6	18,3	19,8	20,2	48	49	33	24	28	4,9	5,1	3,3	2,1	2,7	12	7	6	8	7	1,0	0,6	0,5	0,6	0,6
66	Krasnoyarsk	32,9	28,4	25,9	25,1	17,8	193	146	140	137	113	7,4	5,9	5,7	5,4	4,7	125	109	96	89	67	3,9	3,6	3,2	2,9	2,2
67	Oblasts: Irkutsk	45,0	38,5	35,4	41,8	40,0	208	185	186	210	221	8,0	6,8	6,2	6,7	7,5	153	148	74	92	75	4,9	4,7	2,2	2,6	2,2
68	Kemerovo	45,5	38,3	33,5	33,7	31,5	316	269	225	209	178	8,4	7,4	6,4	5,9	4,9	166	128	94	77	63	3,7	2,9	2,3	1,8	1,5
69	Novosibirsk	39,5	35,6	30,9	28,8	28,4	165	149	137	138	149	5,6	5,1	4,8	4,7	5,2	90	64	67	45	39	2,4	1,8	1,9	1,3	1,1
70	Omsk	29,4	28,0	26,6	23,7	19,7	89	62	73	76	51	4,5	3,1	3,5	3,6	2,4	79	89	97	72	51	3,3	3,6	3,8	2,7	1,9
71	Tomsk	16,2	12,7	11,9	9,4	10,7	34	45	30	36	30	3,8	5,1	3,5	4,1	3,5	10	16	8	9	6	0,9	1,4	0,8	0,9	0,6
	FEDERAL REGION: Far-East	33,0	29,0	28,1	27,0	27,5	320	237	322	353	242	4,5	3,4	4,6	4,6	3,2	139	113	119	146	141	1,6	1,4	1,4	1,5	1,5
72	Republic: Sakha (Yakutia)	8,5	7,3	6,9	9,8	9,8	21	19	34	29	19	2,9	2,7	5,5	4,4	3,0	4	8	4	9	4	0,5	1,0	0,5	1,0	0,5
73	Krais: Kamchatka	14,5	15,2	18,2	15,4	19,0	10	11	16	10	10	3,4	4,3	6,7	3,6	3,4	3	5	3	10	8	0,9	1,7	1,1	3,1	2,4
74	Primorsky	47,8	40,4	34,8	33,2	33,6	149	131	106	141	96	5,7	4,8	3,6	4,5	3,0	59	27	76	79	58	1,8	0,8	2,1	2,1	1,4
75	Khabarovsk	28,0	23,7	27,2	25,6	28,1	62	28	94	107	66	4,1	2,0	6,4	6,9	4,3	15	2	8	3	6	0,8	0,1	0,4	0,2	0,3
76	Oblasts: Amursk	47,3	43,2	41,7	38,1	37,7	49	21	41	30	24	4,7	2,0	4,1	2,7	2,3	28	29	4	7	27	2,1	2,3	0,3	0,5	2,2
77	Magadan	9,8	10,0	10,8	10,9	11,7	4	0	2	5	1	3,4	0,0	1,8	5,1	1,0	4	3	3	5	4	2,8	2,2	2,3	3,5	2,8
78	Sakhalin	22,3	26,2	22,1	20,9	23,6	12	19	17	13	11	2,6	4,3	4,3	2,8	2,7	21	35	13	23	29	3,8	6,0	2,6	3,9	5,2
79	Jewish Aut.Oblast	59,2	47,3	63,0	65,2	46,4	13	8	12	16	14	4,9	3,6	0,0	5,0	5,0	5	4	7	9	5	1,7	1,6	2,3	2,6	1,6
80	Chukotka Aut. Region	7,9	7,9	9,9	12,0	10,2	0	0	0	2	1	0,0	0,0	0,0	4,9	2,3	0	0	1	1	0	0,0	0,0	3,4	2,4	0,0

* data from [20].

** data from [38].

*** data from [53].

**** data from [16].

\# data need further specifying.

Table 9

TB prevalence in the Russian Federation, 2005–2009 (Form No. 33)

№	Federal regions (okrugs) and subjects of the Russian Federation	TB patients registered at the end of the year										Including MbT+				
		Number of cases					per 100,000 population					per 100,000 population				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
	RUSSIAN FEDERATION	298509	289015	276554	270544	262718	209,7	202,5	194,5	190,5	185,1	86,6	83,9	80,9	80,2	77,8
	FEDERAL REGION: Central	55480	52827	49504	46908	43503	147,8	141,4	133,0	126,3	117,2	59,8	57,1	53,8	52,4	50,1
1	Oblasts: Belgorod	1525	1522	1254	1298	1154	100,9	100,7	82,8	85,4	75,7	58,7	58,3	53,2	53,6	50,2
2	Braynsk	3104	3365	3284	3217	2327	230,5	252,7	249,2	245,9	179,0	106,3	104,3	103,8	110,7	91,5
3	Vladimir	2158	2159	2035	1966	1976	145,1	146,6	139,4	135,6	137,2	69,4	67,7	57,4	60,7	66,0
4	Voronezh	3918	3575	3532	3199	3073	167,9	154,5	153,9	140,3	135,4	85,9	82,2	80,5	73,2	75,0
5	Ivanovo	1363	1133	1003	1048	1003	122,3	103,0	92,2	97,1	93,5	61,3	61,8	58,6	59,7	53,5
6	Kaluga	1384	1345	1164	1145	1059	135,5	132,6	115,4	113,9	105,6	72,4	61,9	61,0	52,7	54,1
7	Kostroma	670	526	487	474	444	93,4	74,2	69,4	68,0	64,1	51,4	40,6	36,2	32,6	27,3
8	Kursk	2384	2286	2255	2212	2142	198,8	193,1	192,6	190,3	185,4	77,7	76,7	74,4	76,6	76,4
9	Lipetsk	1992	1910	1826	1767	1551	167,4	161,7	155,6	151,2	133,3	64,0	60,5	56,7	56,7	50,6
10	Moscow	11992	11322	10515	9695	9091	180,9	170,8	158,2	145,3	135,4	50,0	46,8	44,0	42,4	41,0
11	Orel	1083	977	898	808	737	128,6	117,2	108,6	98,3	90,2	48,9	43,1	38,8	33,3	37,7
12	Ryazan	2099	1942	1982	1848	1751	175,7	164,3	169,1	158,7	151,2	71,3	67,0	78,9	82,1	77,5
13	Smolensk	2331	2435	2263	2133	2044	228,7	242,1	227,8	216,9	209,8	112,5	115,3	106,9	99,8	103,4
14	Tambov	1855	1726	1538	1422	1402	162,0	152,7	137,7	128,6	127,8	90,7	84,9	77,1	71,4	70,9
15	Tver	2545	2381	2306	2268	2119	178,5	169,3	165,8	164,4	154,7	77,4	66,7	56,6	61,8	60,5
16	Tula	3582	3075	2814	2745	2705	220,9	192,2	178,0	175,3	174,2	85,8	80,9	73,0	72,8	69,0
17	Yaroslavl	1668	1613	1614	1502	1409	124,6	121,5	122,3	114,2	107,5	58,1	55,3	55,0	52,2	45,5
18	Moscow city	9827	9535	8734	8161	7516	94,4	91,5	83,6	77,9	71,5	34,2	34,5	32,1	30,6	28,3
	FEDERAL REGION: North-West	20029	18824	18247	17592	17185	145,9	138,1	134,7	130,3	127,7	68,7	66,6	64,3	62,9	60,2
19	Republics: Karelia	1251	1087	1045	982	948	177,9	155,8	150,8	142,2	137,9	80,4	75,4	73,1	66,0	63,7
20	Komi	1723	1607	1631	1585	1577	172,9	163,1	167,3	163,7	164,5	74,4	75,8	85,9	91,7	93,8
21	Oblasts: Arkhangelsk	1534	1451	1275	1088	1018	117,6	112,4	99,6	85,5	80,7	70,5	69,5	54,1	46,5	41,4
	Nenets AO	78	68	63	62	59	185,9	161,9	150,1	147,6	140,4	69,1	76,2	59,6	42,8	26,2
22	Vologda	1245	1241	1244	1260	1136	100,0	100,5	101,3	103,0	93,2	55,5	59,3	57,1	57,7	52,2
23	Kaliningrad	2805	2608	2448	2186	1933	296,8	277,5	261,2	233,2	206,2	141,0	148,7	144,9	147,0	131,8
24	Leningrad	2316	2208	2072	2201	2253	140,1	134,3	126,5	134,8	138,1	69,8	68,9	64,2	67,8	64,9
25	Murmansk	1270	1073	1110	1002	1016	145,5	124,1	129,5	117,8	120,6	86,7	73,9	76,7	71,0	68,7
26	Novgorod	1187	1152	1182	1105	1062	176,1	173,1	179,7	169,4	164,4	81,6	79,1	75,6	71,1	69,7
27	Pskov	1289	1245	1341	1276	1326	175,0	171,8	188,0	180,9	190,4	71,9	71,8	76,5	80,3	78,4
28	Saint-Petersburg city	5409	5152	4899	4907	4916	117,6	112,5	107,2	107,4	107,3	47,5	42,9	40,8	37,8	38,0
	FEDERAL REGION: South	51416	54099	52442	50630	29912	237,2	237,4	230,2	221,7	218,1	84,1	79,0	77,4	75,3	83,8
	FEDERAL REGION: North-Caucasus					19123					208,2					52,1
29	Republics: Adygea	769	726	695	718	633	173,0	164,0	157,5	162,7	143,0	100,4	90,1	87,7	89,3	73,9
30	Dagestan	5787	5513	4879	4517	4382	220,7	208,7	183,5	168,1	161,6	50,0	50,2	45,9	44,4	45,2

