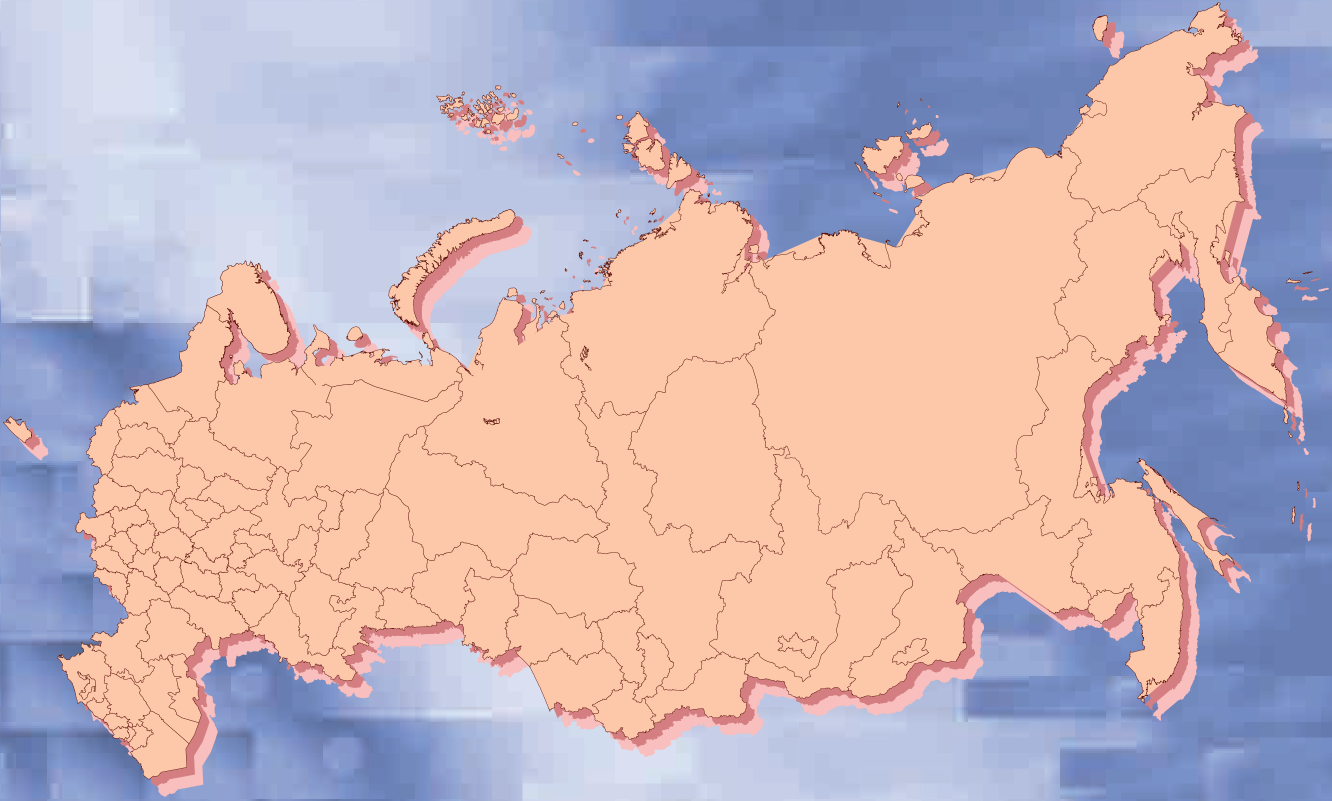

TUBERCULOSIS

in the Russian Federation

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

2010

TUBERCULOSIS
IN THE RUSSIAN FEDERATION
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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 (FRIHCOI), the Research Institute of Phthisiopulmonology, I.M. Sechenov First Moscow State Medical University (RIPP), the Central Tuberculosis Research Institute RAMS (CTRI), the Saint-Petersburg Research Institute of Phthisiopulmonology (St-PRIPP), the Federal Penal Enforcement System (FSIN), and the Federal Service for External Quality Assurance of Clinical Laboratory Tests, 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.

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List of abbreviations

AFB	acid fast bacilli
AIDS	acquired immune deficiency syndrome
ART	antiretroviral therapy
CDL	clinical diagnostic laboratory
CF	correctional facility
CFD	Central Federal District
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 1)
DR	drug resistance
DR-TB	drug resistance tuberculosis
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 FRIHCOI)
FEFD	Far-Eastern Federal District
FRIHCOI	Federal Research Institute for Health Care Organization and Information
FSEQA	Federal Service of External Quality Assurance of Clinical Laboratory Tests
FSIN	Federal Penal Enforcement System
FSSS	Federal Service of State Statistics (“Rosstat”)
FTP	Federal Target Programme
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHC	General Health Care
GLC	Green Light Committee
HBC	high TB burden countries or TB high-burden countries
HIV	human immunodeficiency virus
IBRD	International Bank for Reconstruction and Development
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th Revision
IFRC	International Federation of Red Cross and Red Crescent Societies
IUATLD	International Union against Tuberculosis and Lung Diseases
MbT	*mycobacterium Tuberculosis*
MDR	multidrug-resistance
MDR-TB	multidrug-resistant tuberculosis
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
NC	new case of tuberculosis
NCFD	North-Caucasian Federal District
NTRI	Novosibirsk TB Research Institute

NWFD	Northwestern Federal District
PFD	Povolzhsky Federal District
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
SbFD	Siberian Federal District
SFD	Southern Federal District
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
UFD	Ural Federal District
UNAIDS	The Joint United Nations Programme on HIV/AIDS
URIPP	Ural Research Institute of Phthisiopulmonology
WHO	World Health Organization
WHO RF	WHO Country Office 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 (FRIHCOI), 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 Tuberculosis Research Institute, Russian Academy of Medical Sciences (CTRI), the Federal Penal Enforcement System (FSIN), and the Federal Service for External Quality Assurance 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 2007–2010 [A1, A2, A3 and A4]. Compared to the previous editions, in addition to analysis of 2010 statistical reports, this review contains a separate section with the analysis of monthly monitoring data on the implementation of activities aimed at improvement of TB care (based on the Executive Order of the Ministry of Health and Social Development No. 61 of 05.02.2010) and sections on the spread of extrapulmonary tuberculosis and tuberculosis in the correctional facilities in the countries of the world. In addition, the review provides a broader scope of information on the methods for estimation of TB indicators, external quality assurance of laboratory tests, etc.

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 2006–2010. The review also analyzes the trends in the indicators for the last 10–15 years.

The data analysis has been performed with a due account of the internationally accepted definitions and approaches used in processing medical and epidemiological statistical information. The review considers the indicators used by the WHO for analysis of TB spread and TB control effectiveness, and it provides the comparison of the situation of TB in the Russian Federation, other countries of the world, and the WHO European Region.

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

The recent years can be characterized by significant changes in TB control practices in Russia. RF MoH&SD Orders Nos. 109 and 50 [34, 35] 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. Within the context of modernization, the RF Ministry of Health and Social Development has allocated significant resources for TB control in the framework of the priority national project (PNP) "Health" and the Federal target program (FTP) "Prevention and control of socially significant diseases (2007–2012)" in which subprogram "Tuberculosis" is the main component (37.7% financing). At the end of 2010, "Procedures for TB care delivery in the Russian Federation" were approved. These measures allowed promotion of MDR-TB control activities (drug supplies, TB infection control strengthening, improvement of inpatient clinics, training of staff). In addition, in 2005–2010 the International Bank for Reconstruction and Development (IBRD) loan project "TB and AIDS Prevention, Diagnostics and Treatment" and the Global Fund project "Promoting a Strategic Response to TB Treatment and Care for Vulnerable Populations in the Russian Federation" were implemented. Owing to these projects, almost all bacteriological tuberculosis laboratories and one third of the clinical diagnostics laboratories (CDL) involved in TB diagnosis and treatment were upgraded. The system of supervision and methodological support provided by the federal TB research institutes to the RF regions was resumed, and a number of other activities was performed.

The analysis of data presented in this review shows that at the present there can be observed a significant effect of performed activities and measures taken. For the last five years TB mortality rates have been rapidly decreasing (compared to general mortality due to all causes of death), new TB case notification rates have stabilized and for the last two years have been decreasing both at the national level and practically in all major regions in the Russian Federation, some measures of TB case detection continue to improve (including a more active use of fluorography equipment and laboratory confirmation of TB diagnosis in many regions), and the proportion of chronic TB patients has decreased.

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

It should be noted that these positive results were achieved in a stable but still challenging epidemiological situation of TB. In general, the basic TB indicators in Russia are still high. Moreover, there is a vivid variation of indicators between RF areas, which is due to unfavorable situations of TB in these regions and federal districts. The most challenging TB situations remain in the Siberian and Far-Eastern federal districts. Some basic indicators (such as effectiveness of TB treatment and diagnosis confirmation by the laboratory tests) are still low, whereas there is a current increase in the spread of MDR-TB, TB-HIV co-infection and the proportion of patients with chronic TB remains high. The presence of some alarming prognostic indicators, such as aggravation of the demographic and social characteristics of TB patients, may be due to unfavorable socio-economic situations caused 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 for the analysis of data related to the process of TB detection and effectiveness of TB treatment. In particular, this review more widely uses the information derived from the reporting forms approved by MoH&SD Order No. 50 [35]. This became possible due to intensive work of the specialized Federal Research Institutes, which received technical and expert support from the WHO country office in the Russian Federation in the supervision of developing the reporting forms and verification of data obtained from these forms.

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

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

This publication is intended for public health authorities in constituent entities of the Russian Federation, heads of the medical and prophylactics institutions and PHC facilities, TB specialists and epidemiologists, as well as public health managers.

In preparing this review, the information used was from national 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 2005–2010.

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[1] The Union.

Improvement of TB care in the Russian Federation in the framework of the priority national project “Health”

O.V. Krivonos, L.A. Mikhailova, E.I. Skachkova, P.K. Yablonsky, E.A. Kormacheva

The problem of tuberculosis in the Russian Federation (RF) is still urgent and at the forefront of concern.

For many years, TB control activities in the Russian Federation have been receiving governmental support from the legislative authorities at all levels, including the support of RF Government authorities in the constituents of the Russian Federation and municipalities. In our country TB control is being performed on the basis of scientifically proven methods using the achievements of the Russian and international experience.

The Russian Federation is one of the few countries in which commitment to TB control is determined at the national level by the system of federal laws and Government resolutions (“On prevention of TB spread in the Russian Federation” No. 77-ФЗ of 18.06.2001, the RF government regulation No. 892 of December 25, 2001), ministerial and institutional executive orders (executive orders of the Ministry of Health Nos. 109 and 50 and others [34, 35]), and statutes of the national projects in the field of health care.

At present, the main TB activities in the country are defined in the priority national project (PNP) “Health” and in the Federal Target Program (FTP) “Prevention and control of socially significant diseases (2007–2012 годы),” in which the subprogram “Tuberculosis” is the main component (37.7% of financing).[2]

In the framework of the implementation of activities in the Priority National Project “Health,” aimed at evaluation of the population for the purpose of TB detection, treatment of TB patients, and prevention activities, 2.8 billion rubles was allocated from the federal budget in 2011. Of that amount of money, about 2.15 billion rubles is allocated for purchasing antibacterial drugs for treatment of MDR-TB patients.

In the framework of the Federal Target Program, section “Tuberculosis,” in total 7.9 billion rubles was allocated for 2011; of that amount, 4.1 billion rubles was allocated from the federal budget (including almost 1 billion rubles for the penitentiary facilities in Russia) and 3.8 billion rubles from the budgets of the constituents of the Russian Federation. Of the indicated amounts, about 1.7 billion rubles was allocated for capital construction; 3.1 billion rubles for the introduction of modern diagnostic tools, treatment, and rehabilitation of TB patients and 2.1 billion rubles for TB drugs.

In addition to the funds allocated in the framework of the PNP and FTP, about 20–25 billion rubles is being allocated for TB control from the budgets of the RF constituents.

At present, the work on improvement of current legislation continues in line with the changing requirements for management of TB activities. In 2010, Procedures for Medical Care Delivery to TB Patients were developed and approved (MH&SD Executive Order No.1224 of 29.12.2010, “On approval of the procedures for medical care delivery to TB patients”). At the same time, drafts for the standards of specialized care to TB patients, which cover the issues of treatment of all forms of the disease, were developed.

In order to improve the system for the epidemiological monitoring of tuberculosis, control of TB treatment, and evaluation of treatment effectiveness, as well as to ensure compatibility of the Russian system for TB case notification and evaluation of treatment effectiveness with the international rates, a new Executive Order “On improvement of recording and reporting documentation for TB monitoring” was developed for approval; it should replace the Executive Order No. 50 of February 13, 2004, “On the introduction of the recording and reporting documentation for TB monitoring.” It will include some additional recording and reporting forms for case notification and management of MDR-TB.

In 2010, according to the MH&SD Executive Order No. 61 of 5.02.2010 “On procedures for management of the monitoring activities aimed at improvement of TB care,” a monthly monitoring of the implementation of TB activities in the Russian Federation was introduced. Its first results are presented in this publication.

Therefore, a system of TB activities, which is integrated and mandatory for implementation, is being introduced. It should ensure controlled quality of medical care delivery to TB patients and its universal access.

Since 2009, a decrease in TB incidence has been reported in Russia; for the last five years the TB mortality rate has been steadily decreasing, which is the evidence of effectively performed policy for the modernization of the system for TB care aimed at development of the material resources of the system and improvement of TB care delivery in Russia.

In the framework of the regional programs for health care modernization, in the section of TB detection, diagnostics and care delivery to TB patients it is planned to

- perform capital repair of a number of TB dispensaries;

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[2] As amended in RF Government Regulations No. 95 of 18.02.2008, No. 423 of 02.06.2008 and No. 319 of 09.04.2009.

- replace outdated fluorography equipment in a number of regions to ensure quality diagnostics and timely TB detection;
- purchase automatic systems for rapid laboratory diagnostics at the regional TB laboratories aimed at early detection of sputum positive TB cases and drug susceptibility testing to the first- and second-line drugs;
- ensure directly observed therapy in all facilities that provide care to TB patients, including rural health posts;
- perform the activities for strengthening infection control measures.

The implementation of the program activities on developing TB service will contribute to early detection of TB patients, improvement of treatment success rates, including an increase in the proportion of patients with clinically cured respiratory tuberculosis, and further decrease in TB incidence and mortality rates.

With the goal of strengthening stabilization measures and further improvement of TB epidemiology, in accordance with the regulations of the RF Government in the framework of the national project "Health," it is planned to ensure

- sufficient financing of TB activities (in the draft of the federal budget the amount of funds for TB control remains at a high level, as in the previous years, with the indexation by years);
- priority of the preventive activities of health care facilities aimed at active TB detection and prevention of TB transmission;
- development of new medical technologies in the field of TB treatment and active introduction of surgical methods of TB treatment;
- equipping of TB facilities with modern diagnostic and treatment tools as well as with equipment for infection control and prevention of TB transmission;
- training of qualified staff skilled at TB detection at the level of primary health care, as well as training of staff in specialized services;
- improvement of treatment success by means of introduction of standards for TB care;
- involvement of medical workers from general health care in active case finding and insuring outpatient care under direct supervision of the medical staff;
- development of community based approaches (daycare inpatient clinics, home-based treatment etc.);
- quality improvement of bacteriology examinations due to the introduction of the external quality control of laboratory examinations in the country;
- research activities at specialized research institutes aimed at development of new methods for TB diagnostics and treatment, as well as at the improvement of current ones.

Special attention is paid in the Russian Federation to the timely and complete detection of TB cases among the population. According to the WHO estimates, 79% of the estimated sputum positive TB cases have been detected lately, which meets the Millennium Development Goals. In addition, much effort has been directed recently to detection of TB cases with multidrug resistance. While according to the WHO estimates no more than 3% of MDR-TB cases in the population are being detected in the countries of the world, in the Russian Federation this percentage is much higher (about 30%).

All changes in the national policy in regards to tuberculosis, including the estimation of the funds needed for TB activities and adoption of the managerial solution, are based on the analysis of data of federal statistical reporting and the current national system of TB monitoring.

The introduced system for assessment of treatment effectiveness was based on the cohort analysis and allowed the identification of treatment outcomes in basically 100% of cases, which is an indicator of high reliability of data on treatment effectiveness; it is not typical for all countries of the European Union.

Much attention is being paid to the interagency collaboration in the field of TB and HIV control. The system for action coordination between the TB facilities, centers for prevention and control of AIDS and infectious diseases, the RF penitentiary facilities and other agencies involved is established and functions effectively. It allows increasing the efficiency of diagnostics and treatment of patients with TB and HIV co-infection, improving the accessibility of the specialized treatment for all categories of patients.

The experience of the Russian Federation in management of TB and interagency activities also becomes relevant for other countries of the European region. More often, the Russian experts are being invited as consultants to meetings and conferences at different levels, where they have an opportunity to share their experiences and offer their methods of TB control. Since 1999, the interagency coordination body, the High Level Working Group on Tuberculosis (HLWG), which includes thematic working groups on the main activities of TB control, has been successfully functioning in the Russian Federation. The HLWG was established by the initiative of the RF Ministry of Health and Social Development and the World Health Organization in order to develop the mechanism for an effective dialogue between Russian and international experts on TB control and development of the recommendations on improvement of strategy and tactics of TB control in the Russian Federation.

In addition to the WHO and the Ministry of Health and Social Development, the RF Ministry of Justice, the Russian Agency for Public Health Supervision (“Roszdravnadzor”), the Russian Academy of Medical Science and other partners involved in TB activities in Russia participate in the work of the HLWG.

The thematic working groups are composed of Russian and international experts as well as independent advisers.

The HLWG coordinates the activities of the governmental and non-governmental agencies that function in the territory of the Russian Federation. It also contributes to the effective dialogue with the World Health Organization.

Since the problem of TB prevention is urgent globally, the authors of this analytical review hope that the publication and the use of this information will contribute to the correct interpretation of data obtained during the activities of monitoring and evaluation of TB spread,and ultimately to the improved efficiency of TB activities.

Tuberculosis in the Russian Federation and Globally

Summary

This section contains major indicators that reflect TB epidemiology in the Russian Federation and globally in 2009–2010.

Each indicator has a reference to the corresponding section (chapter) in the Review that contains: 1) detailed information on the generation of data used for its calculation; 2) exhaustive analysis of the indicator values and trends over the recent years both at the national level and by the federal districts and constituent entities of the Russian Federation; 3) comparison of approaches used in Russia and other countries for calculation of the indicators and comparison of the indicator values in the Russian Federation with the corresponding data in other countries.