№	Federal regions (okrugs) and subjects of the Russian Federation	TB patients registered at the end of the year										Including MbT+				
		Number of cases					per 100,000 population					per 100,000 population				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
31	Ingushetia	1376	1368	1289	1195	1160	285,7	280,9	261,6	239,2	228,3	51,3	41,1	40,4	37,8	37,6
32	Kabardino-Balkaria	1596	1625	1549	1489	1433	177,9	181,8	173,8	167,1	160,6	49,5	55,0	49,3	48,5	39,6
33	Kalmykia	1481	1287	1069	910	881	510,9	445,8	372,2	318,7	310,2	149,4	138,6	132,3	143,2	144,7
34	Karachaevo-Cherkessia	922	928	955	960	914	212,2	215,1	222,8	224,6	214,0	38,7	40,6	53,2	52,6	47,5
35	North Ossetia-Alania	1701	1644	1638	1563	1525	241,5	234,1	233,5	222,5	217,3	80,6	86,0	81,8	70,8	64,3
36	Chechnya	4439	4258	4090	4100	4058		366,2	345,5	339,1	327,7		88,5	98,2	106,6	83,7
37	Krais: Krasnodar	9799	9521	9372	9045	8348	192,1	186,8	183,7	176,6	162,4	94,4	89,9	88,2	86,6	75,6
38	Stavropol	5656	5443	5448	5586	5651	208,1	200,8	201,7	206,5	208,7	65,0	55,0	51,4	49,7	49,0
39	Oblasts: Astrakhan	2758	2579	2593	2497	2520	276,3	259,4	260,8	249,5	250,7	98,5	92,1	85,9	80,9	79,3
40	Volgograd	7744	7619	7327	6713	6462	291,7	289,1	279,7	257,3	248,6	102,4	101,6	98,8	89,9	94,1
41	Rostov	11827	11588	11538	11337	11068	272,9	269,3	269,8	266,5	260,9	100,1	86,1	86,6	85,4	85,4
FEDERAL REGION: Privolzhsky		56928	55538	52485	51314	49599	185,4	182,0	173,0	169,7	164,5	83,6	83,2	79,4	78,4	75,1
42	Republics: Bashkortostan	5303	5224	5152	5007	4960	130,0	128,6	127,2	123,5	122,2	57,2	57,7	53,3	51,6	46,6
43	Mariy El	813	787	833	831	906	113,4	110,6	117,9	118,2	129,4	82,0	74,9	76,8	66,4	71,6
44	Mordovia	1651	1620	1469	1437	1424	190,5	189,1	173,3	171,0	170,9	59,0	61,0	52,6	49,1	48,6
45	Tatarstan	5458	4845	4158	3897	3850	144,8	128,8	110,6	103,6	102,2	68,3	65,3	58,4	54,4	54,8
46	Udmurtia	3872	3725	3662	3584	3533	249,4	241,2	238,1	233,8	231,1	106,2	103,2	98,9	96,6	93,2
47	Chuvashia	2138	1912	1699	1709	1535	164,5	148,0	132,1	133,2	120,0	108,8	107,2	101,4	104,9	94,2
48	Krai: Perm	6806	6695	6315	6259	5953	245,7	243,6	231,2	230,3	219,8	110,5	105,0	99,1	98,3	94,2
49	Oblasts: Kirov	2476	2489	2443	2362	2209	169,4	172,5	171,2	167,1	157,7	99,4	105,9	108,4	103,6	94,2
50	Nizhni Novgorod	7074	6984	6543	6372	6303	205,3	204,7	193,5	189,7	188,7	82,1	81,4	78,3	76,6	73,5
51	Orenburg	4391	4425	4545	4634	4601	204,2	207,0	213,8	218,7	217,9	91,5	94,5	92,3	89,9	88,8
52	Penza	2068	2250	2179	2182	2195	145,4	159,8	156,1	157,2	159,1	68,7	64,8	65,7	66,1	68,5
53	Samara	6172	6089	5733	5568	5154	192,8	190,9	180,4	175,5	162,5	89,0	89,2	86,5	89,7	89,7
54	Saratov	5926	5996	5555	5231	4738	225,7	229,9	214,0	202,5	184,2	89,7	98,9	94,4	95,1	78,5
55	Ulyanovsk	2780	2497	2199	2241	2238	205,8	186,9	166,4	170,8	171,5	82,4	75,9	72,6	78,6	87,1
FEDERAL REGON: Ural		30382	29629	28807	28169	27485	247,4	242,0	235,5	230,1	224,3	93,0	92,2	92,6	91,1	87,5
56	Oblasts: Kurgan	2976	2900	2989	3140	2988	300,0	295,9	308,4	326,9	313,6	119,1	115,9	115,5	130,4	129,7
57	Sverdlovsk	11013	11198	11374	11496	11347	248,7	253,9	258,5	261,5	258,2	91,6	95,3	96,7	98,4	97,6
58	Tyumen	9944	9567	8206	7239	6726	300,7	287,9	245,3	214,6	197,9	111,0	105,2	101,4	91,6	80,7
	Khanty-Mansi AO	3471	3429	3177	2922	2679	236,3	232,0	213,5	194,1	176,3	97,8	95,1	90,4	85,9	76,6
	Yamalo-Nenets AO	1563	1386	1247	1228	1283	298,6	261,2	231,5	226,3	236,0	102,0	93,3	84,5	91,6	97,5
59	Chelyabinsk	6449	5964	6238	6294	6424	181,6	168,9	177,4	179,3	183,1	70,7	69,6	72,9	70,8	69,8
FEDERAL REGION: Siberian		63462	59485	57011	57080	56197	320,6	302,3	291,0	291,9	287,5	136,9	132,0	126,7	126,0	126,0
60	Republics: Altai	574	545	516	581	601	281,5	266,5	251,2	280,5	287,3	147,1	102,2	111,5	129,9	121,9
61	Buryatia	3332	2857	2689	2819	2420	343,8	296,6	280,1	293,7	251,9	169,6	161,9	158,4	168,1	141,8
62	Tyva	2174	2026	1990	2088	2183	706,6	656,7	643,1	670,0	695,4	365,0	341,3	327,4	349,8	359,9
63	Khakassia	1862	1770	1691	1676	1585	344,2	328,9	315,1	312,0	294,6	173,0	182,1	172,4	158,0	138,1
64	Krais: Altai	8786	8526	8165	8154	8390	342,5	335,2	323,6	325,1	336,0	112,6	111,9	105,3	108,4	119,8

№	Federal regions (okrugs) and subjects of the Russian Federation	TB patients registered at the end of the year										Including MbT+				
		Number of cases					per 100,000 population					per 100,000 population				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
65	Trans-Baikal (Chita Oblast)	2711	2616	2590	2600	2377	238,7	231,9	230,8	232,4	212,8	77,7	79,1	78,4	82,8	79,0
66	Krasnoyarsk	7613	7355	7276	7582	7395	260,2	253,1	251,4	262,3	255,9	110,8	108,2	106,6	104,5	100,6
67	Oblasts: Irkutsk	9286	9134	9398	9452	9347	364,8	361,5	373,9	376,9	373,0	146,2	144,2	149,5	148,5	159,8
68	Kemerovo	9990	8607	7676	7360	7021	349,9	303,2	271,6	260,7	248,8	176,9	160,0	146,0	140,1	137,9
69	Novosibirsk	8044	7189	6880	6829	6942	302,1	271,3	260,5	259,1	263,0	149,8	138,2	133,2	131,0	130,4
70	Omsk	7126	6984	6384	6415	6565	348,2	343,3	315,2	317,9	325,9	98,9	105,1	94,5	98,1	103,6
71	Tomsk	1964	1876	1756	1524	1371	189,5	181,4	170,0	147,2	132,0	125,7	126,0	116,1	100,4	89,4
FEDERAL REGION: Far-East		20774	18579	18017	18809	19668	315,1	283,8	276,8	290,0	304,5	136,6	133,4	130,3	142,0	146,5
72	Republic: Sakha (Yakutia)	1955	1974	1854	1853	1783	205,6	207,8	195,2	194,8	187,7	91,8	95,4	88,8	96,7	97,2
73	Krais: Kamchatka	831	727	654	702	785	236,0	208,2	188,4	203,1	228,5	102,5	95,1	78,4	83,9	96,9
74	Primorsky	6729	5388	5660	6431	7411	330,5	266,8	282,2	322,2	372,8	159,8	158,3	164,8	186,3	197,5
75	Khabarovsk	3746	3257	3191	3218	3196	263,8	230,6	227,0	229,2	228,0	111,1	105,1	98,7	112,5	120,8
76	Oblasts: Amursk	4205	4184	3821	3780	3703	473,8	474,9	436,9	434,7	428,4	174,9	169,3	157,2	158,2	149,3
77	Magadan	473	362	275	263	284	270,8	211,0	163,2	158,6	174,3	75,0	57,7	51,0	59,7	66,3
78	Sakhalin	1940	1859	1724	1716	1714	364,4	353,3	330,8	330,9	333,1	137,9	140,1	131,4	130,6	132,9
79	Jewish Aut.Oblast	788	724	741	746	674	417,5	388,1	399,1	402,1	363,5	247,9	231,6	252,6	258,7	235,2
80	Chukotka Aut. Region	107	104	97	100	118	211,0	205,8	192,1	199,0	238,3	110,4	112,8	118,8	139,3	143,4

Prevalence of selected forms of TB in the Russian Federation, 2005–2009 (Form No. 33)

№	Federal regions (okrugs) and subjects of the Russian Federation	PTB patients with lung destruction										Fibrous-cavernous TB										MDR in registered MbT+ RTB patients (%)				
		Number of cases					per 100,000 population					Number of cases					per 100,000 population									
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
	RUSSIAN FEDERATION	112676	111089	107610	104331	102415	79,2	77,8	75,7	73,5	72,2	35351	34999	33922	32319	31130	24,8	24,5	23,9	22,8	21,9	18,7	20,3	21,4	23,4	26,5
	FEDERAL REGION: Central	17872	17548	16695	15721	14892	47,6	47	44,9	42,3	40,1	5215	5241	5022	4751	4464	13,9	14,0	13,5	12,8	12,0	19,3	20,4	20,6	22,8	28,6
1	Oblasts: Belgorod	608	589	498	443	358	40,2	39	32,9	29,2	23,5	237	196	172	121	91	15,7	13,0	11,4	8,0	6,0	22,9	26,4	37,8	41,4	49,1
2	Braynsk	1306	1375	1411	1395	1170	97,0	103,3	107,1	106,6	90,0	406	397	395	391	335	30,2	29,8	30,0	29,9	25,8	22,0	26,1	21,0	25,0	27,4
3	Vladimir	728	762	616	548	582	49,0	51,7	42,2	37,8	40,4	180	160	154	133	133	12,1	10,9	10,6	9,2	9,2	27,0	34,8	34,7	36,8	41,0
4	Voronezh	1437	1469	1416	1458	1407	61,6	63,5	61,7	63,9	62,0	434	464	487	495	492	18,6	20,1	21,2	21,7	21,7	32,7	30,1	24,5	27,8	38,9
5	Ivanovo	430	439	437	416	343	38,6	39,9	40,2	38,5	32,0	95	102	98	7	80	8,5	9,3	9,0	0,6	7,5	44,9	43,6	38,5	40,7	45,3
6	Kaluga	511	416	413	351	317	50,0	41	40,9	34,9	31,6	176	168	163	137	113	17,2	16,6	16,2	13,6	11,3	12,3	13,5	18,2	29,4	25,7
7	Kostroma	156	144	135	142	106	21,7	20,3	19,2	20,4	15,3	48	40	30	27	27	6,7	5,6	4,3	3,9	3,9	22,9	31,7	31,9	32,6	25,9
8	Kursk	779	823	848	804	859	65,0	69,5	72,4	69,2	74,3	349	372	378	373	388	29,1	31,4	32,3	32,1	33,6	2,9	2,8	5,8	11,3	15,4
9	Lipetsk	453	439	435	392	391	38,1	37,2	37,1	33,5	33,6	165	155	147	155	149	13,9	13,1	12,5	13,3	12,8	22,6	20,2	15,2	26,2	32,5
10	Moscow	3278	3182	3057	2809	2793	49,4	48	46,0	42,1	41,6	866	864	859	854	806	13,1	13,0	12,9	12,8	12,0	17,0	16,4	19,0	21,6	22,9
11	Orel	274	257	250	205	194	32,5	30,8	30,2	24,9	23,7	65	52	38	31	23	7,7	6,2	4,6	3,8	2,8	19,3	20,4	22,5	28,9	21,2
12	Ryazan	784	811	814	823	796	65,6	68,6	69,4	70,7	68,8	314	364	347	345	317	26,3	30,8	29,6	29,6	27,4	9,5	9,6	16,6	30,6	30,4
13	Smolensk	1138	1142	1095	1046	1000	111,7	113,5	110,2	106,4	102,7	205	240	237	266	247	20,1	23,9	23,9	27,1	25,4	6,6	10,5	8,3	10,2	11,6
14	Tambov	826	737	684	585	595	72,2	65,2	61,2	52,9	54,2	255	239	201	182	145	22,3	21,1	18,0	16,5	13,2	25,7	15,3	21,9	25,0	29,9
15	Tver	1052	1124	1049	979	911	73,8	79,9	75,4	71,0	66,5	225	248	221	222	216	15,8	17,6	15,9	16,1	15,8	8,1	6,1	2,4	2,4	22,2
16	Tula	1079	909	848	793	750	66,5	56,8	53,7	50,6	48,3	401	390	338	313	297	24,7	24,4	21,4	20,0	19,1	20,4	22,2	24,6	26,3	33,3
17	Yaroslavl	604	531	551	524	455	45,1	40	41,7	39,8	34,7	158	147	140	131	127	11,8	11,1	10,6	10,0	9,7	10,6	12,0	16,6	17,8	24,5
18	Moscow city	2429	2399	2138	2008	1865	23,3	23	20,5	19,2	17,7	636	643	617	568	478	6,1	6,2	5,9	5,4	4,5	19,4	23,0	21,5	23,0	26,4
	FEDERAL REGION: North-West	8495	8111	7887	7422	7151	61,9	59,5	58,2	55,0	53,1	1267	1210	1216	1150	1150	9,2	8,9	9,0	8,5	8,5	26,5	28,5	33,0	34,1	33,0
19	Republics: Karelia	473	457	449	404	391	67,3	65,5	64,8	58,5	56,9	95	89	83	79	61	13,5	12,8	12,0	11,4	8,9	23,0	25,4	30,8	35,2	39,8
20	Komi	783	727	767	804	836	78,6	73,8	78,7	83,0	87,2	101	87	118	116	139	10,1	8,8	12,1	12,0	14,5	28,1	26,2	31,8	33,0	34,7
21	Oblasts: Arkhangelsk	872	858	670	602	522	66,8	66,4	52,3	47,3	41,4	88	74	44	42	18	6,7	5,7	3,4	3,3	1,4	52,7	48,3	47,7	44,6	47,8
	Nenets AO	29	29	23	16	13	69,1	69,1	54,8	38,1	30,9	7	8	9	8	5	16,7	19,1	21,4	19,0	11,9	51,7	40,6	56,0	66,7	90,9
22	Vologda	606	617	624	656	600	48,7	49,9	50,8	53,6	49,3	82	75	78	83	94	6,6	6,1	6,4	6,8	7,7	20,3	0,0	21,6	23,4	24,5
23	Kaliningrad	860	904	912	731	702	91,0	96,2	97,3	78,0	74,9	151	243	257	227	242	16,0	25,9	27,4	24,2	25,8	19,4	22,6	24,5	24,1	30,3
24	Leningrad	1232	1136	1101	1132	1136	74,5	69,1	67,2	69,3	69,6	166	146	132	150	173	10,0	8,9	8,1	9,2	10,6	19,6	24,8	31,2	30,3	37,1
25	Murmansk	431	391	446	336	383	49,4	45,2	52,0	39,5	45,5	123	93	81	72	76	14,1	10,8	9,5	8,5	9,0	38,6	39,9	40,4	44,3	42,9
26	Novgorod	435	410	382	345	330	64,5	61,6	58,1	52,9	51,1	41	35	39	44	38	6,1	5,3	5,9	6,7	5,9	29,7	43,2	40,7	45,0	43,4
27	Pskov	526	518	546	576	556	71,4	71,5	76,5	81,7	79,8	81	75	88	85	78	11,0	10,4	12,3	12,1	11,2	22,5	29,9	35,2	43,6	52,5
28	Saint-Petersburg city	2277	2093	1990	1836	1695	49,5	45,7	43,5	40,2	37,0	339	293	296	252	231	7,4	6,4	6,5	5,5	5,0	21,9	30,1	34,8	36,2	16,6
	FEDERAL REGION: South	20748	21170	21007	19700	12810	95,7	92,9	92,2	86,3	93,4	7865	8029	7939	6896	4492	36,3	35,2	34,9	30,2	32,8	10,0	11,3	13,7	16,5	23,0