Section	Indicator, brief description	**2009**	**2010**
	NEW TB CASE NOTIFICATION		
	Russian Federation		
Chapter 2	**New TB case notification rate**	82.6 per 100,000 population[3]	77.4
	Total number of new TB cases	117,227	109,904
	After the increase of this rate to 90.7 per 100,000 (2000), when the number of new TB cases reached 130,657 and then stabilized at the level of 83–85 cases per 100,000 in 2009–2010, the notification rate for new TB cases started to decline significantly for the first time since 2003. It reached the lowest level in the last 12 years (77.4), which approximately corresponds with the level of 1998 (76.0). The notification rate decrease was reported in all the federal districts (FD), including the FEFD, where the indicator continuously increased up until 2009. The new TB case notification rate in the FD located in the eastern part of the country is almost 2.2–2.5 times higher than that in the federal districts located in the European part of the country: 55–58 per 100,000 in CFD, NWFD, NCFD and 121–139 in SFD and FEFD, respectively.		
Chapter 2.9	**WHO estimation of TB incidence (new TB cases and ss+ relapses)**	106.0 per 100,000 population	–
	WHO estimation of TB cases (new TB cases and ss+ relapses)	150,000	
	Case Detection Rate (proportion of notified TB cases relative to the estimated new TB cases)	84% of the estimated number of all new TB cases	
	Based on the WHO estimates of TB cases, Russia is in the list of 22 High Burden Countries (HBC) with 80% of all estimated new TB cases occurring in the world. According to the current estimates, Russia accounts for 1.6% of all new TB cases worldwide, 2.0% of all new TB cases in the HBC and 35.7% of new TB cases in the WHO European Region. At the same time, RF reports about 2.1% of all new TB cases notified worldwide and 38.4% of all new TB cases notified in the WHO European Region.		
Chapter 2.5	Laboratory confirmation of TB cases (The RF MH&SD data) (SS+ and CU+ confirmed by **microscopy and culture, respectively**) SS+	33.6%	33.7%
	CU+	41.8%	42.5%
	The recommended levels of the laboratory confirmed cases: 50% for microscopy confirmed (ss+) and 70–75% of culture confirmed (CU+) cases have not yet been attained.		
Chapter 12	**External quality assurance (EQA) of the laboratory tests** **Ziehl–Neelsen microscopy examination method** Proportion of the constituent entities (regions) where the laboratories demonstrated satisfactory EQA results (2009)		
	sensitivity: for the regional TB facilities for the general health care system	80–93% 46–50%	93–96% 35–55%
	specificity: for the regional TB facilities for the general health care system	91% 53%	97.7% 77.9%

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[3] Hereinafter, the calculation of rates is based on the population, indicated in the reporting form No 4. The preliminary data on the population obtained during the National population census of 2010 is not used in this edition.

Section	Indicator, brief description	**2009**	**2010**
	Culture examinations Proportion of the laboratories at the regional TB facilities that demonstrated satisfactory EQA results:		
	sensitivity: specificity:	80–86% 55%	89% 71%
Chapter 5	**New TB case notification rate in children (0–14 years)**	14.7 per 100,000 population	15.2
	With relatively stable indicators in 2002–2007 (16.2–16.7), there was a 10% decrease in the notification rates for new TB cases among children in 2008v2009 and a slight increase in 2010.		
Chapter 6	**New extra-respiratory TB case notification rate**	2,6 per 100,000 population	2,5
	A slow year-by-year decrease from 10.2% in 1992 to 3.3% was observed in the proportion of new TB cases in 2010.		
Chapter 2.6	**New TB case notification rates among people in contact with MbT+ TB patients** (including occupation exposure cases, all age groups)	568.9 per 100,000 contacts	529.1
Chapter 2.7	Coverage of the population (15 years of age and older) with all methods of active detection	62.5%	63.8%
	Coverage of the population (15 years of age and older) with mass screening (fluorography examinations)	54.6%	55.7%
Global (2009 WHO estimates; the uncertainty intervals are indicated in parentheses)			
Chapter 2.9	Number of people with TB in the world (WHO estimate)	9.4 millions (8.9–9.9)	
	TB incidence in the world (WHO estimate)	137 per 100,000 population (131–145)	
	Number of new cases and relapses (ss+), notified	5,889,265 people	
	Notification rate	86 per 100,000 population	

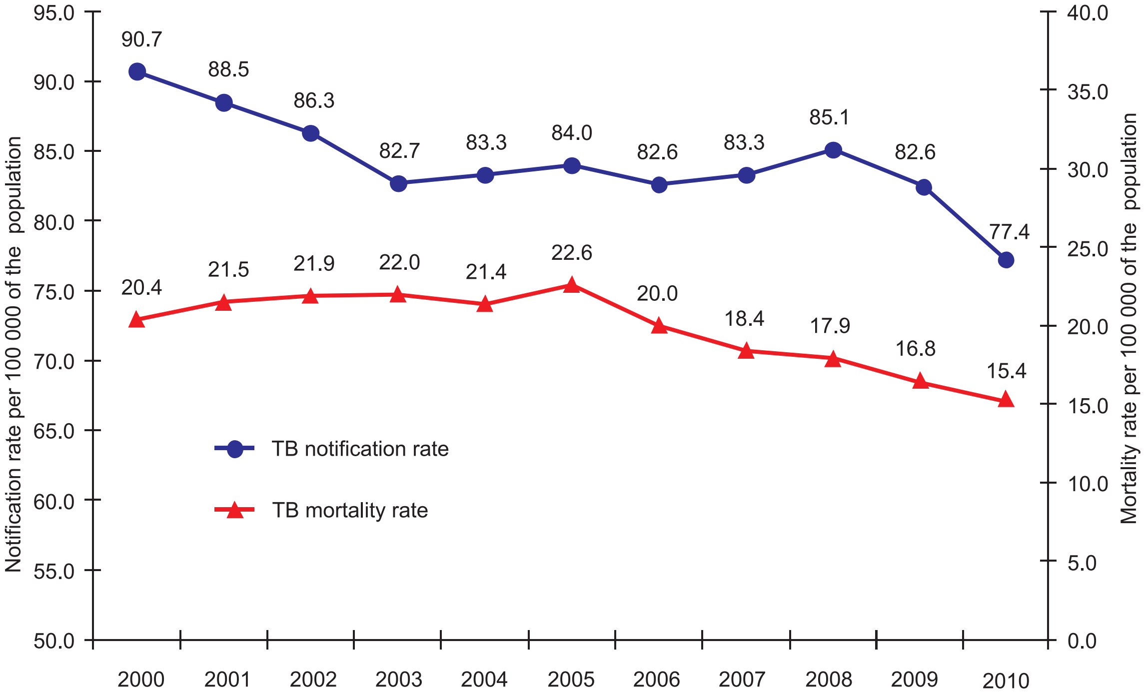
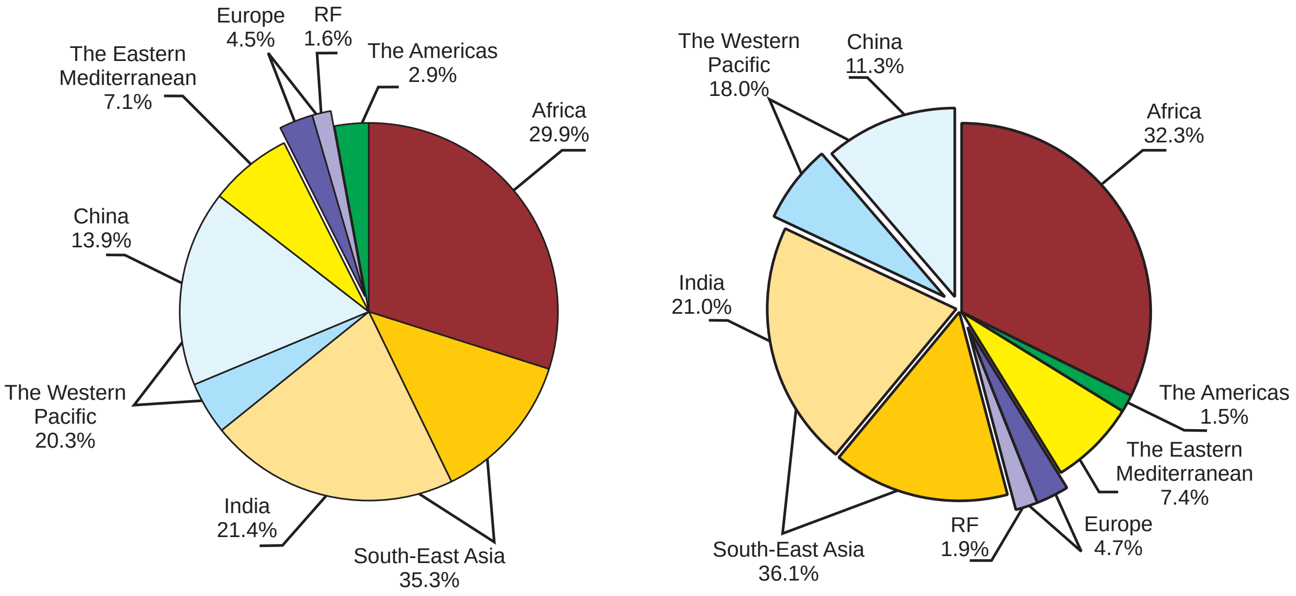


Fig.1. New TB case notification rate and mortality rate, Russian Federation



a) distribution of new TB cases by the WHO regions

b) distribution of patients who died of TB by the WHO regions

Fig.2. WHO estimation of people who developed TB and died of TB in the WHO regions and RF

<table>
<tr><td>Section</td><td>Indicator, brief description</td><td>**2009**</td><td>**2010**</td></tr>
<tr><td colspan="4">**TB MORTALITY**</td></tr>
<tr><td colspan="4">**Russian Federation**</td></tr>
<tr><td rowspan="7">**Chapter 3**</td><td>**TB mortality**</td><td colspan="2">16.8 15.4
per 100,000 population</td></tr>
<tr><td>Number of people who died of TB</td><td>23,892</td><td>21,829</td></tr>
<tr><td colspan="3">Over the last 5 years, this indicator has decreased by almost 1/3 (by 32% compared with the 2005 rate of 22.6 cases per 100,000).
According to the WHO assessment, RF has a well-developed system of vital statistics and registration that covers 99% of deaths.</td></tr>
<tr><td>**Proportion of TB patients who died within one year after TB case registration**</td><td>3.8%</td><td>3.5%</td></tr>
<tr><td colspan="3">Since 2005 when the rate was 5.1%, it has been decreasing annually.</td></tr>
<tr><td>**Proportion of TB cases diagnosed post-mortem**</td><td>1.8%</td><td>1.8%</td></tr>
<tr><td colspan="3">Since 2005 when the rate was 2.8%, it was decreasing up until 2008. Then it stabilized at 1.8%.</td></tr>
<tr><td colspan="4">**Global**
(2009 WHO estimates; the uncertainty intervals are indicated in parentheses)</td></tr>
<tr><td rowspan="4">**Chapter 3.4**</td><td>Number of TB deaths among HIV-negative TB cases</td><td colspan="2">1.3 million (1.2–1.5)</td></tr>
<tr><td>TB mortality among HIV-negative TB cases</td><td colspan="2">19.3 per 100,000 population
(17–22)</td></tr>
<tr><td>Number of TB deaths including HIV-positive TB cases</td><td colspan="2">1.77 million</td></tr>
<tr><td>TB mortality including HIV-positive TB cases</td><td colspan="2">26.6 per 100,000 population</td></tr>
</table>

Section	Indicator, brief description	**2009**	**2010**
	TB PREVALENCE		
	Russian Federation		
Chapter 4	**Registered TB prevalence**	185.1 per 100,000 population	178.7
	Number of TB patients registered in the follow-up register as of the end of a year	26,2718	253,555
	Registered prevalence of TB confirmed by laboratory methods (MbT+ cases)	77.2 per 100,000 population	72.9
	The rates of the overall prevalence and prevalence of TB with MbT+ have been decreasing for the last 11 years, the latter has decreased by 15% since 2005 (from 85.6 per 100,000)		
	Global (2009 WHO estimates; the uncertainty intervals are indicated in parentheses)		
Chapter 4.5	Total number of TB cases in the world	14 million (12–16)	
	TB prevalence	201 per 100,000 population (169–239)	

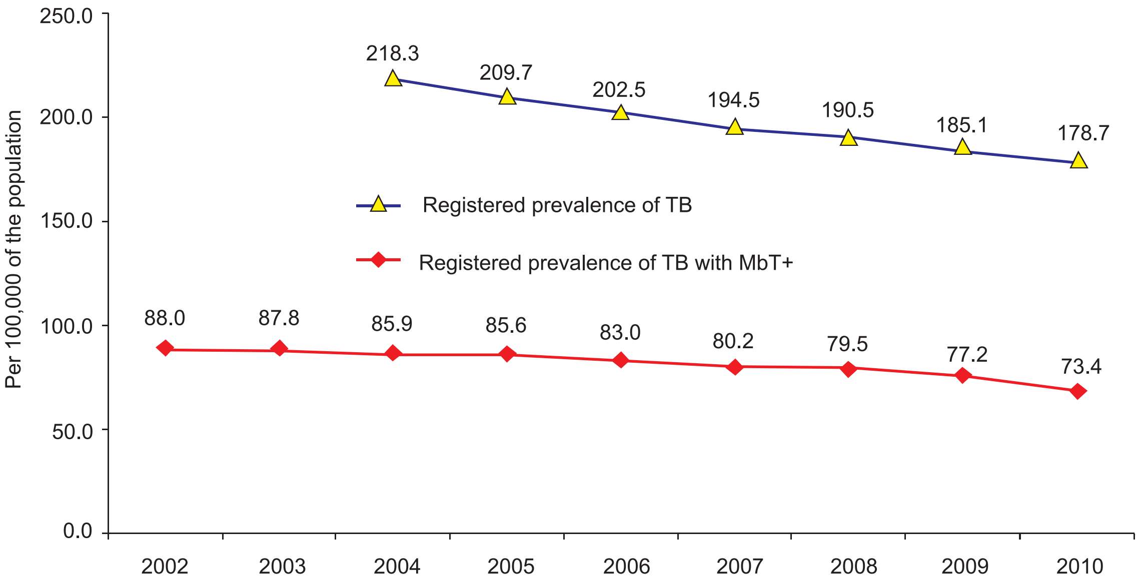


Fig. 3. Registered prevalence of tuberculosis and prevalence of MbT+ tuberculosis in the Russian Federation

<table>
<tr><td>Section</td><td>Indicator, brief description</td><td>2009</td><td>2010</td></tr>
<tr><td colspan="4">MULTIDRUG-RESISTANT TUBERCULOSIS (MDR-TB)</td></tr>
<tr><td colspan="4">Russian Federation</td></tr>
<tr><td rowspan="6">Chapter 10</td><td>MDR-TB among new TB cases, including the penitentiary system data</td><td>15.8%</td><td>17.3%</td></tr>
<tr><td>Number of MDR-TB cases registered prior to treatment initiation among new TB cases, including penitentiary system</td><td>5,816</td><td>6,218</td></tr>
<tr><td>Number of MDR-TB cases in the registry by the end of the year,
resident population only</td><td>29,031</td><td>31,359</td></tr>
<tr><td>Including the penitentiary system</td><td>36,848</td><td>39,759</td></tr>
<tr><td>Prevalence of MDR-TB among resident population</td><td>26.5</td><td>30.3</td></tr>
<tr><td colspan="3">per 100,000 population
The Russian Federation has a relatively high MDR-TB rate with a trend to its annual growth due to the increased number of such cases, improved laboratory diagnosis and data registration.
Russia is in the list of 27 countries that account for 86% of all MDR-TB cases in the world. According to the WHO, these are the priority countries in terms of the need to improve diagnostics and management of MDR-TB cases.</td></tr>
<tr><td>Chapter 12</td><td>External quality assurance of the laboratory examinations
Proportion of the laboratories at the regional TB dispensaries with at least 90% of EQA matching results of drug susceptibility testing for rifampicin and isoniazid</td><td></td><td>56.1%</td></tr>
<tr><td rowspan="3">Chapter 10.4</td><td>WHO estimated number of MDR-TB cases
total number of MDR-TB cases (thousands), 2008</td><td colspan="2">38 (30–42)</td></tr>
<tr><td>Number of MDR-TB cases among notified pulmonary TB cases (thousands), 2009</td><td colspan="2">30 (26–34)</td></tr>
<tr><td>proportion of MDR-TB among all new TB cases, %</td><td colspan="2">15.8 (11.9–19.7)</td></tr>
<tr><td rowspan="2">Chapter 10.4</td><td colspan="3">Registration of MDR-TB cases (performance quality of the surveillance system): according to WHO estimates, 24–27% of all MDR-TB cases among new TB cases and relapses are registered in the Russian Federation compared to 12% of such cases reported worldwide.</td></tr>
<tr><td>Including the Russian Federation MDR-TB notification data in the WHO Global Reports on MDR-TB (according to the WHO criteria for accuracy and representativeness of the DR-TB surveillance systems)</td><td>2008:
Data of 4 RF constituent entities</td><td>2009:
Data of 20 RF constituent entities</td></tr>
<tr><td colspan="4">Global
(WHO estimates, including uncertainty intervals indicated in parentheses)</td></tr>
<tr><td rowspan="5">Chapter 10.4</td><td>Estimation of the total number of MDR-TB cases in the world (2008)</td><td colspan="2">440,000 (390–510)</td></tr>
<tr><td>Estimated number of MDR-TB cases among notified pulmonary TB cases worldwide (2009)</td><td colspan="2">250,000 (230–270)</td></tr>
<tr><td>Number of notified MDR-TB cases (2009)</td><td colspan="2">30.5 thousand (12% of the estimated notified TB cases)</td></tr>
<tr><td>Proportion of MDR-TB among all new TB cases (2009)</td><td colspan="2">3.3% (3.0–3.6)</td></tr>
<tr><td>Number of MDR-TB patients enrolled for treatment (2009)</td><td colspan="2">23,165</td></tr>
</table>