№	Federal regions (okrugs) and subjects of the Russian Federation	PTB patients with lung destruction: Number of cases					PTB patients with lung destruction: per 100,000 population					Fibrous-cavernous TB: Number of cases					Fibrous-cavernous TB: per 100,000 population					MDR in registered MbT+ RTB patients (%)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
	FEDERAL REGION: North-Caucasus					7328					79,8					2510					27,3					10,8
29	Republics: Adygea	385	365	354	300	268	86,6	82,4	80,2	68,0	60,5	132	118	128	125	103	29,7	26,7	29,0	28,3	23,3	7,0	7,2	6,3	8,4	9,9
30	Dagestan	2824	2745	2461	2326	2331	107,7	103,9	92,6	86,5	86,0	1343	1179	1063	902	850	51,2	44,6	40,0	33,6	31,3	6,6	4,9	8,3	10,8	5,5
31	Ingushetia	320	307	257	242	265	66,5	63	52,2	48,4	52,2	167	151	137	127	114	34,7	31,0	27,8	25,4	22,4	8,1	16,5	24,6	24,9	36,6
32	Kabardino-Balkaria	698	876	688	630	684	77,8	98	77,2	70,7	76,6	375	324	321	301	260	41,8	36,2	36,0	33,8	29,1	0,0	0,0	0,0	0,0	0,0
33	Kalmykia	455	434	394	344	327	157,0	150,3	137,2	120,5	115,1	242	244	220	175	138	83,5	84,5	76,6	61,3	48,6	0,0	23,8	21,5	24,2	22,9
34	Karachaevo-Cherkessia	231	231	266	257	221	53,2	53,5	62,0	60,1	51,7	85	81	117	107	124	19,6	18,8	27,3	25,0	29,0	9,6	12,7	12,7	14,0	9,9
35	North Ossetia-Alania	669	637	349	0	612	95,0	90,7	49,8	0,0	87,2	325	362	336	0	326	46,1	51,5	47,9	0,0	46,5	0,0	1,5	9,4	16,1	15,6
36	Chechnya		1138	1478	1613	1573		97,9	124,9	133,4	127,0	323	418	441	452	453		35,9	37,3	37,4	36,6				0,0	0,0
37	Krais: Krasnodar	5189	5206	5453	4946	4591	101,7	102,1	106,9	96,6	89,3	2283	2327	2474	2427	2125	44,8	45,7	48,5	47,4	41,3	17,1	18,2	21,3	23,6	27,9
38	Stavropol	1637	1515	1518	1482	1642	60,2	55,9	56,2	54,8	60,7	448	414	400	108	383	16,5	15,3	14,8	4,0	14,1	10,8	16,9	19,0	18,1	21,9
39	Oblasts: Astrakhan	1002	916	928	870	852	100,4	92,1	93,3	86,9	84,8	449	440	412	358	365	45,0	44,3	41,4	35,8	36,3	9,8	13,0	16,9	20,1	18,5
40	Volgograd	3108	3187	3238	3124	3108	117,1	120,9	123,6	119,8	119,6	957	967	1007	1025	1018	36,0	36,7	38,4	39,3	39,2	9,4	10,4	13,4	15,8	18,8
41	Rostov	4230	3613	3623	3566	3664	97,6	84	84,7	83,8	86,4	1059	1004	883	789	743	24,4	23,3	20,7	18,5	17,5	6,8	7,9	9,7	16,3	22,8
	FEDERAL REGION: Privolzhsky	21572	21356	19944	19684	18649	70,2	70	65,7	65,1	61,8	5928	5711	5474	5313	4998	19,3	18,7	18,0	17,6	16,6	19,8	22,4	24,3	27,2	29,5
42	Republics: Bashkortostan	2049	2049	1918	1885	1813	50,2	50,4	47,3	46,5	44,7	828	803	802	776	682	20,3	19,8	19,8	19,1	16,8	25,0	24,3	25,6	22,6	21,8
43	Mariy El	293	300	311	269	264	40,9	42,2	44,0	38,3	37,7	67	61	52	49	39	9,3	8,6	7,4	7,0	5,6	30,3	33,0	36,9	38,4	38,1
44	Mordovia	568	601	508	453	428	65,5	70,1	59,9	53,9	51,4	225	167	166	142	151	26,0	19,5	19,6	16,9	18,1	13,2	14,9	16,6	24,5	23,9
45	Tatarstan	1952	1924	1616	1548	1504	51,8	51,1	43,0	41,1	39,9	446	452	392	360	354	11,8	12,0	10,4	9,6	9,4	15,2	15,9	17,3	17,7	15,8
46	Udmurtia	1386	1284	1254	1192	1130	89,3	83,1	81,5	77,8	73,9	291	283	286	275	290	18,7	18,3	18,6	17,9	19,0	13,7	15,1	16,7	20,2	21,1
47	Chuvashia	1096	1035	971	900	714	84,4	80,1	75,5	70,2	55,8	168	159	164	163	134	12,9	12,3	12,8	12,7	10,5	9,1	23,1	32,4	30,4	30,2
48	Krai: Perm	2573	2578	2459	2450	2262	92,9	93,8	90,0	90,1	83,5	827	800	731	720	609	29,9	29,1	26,8	26,5	22,5	23,1	22,3	28,3	31,9	32,9
49	Oblasts: Kirov	830	766	698	733	686	56,8	53,1	48,9	51,9	49,0	95	96	104	116	112	6,5	6,7	7,3	8,2	8,0	22,6	22,1	23,0	24,8	26,8
50	Nizhni Novgorod	2937	2831	2723	2594	2606	85,2	83	80,5	77,2	78,0	981	956	964	947	960	28,5	28,0	28,5	28,2	28,7	28,4	29,3	26,3	35,0	39,1
51	Orenburg	1972	2065	1921	1985	1893	91,7	96,6	90,4	93,7	89,7	273	254	250	251	259	12,7	11,9	11,8	11,8	12,3	19,0	18,5	22,6	25,8	32,1
52	Penza	801	812	712	728	662	56,3	57,7	51,0	52,4	48,0	221	241	207	201	177	15,5	17,1	14,8	14,5	12,8	10,8	16,1	16,1	28,2	30,9
53	Samara	2246	2321	2272	2357	2235	70,2	72,8	71,5	74,3	70,5	716	702	660	637	567	22,4	22,0	20,8	20,1	17,9	16,7	27,7	27,1	30,1	31,1
54	Saratov	1806	1820	1676	1656	1502	68,8	69,8	64,6	64,1	58,4	534	491	464	435	414	20,3	18,8	17,9	16,8	16,1	19,8	21,1	23,3	26,0	35,0
55	Ulyanovsk	1063	970	905	934	950	78,7	72,6	68,5	71,2	72,8	256	246	232	241	250	19,0	18,4	17,6	18,4	19,2	21,7	26,5	25,7	25,1	29,7
	FEDERAL REGON: Ural	9628	9403	9417	8984	8864	78,4	76,8	77,0	73,4	72,3	3055	3077	2845	3104	3013	24,9	25,1	23,3	25,4	24,6	10,8	13,0	14,4	17,0	19,4
56	Oblasts: Kurgan	946	1017	1051	956	1019	95,4	103,8	108,4	99,5	107,0	484	442	449	466	518	48,8	45,1	46,3	48,5	54,4	7,7	8,1	7,2	7,7	21,6
57	Sverdlovsk	3227	3215	3300	3272	3188	72,9	72,9	75,0	74,4	72,5	967	1042	1020	1099	1090	21,8	23,6	23,2	25,0	24,8	9,9	11,3	12,6	14,5	17,4
58	Tyumen	3331	3091	2967	2645	2597	100,7	93	88,7	78,4	76,4	1017	987	795	1010	923	30,7	29,7	23,8	29,9	27,2	12,6	16,9	21,1	27,0	26,8
	Khanty-Mansi AO	1202	1096	1039	978	942	81,8	74,1	69,8	65,0	62,0	309	270	226	194	174	21,0	18,3	15,2	12,9	11,4	14,9	18,2	21,4	27,0	34,0
	Yamalo-Nenets AO	476	424	394	400	429	90,9	79,9	73,2	73,7	78,9	117	135	137	135	141	22,4	25,4	25,4	24,9	25,9	9,3	22,5	25,1	31,5	36,1

№	Federal regions (okrugs) and subjects of the Russian Federation	PTB patients with lung destruction										Fibrous-cavernous TB										MDR in registered MbT+ RTB patients (%)				
		Number of cases					per 100,000 population					Number of cases					per 100,000 population									
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
59	Chelyabinsk	2124	2080	2099	2111	2060	59,8	58,9	59,7	60,1	58,7	587	606	581	529	482	16,5	17,2	16,5	15,1	13,7	11,1	12,8	11,5	13,3	13,5
	FEDERAL REGION: Siberian	26099	25384	24519	24074	23817	131,9	129	125,2	123,1	121,9	8951	8722	8390	8125	7743	45,2	44,3	42,8	41,6	39,6	23,4	25,8	25,4	27,0	30,3
60	Republics: Altai	213	214	176	185	216	104,5	104,7	85,7	89,3	103,2	117	108	101	103	95	57,4	52,8	49,2	49,7	45,4	25,1	20,1	44,3	44,6	39,8
61	Buryatia	1749	1737	1683	1682	1343	180,5	180,3	175,3	175,2	139,8	488	527	517	471	335	50,4	54,7	53,9	49,1	34,9	8,8	11,7	11,5	14,4	25,5
62	Tyva	924	867	825	840	870	300,3	281	266,6	269,6	277,1	401	427	407	435	412	130,3	138,4	131,5	139,6	131,2	52,7	58,3	27,9	43,6	34,9
63	Khakassia	793	843	830	712	604	146,6	156,6	154,7	132,5	112,3	220	121	152	123	114	40,7	22,5	28,3	22,9	21,2	24,8	32,2	34,9	41,4	45,3
64	Krais: Altai	4005	3979	3703	3443	3802	156,1	156,5	146,8	137,3	152,3	1283	1169	1058	939	834	50,0	46,0	41,9	37,4	33,4	15,1	13,2	13,0	11,1	15,5
65	Trans-Baikal (Chita Oblast)	867	845	860	938	909	76,3	74,9	76,6	83,8	81,4	351	324	313	340	341	30,9	28,7	27,9	30,4	30,5	23,3	22,3	16,5	16,5	19,8
66	Krasnoyarsk	3315	3271	3276	3296	3080	113,3	112,6	113,2	114,0	106,6	874	849	809	775	733	29,9	29,2	28,0	26,8	25,4	21,8	25,2	26,8	27,9	34,4
67	Oblasts: Irkutsk	4129	4112	4259	4377	4502	162,2	162,7	169,4	174,5	179,7	1631	1594	1690	1756	1845	64,1	63,1	67,2	70,0	73,6	7,8	8,3	10,6	11,8	12,6
68	Kemerovo	4005	3609	3298	3080	2988	140,3	127,1	116,7	109,1	105,9	1427	1495	1310	1187	1049	50,0	52,7	46,4	42,0	37,2	25,8	30,2	36,7	36,5	41,9
69	Novosibirsk	3362	3016	2984	2845	2900	126,3	113,8	113,0	107,9	109,9	1015	923	925	893	881	38,1	34,8	35,0	33,9	33,4	28,8	30,6	30,5	36,3	43,7
70	Omsk	1958	2156	2017	2145	2119	95,7	106	99,6	106,3	105,2	1041	1083	1030	1024	1044	50,9	53,2	50,8	50,7	51,8	31,0	36,6	30,6	30,6	29,9
71	Tomsk	779	735	608	531	484	75,2	71,1	58,9	51,3	46,6	103	102	78	79	60	9,9	9,9	7,6	7,6	5,8	43,7	45,9	44,0	41,9	40,6
	FEDERAL REGION: Far-East	8261	8117	8140	8745	8904	125,3	124	125,1	134,8	137,8	3069	3009	3035	2980	2759	46,5	46,0	46,6	45,9	42,7	19,8	17,0	17,5	16,3	19,9
72	Republic: Sakha (Yakutia)	568	571	589	598	616	59,7	60,1	62,0	62,9	64,9	99	101	109	111	105	10,4	10,6	11,5	11,7	11,1	21,9	23,2	34,6	36,7	39,7
73	Krais: Kamchatka	330	327	335	376	398	93,7	93,6	96,5	108,8	115,9	156	152	140	160	152	44,3	43,5	40,3	46,3	44,2	4,7	6,6	3,7	1,7	21,3
74	Primorsky	2913	2992	3060	3442	3530	143,1	148,2	152,5	172,5	177,6	1243	1290	1328	1330	1317	61,1	63,9	66,2	66,6	66,2	14,6	18,0	16,4	13,2	17,4
75	Khabarovsk	1382	1304	1352	1442	1478	97,3	92,3	96,2	102,7	105,4	427	401	402	409	346	30,1	28,4	28,6	29,1	24,7	34,3	9,8	10,9	12,3	20,4
76	Oblasts: Amursk	1755	1776	1691	1732	1788	197,7	201,6	193,3	199,2	206,8	714	655	668	568	483	80,4	74,3	76,4	65,3	55,9	19,3	22,7	20,7	17,8	12,3
77	Magadan	147	112	94	98	112	84,2	65,3	55,8	59,1	68,7	30	25	27	32	32	17,2	14,6	16,0	19,3	19,6	32,1	19,2	26,7	30,6	31,5
78	Sakhalin	807	714	669	694	638	151,6	135,7	128,4	133,8	124,0	285	258	230	241	206	53,5	49,0	44,1	46,5	40,0	18,5	18,1	19,7	19,0	26,2
79	Jewish Aut. Oblast	312	268	298	300	275	165,3	143,7	160,5	161,7	148,3	94	97	102	100	89	49,8	52,0	54,9	53,9	48,0	6,8	3,7	4,9	9,4	8,5
80	Chukotka Aut. Region	47	53	52	63	69	92,7	104,9	103,0	125,3	139,3	21	30	29	29	29	41,4	59,4	57,4	57,7	58,6	92,9	50,0	43,3	31,4	23,9