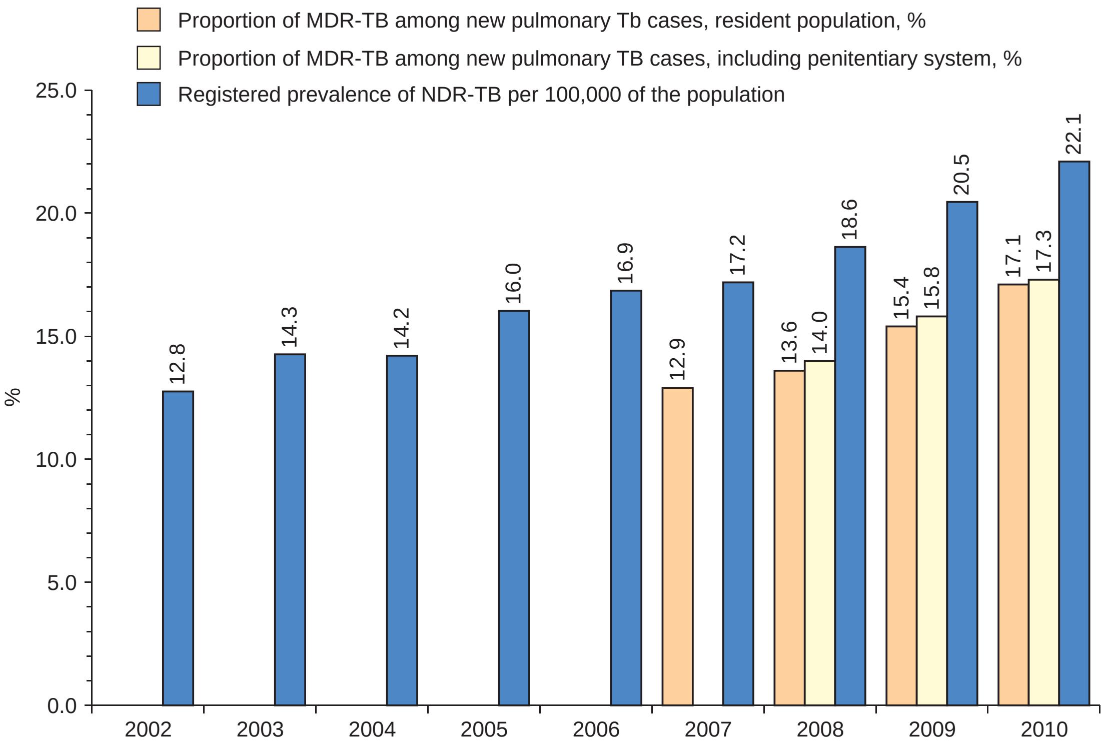


Fig. 4. MDR-TB in the Russian Federation

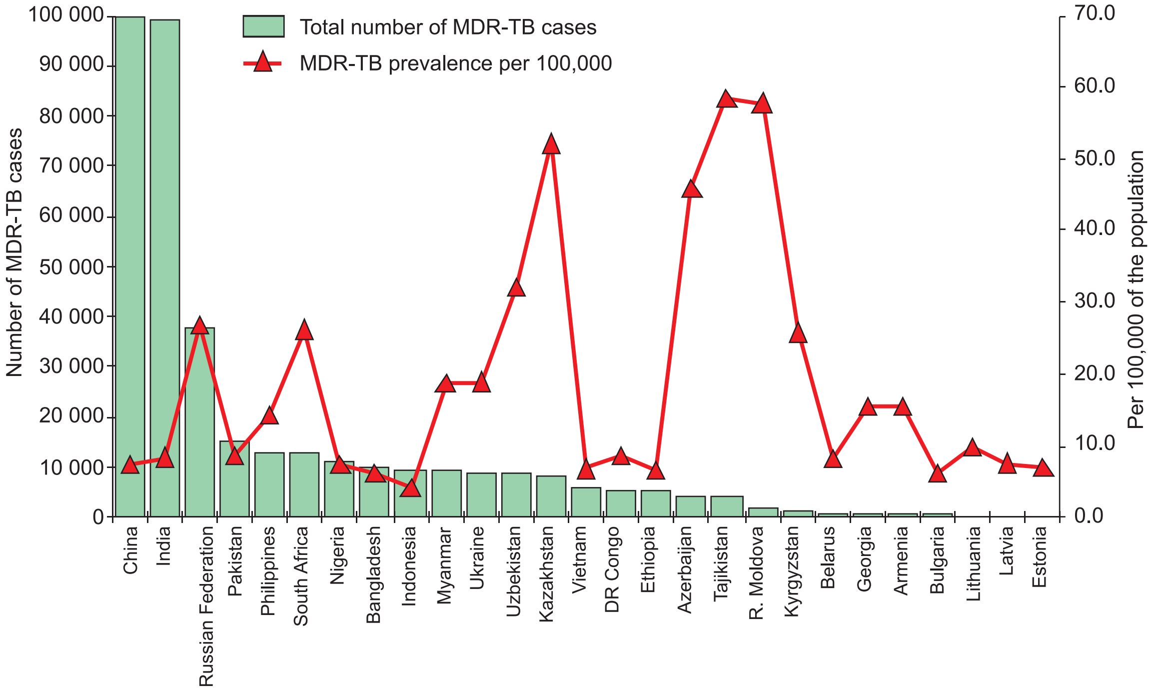


Fig. 5. MDR-TB among all (new and retreatment) cases of tuberculosis in 27 high MDR-TB burden countries, WHO estimates, 2008

Section	Indicator, brief description	**2009**	**2010**
	TUBERCULOSIS IN THE FACILITIES OF THE FEDERAL PENAL ENFORCEMENT SYSTEM		
Chapter 8	**New TB case notification rate in penitentiary facilities**	1,306 per 100,000 population	1,302
	Number of new TB cases	14,236	13,378
	TB notification rate for new TB cases 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). The TB notification rate in pre-trial detention centers is ~25% higher than that in correctional facilities (2009: ~1,600 and ~1,200 per 100K, respectively)		
Chapter 8	**Proportion of TB patients in penitentiary system facilities among the total number of new TB cases countrywide**	12%	12%
	Proportion of new TB cases notified in **penitentiary** system facilities among the total new TB cases notified in the country decreased twofold from 25% to 12%.		
Chapter 8	**TB mortality rate in penitentiary system facilities**	85.0 per 100,000 population	92.0
	Over the past decade, TB mortality rates declined by 2.5 times from 238 and 181 per 100,000 in 1999 and 2000, respectively, to 85–92 per 100,000 at present. The increase in the rate reported in 2009–2010 was due to the increased incidence of MDR-TB and TB/HIV co-infection.		
Chapter 8	**Number of TB patients registered at penitentiary system facilities**	40,765	38,896
	The number of TB patients in **penitentiary** system facilities is steadily decreasing year-by-year (from almost 100,000 in 2001 to 39,000 in 2010).		
Chapters 7 and 8	**Effectiveness of chemotherapy in new ss+ TB cases in the penitentiary system** (2008 and 2009 cohorts)	2008: Treatment success – 54.2% Failure – 24.5% Default – 3.5% Died of TB – 2.5%	2009: Treatment success – 49.1% Failure – 25.2% Default – 3.4% Died of TB – 2.1%
Chapter 8	**Proportion of HIV-infected TB patients among all TB patients**	11.9%	13.3%
	Number of TB/HIV co-infected patients in the penitentiary system facilities	4,870	5,154
	An annual increase is being observed in the number of HIV-infected individuals and patients with TB/HIV co-infection.		
	MDR-TB among new TB cases detected at the penitentiary system facilities	21.9%	22.0%

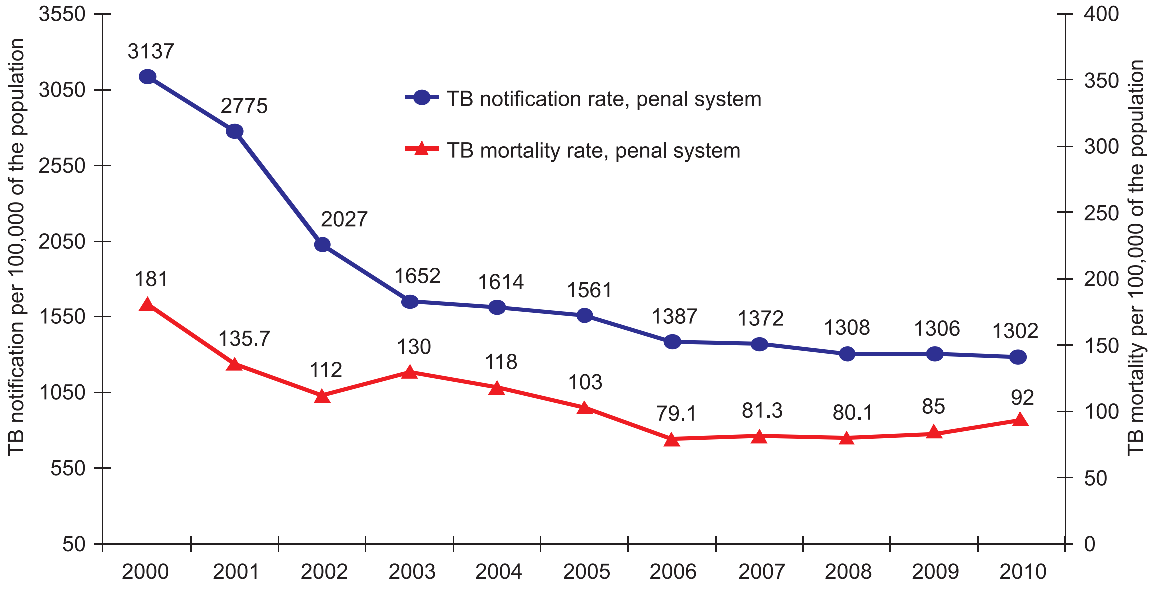


Fig. 6. Tuberculosis in the penitentiary system, Russian Federation

Section	Indicator, brief description	**2009**	**2010**
	TB/HIV CO-INFECTION		
	Russian Federation		
Chapter 9 (see also Chapter 8)	**Number of new TB/HIV co-infected cases registered annually**	9,253	10,617
	Proportion of TB/HIV co-infected cases among permanent residents only	4.6%	6.0%
	Number of TB/HIV co-infected cases among permanent residents only	16,385	19,738
	Proportion of TB/HIV co-infected cases, including penitentiary system facilities	5.3%	6.8%
	Number of all TB/HIV co-infected cases, including penitentiary system facilities	20,775	24,963
	An annual growth of the number and proportion of TB/HIV co-infection cases is being observed due to the overall increase in the number of such cases and improved registration.		
	Global (2009 WHO estimates; including uncertainty intervals indicated in parentheses)		
Chapter 9.5	Number of patients with TB/HIV co-infection in the world, WHO estimate	1.2 million (1.1–1.3)	
	per 100,000 of the estimate population	17 (16–18)	
	Proportion of the new TB cases and relapses with HIV co-infection, WHO estimate	12% (11–13)	
	Proportion of TB-HIV cases among TB patients tested for HIV-infection	27%	

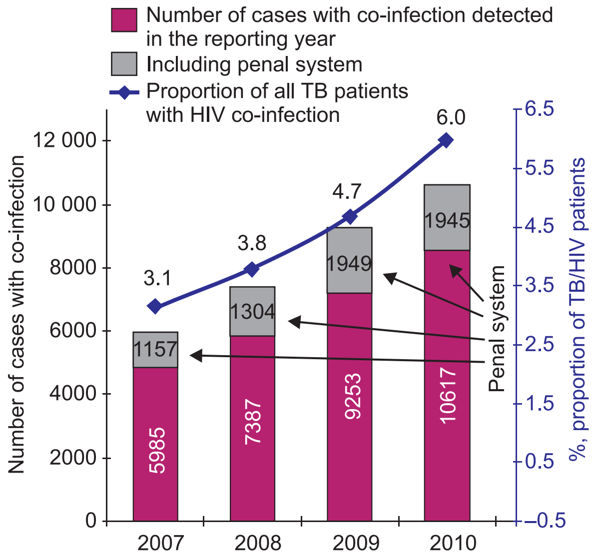


Fig. 7. TB/HIV co-infection in the Russian Federation

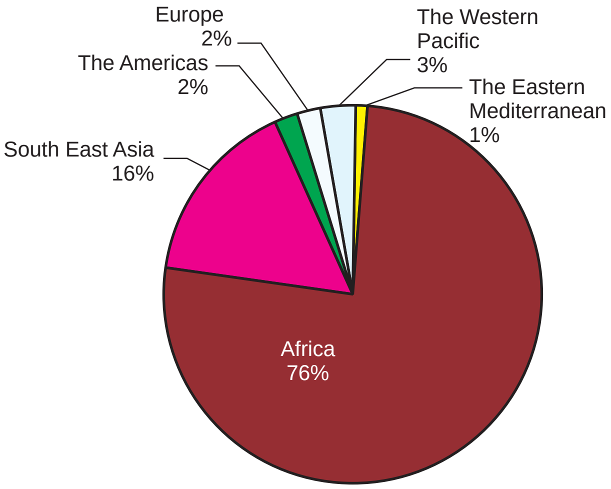
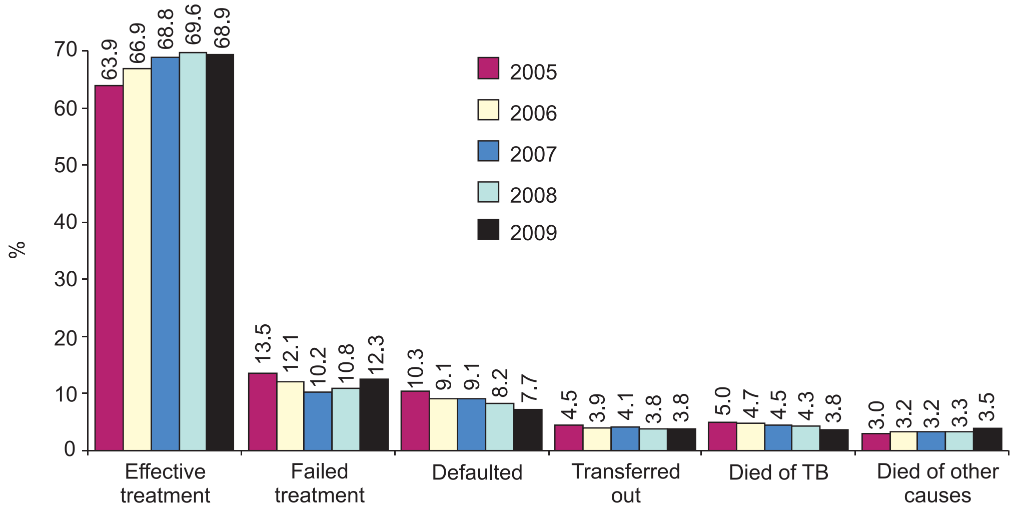


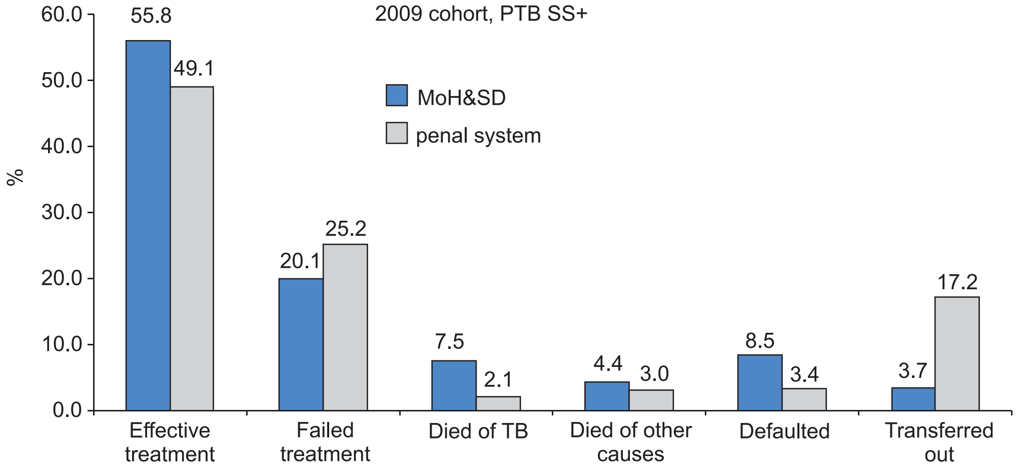
Fig. 8. TB/HIV co-infection in the WHO regions according to the estimate (according to the WHO estimate, the total number of TB/HIV patients is 1.2 million)

	PHTHISIATRIC SERVICE NETWORK RESOURCES		
Chapter 13.1	In-patient treatment and sanatorium care: 2010: 5 Federal research institutes, 2 research and practical centres (in Moscow and Yakutsk), 303 TB dispensaries, 73 TB hospitals, 41 sanatoria for adult patients, 104 sanatoria for children with TB and 1,790 TB units		
Chapter 13.3	Human resources Number of TB specialists: TB specialists per 100,000 population	2009: 8,302 5.7 per 100,000 population	2010: 8,171
Chapter 13.4	Financing In 2011, 10.7 billion rubles was allocated from the federal budget (of them PNP “Health” – 2.8 billion rubles, FTP “Tuberculosis” – 7.1 billion rubles), as well as 20–25 billion rubles from the budgets of the constituent entities of the Russian Federation and municipalities.	2009 г. 30.7 billion rubles	2010 г. 36 billion rubles ($1.2 billion.)

<table>
<tr><th>Section</th><th colspan="3">Indicator, brief description</th></tr>
<tr><td colspan="4">**TREATMENT OF TUBERCULOSIS**</td></tr>
<tr><td colspan="4">**Russian Federation**</td></tr>
<tr><td rowspan="4">**Chapter 7**</td><td>**Effectiveness of chemotherapy among all new TB cases** (Report of Ministry of Health & Social Development (MoH&SD))</td><td>Cohort of 2008
Treatment success – 69.6%
Failure – 10.8%
Default – 8.2%
Died of TB – 4.3%</td><td>Cohort of 2009
Treatment success – 68.9%
Failure – 12.3%
Default – 7.7%
Died of TB – 3.8%</td></tr>
<tr><td colspan="3">There was a statistically significant reduction in the proportion of default deaths from TB and treatment failures (not considering MDR-TB) as compared with the 2005 cohort when defaults were reported in 10.3% of cases, and deaths of TB in 5% of cases.</td></tr>
<tr><td>**Effectiveness of TB treatment among new cases SS+** (MoH&SD report)</td><td>Cohort of 2008
Treatment success – 57.6%
Failure – 17.3%
Default – 8.9%
Died of TB – 8.3%</td><td>Cohort of 2009
Treatment success – 55.8%
Failure – 20.1%
Default – 8.5%
Died of TB – 7.5%</td></tr>
<tr><td colspan="3">High level of treatment failures is due to the high proportion of MDR-TB; the levels of treatment default and deaths of TB went down (2005: treatment success – 57.2%, default – 11.0%, deaths of TB – 9.9%).</td></tr>
<tr><td colspan="4">**Global**</td></tr>
<tr><td>**Chapter 7.5**</td><td colspan="2">**Treatment outcomes for the new pulmonary TB cases, ss+,** registered in 2008</td><td>Treatment success – 87%
Failure – 2%
Default – 5%
Death due to all reasons – 4%</td></tr>
</table>



a) Cohort of the new pulmonary TB cases (ss+ and ss –)



b) Cohort of the new pulmonary TB cases, ss+, 2008

Fig. 9. Effectiveness of TB treatment among new pulmonary TB patients in the Russian Federation

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

I.M. Son, E.I. Skachkova

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

TB surveillance is a multi-level and organizationally complicated system due to the specificity of disease onset and development. Therefore, the system of statistical reporting should be developed accordingly.

A number of factors have an impact on TB spread among the population, and to a certain degree of completeness and confidence they can be specified by different statistical indicators [4, 30].

TB spread depends on the following:

- the regional specifics (demographic, social and economic characteristics, intensity of migration etc.);
- the political and macroeconomic processes (crises, conflicts);
- the level of TB spread in the penitentiary system;
- the level of development and specifics of the TB control system (management of TB prevention activities, timely case detection and effective treatment of TB patients in both TB-specialized and general health care facilities);
- the level of HIV epidemics.

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

- the system of statistical surveillance (quality of completing the recording and reporting forms, completeness of data collection and effective data management and flow of data);
- qualifications of the staff responsible for data collection and processing, and the level of technical support (communications infrastructure, computerization and availability of software);
- interest in receiving objective information among health care authorities, leaders and staff members in the central and regional specialized TB institutions.

Unfortunately, the limited scope 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 attained. Nevertheless, some of these factors will be reviewed during data analysis and interpretation.

The monitoring and evaluation of changes in the epidemiological rates and indicators of TB activities efficiency should be based not only upon the information received from the federal statistical surveillance, but also upon the results of special sampling studies. In this respect, it is important that the system of statistical reporting ensures collection of reliable information and data analysis at the regional and federal levels by using up-to-date data processing techniques and provides a solid basis for making appropriate managerial 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 some additional indicators.