Table 11

TB treatment effectiveness in the Russian Federation, 2005–2009

№	Federal regions (okrugs) and subjects of the Russian Federation	Indicators of treatment effectiveness based on dispensary follow-up data: Clinical cure of PTB patients, % 2006	% 2007	% 2008	% 2009	DFG 1A (2008) New cases (2009) % 2008	2009	Abacillation in RTB patients % 2006	2007	2008	2009	TB chemotherapy effectiveness in TB control facilities in the subjects of the Russian Federation (MoH&SD report); cohort of new registered ss+ PTB patients: 2007 n Cohort size	2007 %, outcomes: Successful treatment	Treatment failure	Died of TB	Died other causes of death	Died Total	Default	Transferred out	2008 n Cohort size	2008 %, outcomes: Successful treatment	Treatment failure	Died of TB	Died other causes of death	Died Total	Default	Transferred out
	RUSSIAN FEDERATION	30,3	31,6	31,9	33,0	46,8	43,1	33,4	35,1	35,9	39,6	29851	57,8	15,5	8,8	3,9	12,7	10,0	4,0	30104	57,6	17,3	8,3	4,2	12,5	8,9	3,8
	FEDERAL REGION: Central	30,1	33,9	35,7	39,6	52,3	50,0	37,9	39,9	41,7	44,6	5900	59,7	14,4	7,6	3,3	10,9	9,2	5,7	5935	59,2	15,5	7,9	4,3	12,2	8,2	4,9
1	Oblasts: Belgorod	51,7	71,9	63,4	70,3	76,5	79,4	48,7	60,8	59,3	61,5	277	78,3	7,2	5,1	4,3	9,4	3,2	1,8	279	72,8	15,1	2,9	5,0	7,9	1,1	3,2
2	Braynsk	17,4	29,3	27,6	65,9	45,9	66,4	42,7	43,3	47,3	62,7	401	44,4	16,2	8,0	1,7	9,7	29,2	0,5	368	48,1	17,1	11,1	1,9	13,0	20,9	0,8
3	Vladimir	33,8	38,3	43,2	38,0	68,0	49,0	37,6	46,4	44,6	42,0	314	69,7	9,2	9,2	1,6	10,8	5,1	5,1	386	63,7	14,8	8,0	4,4	12,4	7,0	2,1
4	Voronezh	34,8	33,3	44,0	41,1	65,6	58,0	35,1	35,4	42,8	38,1	342	66,4	11,7	6,1	5,0	11,1	6,4	4,4	333	56,2	24,9	7,5	6,3	13,8	3,6	1,5
5	Ivanovo	55,6	50,4	41,8	48,9	57,4	56,9	46,6	52,7	51,2	57,2	216	74,1	10,2	7,9	1,9	9,8	4,2	1,9	212	67,9	9,5	9,4	5,2	14,6	6,6	1,4
6	Kaluga	36,5	43,0	33,4	41,5		56,0	47,8	39,2	48,9	39,9	230	63,5	13,9	7,8	3,5	11,3	8,3	3,0	224	58,0	11,1	9,4	6,7	16,1	10,3	4,5
7	Kostroma	58,5	45,4	46,9	45,4	64,9	58,3	55,0	55,1	52,8	63,9	80	48,8	12,5	13,8	3,8	17,6	20,0	1,3	71	53,5	18,3	8,5	2,8	11,3	16,9	0,0
8	Kursk	25,6	23,4	26,2	31,2	45,4	40,1	33,3	35,6	35,5	41,5	261	64,8	10,3	5,7	4,2	9,9	12,3	2,7	249	58,6	12,8	6,8	2,4	9,2	16,5	2,8
9	Lipetsk	36,3	43,2	37,7	51,0	61,7	69,6	48,4	50,8	48,9	58,5	170	70,6	9,4	8,8	3,5	12,3	4,1	3,5	105	65,7	10,5	8,6	1,9	10,5	8,6	4,8
10	Moscow	20,8	25,7	28,4	28,2	35,4	36,4	31,1	30,9	32,1	34,6	797	58,6	15,7	10,8	5,4	16,2	4,6	4,9	828	56,3	15,3	10,5	5,2	15,7	5,9	6,8
11	Orel	42,8	43,6	50,0	53,7	53,9	44,5	87,8	103,9	109,0	78,6	205	81,5	10,7	4,9	2,4	7,3	0,5	–	196	81,1	8,2	3,6	5,6	9,2	1,5	0,0
12	Ryazan	38,6	29,0	36,2	40,0	48,8	49,2	28,6	18,2	28,5	34,0	248	35,5	32,7	6,0	3,2	9,2	18,5	4,0	257	43,6	28,0	7,8	4,3	12,1	13,2	3,1
13	Smolensk	18,6	25,9	28,1	28,1	40,1	36,8	22,6	23,5	22,3	18,8	140	50,0	12,1	16,4	2,9	19,3	16,4	2,1	142	56,3	12,7	13,4	4,9	18,3	11,3	1,4
14	Tambov	31,7	40,1	43,7	44,8	60,0	52,3	33,6	42,1	40,6	42,0	241	65,1	10,8	9,5	4,6	14,1	5,0	5,0	228	63,6	18,0	7,0	3,9	10,9	4,8	2,6
15	Tver	34,0	32,6	31,3	33,5	43,8	41,4	42,5	42,9	33,0	40,6	313	60,1	10,2	9,6	4,2	13,8	10,5	5,4	381	58,3	8,7	10,0	8,4	18,4	11,8	2,9
16	Tula	35,0	34,1	33,2	31,6	47,1	49,6	41,5	45,3	43,3	48,4	332	47,6	17,8	11,4	2,1	13,5	17,5	3,6	331	47,1	23,3	13,3	1,8	15,1	13,3	1,2
17	Yaroslavl	29,0	32,3	30,5	29,1		39,6	29,0	29,1	29,0	36,2	195	41,0	32,8	5,1	2,6	7,7	16,9	1,5	135	66,7	12,6	6,7	1,5	8,2	11,9	0,7
18	Moscow city	30,5	37,1	41,2	44,1	49,5	49,8	36,8	41,0	47,0	51,3	1138	59,1	14,3	3,7	2,5	6,2	4,7	15,7	1210	61,6	14,0	4,4	3,3	7,7	4,0	12,6
	FEDERAL REGION: North-West	31,8	32,0	33,8	34,0	44,0	39,1	33,6	37,1	36,8	40,6	2376	55,0	18,5	11,3	4,2	15,5	8,6	2,4	2347	56,2	18,7	11,2	5,2	16,4	6,6	2,1
19	Republics: Karelia	36,2	30,1	28,5	27,6	34,2	25,8	34,8	33,8	33,5	34,3	165	44,2	20,6	15,2	6,7	21,9	10,9	2,4	142	43,0	23,9	15,5	5,6	21,1	9,9	2,1
20	Komi	28,7	32,8	33,9	33,2	43,6	38,2	27,3	34,9	32,6	35,3	309	52,8	14,9	11,7	4,5	16,2	9,7	6,5	296	53,0	24,0	8,8	2,4	11,2	9,8	2,0
21	Oblasts: Arkhangelsk	37,1	46,5	53,4	51,0	70,9	52,5	35,4	58,5	54,0	65,1	249	43,0	31,3	11,2	2,8	14,0	10,0	1,6	218	51,4	27,5	11,5	3,7	15,2	2,8	3,2
	Nenets AO	45,4	40,6	37,7	33,9	44,2	5,9	55,7	84,2	74,4	82,8	9	77,8	11,1	11,1		11,1										
22	Vologda	30,6	30,8	30,0	36,8	34,6	36,0	20,6	26,5	24,8	27,6	155	61,3	6,5	13,5	3,2	16,7	13,5	1,9	154	61,0	3,9	14,9	7,1	22,0	10,4	2,6
23	Kaliningrad	33,5	35,5	38,4	40,0	46,9	48,6	21,6	27,9	26,4	32,2	361	51,0	30,7	6,4	5,3	11,7	4,7	1,9	378	50,3	32,3	5,6	6,9	12,5	4,0	1,1
24	Leningrad	40,7	39,1	37,5	34,8	53,9	45,7	43,7	43,4	42,6	47,8	206	56,8	11,7	15,0	5,3	20,3	9,7	1,5	288	57,6	10,1	18,8	5,2	24,0	6,6	1,7
25	Murmansk	24,9	18,2	26,0	25,7	36,5	28,9	27,9	16,4	22,0	27,5	150	32,7	26,7	14,0	3,3	17,3	21,3	2,0	94	26,6	30,8	13,8	5,3	19,1	21,3	2,1
26	Novgorod	25,6	25,6	37,0	39,1	45,0	43,3	43,8	48,0	53,6	48,6	147	66,0	12,9	15,6		15,6	5,4		141	63,8	17,0	9,9	4,3	14,2	4,3	0,7