Currently, the bulk of information used for assessment of 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,” which includes data on TB patients registered and followed-up at TB facilities in the entities of the Russian Federation, permanent residents of the respective regions, along with data on the scope of TB services provided to TB patients who temporarily live in the catchment areas of the respective TB facilities.[4]
- Form No. 8 “Information on new TB case notification,” which includes all new TB cases and TB relapses registered in the entities of the Russian Federation. The form includes information on cases registered at TB facilities and in other sectors (including the Federal Penal Enforcement System (FSI)), as well as cases diagnosed post-mortem and among foreigners, persons from other regions and homeless people.

The data of the Federal statistical surveillance (FSS) form are being provided by the main TB facilities in the RF entities and submitted to the respective health care authorities in the constituent entities (medical statistics agencies and medical information and analytical centers). Then these forms are being submitted to the Medical Statistics Department at the Federal Research Institute for Health Care Organization and Information (FRIHCOI),

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[4] Information from reporting form No.33 obtained after the validation of data collected from some constituent entities of the Russian Federation, which was performed by the FRIHCOI, was used in this publication. Therefore, the values of some indicators cited in this review may slightly differ from those in the previous statistical publications (for example, in [41]).

which verifies and processes the data from the reporting forms and submits them to the Russian Ministry of Health and Social Development (MoH&SD) and ultimately to FSSS ("Rosstat").

2. Forms of sectoral TB statistical reporting introduced by the Executive Order of the RF Ministry of Health of February 13, 2004 No 50 [35] based on the definitions introduced by [34]:

- Form No. 7-TB "Information on new TB cases and TB relapses," which contains data on detection of TB patients and registration for treatment.
- Form No. 8-TB "Information on chemotherapy outcomes in pulmonary TB patients," which reflects the results (outcomes) of TB treatment.

The above-mentioned reporting forms are being completed at surveillance units at the main tuberculosis dispensaries (TBD) in the constituent entities of the Russian Federation and thereafter submitted to regional monitoring centers at the respective TB research institutes,[5] which verify the quality of the reports. At the same time, the reporting forms are being submitted to the FRIHCOI Centre for Monitoring TB Control in the Russian Federation (FCMTB) and to the RIPP. The FCMTB verifies and processes the reports. Before 2008, the Monitoring Center at the RIPP was responsible for data collection and analysis, but in 2008 this function was transferred to the FRIHCOI's Federal Center for Monitoring TB Control in the Russian Federation.[6]

3. Statistical reporting on tuberculosis in the penitentiary facilities (FSIN) is based on the respective Executive orders of the RF Ministry of Justice and Ministry of Health and Social Development ([34, 35] and MoH&SD and MJ Executive Order No. 640/190 of October 17, 2005). The main data on registered TB prevalence in the penitentiary sector and on the results of the TB control activities can be obtained from the following FSIN forms:

- Form No. 4-TB, annual, is completed in late January for TB patients registered and followed up at the FSIN pre-trial detention centers (SIZO) and correctional facilities (convicts, defendants and persons on trial).
- Form No. 1-MED, a quarterly aggregated report "Information on socially significant diseases in persons imprisoned in penitentiary system facilities and on selective indicators of health services," which provides aggregated data from the detention centers and correctional facilities on persons who developed the disease, registered as patients or died of TB, HIV infection, TB-HIV co-infection, malaria and other socially significant diseases.

Since 2004, the data on TB detection, diagnostics and treatment at the penitentiary facilities have also been included in the reporting forms of the cohort analysis No. 7-TB, 8-TB, 2-TB and 10-TB, introduced according to the MoH&SD Executive Order No. 50 [35].

The medical departments (divisions, units) in the territorial penitentiary service and surveillance departments at the main TB dispensaries in the constituent entities of the Russian Federation complete Form No.8 for all new TB cases. The form contains the summary data from the penitentiary facilities, civilian services and other institutions involved in TB control activities. The data are being submitted to the MoH&SD and FRIHCOI for processing and analysis of theTB situation.

4. The information needed for the evaluation of a number of the epidemiology indicators and efficiency indicators for TB control activities can be found in the following forms:

- Form No.61 "HIV patients' information," which contains information about TB/HIV co-infection cases among HIV-infected individuals.
- Form No. 30 "Information on the performance of public health facilities" (numbers of phthisiatric departments/units, patients examined for TB, health workers according to the staff positions and actually occupied positions, number of AFB smears and cultures performed, number of microscopes, fluorographs etc.).
- Form No. 17 "Information on medical and pharmaceutical staff" (number of TB specialists, their qualifications, certificates and areas of specialization).
- Form No. 14 "Information on in-patient facilities" (number of hospitalized, discharged and died patients, including data on the number of autopsies performed).
- Form No. 14DC "Information on day-care units at the treatment facilities" (number of hospital beds and patients treated).
- Form No. 47 "Information on health care facilities" (data on TB beds, occupation per hospital bed, number of dispensaries, their capacity and equipment, number of TB hospitals and data on their performance).
- Form No. 62 "Information on care delivery and financing health services" (data on funds allocated, major resources of funds and budget items). The form is approved by the FSSS Executive Order No. 154 of 29 July

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[5] The designated areas of the Russian Federation submit the information in accordance with their affiliation with the following specialized research institutes: RIPP, 1st I,M. Sechenov MSMA ,CTRI RAMS, NTRI, SPRIPP and URIP of the RF MH&SD. During the first years of the Executive Order [35] implementation, the quality control of filling in the forms was performed with active support from the WHO coordination offices established at those research institutes.

[6] The aggregated data presented in the 2007 Analytical Report [A2] were reviewed and approved by experts of the Thematic Working Group on Epidemiological Surveillance (Russian Federation, WHO TB RF). In subsequent publications, the 2007 data were based on the updated information contained in the sectoral reporting forms published by FRIHCOI[26].

2009 “On the Approval of Statistical Tools for development of the Statistical Control in Public Health at the MoH&SD.” It is based on the data collected from all regional TB facilities irrespective of their jurisdiction (state or municipal).

To some extent, certain units of TB facilities are involved in providing information for specific sections of the above-mentioned forms.

5. Demographic and socio-economic data used for the calculation of a number of important indicators can be found in the following forms:

- Form No. 1 “Number of population in the constituent entities of the Russian Federation and nationwide (for the calculation of rates prior to 2006).
- Form No. 4 “Number of population in the constituent entities of the Russian Federation and nationwide (for the calculation of rates in 2006–2008).
- Form No C51 “Distribution by sex, age groups and causes of death.”
- Form No C52 “Mortality, causes of death.”
- Official WEB publications of FSSS [29].

When analyzing the TB data for the years prior to 2010, the TB case notification and mortality rates were calculated for the average annual population in the reporting year, and the registered prevalence rate for the population as of January 1 of the year following the reporting one. The values of the rates for 2010 provided in the review are preliminary; they were calculated for the population as of 01.01.2010 using form No.4. The values of the indicators will be specified upon the receipt of the final data on the population of the Russian Federation and its constituent entities as of 01.01.2011 considering the results of the national census of 2010.[7]

The contents of the reporting forms are being periodically updated and supplemented. Thus, the FSSS Executive Order No. 12 of 28.01.2009 approved changes in reporting forms No. 8 and No. 33. Following those changes, the 0–2 year age group was deleted from Form. No. 8 (and included in the age group 0–4). There were also some changes in the lines referring to the clinical structure of new TB cases and added lines for a number of people without permanent place of residence and for a number of TB relapse cases with bacillary excretion.

Form No. 33 was substantially modified in 2009. It was updated in conformity with the national and international requirements, particularly in the sections referring to the risk groups, TB patients with bacillary excretion, and 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 improve completeness of information on the total number of TB patients in the country.

In addition, the review is based on the results of processed and analyzed data from State TB Monitoring System (SSTM) databases, which include information from the TB recording forms approved by the Rosstat.

1.2. Presentation of TB data in the WHO Global reports

As it was repeatedly stated in the WHO documents [Tuberculosis – A Global Emergency: Case Notification Update, February 1996, Globall TB Programme, WHO, Geneva, WHO/TB/96.197], efficient TB surveillance is a necessary and realistic task for any national TB control program (NTP).

At present, the main sources of data on TB spread in the world are two global reports: “Global Tuberculosis Control,” annually published by the WHO, and “Anti-TB Drug Resistance in the World,” periodically published once every 1–3 years by the WHO and IUATLD (“The Union[8]).

In 1984, the WHO started data collection on notified TB cases from the UN and other countries. Since 1992, data on notified cases have been published annually. Finally, since 1997, in the framework of the global project on TB surveillance and monitoring, the WHO started developing and publishing detailed “Global Tuberculosis Control” reports.

The main goal of the Global Tuberculosis Control report is to provide a comprehensive evaluation of the current TB epidemiology and progress achieved in TB control at the global, regional and country levels.

The main sections of the Global Tuberculosis Control report are the following:

- data on TB surveillance, which include the information on case notification and treatment outcomes as well as assessment of TB burden presented as estimates of actual (assumed) TB notification, mortality and prevalence;

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[7] During the preparation of the review, Roscomstat published only the preliminary results of the National population census; therefore, data of reporting Form No. 4 as of 01.01.2011 (not the data from the national census) was used for the calculation of the intensive indicators presented in this review. Some values of the rates published in this edition may slightly differ from those presented in other publications [for example, 6a], where the preliminary census data was used for the calculation of the intensive indicators.

[8] International Union Against Tuberculosis and Lung Diseases.

- progress achieved in implementing the WHO recommended TB control strategy and perspectives in achieving the stated goals and targets;
- planning activities on strengthening TB control;
- amount of financial expenditures in the countries of the world in the framework of TB control, as well as estimation of the needed and expected budget for the coming years.

Based on the obtained information, processing of data and calculation of estimates for TB notification, mortality, prevalence and proportion of MDR-TB, TB-HIV etc., country profiles (brief overview of the main data) are being generated for individual countries, six WHO regions (Africa, the Americas, Europe, the Eastern Mediterranean, South-East Asia and the Western Pacific) and worldwide.

The “Anti-TB Drug Resistance in the World” reports are being published in the framework of the Global project on Drug resistance surveillance, which has been jointly implemented by the WHO and IUATLD since 1994. The reports were issued in 1997, 2000, 2004, 2008 and 2010 (see Chapter 10). The publications have data on prevalence of drug-resistant TB in the countries of the world. The generation of data is based on the results of the special surveys, routine drug-resistance TB surveillance and mathematical estimations.

The need to use the estimates of the main rates in the Global reports is due to significant differences in the quality of national surveillance systems. Based on the information collected by countries, it is practically impossible to perform an adequate comparison of the countries and regions using the main epidemiology indicators. In many countries of the world, the surveillance data do not allow assessment of the real TB burden. Mathematical estimation of the main indicators gives answers (even if with a high degree of uncertainty) to many questions related to the TB burden in countries, regions and globally [96]. Methods used for the estimation of indicators have been repeatedly improved. In the 1980s and 1990s, the estimation was based on the annual risk of infection data (K. Styblo et al. [84, 89, 93]). Starting with 1999, the approaches of Ch. Dye et al. [66] were used. Finally, at present the estimation is being performed on the basis of Ph. Glaziou’s methodology [67, 72]. The methods currently used for the calculation of various estimates are reviewed in the respective chapters of this publication.

The information used for the Global reports is being collected in the standard forms, which have been repeatedly modified lately.

At present, the generation of country reports is being performed by national coordinators by entering the data online into the Web-based database “The WHO global TB data collection system.” This system allows National TB Programme representatives and WHO regional offices to complete the annual TB data collection forms online. The system is managed by WHO’s Tuberculosis Monitoring and Evaluation team from the WHO Headquarters in Geneva, Switzerland.

National TB Programme representatives are strongly encouraged to use this system, as this will ensure that the most accurate data are used in forthcoming WHO Global TB Control Reports.

The data entry form contains the following main sections:

- TB case notification, including MDR-TB and TB/HIV cases and treatment outcomes;
- implementation of the Stop TB Strategy, including the laboratory data, drug management and surveillance data and MDR-TB and TB/HIV surveillance in particular, human resource development, infection control activities etc;
- financing, including data on the costs of the main TB control activities and expected budget expenditures in the next two years.

For the calculation of indicators in the reports the WHO uses the estimation of the population in the countries of the world provided by the United Nations Population Division, UNPD. An estimation of the population with the adjustments of 2008 is used in this publication for the calculation of the WHO estimates. It has been accessible at http://esa.un.org/unpd/wpp/unpp/panel_population.htm since June 7, 2010. In general, the UNPD estimate may differ from the number of the population directly provided by the statistical systems of the countries.

2. New TB case notification rate in the Russian Federation

E.M. Belilovsky, S.E. Borisov, I.M. Son, O.B. Nechayeva, V. B. Galkin, G.S. Balasanyants, I.D. Danilova, D.D. Pashkevich

TB case notification rate, together with TB mortality and TB prevalence rates, is an essential epidemiological indicator that characterizes the tuberculosis situation.

The case notification rate has epidemiological and “management” characteristics [4], reflecting both tuberculosis incidence rate in a given area and performance of the health care facilities in motivating the population to undergo examinations and, consequently, finding more TB cases.

It is unfeasible to ensure that in a given area all cases of the disease will be detected; therefore, true incidence rates in the population will always differ – to a greater or lesser extent – from the registered numbers.

Hereinafter in this review the term “registered TB incidence” or “New TB case notification rate” will be used,[9] and the existing methodology for estimating the true value of this indicator will be viewed in the last section of the chapter.

This chapter

- provides epidemiological data on TB cases notified in the Russian Federation, in the constituent entities of the Russian Federation in general, in the federal districts (*“okrugs” in Russian*) and in specific populations;
- reviews the structure of new TB cases by socio-occupational, age and gender, and clinical characteristics;
- analyzes indicators that reflect the management of TB case finding and diagnosis;
- compares the new TB case notification rates for new TB cases and “estimated incidence” computed by the WHO for the Russian Federation, former Soviet Union countries and other selected countries in the world.

2.1. Notification rates for new TB cases and socio-occupational structure of the new tuberculosis cases in the Russian Federation

Over the last 20–25 years considerable changes have been observed in new TB case notification rates for new TB cases in Russia ([4], Fig. 2.1). A gradual decrease of this indicator in the 1970s and 1980s to 34.0[10] was followed by a significant increase in 1991–2000 by 2.7 times (up to 90.7 in 2000), with the trend levelling off at the beginning of the new century at 82–85 (85.1 in 2008). Finally, in the last two years the TB case notification rate began to decline and reached 77.4 cases per 100,000 population (82.6 in 2009).

The decrease in notification rates for the Soviet Union in the pre-*perestroika* years was a true reflection of relative stability in the society and the targeted efforts to curb the spread of the disease with methods that included administrative measures. Those years were marked by considerable government allocations for TB control and effective performance of TB control services regarding case registration and follow-up of TB patients. The quality of TB diagnosis for the resident population ensured a relatively low level of “hidden” incidence, or the proportion of unregistered TB cases. According to the data obtained from reporting forms of that time [47, 58], the estimated proportion of undetected TB cases in the population was about 12–15%.[11]

It should be noted that the definition of hidden incidence or undetected new TB cases over a reporting period includes three population groups [58, 77]:

1) those who contracted the disease, but were not diagnosed by the health care service and ultimately either had a spontaneous recovery, died or transferred out;
2) those who contracted the disease and were diagnosed in the following reporting period (for example, next year) and in the given year remained an undetected source of TB infection;[12]
3) those new cases who were erroneously registered as transferred-in or as registered cases in a TB facility (without completing Form 089/r-tub that is required for a new TB case).

A faster rate of decline in TB incidence in 1988–1990 may be attributed to errors in registration and delays in notification of new cases for subsequent inclusion into the reporting documents of the RF areas.

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[9] The Russian term “registered TB incidence” corresponds to the international “new TB case notification rate” or “case notification rate,” as opposed to the English terms “TB incidence rate” or “TB morbidity,” which should denote the true incidence rate that can be estimated, with certain assumptions, by special methods

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

[11] The estimate was made based on the data of post-mortem diagnosis, spontaneous recoveries and cases with severe advanced TB forms as registered at the time of diagnosis.

[12] This component of hidden incidence is set off with a number of registered patients who contracted the disease prior to the reporting period.

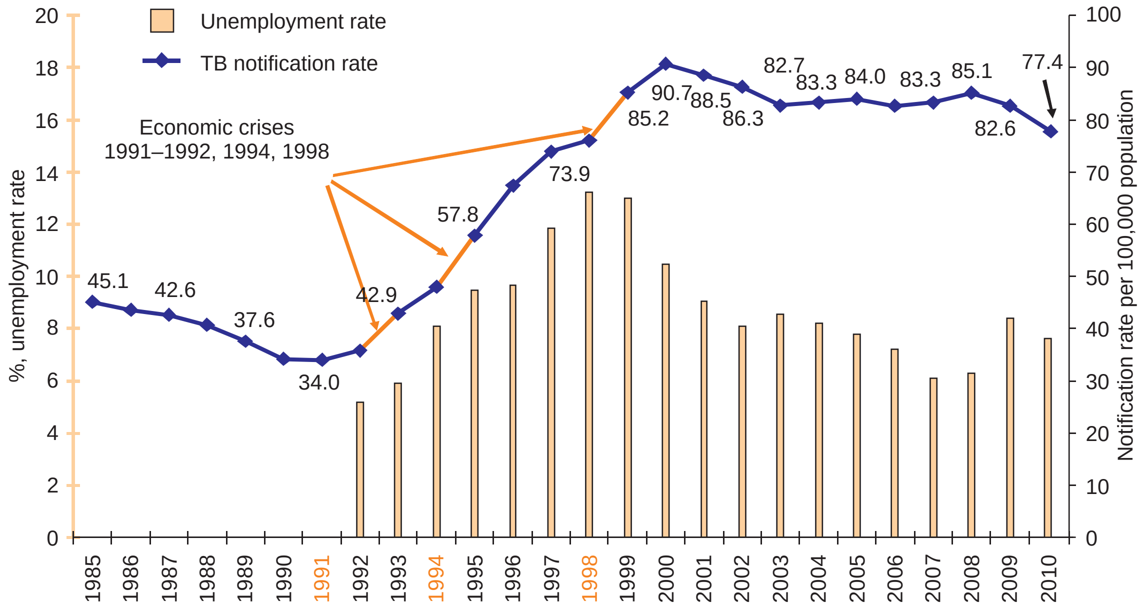

Fig. 2.1. Notification rates for new TB cases and unemployment in the Russian Federation, 1985–2010, all sectors (Sources: Form No. 8 and [29, 38], population data: Forms No. 1 and No. 4)

The changes in new TB case notification rates after 1991 are the reflection of developments in the social and economic environment in the Russian Federation. A statistically significant increase in the incidence rate was observed in the wake of the economic crises of 1991, 1994[13] and 1998 (an increase by 19.8%, 20.4% and 12.1%, respectively) [58].

A considerable impact of socio-economic factors on TB incidence is proven by data in SSTM registers showing that unemployed persons constitute a significant share of new TB cases, which was particularly noticeable in the crisis years [3, 4]. Currently their share remains high, reaching 50% in many RF entities [31, 24], while the official unemployment rate in the country was 7.5%[14] by the end of 2009 ([29], Fig. 2.2). This fact proves a well-known concept that TB is a social disease [3, 4, 24, 30, 45, 52, 70].