№	Federal regions (okrugs) and subjects of the Russian Federation	Indicators of treatment effectiveness based on dispensary follow-up data: Clinical cure of PTB patients, % 2006	2007	2008	2009	DFG 1A (2008) New cases (2009) % 2008	2009	Abacillation in RTB patients % 2006	2007	2008	2009	TB chemotherapy effectiveness in TB control facilities in the subjects of the Russian Federation (MoH&SD report); cohort of new registered ss+ PTB patients: 2007 n Cohort size	2007 %, outcomes: Successful treatment	Treatment failure	Died: of TB	Died: other causes of death	Died: Total	Default	Transferred out	2008 n Cohort size	2008 %, outcomes: Successful treatment	Treatment failure	Died: of TB	Died: other causes of death	Died: Total	Default	Transferred out
27	Pskov	30,2	26,4	31,8	25,8	45,0	33,4	47,1	49,2	47,6	49,5	207	55,1	17,4	11,6	4,8	16,4	9,7	1,4	234	49,6	21,4	14,5	2,6	17,1	10,7	1,3
28	Saint-Petersburg city	29,1	29,6	28,7	30,8	37,3	31,8	37,3	37,4	39,7	43,3	418	72,0	9,8	8,6	4,3	12,9	3,1	2,2	402	76,4	3,2	8,0	7,2	15,2	1,5	3,7
	FEDERAL REGION: South	26,4	26,8	27,6	64,6	37,8	49,8	34,3	34,1	35,9	42,6	4666	63,7	15,6	4,9	3,3	8,2	8,4	4,2	2532	63,5	16,5	5,9	3,3	9,2	6,4	4,4
	FEDERAL REGION: North-Caucasus				45,6		27,6				40,9									1866	71,7	13,8	3,8	2,3	6,1	5,2	3,3
29	Republics: Adygea	34,5	38,7	31,9	47,9	43,3	64,5	30,0	29,8	23,5	36,9	190	54,7	18,9	7,9	1,6	9,5	9,5	7,4	118	60,2	14,4	12,7	2,5	15,2	5,9	4,2
30	Dagestan	28,0	35,1	33,6	29,7	37,0	28,0	31,9	46,2	56,5	44,0	621	75,5	11,8	3,9	1,6	5,5	4,0	3,2	676	78,7	14,6	1,8	1,3	3,1	2,1	1,5
31	Ingushetia	10,3	16,1	15,5	14,6	43,6	43,0	50,6	40,1	39,7	34,2	102	68,6	12,7	2,0	4,9	6,9	3,9	7,8	67	67,2	16,4	6,0	1,5	7,5	4,5	4,5
32	Kabardino-Balkaria	20,7	21,4	20,2	21,5	29,6	35,0	22,0	42,6	26,4	38,7	187	56,1	20,9	2,7	3,2	5,9	15,5	1,6	149	59,7	16,1	2,7	1,3	4,0	14,8	5,4
33	Kalmykia	41,2	47,6	50,7	40,4	79,5	73,0	42,6	46,4	40,5	46,2	74	60,8	16,2	4,1		4,1	16,2	2,7	75	57,3	30,7	5,3	1,3	6,6	4,0	1,3
34	Karachaevo-Cherkessia	16,3	12,7	15,5	25,1	23,6	31,0	40,1	32,4	37,9	44,3	33	33,3	54,5		6,1	6,1		6,1	27	48,1	37,0	0,0	0,0	0,0	11,1	3,7
35	North Ossetia-Alania	21,3	21,4	23,7	26,5	34,8	51,4	26,4	28,0	34,1	34,3	146	71,2	9,6	4,8	4,8	9,6	5,5	4,1	134	58,2	21,6	6,0	4,5	10,5	4,5	5,2
36	Chechnya	19,6	17,7	18,1	18,8	30,1	34,0	35,6	13,2	16,3	27,2	353	72,5	8,5	4,8	1,7	6,5	8,5	4,0	350	72,6	10,6	4,3	2,9	7,2	5,7	4,0
37	Krais: Krasnodar	25,3	29,7	31,7	35,0	47,9	60,1	26,5	29,0	32,0	45,3	887	52,5	21,4	4,3	4,5	8,8	13,8	3,5	827	57,8	19,1	4,1	3,3	7,4	10,6	5,1
38	Stavropol	24,0	20,7	21,2	19,8	26,6	12,6	38,9	36,1	39,9	48,0	470	55,7	14,7	5,7	4,0	9,7	13,4	6,4	463	70,4	10,1	6,0	3,0	9,0	6,3	4,1
39	Oblasts: Astrakhan	34,8	33,2	37,4	35,4	58,1	64,9	36,1	39,8	39,2	43,7	249	72,7	9,6	3,2	2,8	6,0	7,2	4,4	210	72,9	11,4	1,4	3,3	4,7	4,8	6,2
40	Volgograd	25,5	27,1	31,5	32,7	48,9	51,1	30,0	36,5	42,3	41,3	636	73,4	8,8	6,4	4,7	11,1	3,3	3,3	647	71,4	11,3	6,3	2,6	8,9	4,5	3,9
41	Rostov	25,6	25,7	24,7	25,9	26,7	30,3	40,9	37,6	35,6	37,1	718	59,9	21,6	5,7	2,4	8,1	5,6	4,9	655	61,1	18,6	7,9	4,4	12,3	4,0	4,0
	FEDERAL REGION: Privolzhsky	30,0	32,4	32,9	35,1	45,8	44,4	31,6	34,9	36,0	40,9	5407	62,5	11,4	9,3	5,2	14,5	8,7	2,9	5336	61,0	15,9	7,3	4,6	11,9	8,5	2,6
42	Republics: Bashkortostan	38,6	39,7	44,7	42,0	62,5	65,3	35,8	37,9	38,7	39,5	475	62,3	14,7	10,3	5,9	16,2	5,9	0,8	448	62,9	16,2	6,5	4,7	11,2	7,8	1,8
43	Mariy El	51,4	54,0	57,5	53,3	68,6	58,6	57,7	58,7	68,3	62,0	220	70,9	10,9	8,6	1,8	10,4	6,4	1,4	202	64,9	13,9	7,4	6,4	13,8	3,5	4,0
44	Mordovia	29,4	38,5	33,8	31,8	48,2	40,2	42,2	51,1	54,9	51,4	126	77,0	4,0	6,3	5,6	11,9	4,8	2,4	95	71,6	9,5	4,2	9,5	13,7	2,1	3,2
45	Tatarstan	42,0	49,6	46,8	46,5	68,2	63,8	32,5	42,1	40,2	40,1	512	64,8	6,8	9,8	2,9	12,7	9,2	6,4	462	68,8	11,7	6,7	5,2	11,9	5,0	2,6
46	Udmurtia	23,0	20,1	23,4	20,0	30,2	21,3	26,8	26,2	28,8	25,7	342	53,5	9,9	17,0	7,0	24,0	9,4	3,2	315	44,8	16,8	9,2	6,3	15,5	18,4	4,4
47	Chuvashia	47,6	55,9	49,7	61,6	67,8	71,9	41,0	49,7	44,0	57,5	454	66,1	19,8	4,4	3,7	8,1	4,8	1,1	474	70,7	15,4	4,4	3,4	7,8	5,3	0,8
48	Krai: Perm	27,4	30,5	31,3	33,2	40,6	37,4	33,6	38,4	38,9	43,6	733	72,2	1,4	10,0	6,1	16,1	5,7	4,6	593	74,2	10,3	7,1	2,5	9,6	3,2	2,7
49	Oblasts: Kirov	22,5	22,0	27,7	28,4	33,9	9,3	18,7	23,7	29,6	33,9	190	65,3	16,8	6,3	2,6	8,9	5,8	3,2	209	53,1	18,1	11,5	3,3	14,8	11,5	2,4
50	Nizhni Novgorod	20,5	21,7	21,2	22,5	32,5	20,8	27,5	29,0	32,5	38,8	614	51,5	15,3	9,8	5,7	15,5	14,7	3,1	636	55,5	18,0	9,3	3,6	12,9	10,8	2,8
51	Orenburg	35,9	30,9	33,3	34,1	46,5	46,4	36,6	39,7	42,5	40,5	329	62,3	8,5	7,0	8,5	15,5	9,7	4,0	388	58,2	15,0	6,4	6,2	12,6	10,8	3,4
52	Penza	27,3	32,4	30,3	32,8	42,4	42,9	46,7	45,4	49,9	53,6	279	74,9	10,4	6,8	2,2	9,0	5,4	0,4	306	64,7	15,1	6,2	4,2	10,4	8,8	1,0
53	Samara	27,1	33,4	34,6	41,2	43,6	47,5	30,0	32,2	33,3	38,7	479	58,7	13,4	11,1	6,1	17,2	8,1	2,7	513	65,7	11,1	7,4	7,4	14,8	4,3	4,1
54	Saratov	23,1	25,7	27,9	37,5	37,5	44,2	17,5	20,8	21,1	43,2	376	53,7	13,0	9,0	6,6	15,6	14,6	2,9	403	49,9	22,4	4,2	5,5	9,7	15,1	3,0
55	Ulyanovsk	35,4	39,3	29,3	34,1	43,1	50,2	33,4	32,1	26,1	30,6	278	53,6	18,7	9,4	4,7	14,1	12,6	1,1	292	39,0	33,2	12,0	0,7	12,7	13,7	1,4

№	Federal regions (okrugs) and subjects of the Russian Federation	Indicators of treatment effectiveness based on dispensary follow-up data										TB chemotherapy effectiveness in TB control facilities in the subjects of the Russian Federation (MoH&SD report); cohort of new registered ss+ PTB patients															
												2007								2008							
												n	%, outcomes							n	%, outcomes						
		Clinical cure of PTB patients						Abacillation in RTB patients %				Cohort size	Successful treatment	Treatment failure	Died			Default	Transferred out	Cohort size	Successful treatment	Treatment failure	Died			Default	Transferred out
		%				DFG 1A (2008) New cases (2009) %									of TB	other causes of death	Total						of TB	other causes of death	Total		
		2006	2007	2008	2009	2008	2009	2006	2007	2008	2009																
	FEDERAL REGON: Ural	28,8	30,8	31,4	30,1	48,7	35,2	31,9	33,6	37,1	40,9	2649	56,6	15,9	10,3	4,3	14,6	8,6	4,3	2791	56,8	16,8	8,6	5,1	13,7	7,1	5,6
56	Oblasts: Kurgan	32,0	27,4	25,2	27,4	31,7	42,7	29,6	35,2	27,4	34,1	286	59,8	11,5	11,9	3,8	15,7	10,5	2,4	267	49,4	20,6	12,0	3,0	15,0	8,6	6,4
57	Sverdlovsk	24,0	25,5	26,9	26,7	36,0	25,4	33,3	36,3	37,4	38,9	1055	58,8	15,3	10,6	4,7	15,3	6,7	3,9	1119	60,8	13,5	9,0	6,0	15,0	6,1	4,6
58	Tyumen[1]	30,0	40,6	42,5	39,9	76,3	51,6	28,6	30,3	40,4	49,7	270	55,9	23,7	6,3	3,7	10,0	6,7	3,7	292	65,4	17,1	3,8	5,8	9,6	4,5	3,4
	Khanty-Mansi AO	28,9	36,0	38,6	39,5	56,5	49,3	28,7	34,7	36,5	38,2	270	49,6	20,7	8,9	3,7	12,6	9,6	7,4	291	51,9	15,5	8,6	6,9	15,5	7,9	9,3
	Yamalo-Nenets AO	27,4	28,8	27,1	21,6	37,8	30,2	30,5	27,1	27,6	28,0	62	61,3	14,5	11,3	6,5	17,8	1,6	4,8	87	54,0	27,5	5,7	1,1	6,8	9,2	2,3
59	Chelyabinsk	34,3	27,8	28,9	26,6	64,0	29,2	35,4	33,1	37,0	37,2	706	54,7	13,9	11,3	4,0	15,3	11,6	4,5	735	52,2	19,6	9,1	3,8	12,9	8,6	6,7
	FEDERAL REGION: Siberian	31,9	32,9	31,6	33,2	47,5	42,5	32,2	33,9	34,0	36,7	6565	53,8	17,3	10,2	3,6	13,8	11,1	4,0	6836	52,4	18,5	10,2	3,8	14,0	11,2	3,8
60	Republics: Altai	43,8	47,2	28,9	32,2	46,9	40,4	44,5	34,8	24,1	38,2	34	50,0	14,7	14,7		14,7	14,7	5,9	51	45,1	27,5	17,6	2,0	19,6	5,9	2,0
61	Buryatia	53,8	50,5	41,0	48,2	119,2	62,7	39,6	36,1	33,2	40,2	453	55,6	16,6	6,2	5,1	11,3	14,3	2,2	414	56,3	18,8	6,5	3,1	9,6	14,3	1,0
62	Tyva	32,4	23,9	24,8	24,6	35,6	32,3	34,6	27,5	25,5	27,2	166	42,8	29,5	10,2	4,8	15,0	12,0	0,6	167	25,7	34,8	12,0	3,6	15,6	23,4	0,6
63	Khakassia	28,8	29,3	27,3	34,9	37,4	33,2	22,4	31,8	33,8	45,6	189	55,0	24,9	7,9	2,6	10,5	8,5	1,1	184	50,0	27,7	8,7	1,6	10,3	10,9	1,1
64	Krais: Altai	28,9	31,5	29,2	25,9	50,5	46,0	27,5	26,8	24,8	26,2	624	46,5	18,1	14,6	2,2	16,8	12,2	6,4	682	47,9	17,1	14,5	3,2	17,7	12,3	4,8
65	Trans-Baikal (Chita Oblast)	25,8	30,1	36,7	43,5	54,6	48,1	31,5	35,2	38,8	53,4	310	72,6	10,0	7,1	4,2	11,3	3,9	2,3	366	69,4	11,8	7,4	3,8	11,2	4,9	2,7
66	Krasnoyarsk	24,9	24,5	20,4	26,4	26,1	21,6	32,9	35,0	32,5	36,5	808	48,9	15,3	10,5	3,7	14,2	17,8	3,7	797	53,7	14,2	10,2	1,9	12,1	16,6	3,5
67	Oblasts: Irkutsk	21,8	21,1	26,7	29,2	37,3	27,7	24,9	24,3	30,7	30,9	866	54,2	13,2	9,8	5,0	14,8	15,7	2,2	948	51,2	15,0	11,2	5,8	17,0	13,6	3,3
68	Kemerovo	40,7	42,5	40,6	44,8	60,2	57,8	39,0	41,0	40,6	41,9	1237	46,4	24,7	13,1	4,4	17,5	6,4	4,9	1204	46,2	26,6	12,0	5,2	17,2	6,6	3,5
69	Novosibirsk	39,1	40,3	38,5	35,1	55,3	49,5	30,1	33,4	32,9	33,8	849	57,7	15,1	9,1	3,8	12,9	8,6	5,8	930	56,2	18,1	7,5	3,1	10,6	7,4	7,5
70	Omsk	22,8	30,4	24,9	24,4	37,5	38,9	27,6	38,0	34,9	37,3	672	56,1	14,7	8,8	1,2	10,0	14,1	5,1	755	49,3	15,9	10,1	4,1	14,2	16,3	4,4
71	Tomsk	51,0	54,3	65,8	70,6	75,0	40,6	43,7	49,4	57,5	60,8	357	74,5	12,9	6,7	2,0	8,7	1,7	2,2	338	73,4	10,4	6,5	3,3	9,8	4,1	2,4
	FEDERAL REGION: Far-East	37,2	34,3	30,8	28,4	67,9	41,5	30,6	29,2	25,1	28,5	2288	45,6	19,2	9,8	4,0	13,8	18,2	3,2	2461	46,5	23,9	8,4	3,9	12,3	14,9	2,4
72	Republic: Sakha (Yakutia)	33,4	38,0	36,5	40,5	48,9	40,4	39,7	41,6	36,9	40,8	179	67,6	9,5	11,2	2,8	14,0	5,6	3,4	204	57,4	29,9	4,4	1,5	5,9	4,9	2,0
73	Krais: Kamchatka	36,4	33,9	25,4	22,0	37,4	30,7	31,2	28,8	22,1	21,2	63	23,8	28,6	19,0	3,2	22,2	25,4	–	98	34,7	30,6	10,2	8,2	18,4	14,3	2,0
74	Primorsky	53,0	39,2	30,0	23,2		41,3	32,3	26,5	18,7	24,7	1005	41,2	20,7	7,3	4,9	12,2	20,9	5,1	1075	48,2	19,7	8,4	3,7	12,1	16,6	3,4
75	Khabarovsk	41,4	40,5	39,7	38,8	55,0	50,0	33,5	31,4	29,3	31,2	489	42,1	12,3	13,3	3,7	17,0	27,2	1,4	530	44,9	23,1	11,1	1,7	12,8	18,1	1,1
76	Oblasts: Amursk	19,6	24,7	24,8	25,4	35,5	39,5	17,8	22,5	22,4	21,3	230	40,9	32,2	10,4	3,5	13,9	11,3	1,7	248	24,6	39,9	6,0	7,3	13,3	21,0	1,2
77	Magadan	43,1	51,9	39,0	27,7	60,0	40,2	62,6	56,2	52,2	42,7	33	51,5	33,3	3,0	6,1	9,1	6,1	–	30	26,7	23,3	13,3	10,0	23,3	20,0	6,7
78	Sakhalin	19,9	22,2	23,2	20,0	29,2	21,0	29,9	38,7	37,8	38,0	190	69,5	12,1	11,1	2,6	13,7	3,7	1,1	183	63,4	19,1	6,6	5,5	12,1	2,2	3,3
79	Jewish Aut. Oblast	31,7	30,3	31,7	42,1	44,7	50,9	26,0	21,1	26,6	34,9	97	44,3	28,9	8,2	2,1	10,3	13,4	3,1	85	51,8	24,7	9,4	5,9	15,3	8,2	0,0
80	Chukotka Aut. Region	29,0	29,7	36,5	22,0	78,6	32,5	42,9	25,9	26,2	34,0	2	100,0	–	–	–	–	–	–	8	100,0	0,0	0,0	0,0	0,0	0,0	0,0

[1] Data for cohort analysis of the 2006 cohort.