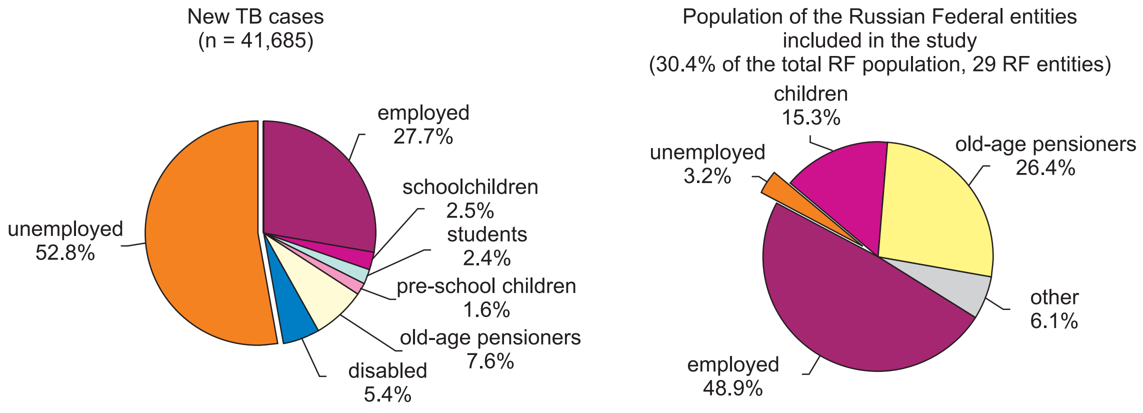

Fig. 2.2. Socio-economic status of new TB patients and population as a whole, 2007, 29 constituent entities of the Russian Federation [38, 45, 52]

According to SSTM data [38, 45, 52], with the national new TB case notification rate for new TB cases being at 83.3 per 100,000 population in 2007, the notification rate among unemployed persons is 1,100–1,200 per 100,000 unemployed population; moreover, during three years (2004–2006) it increased by almost 20%. At the

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[13] Reference to the so-called “Black Tuesday” on November 11, 1994 – the events that ultimately resulted in a 25–30% decrease in people’s income and an increase by the same numbers in the proportion of people living below the poverty line (see, for example, a 1997 report by the Centre for Macroeconomic Analysis and Short-Term Forecasting “Standard of living: concepts, indicators, situation in Russia” http://www.forecast.ru/_archive/projects/urg/urg.htm, data of reference is 15.05.2012).

[14] Data from selected surveys of the population on employment issues. The definition of “unemployed” was attributed to people in the economically active age who did not have a job (gainful occupation), were seeking a job or were ready to start employment at the time of a survey [16–19].

same time, the new TB case notification rate among the employed population was as low as 45,[15] and among the disabled, under 40 (per 100,000 of the respective populations).

Available data on the social status of TB patients confirm the need for further development of the social support programme for patients in Russia [81], which currently functions with active participation of MoH&SD, WHO TB control programme in the RF, the Russian Red Cross and the International Federation of Red Cross and Red Crescent Societies.

In 2003–2006, a general stabilization in TB case notification rates [58] in the range of 82–84 per 100,000 population was observed in Russia, these rate fluctuations were statistically insignificant and commensurate with a 95% confidence interval (0.5 per 100,000 population, Fig. 2.3). After a small but statistically significant growth of the indicator in 2007–2008 to 85.1, finally in 2009–2010 the notification rate showed a considerable decrease to 77.4 per 100,000 population that brought it back to the level preceding the crisis of 1998.

Changes in the notification rate in 2006–2010 (initial growth that might have been caused by better registration practices followed by a decrease due to the improved epidemiological situation) combined with a marked reduction in TB mortality in the same period (see Chapter 3) can be viewed as a typical manifestation of improving key epidemiological indicators as a result of successful implementation of activities aimed at enhancing TB control strategy that were initiated in 2003–2005 by the MoH Executive Orders No. 109 and No. 50 [34, 35]. Similar changes of these indicators resulting from successful implementation of TB control strategy have been observed in other countries as well [71].

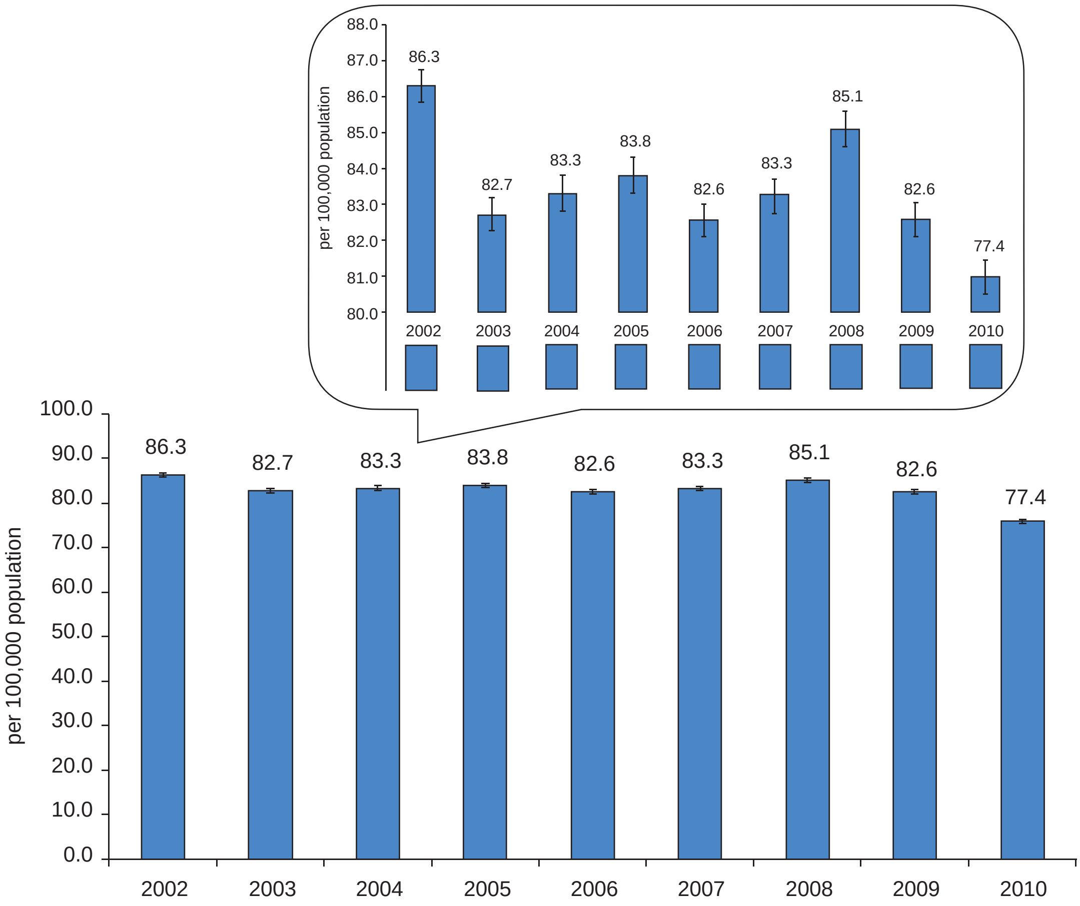

Fig. 2.3. Notification rate for new TB cases in 2002–2010 in the Russian Federation
(error bars indicate a 95% confidence interval). Source: Form No. 8, population data: Forms No. 1 and No. 4

The overall new TB case notification rate for the Russian Federation is calculated based on the data of Form No. 8 reports that contain information about all cases of active TB disease that were registered in the country by TB control facilities. The form makes it possible to derive the age- and sex-specific notification rates for various populations, including resident population, penal enforcement system (FSIN) populations, foreign nationals etc.

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[15] Data of the Federal Centre of MonitoringTB control in the Russian Federation for 31 Federal entities, according to which in 2006 among 46,612 new TB cases 24,009 persons were unemployed; 12,717 were employed and 2,556 were disabled. According to FSSS, in the same areas there were 2,254,000 registered unemployed persons, or 2,481,000 economically active persons with no employment in the economy sectors, as well as 28,440,000 employed people.

(Table 2.1), which is important for analyzing the changes in national epidemiological indicators for a country as large as Russia, with its regional demographic and economic variations.

According to this reporting form, in 2010 new the TB case notification rate in Russia was 77.4 per 100,000 population (109,904 patients), with cases from the resident population constituting the largest share[16] (90,265 patients or 82.1%).

Table 2.1

New TB cases notified in 2005–2010 in the Russian Federation
(reporting Forms No. 8, No. 33 and No. 7-TB)

Indicators	Source (Form N)	2005		2006		2007		2008		2009		2010	
		# cases	%	# cases	%	# cases	%	# cases	%	# cases	%	# cases	%
New TB cases, total	8	119226	100.0	117646	100.0	118367	100.0	120835	100.0	117227	100.0	109904	100.0
Including new TB cases among the resident population, without those with post-mortem diagnosis*	8	99218	83.2	99206	84.3	98678	83.4	99863	82.6	96726	82.5	90265	82.1
Including new TB cases among foreign citizens	8	896	0.8	554	0.5	2123	1.8	2500	2.1	2217	1.9	2110	1.9
Including those notified in the penitentiary system	8	14898	12.5	14283	12.1	13865	11.7	14501	12.0	14072	12.0	13153	12.0
Including homeless people	8	924	0.8	830	0.7	1236	1.0	1810	1.5	2148	1.8	2361	2.1
Including those diagnosed post-mortem	8	3290	2.8	2773	2.4	2465	2.1	2161	1.8	2064	1.8	2015	1.8
Notified and registered in the follow-up register at the TB dispensaries of RF constituent entities	33	96646	81.1	96867	82.3	96251	81.3	97886	81.0	94755	80.8	88391	80.4
Registered in the cohort of new TB cases for chemotherapy in line with the MoH&SD orders [34, 35]***	7-ТБ	70495**	60.8	107539	93.6	111144	95.9	114007	96.1	112110	97.3	104432	96.8

* Excluding new TB cases among foreign citizens, persons notified in the penitentiary system, homeless people and TB patients diagnosed post-mortem. ** Based on the sectoral reporting forms for the cohort analysis by MoH&SD, received from 77% of the RF entities (excl. MoJ data). *** Percentage of cohorts to the total new TB cases is calculated without TB cases diagnosed post-mortem.

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[16] Conditionally derived by excluding from all new TB cases individuals who were registered in FSIN facilities, foreign citizens, homeless people and patients diagnosed post-mortem, a significant share of these groups may not belong to the population of the given area, or there is no available information that would specify it.

Reporting Form No. 33 provides the number of new cases that were identified during a reporting period. This Form gives information about TB cases among the resident population who are registered at the TB facilities (TBFs) of the given area (constituent entity) of the RF. By the end of 2010, 80.4% of all new TB cases were registered at the TB facilities of the RF entities (88,391 persons). Together with the deceased permanent population who were diagnosed post-mortem with TB (1,509 persons in 2010), Form No. 33 provides the data for calculating the TB notification rate for the resident population within an individual RF entity.[17] Countrywide, the data show that 62.3 new TB cases per 100,000 resident population were identified and registered at the TB facilities of RF entities in 2010; combined with the cases found post-mortem among the resident population this indicator was 63.3 per 100,000 population (see Fig. 2.5).

The difference in numbers for the patients detected among the resident population (according to Forms No. 8 and No. 33) allows the estimation of the coverage of new TB cases by dispensary follow-up in an area, as well as the proportion of persons from other regions who are identified in the given RF entity, that is, who were found outside the area of their permanent residence. The lowest proportion of new TB cases registered at the TB facilities per notified patients in the resident population is observed in the Republic of Ingushetia (84.2%), which may be explained by the shortcomings in the dispensary follow-up management in the Republic, and in Moscow city (81.9%), most probably due to finding TB cases from other RF entities.

Sectoral reporting Form No. 7-TB, which was introduced in the country by the RF MoH Executive Orders in 2003–2004 [34, 35], allows for monitoring the proportion of new TB cases enrolled in treatment cohorts. The value of this indicator has become quite high since 2007, reaching 95–96% (see Chapter 7)

TB cases detected by the medical service of the Federal Penal Enforcement Service (FSIN) among persons under custodial investigation, persons on trial and convicts still contribute to a certain extent to the national new TB case notification rate. In 2010, similar to the preceding five years, 12.0% (13,153 cases, Fig. 2.4 and Table 2.1) of all TB cases were detected at the penitentiary facilities. Major efforts to improve effectiveness of TB control in the penitentiary system resulted in the TB notification rate decreasing from 4,347 (1999) to 1,302 (2010) per 100,000 people under custodial investigation, persons on trial and convicts. This corresponded to a decreasing proportion of new cases of those who contracted TB at the FSIN facilities among all new TB cases in the RF from 25% to 12% (see Chapter 8 “TB Control in the penal enforcement system”). At the same time, new TB case notification rates reported by the regional TB facilities for the resident population, including those diagnosed post-mortem (Fig.2.5), showed a statistically significant growth until 2004 with subsequent leveling-off at 69–70 per 100,000, which then began to decrease since 2009 (to 63.3 in 2010). In the decade until 2009 two different processes contributed to changes in the new TB case notification rates, that is, changes in this indicator for the resident population and for the penal enforcement system (Fig. 2.5). Following the growth until 2005 (69.9 per 100,000, or 96,646 cases, Form No. 33), the new TB case notification rate among the resident population leveled off at 69–70 and began to decline in 2009–2010 (to 63.3 per 100,000, or 88,391 cases). A sharp decline in new TB case notification rates among FSIN populations was observed in the same period (from 35–40 thousand to 16 thousand new notified TB cases annually) followed by a plateau at the level of 1,300 new TB cases per 100,000 individuals under custodial investigation, persons on trial and convicts.

Thus, whereas in the early 2000s countrywide changes in the new TB case notification rates were due to a significant decline in TB notification at FSIN facilities that was accompanied by a slight growth in incidence among the resident population, the situation has changed lately and now reflects a declining new TB case notification rate for new TB cases among the resident population against the stable rates in the FSIN.

It should be noted that the level of new TB case notification rate for FSIN populations still remains high (1,309 per 100,000 in 2009, see Chapter 8). At the same time, the incidence rate in a specific population has a relative value and denotes the risk of disease in this group, rather than a proportion of this group in all TB cases in the country. On the other hand, information about the absolute numbers of TB patients is essential for planning the required resources for TB control activities. For instance, with high incidence rates in the penitentiary population, which are more than 20 times (as indicated earlier) higher than the incidence rates for the resident population, the absolute number of patients in the penal enforcement sector constitutes just 12% of all TB cases in Russia.

The proportion of foreign citizens among new TB cases remains insignificant (under 2%). A considerable increase in the number and proportion of foreigners among notified TB cases that was observed in 2007 (from 0.5% in 2006 to 1.8% in 2007) was caused not only by the growing number of TB cases in this population, but also by the improved case notification pursuant to implementation of the Federal law No. 115-FZ “On the legal status of foreign nationals in the Russian Federation” of 25.07.2002, Regulation No. 188 of the RF Government

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[17] In the country overall, the new TB case notification rate derived from this form does not fully reflect the value for the resident population (approx. to 98%, see Table 2.1), because it excludes permanent residents who contracted TB and were registered in other RF entities.

of 02.04.2003 and the Federal law No. 189-FZ of 05.11.2006 “On amending the Code of administrative offences of the Russian Federation.” The increase in the number of TB cases in this population was determined by the mandatory TB screening for persons arriving in Russia before they are granted temporary registration in the country.

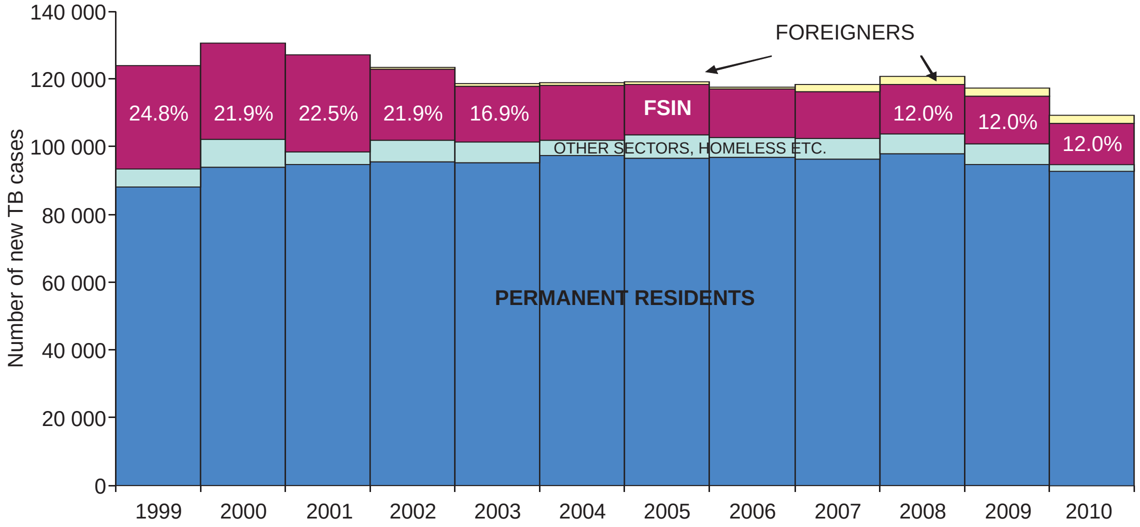

Fig. 2.4. New TB cases notified in the Russian Federation in 2002–2010 among the resident population, within FSIN and other sectors, and among foreign citizens (source: Form No. 8)

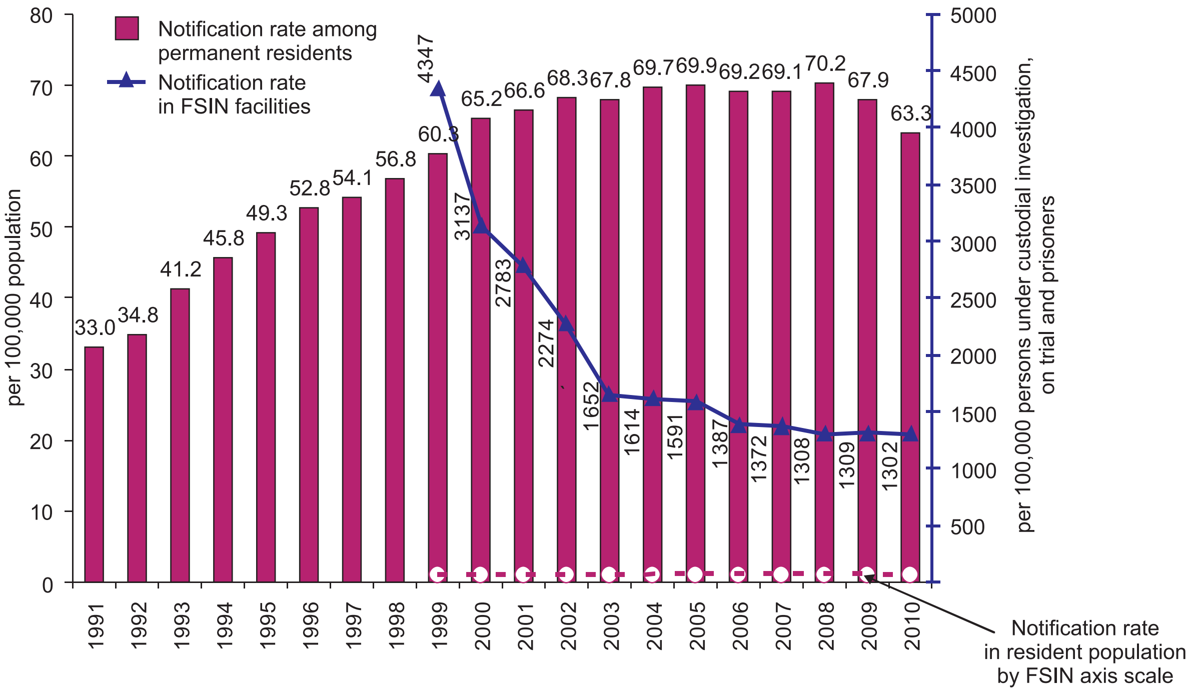

Fig. 2.5. New TB case notification rate among the resident population and FSIN population, 1991–2010, Russian Federation. The notification rate for the resident population is derived from Form No. 33 data, including the deceased resident population who died of TB and had a post-mortem diagnosis of the disease (their number has been registered since 1999). The bottom-right dotted line and circles indicate the notification rate for the resident population against FSIN right-hand axis scale (Sources: Forms No. 33 and No. 4-tub; population data: Forms No. 1, No. 4)

2.2. New TB case notification rates in the federal districts and entities of the Russian Federation

The aggregate (cumulative) value of any indicator calculated for the whole country may differ considerably from the values derived for its specific areas. This is especially pronounced in Russia, it being the country with the largest area in the world that includes essentially different regions in terms of geographic and demographic characteristics, as well as their socio-economic level and population structure.

Management decisions in implementing TB control activities for each specific RF entity are not based on just the overall indicators. Therefore, together with the national Russian indicators, account should be taken of the changes in notification rates at the level of a specific federal district or entity.

The above-mentioned decline in the number of new TB cases and notification rates in the areas in 2008–2009 was observed not only in the country as a whole, but also in most RF entities. Both the overall notification rate and the notification rate among the resident population declined in 70 out of 83 federal entities.

However, new TB case notification rates differ significantly in the entities of the Russian Federation (Fig. 2.6a and 2.6b). The highest rates (over 130 per 100,000 population, according to Form No. 8, 2010) are still registered in a number of areas, mostly in Siberia and in the Far East:[18] in the Republic of Tyva (233.4), Primorsky Krai (200.5), Jewish AR (173.5), Republic of Buryatia (144.8), Irkutsk (147.4), Amur (144.5), Kurgan (137.7), Kemerovo (130.0) and Novosibirsk (130.8) Regions. The lowest rates (under 50 per 100,000 population) were registered in Ivanovo (50.0), Orel (48.1), Yaroslavl (47.5), Murmansk (47.0), Belgorod (46.5), Vologda (45.2) and Kostroma (42.3) Regions, in cities of Moscow (45.5) and St. Petersburg (43.0), in the Republics of Ingushetia (45.3), Bashkortostan (47.0), Kabardino-Balkaria (40.1) and Karachaevo-Cherkessia (47.5). Rates as low as these may be explained both by the actual lower incidence of TB in the area or by the existing shortcomings in detection, diagnosis and registration of new cases.

Overall, in 2010 the TB incidence rates exceeding 100 cases per 100,000 population were registered in 19 RF entities that account for approximately one third of new TB cases (34%), with the population corresponding to just one-fifth of the total country's population (20.6%, see Fig. 2.6).

Quite high notification rates – from 50 to 100 per 100,000 population – were registered in 50 other areas. They have slightly over half (54.2%) of new TB cases in Russia, with almost 60% of the nation's population. And, finally, in 13 RF entities relatively low rates are registered – under 50 per 100,000 population (in 2009 there were only 8such areas). With a fifth of the nation's population (20.1%) residing there, in 2010 these areas contributed just about 12% of all new TB cases.

A statistically significant correlation is observed between the level of notification rates and the geographical location of Russia's regions. Except Kaliningrad Region, which is located ata considerable distance from Russia's mainland, the rates are consistently increasing from west to east (Fig.2.7a): from 55.4 and 57.7 in CFD and NWFD to 121.4 and 139.4 in FEFD and SbFD (Form No. 8, 2010).

The areas in the Far East Federal district and Siberian federal district were the main contributors to the overall growth of new TB case notification rate in Russia. From 1991 to 2005 notification rates in these districts (excluding the penal enforcement system) increased 2.7 times compared to 1.8–1.9 times in the western districts (Fig. 2.7b). On the other hand, no increase in the notification rates at the beginning of the new century (2000–2003) in the more populated regions of the European part of Russia (CFD, NWFD, SFD and PFD) to some extent curbed the growth of the overall new TB case notification rates for new TB cases in Russia and ultimately determined the starting process for its stabilization. SbFD and FEFD contributed almost 60% to the overall growth in the notification rate that was observed in 2008.

Declining new TB case notification rates in 2010 were observed in all Russian regions (Fig. 2.7b, c), including FEFD, which registered increasing rates up until 2009.

There is a certain correlation between the new TB case notification rates within federal districts and socio-economic factors, mainly the living standards of the population. To assess the living standards such indicators are reviewed as the proportion of the population with income below the minimum subsistence level (Fig.2.8) and the unemployment rate[19] (Fig. 2.9) published in the FSSS annual statistical reports [39, 50].

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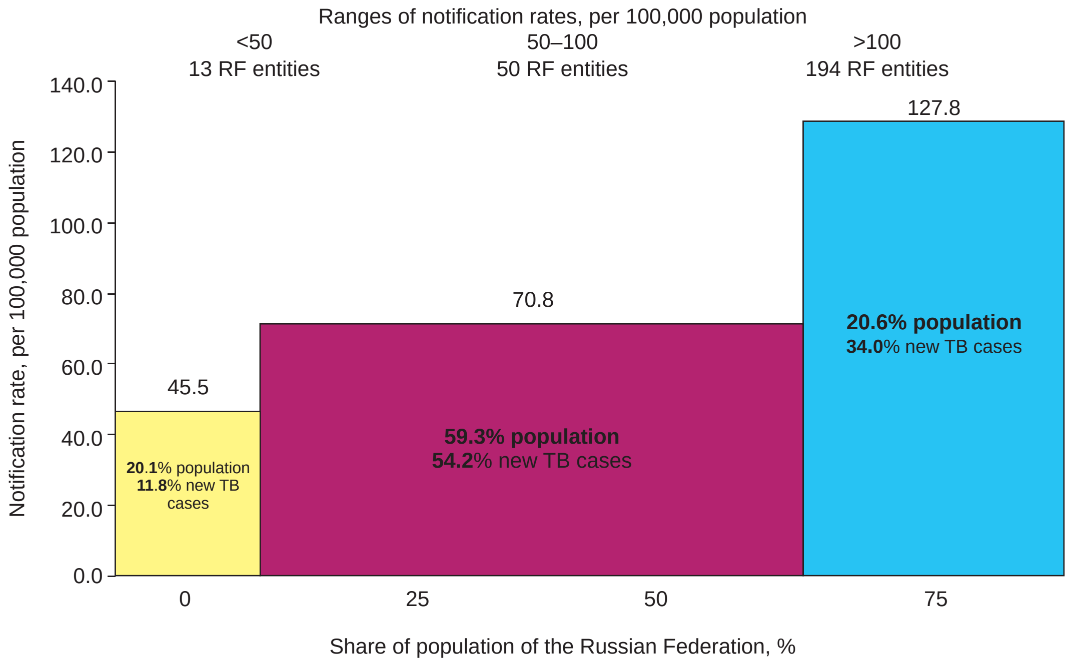
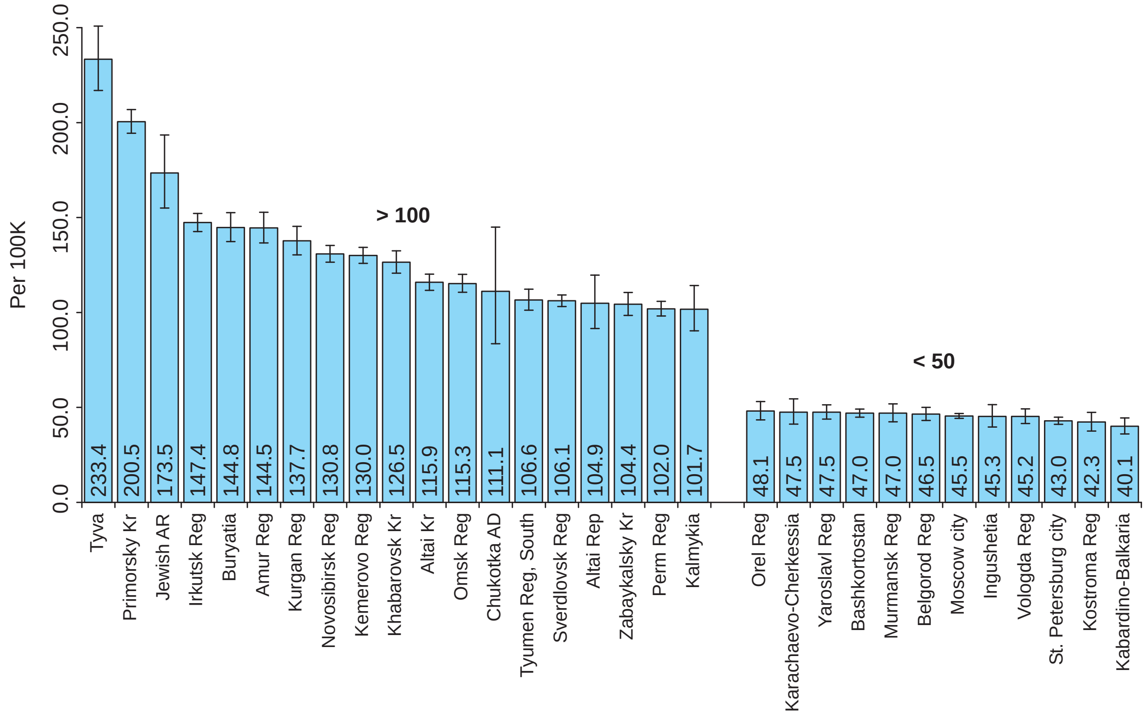
[18] Hereinafter the TB indicators are given only for the areas with population over 100,000.

[19] According to [39] is defined as "…the ratio of the number of unemployed individuals in a certain age group to the number of economically active population of the corresponding age group, as percentage. The unemployed are defined as individuals…in the active working age who in the surveyed period were: jobless…; seeking a job…; starting a job within the surveyed week …"

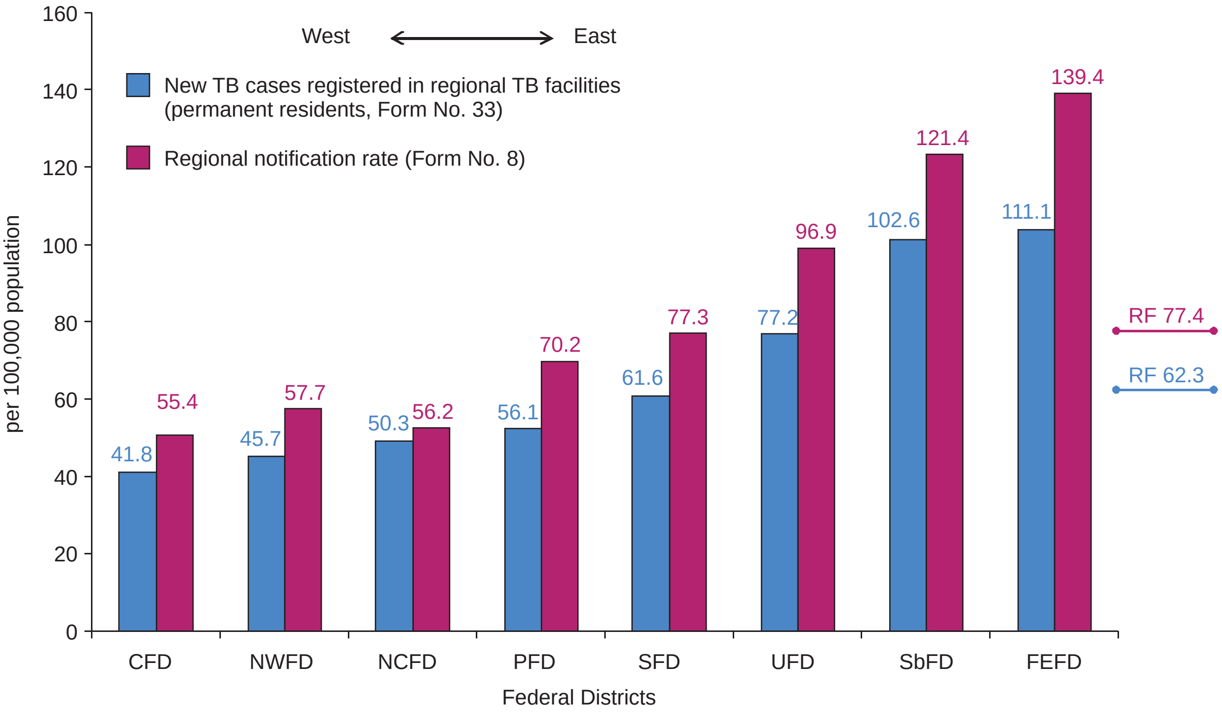


a) Distribution of the population and the number of RF constituent entities by the level of new TB case notification rates. Three groups of constituent entities with the indicator levels under 50, 50 to 100 and over 100 new TB cases per 100,000 population. The width of the rectangles represents the share of the RF population in these areas; the height of the rectangles reflects the notification rates in each of the three groups of areas

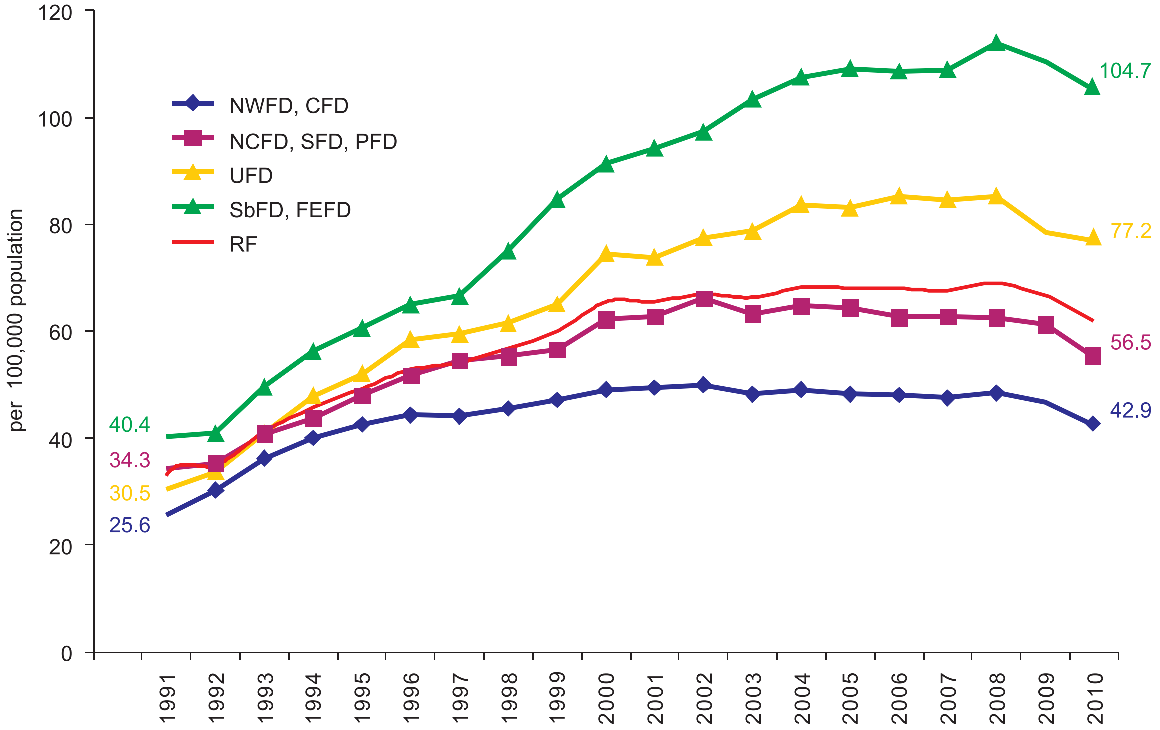


b) RF entities with the highest (over 100) and lowest (under 50) values of the new TB case notification rate. The error bars indicate 95%CI

Fig. 2.6. New TB case notification rates in RF entities, 2010 (Source: Form No. 8, population data: Form No. 4)

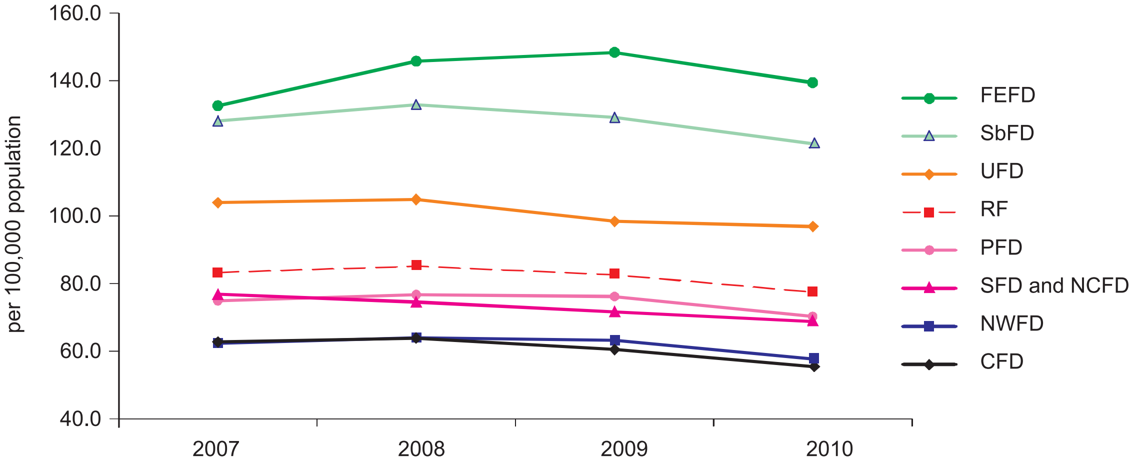


a) Distribution of the territorial new TB case notification rates and cases registered in regional TB facilities by federal district, per 100,000 population



b) New TB cases registered at regional TB facilities in the four groups of areas and in the Russian Federation, per 100,000 resident population, 1991–2010, Form No. 33

Fig. 2.7. Geographic distribution of new TB case notification rate and the number of new cases notified in TBFs by federal districts per 100,000 population. Russian Federation (Sources: Forms No. 33 and No. 8, population data: Forms No. 1 and No. 4)



c) Changes in new TB case notification rates in the federal districts and in the Russian Federation overall, 2007–2010, Form No. 8

Fig. 2.7. Geographic distribution of new TB case notification rate and the number of new cases notified in TBFs by federal districts per 100,000 population. Russian Federation (Sources: Forms No. 33 and No. 8, population data: Forms No. 1 and No. 4)