Table 12

TB case finding in the Russian Federation, 2005–2009

№	Federal regions (okrugs) and subjects of the Russian Federation	Population coverage with screenings Form No.30 Average annual population (%)				Proportion of TB cases detected during screenings of all new and post mortem detected cases (%) (Form No. 33)				
		2006	2007	2008	2009	2005	2006	2007	2008	2009
	RUSSIAN FEDERATION	58,2	63,2	61,4	62,5	52,0	54,7	56,0	57,8	61,5
	FEDERAL REGION: Central	50,2	51,6	54,7	56,4	43,6	44,0	46,7	52,1	56,8
1	Oblasts: Belgorod	64,0	64,4	72,1	69,8	56,8	57,4	62,9	66,4	67,1
2	Braynsk	47,7	49,3	52,7	55,2	40,4	36,0	40,5	40,5	48,7
3	Vladimir	46,1	48,0	48,3	48,0	39,1	41,1	42,2	53,6	50,0
4	Voronezh	65,1	67,8	73,2	89,9	67,0	65,8	69,5	71,6	70,9
5	Ivanovo	67,6	63,9	66,8	65,0	41,2	44,4	44,8	44,7	59,4
6	Kaluga	44,0	44,9	46,6	44,6	41,4	39,0	49,7	55,7	54,6
7	Kostroma	53,4	52,8	53,8	54,0	42,9	39,0	46,3	46,9	57,9
8	Kursk	54,6	54,8	56,5	53,1	46,5	47,4	50,5	58,3	57,5
9	Lipetsk	79,5	85,2	87,7	88,6	60,0	61,1	68,3	75,5	73,0
10	Moscow	39,8	41,1	44,6	40,0	37,1	35,6	34,1	40,4	47,1
11	Orel	55,3	56,0	58,5	57,9	39,6	39,9	42,8	52,8	59,1
12	Ryazan	61,4	63,2	65,5	68,3	56,6	55,7	57,6	57,5	63,3
13	Smolensk	57,9	49,0	52,7	55,7	36,0	36,9	37,4	40,5	45,6
14	Tambov	58,9	59,6	63,3	65,6	53,4	58,1	53,6	65,7	65,7
15	Tver	59,3	59,7	59,4	54,9	41,6	38,9	43,9	43,1	43,0
16	Tula	54,0	53,7	54,6	54,2	41,2	46,4	40,3	45,9	54,5
17	Yaroslavl	50,4	51,0	59,1	62,0	40,9	41,9	42,0	48,0	56,8
18	Moscow city	41,9	45,1	48,3	53,7	34,5	38,0	46,5	53,9	63,2
	FEDERAL REGION: North-West	54,6	55,1	56,4	56,3	41,3	46,9	45,9	49,3	57,6
19	Republics: Karelia	53,8	51,5	52,9	50,0	46,9	40,6	46,5	47,0	44,0
20	Komi	64,3	70,5	73,0	73,2	41,7	39,5	45,9	49,3	56,1
21	Oblasts: Arkhangelsk	52,7	51,7	50,2	50,9	32,2	35,7	40,0	44,3	47,0
	Nenets AO	83,6	81,0	84,2	53,4	75,0	95,7	64,7	83,3	88,9
22	Vologda	62,6	63,1	67,4	69,6	41,7	49,3	50,8	55,4	58,5
23	Kaliningrad	52,7	51,8	53,5	56,2	36,3	58,5	49,9	55,4	59,7
24	Leningrad	49,7	51,5	54,1	52,4	43,1	47,3	40,9	44,9	48,1
25	Murmansk	50,1	49,3	49,8	50,5	38,1	39,9	45,0	46,3	46,2
26	Novgorod	65,8	65,6	69,2	71,4	46,1	48,9	48,2	62,3	
27	Pskov	54,7	55,7	59,8	58,2	42,1	42,9	42,7	51,8	52,1
28	Saint-Petersburg city	52,3	52,5	52,5	51,7	44,6	49,9	47,4	46,1	64,5
	FEDERAL REGION: South	58,2	57,3	60,3	62,6	47,2	50,6	52,3	57,0	63,9
	FEDERAL REGION: North-Caucasus				54,3					49,5
29	Republics: Adygea	53,3	52,6	53,1	66,4	39,9	42,5	38,1	44,3	45,4
30	Dagestan	70,8	71,5	77,7	65,5	43,1	41,8	41,8	47,9	46,6

№	Federal regions (okrugs) and subjects of the Russian Federation	Population coverage with screenings Form No.30 Average annual population (%)				Proportion of TB cases detected during screenings of all new and post mortem detected cases (%) (Form No. 33)				
		2006	2007	2008	2009	2005	2006	2007	2008	2009
31	Ingushetia	39,5	39,5	47,8	59,8	46,8	28,6	32,5	43,3	44,0
32	Kabardino-Balkaria	37,1	37,2	69,5	69,2	33,1	28,4	38,1	65,4	45,2
33	Kalmykia	66,3	65,3	54,7	56,4	44,4	47,7	52,4	42,7	61,0
34	Karachaevo-Cherkessia	59,4	53,5	63,1	64,3	44,7	46,4	46,7	46,1	46,6
35	North Ossetia-Alania	59,4	59,8	17,5	72,9	80,5	85,1	81,7	10,9	
36	Chechnya	9,3	15,8	53,6	56,5	6,2	10,3	7,8	48,9	12,8
37	Krais: Krasnodar	55,9	62,6	64,1	54,4	43,8	48,4	52,6	57,2	55,0
38	Stavropol	70,5	70,1	73,9	53,1	0,1	52,4	52,9	59,2	63,2
39	Oblasts: Astrakhan	55,3	50,3	54,6	72,2	49,1	52,5	53,8	64,5	65,3
40	Volgograd	56,0	56,9	60,4	37,1	47,4	52,8	58,3	61,5	64,0
41	Rostov	51,2	53,5	52,9	72,8	72,4	68,5	68,8	74,9	75,3
FEDERAL REGION: Privolzhsky		66,0	62,6	65,8	67,2	54,4	54,8	55,8	61,0	66,1
42	Republics: Bashkortostan	64,1	59,8	67,5	70,49	53,5	53,7	54,7	58,5	59,0
43	Mariy El	65,4	64,6	66,6	65,385	46,0	45,4	56,1	54,7	61,9
44	Mordovia	74,2	73,3	76,3	73,044	56,4	56,9	61,8	67,2	70,5
45	Tatarstan	65,5	58,9	57,6	60,381	55,3	55,9	55,3	61,5	64,6
46	Udmurtia	65,6	66,9	69,6	68,357	46,6	50,2	48,8	58,2	59,5
47	Chuvashia	58,5	60,6	63,3	68,502	42,6	47,4	48,0	54,7	
48	Krai: Perm	0,0	0,0	70,5	71,226	52,8	53,5	56,1	62,3	62,4
49	Oblasts: Kirov	60,3	61,7	66,1	65,8651	48,5	56,5	56,4	57,7	64,6
50	Nizhni Novgorod	50,5	48,5	50,9	53,6	50,0	48,0	48,1	54,7	61,2
51	Orenburg	69,2	66,8	73,0	73,8	57,6	58,0	58,7	65,4	68,5
52	Penza	131,2	137,3	61,7	64,0	61,3	53,1	60,7	62,5	67,6
53	Samara	75,5	71,4	71,4	72,5	59,6	61,3	61,0	64,1	68,6
54	Saratov	86,3	65,8	71,1	72,0	71,7	68,5	67,6	72,2	72,5
55	Ulyanovsk	65,7	68,0	71,4	68,3	40,6	45,2	45,2	50,6	52,6
FEDERAL REGON: Ural		64,0	66,7	67,7	68,2	52,9	54,4	54,6	60,1	61,8
56	Oblasts: Kurgan	61,1	58,9	60,4	70,065	48,7	54,2	58,5	59,1	59,4
57	Sverdlovsk	60,1	61,2	63,3	63,988	47,5	49,8	51,5	59,0	60,4
58	Tyumen	75,6	78,0	78,6	77,746	59,1	60,4	54,3	60,4	63,5
	Khanty-Mansi AO	79,0	80,0	78,7	77,787	64,0	66,3	62,8	68,0	64,1
	Yamalo-Nenets AO	82,0	88,3	85,7	84,503	59,1	57,0	56,2	60,3	66,4
59	Chelyabinsk	58,9	65,0	64,8	63,835	54,2	53,2	58,1	61,9	63,2
FEDERAL REGION: Siberian		61,4	61,0	65,9	65,8	49,1	50,8	53,4	60,8	63,3
60	Republics: Altai	68,6	71,9	75,8	72,977	47,7	52,3	0,0	57,4	75,4
61	Buryatia	59,7	61,3	60,5	58,363	51,5	54,9	56,7	62,7	76,1
62	Tyva	85,9	87,7	87,1	76,243	49,6	57,9	57,1	65,4	100,0
63	Khakassia	63,2	63,3	56,4	51,965	35,5	38,3	49,3	54,8	63,5

№	Federal regions (okrugs) and subjects of the Russian Federation	Population coverage with screenings Form No.30 Average annual population (%)				Proportion of TB cases detected during screenings of all new and post mortem detected cases (%) (Form No. 33)				
		2006	2007	2008	2009	2005	2006	2007	2008	2009
64	Krais: Altai	62,2	57,8	63,6	64,232	51,6	54,3	55,0	61,5	63,2
65	Trans-Baikal (Chita Oblast)	72,9	72,9	82,0	79,1	55,9	59,3	62,4	69,3	70,7
66	Krasnoyarsk	54,3	47,2	54,4	52,5	46,2	46,9	57,3	68,9	57,5
67	Oblasts: Irkutsk	51,8	59,2	62,8	64,5	36,9	39,0	45,5	54,7	50,2
68	Kemerovo	60,6	63,7	70,8	70,9	43,7	44,6	46,5	53,3	59,2
69	Novosibirsk	59,9	63,0	68,8	69,9	56,1	57,5	58,4	63,1	65,6
70	Omsk	77,7	76,7	78,3	79,9	67,2	62,0	62,2	66,9	70,2
71	Tomsk	56,5	44,9	50,6	52,2	44,7	52,0	52,5	53,4	61,0
FEDERAL REGION: Far-East		62,4	62,6	67,2	63,9	38,7	53,3	53,9	60,2	64,1
72	Republic: Sakha (Yakutia)	69,7	69,8	69,0	69,2	50,8	46,3	56,6	56,8	61,4
73	Krais: Kamchatka	52,7	47,1	50,2	48,5	49,0	54,1	57,0	56,5	77,4
74	Primorsky	53,3	55,0	64,6	53,7	45,8	46,5	48,5	55,5	58,8
75	Khabarovsk	68,4	70,1	74,0	71,4	0,0	64,7	61,9	66,3	70,8
76	Oblasts: Amursk	65,0	65,5	69,1	72,9	55,0	66,3	63,1	71,0	68,4
77	Magadan	66,5	67,7	68,1	71,141	61,0	58,4	46,4	64,6	71,2
78	Sakhalin	66,9	60,1	63,4	64,853	46,6	41,7	41,5	53,5	63,4
79	Jewish Aut.Oblast	60,7	60,9	61,7	62,578	54,3	45,4	49,5	58,7	63,0
80	Chukotka Aut. Region	84,1	92,6	87,2	85,976	48,7	68,8	51,7	48,8	56,8

ООО «Издательство «Триада». ИД № 06059 от 16.10.01 г.
170034, г. Тверь, пр. Чайковского, д. 9, оф. 504.
Тел./факс: (4822) 42-90-22, 35-41-30.
E-mail: triada@stels.tver.ru
http://www.triada.tver.ru

Подписано к печати 12.09.2011. Формат бумаги 62×94 1/8.
Бумага офсетная. Усл. печ. листов 26. Тираж 500 экз.

Заказ №
Отпечатано в филиале ОАО «ТОТ» Ржевская типография.
г. Ржев, ул. Урицкого, д. 91

9 785947 894677