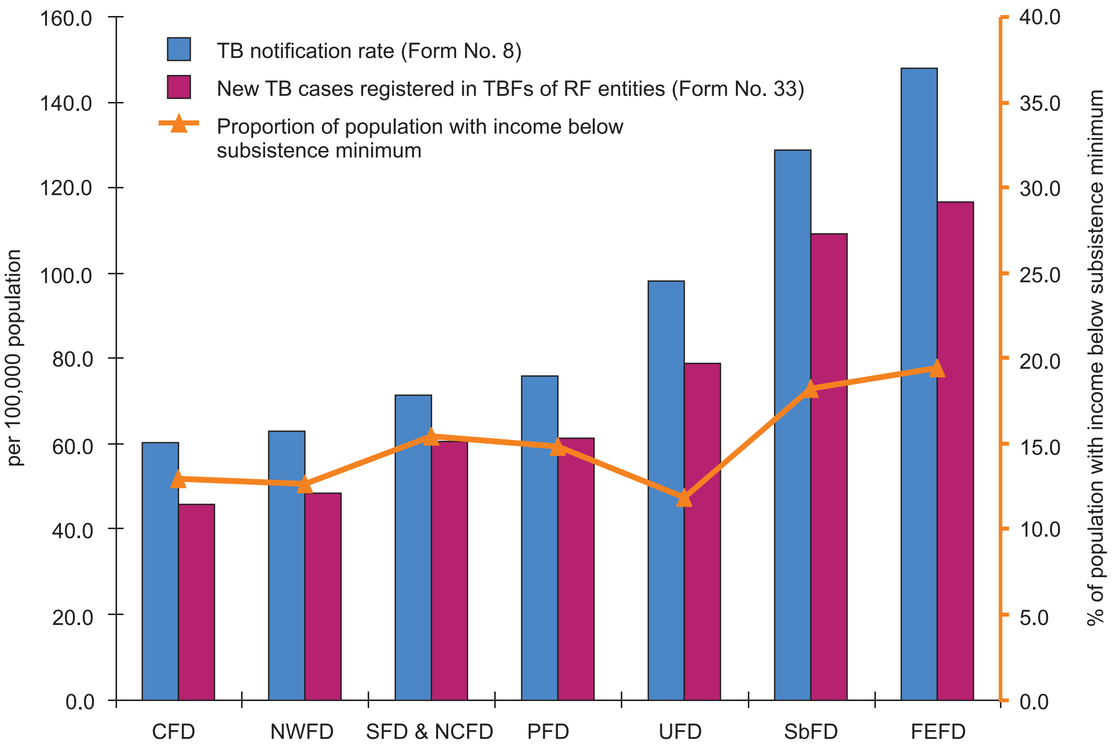


Fig. 2.8. Proportion of the population with income below the minimum subsistence level and the new TB case notification rates in the federal districts of the Russian Federation, 2009. The regions are included in the chart by the geographic principle: from the northwest to the Far East (Sources: Forms No. 8 and No. 33, FSSS data [39, 50])

Variations within the federal districts in the percentage of population with income below the minimum subsistence level in 2009 correlate in general (except UFD) with the different levels in notification rates that were registered in those districts in the same year (Fig. 2.8). In general (with the exception of SFD[20]), the unemployment rate variations in the districts also correlate with the varying notification rates (Fig. 2.9). In CFD and NWFD, which show the lowest new TB case notification rates for new TB cases in the country (61–63 per 100,000), approximately 13% of the population have income below the minimum subsistence level, and the unemployment rate amounts to 6–7% of the economically active population. In districts with average values of the notification rate – PFD, SFD,

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[20] SFD data differ considerably from the data of other districts mostly due to high unemployment rates in the Republics of Ingushetia (55.0%) and Chechnya (35.5%) that are related to the former Chechnya crisis (data of 2009).

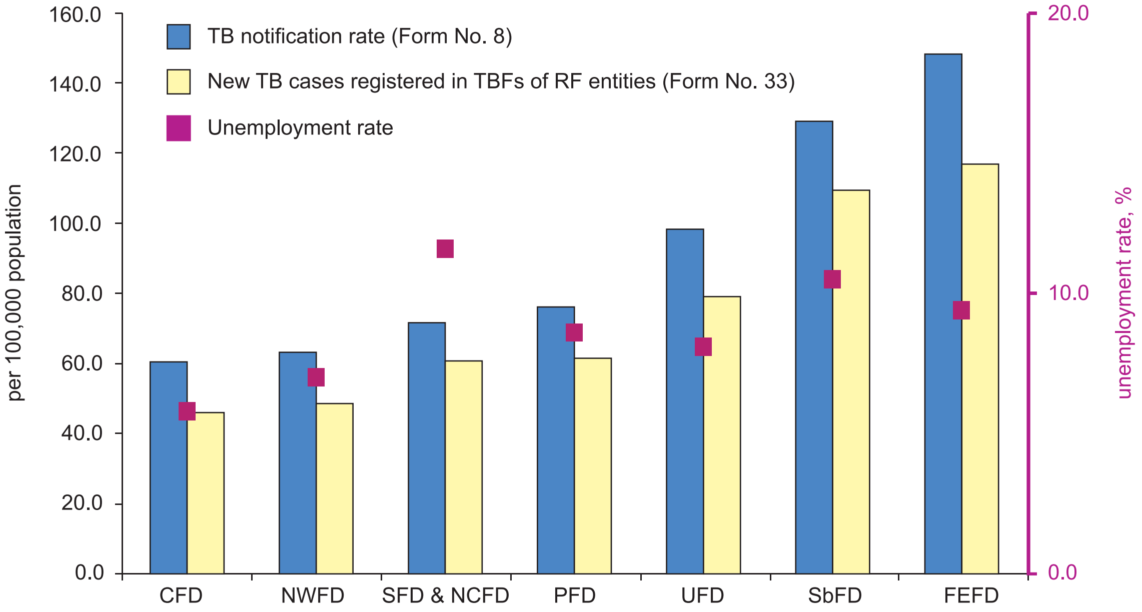


Fig. 2.9. Unemployment rate and new TB case notification rate by Federal districts, 2009.
Pink squares indicate unemployment rates for each district. The regions are shown by geographic location: from the northwest to the Far East (Sources: Forms No. 8 and No. 33, FSSS data [39, 51].

NCFD, and UFD (72–98 per 100,000) – and taking into account the above exceptions, about 15–15.5% of the population have income below the minimum subsistence level, and the unemployment rate is 8.1–8.6%. Finally, in the eastern regions (SbFD and FEFD) with the highest new TB case notification rates (130–150 per 100,000), the corresponding indicators amount to 18–20% and 9.5–10.5%, respectively.

Unlike many countries in the world, new TB case notification rates among the rural population in Russia is higher than for the urban residents – 85.4 versus 74.5 per 100,000 population ($p < 0.001$, Form No. 8). In 2002–2008, rural residents contributed almost exclusively to the growing incidence rate (Fig. 2.10). The overall decline of the indicator in 2009–2011 was accompanied by a statistically significant decrease in the new TB case notification rate among the rural population that occurred for the first time in many years.

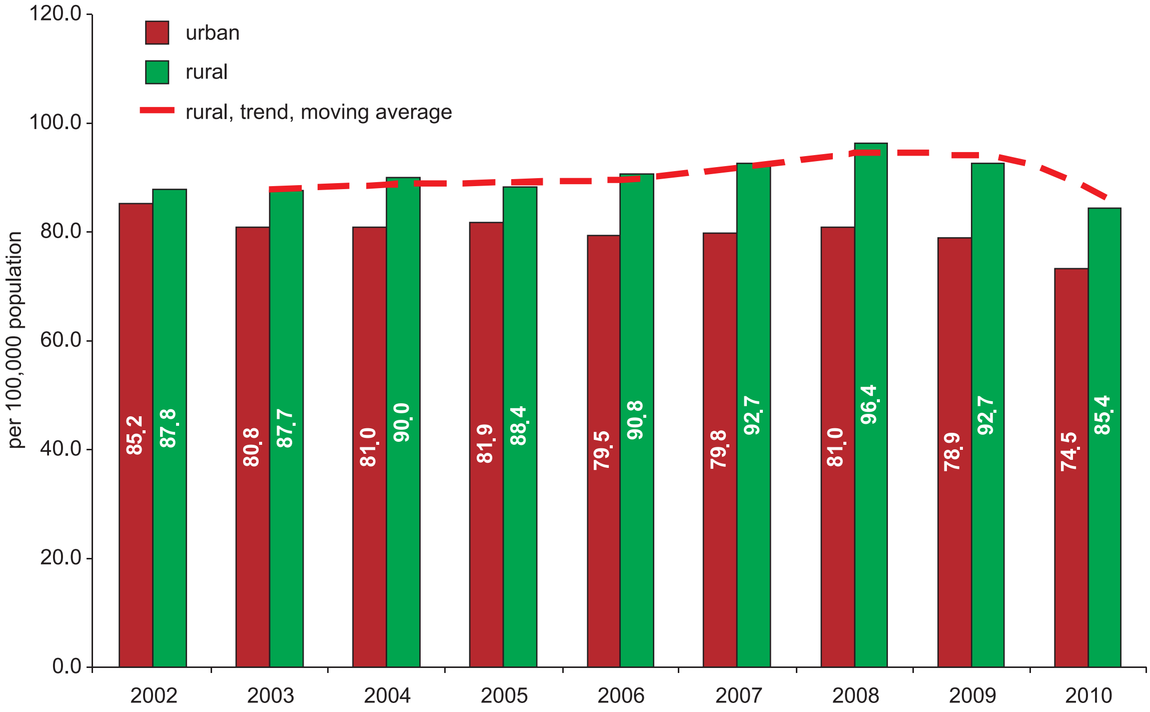


Fig. 2.10. New TB case notification rates for urban and rural population in the Russian Federation, 2002–2010
(Source: Form No. 8, population data: Form No. 1 and No 4)

2.3. New TB case notification rates by age and sex

People in different age groups have various degrees of susceptibility to TB infection and probability of contact with its sources; therefore, they require specific TB control activities. Therefore, it is important to register distribution of the notification rates both by sex and by different age groups.

Estimates of age- and sex-specific TB incidence are also often used for indirect assessment of regional and national TB epidemiological burden. It is assumed that a significantly higher notification rate in men than in women and high values of this indicator in the young and middle-aged population are prognostic characteristics for an unfavorable future TB epidemiological situation [77]. These population groups (men; young and middle-aged people) as a rule are more socially active and have a relatively higher probability of numerous contacts in their external environment, thus increasing the risk of TB transmission in the population.

When assessing age- and sex-specific values of the new TB case notification rate for new TB cases, it is also important to single out the penitentiary population, which consists predominantly of young men. As demonstrated further in this review, this factor has a significant impact on various age- and sex-specific new TB case notification rates. Moreover, epidemiological features of the disease progression and the required management activities for TB control are essentially different in the penitentiary and civil sectors.

In the Russian Federation the risk of contracting TB is 2.6 times higher (per 100,000 population) for men than for women (2010, Fig. 2.11). This ratio has declined by almost 20% since 2002, when it was 3.2. Countrywide, men currently constitute 70% of all new TB cases (76,330 out of 109,904 people, 2010).

With the continuously increasing new TB case notification rate in women in 2002–2008 (from 41.9 to 47.5 per 100,000 of female population), this indicator for men decreased in 2002–2007 from 136.2 to 125.4. It is important to note that the decline in the notification rates for men in these years was determined by the decreasing number of new cases registered in the penitentiary system (among persons under custodial investigation, persons on trial or convicts). The notification rates for men in the resident population have hardly changed over these years (105–107 per 100,000 population, Fig. 2.11b).

In 2008, the notification rates both for men and for women showed an increase followed by a decline in 2009–2010 to 116.3 and 44.0, respectively.

In the male population of the Russian Federation, men in the age group of 25–34 are at the highest risk of contracting TB (189.9 per 100,000 population, Fig. 2.12a), with the notification rates in FSIN populations contributing almost a quarter to the overall indicator. Without TB cases in the penitentiary system, the new TB case notification rate for men in this age group is 140.5.

In Russia, the overall new TB case notification rate in men of the resident population, excluding FSIN, peaks in the age group of 35–44 (150.2 per 100,000 population, 2010).

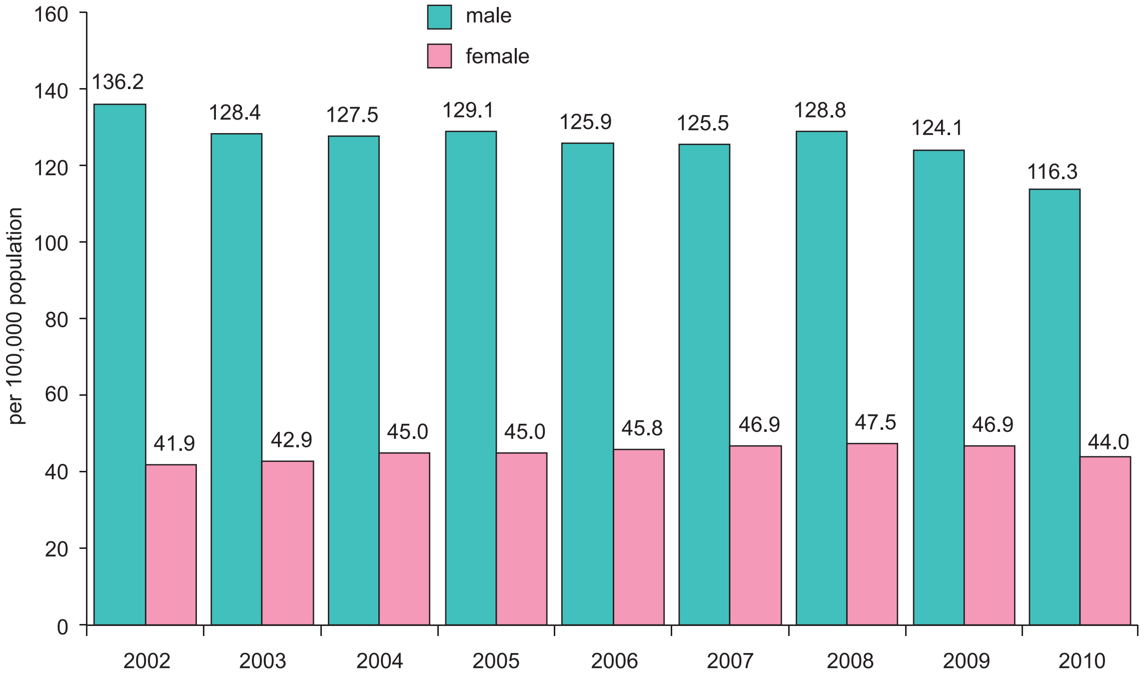
It should be noted that the socio-economic damage due to tuberculosis is determined by the absolute numbers of TB cases in the respective age groups of the population, rather than by the notification rates. The analysis of Form No. 8 data reveals that over 70% of new cases occur in men of the economically active age group of 25–54 (nearly 54,000 new TB cases annually, Fig 2.12b). Notably, in 2002–2008 the TB rates in men were mostly growing due to the emergence of new cases in the most socially and economically productive age group (25–34 years of age, see Fig 2.13). Moreover, although in 2009 the decline of TB cases among men was determined almost exclusively by changes in the age group of 35–44 years of age, in 2010 the decrease in new TB cases in the male population was observed in all groups over 15 years of age.

New TB case notification rates for women peak in the fertile age group of 25–34 years of age (Fig. 2.12a). The rate in this age group was steadily growing up to 2008. From 1999 to 2008 the new TB case notification rate for women aged 25–34 years increased from 70.6 to 91.9 per 100,000 population (Fig. 2.14), and the proportion of women in this age group among all TB cases grew from 23.3% to 28.3%. The overall decline in TB incidence was registered also in this female age group: for the first time in many years the rates have fallen to 86.6, though the proportion of women in the age group of 25–34 among all TB cases is still on the rise (29.5% in 2010).

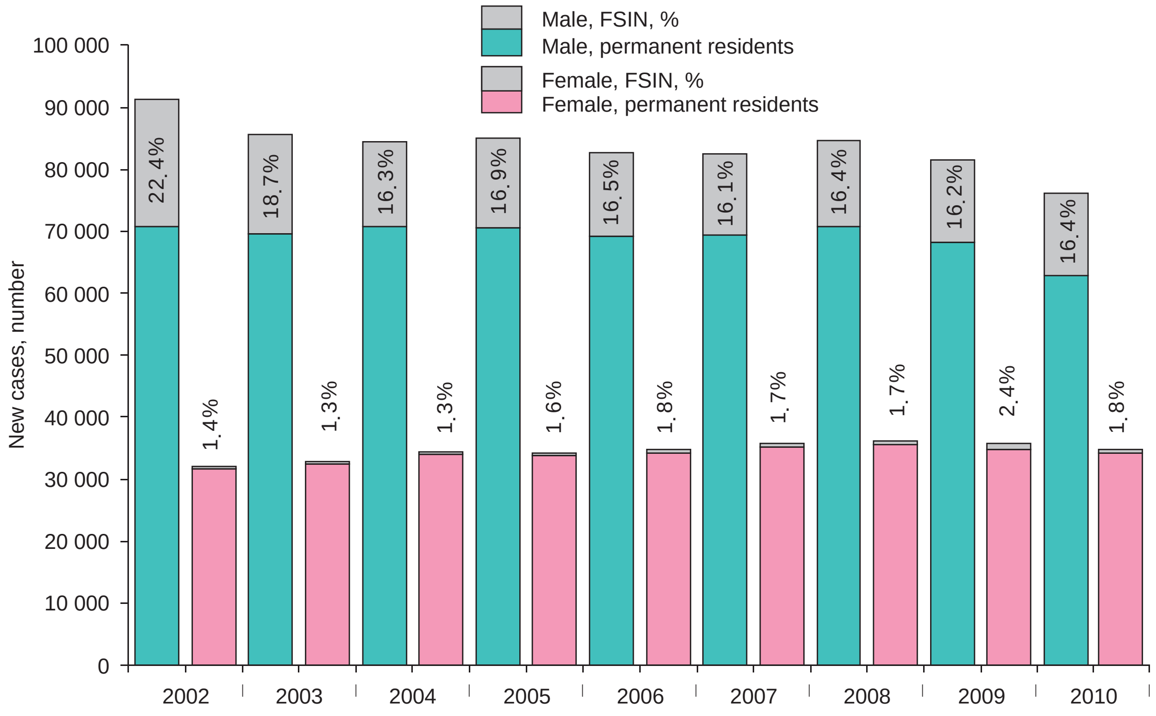
In Russia the registered notification rate peaks in younger and more economically active age groups both for men (25–44 years of age) and women (25–34 years of age), reflecting a somewhat unfavorable epidemiological situation of TB and indicating existence of conditions for the potential spread of the disease in the immediate future, unless adequate TB control activities are maintained.

Analysis of the age- and sex-specific trends for TB cases over the last nine years, 2002–2010 (excluding the new TB case notification rate in the FSIN population), showed that despite the rates leveling off and later going down, the age structure of new TB cases has generally deteriorated since 2002, and new TB patients have become younger. The notification rates in the age group of 25–34 have increased, although in the age groups over 35 years of age they have declined. This pattern has been observed (to a different extent) in all federal districts of Russia.

The increase in the notification rates in younger age groups may indicate certain deterioration in the epidemiological situation of TB and also improved quality of TB case-detection activities that can have an impact on case finding among young persons. They are the most difficult group to reach in terms of case finding, as they are the most economically active population; this factor may prevent them from seeking timely health care and subsequent fluorography examinations at medical facilities. Moreover, this population has a high rate of persons who work in non-governmental (private) companies and are most prone to moving and migration.

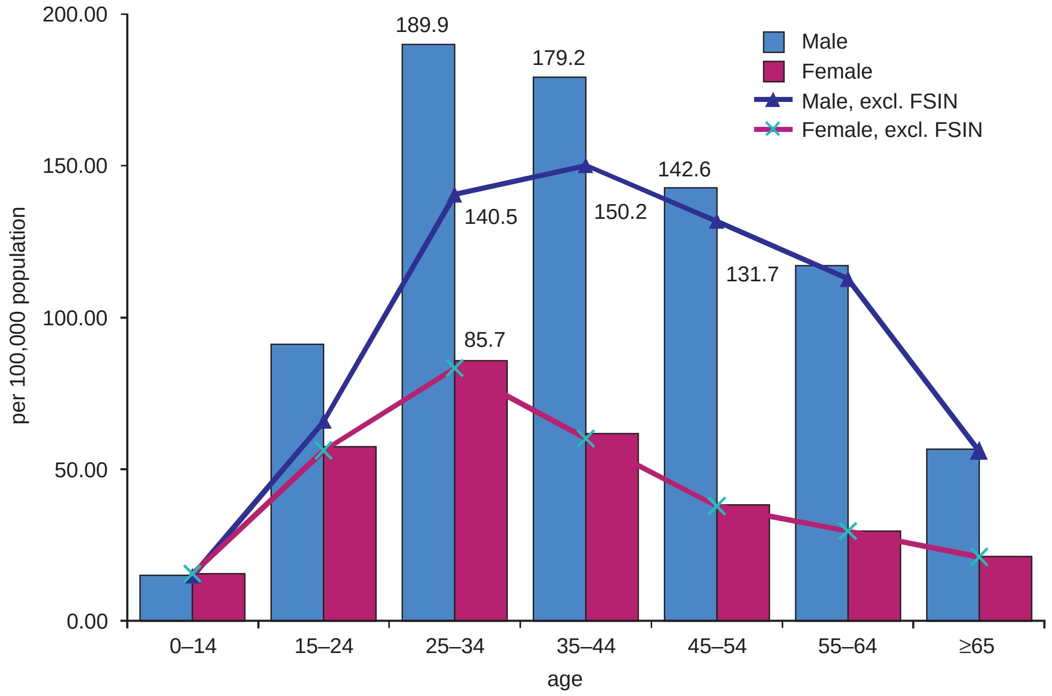


a) New TB case notification rates for men and women

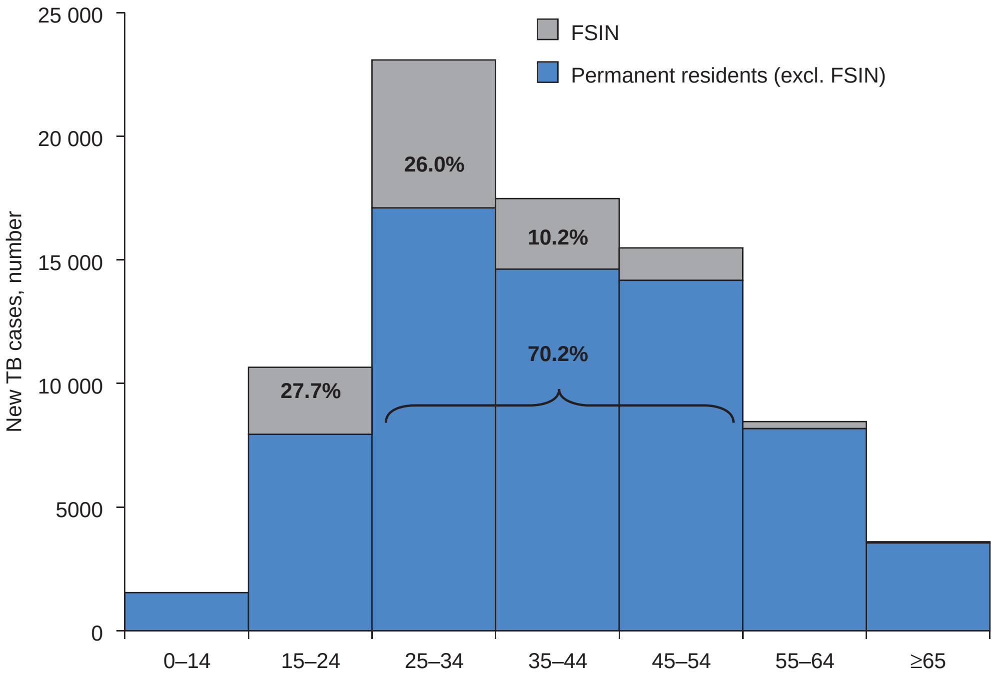


b) Number of new TB cases for males and females, with and without FSIN cases (the grey parts of the green and pink bars indicate the percentage of men and women, respectively, who were diagnosed with TB in the FSIN system among the total new TB cases of the corresponding gender group.

Fig. 2.11. New TB cases among men and women, Russian Federation, 2002–2010 (Sources: Form No. 8, population data: Form No. 4)



a) Age- and sex-specific new TB case notification rates for the total population and for the resident population



b) Structure of notified new TB cases in men of different age groups; patients in FSIN and in the resident population of the Russian Federation. The curly bracket indicates the proportion of new TB cases in men in the 25–54 age group

Fig. 2.12. Age- and sex-specific new TB case notification, 2010 г. Total population, FSIN and the resident population in the Russian Federation (Sources: Form No. 8, population data: Form No. 4)

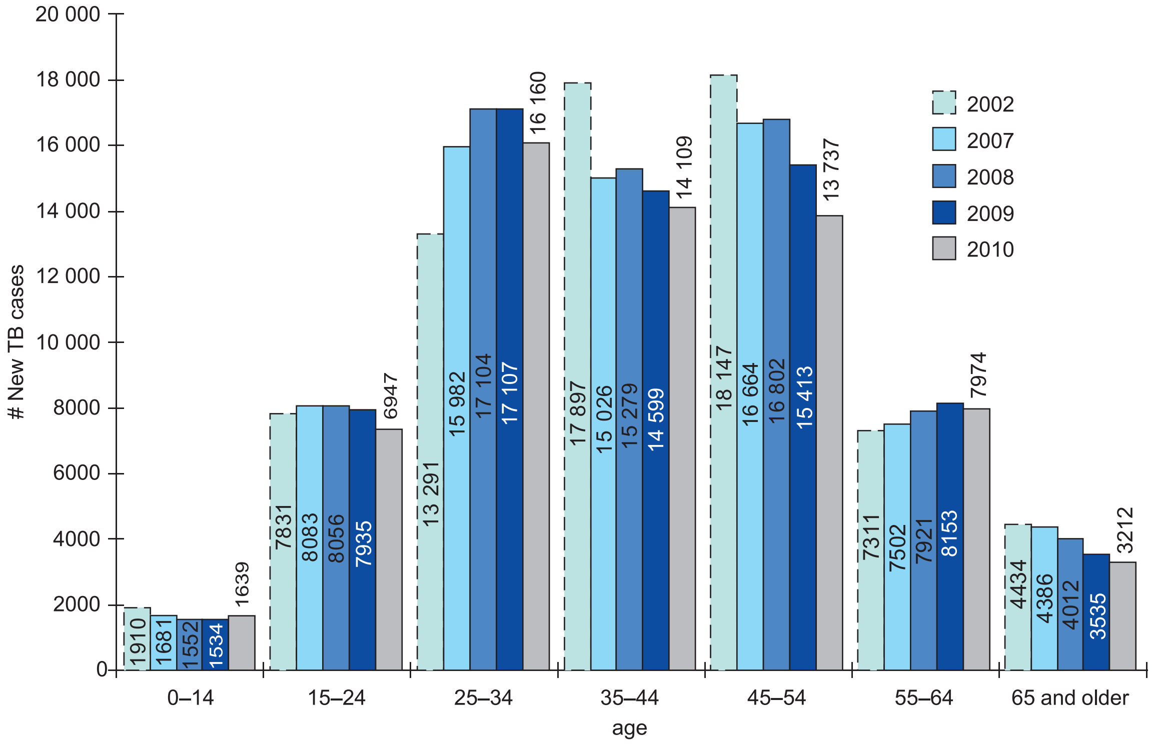
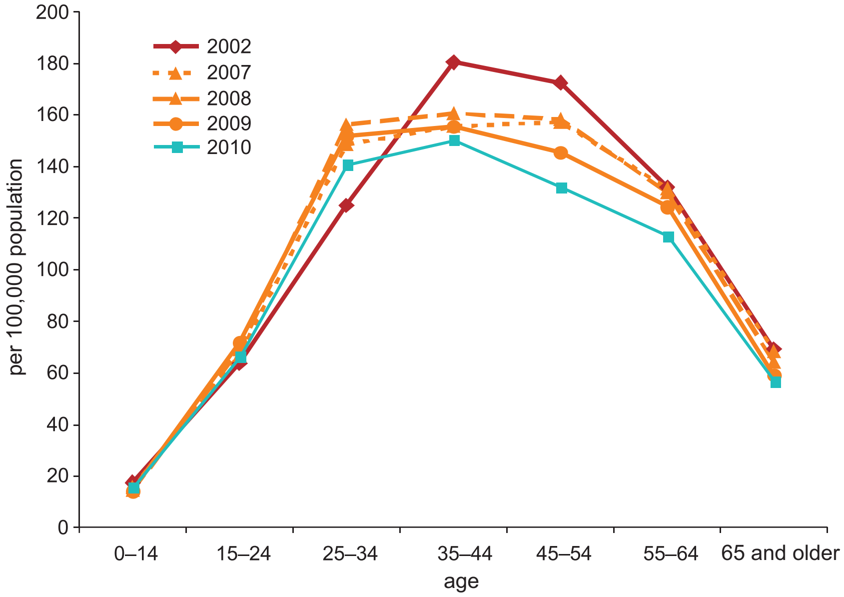


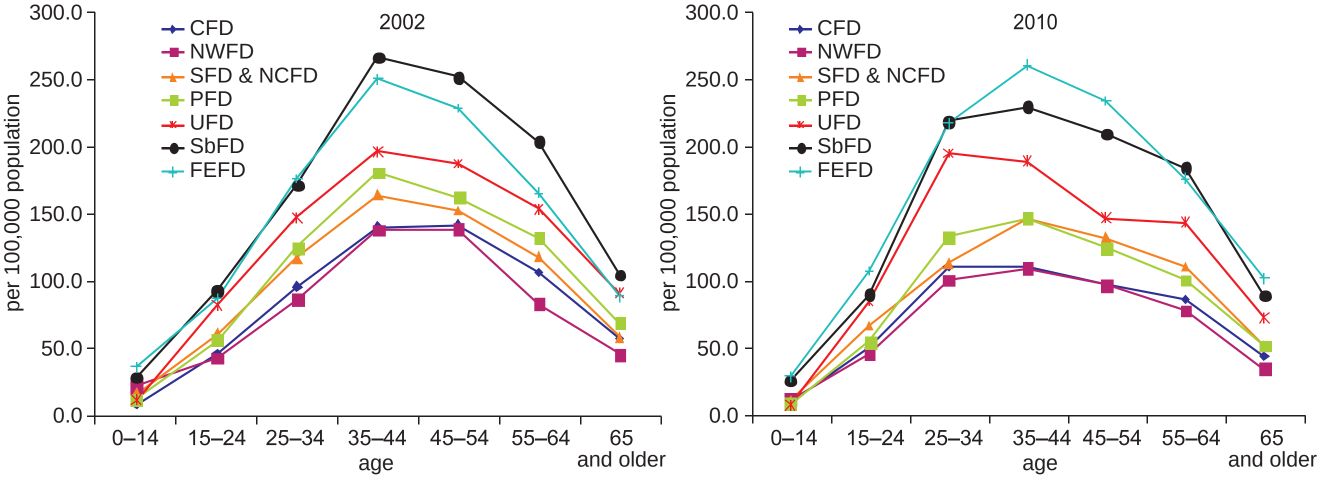
Fig. 2.13. Number of new TB cases among men of different age groups, resident population, the Russian Federation, 2002, 2007, 2008 and 2009. Form No. 8 data without FSIN data (Sources: Form No. 8, population data: Forms No. 1 and No. 4)

Fig. 2.14. The new TB case notification rate among women (Sources: Form No. 8, population data: Forms No. 1 and No. 4)

Fig. 2.15 and 2.16 show a new peak that emerged in 2007–2008 (or a gradual shift to this peak) for men in the age group of 25–34, particularly in SbFD and UFD. In recent years, the new TB case notification rate in women aged 25–34 years has been significantly higher than in other age groups. This pattern is particularly distinct in SbFD, FEFD, and UFD.



a) Russian Federation



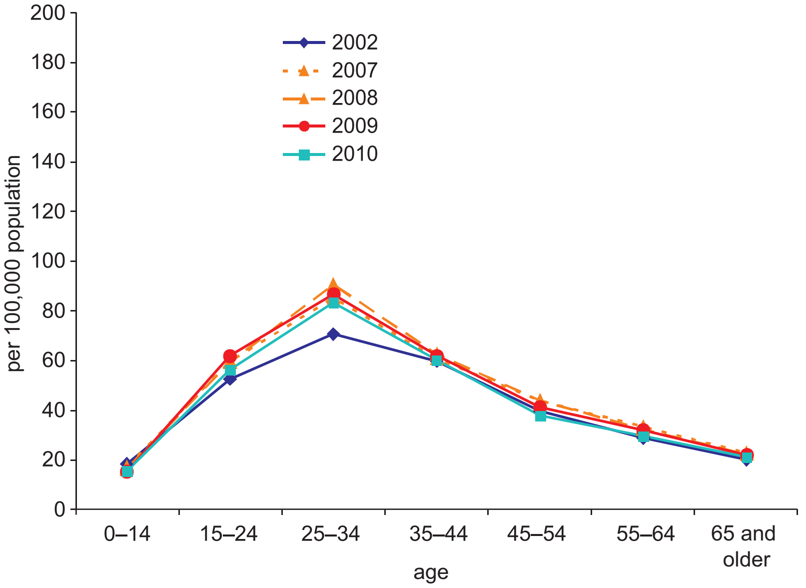
b) Federal districts

Fig. 2.15. New TB case notification rates in the male residents of various age groups, the Russian Federation, 2002 and 2007–2010. Form No. 8 data excluding FSIN
(Sources: Form No. 8, population data: Forms No. 1 and No. 4)

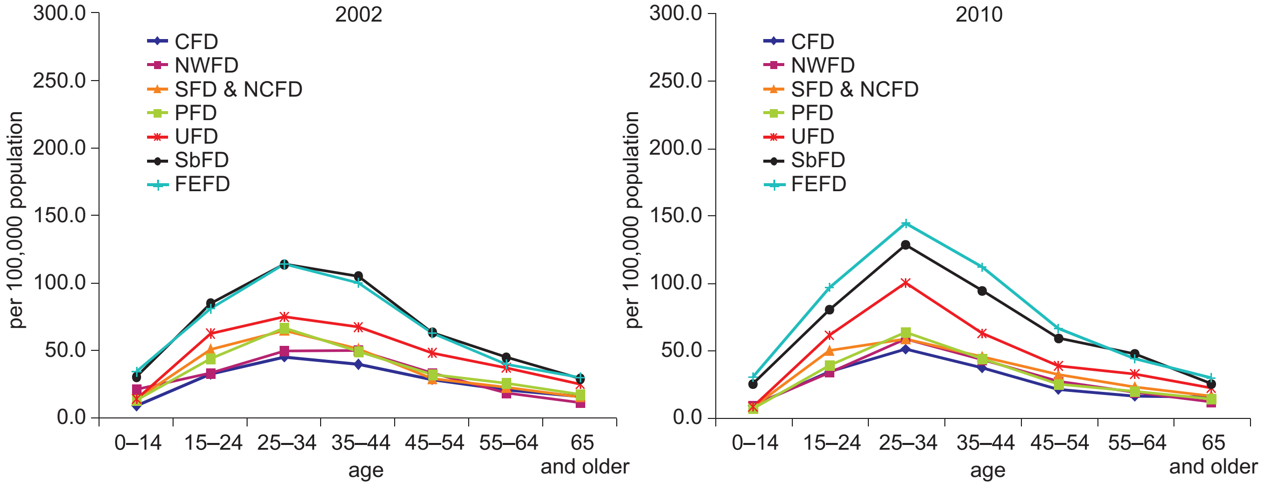
The decline in the rate of 2009–2010 was due primarily to the decreasing notification rates in men aged 45–54 years. Besides, in 2010 a decline was observed in the rates for men in the age groups of 25–34 and 55–64, though in 2009 there was virtually no decrease reported for these groups.

Age-dependent rates vary in different areas. With FSIN data included, in 40 RF entities the peak in notification rates for men was registered in the age group of 25–34 years of age, and in 31 entities it was in the age group of 35–44 years of age; that is, in 87% of areas men aged 25–44 years are at maximum risk of contracting TB. And although for women in the penitentiary sector population the indicators do not contribute significantly to the overall rates (see later in the text), for the male population exclusion of FSIN data yields more varied age-specific notification rates: only 16 federal entities register a peak in the age group of 25–34 years of age, 42 entities in the age group of 35–44 years of age, and 14 entities in age group of 45–54 years of age.

In 2002, (excluding the FSIN data) a distinct peak of the new TB case notification in men aged 25–34 years was registered only in two areas: the Republic of Tyva and the Yamalo-Nenets AD (1.5–2 times higher than the total regional new TB case notification rate for men among the resident population). In 2010, the number of RF entities with a single distinct peak of notification rates in the age group of 25–34 (over 1.6 times higher than the overall regional new TB case notification for men) increased to 13 areas (the Khanty-Mansi and the Chukotka AD, Tver, Ulyanovsk, Leningrad, Tyumen, Irkutsk, Kostroma, Ivanovo, Chelyabinsk Regions, the Republics of



a) Russian Federation



b) Federal districts

Fig. 2.16. New TB case notification rates in the female residents of various age groups, the Russian Federation, 2002 and 2007–2010. Form No. 8 data excluding FSIN (Sources: Form No. 8, population data: Forms No. 1 and No. 4)

Kalmykia, Bashkortostan and Khakassia). Notably, in 2009–2010 these areas did not include the Republic of Tyva, which over the past years saw dramatic changes in the age structure of new TB cases and now has a second, more pronounced peak, in the age group of 55–64 years of age.

A marked peak in the new TB case notification rates in males over 55 that exceeds 1.6 times the overall regional indicators for men among the resident population was observed in the Republics of Kabardino-Balkaria, North Ossetia (Alania), Dagestan, Tyva, Karelia, the Republic of Chechnya, as well as in Magadan, Smolensk and Tambov Regions.

Theoretically, this age- and sex-specific structure reflects a relatively favourable situation of tuberculosis from the epidemiological perspective; however, in many of the listed areas it may indicate the problem with registration of young patients (high stigma[21] of TB) or extensive migration of young men from the regions resulting in overestimation of population numbers in the given age group used in calculations of the incidence rate.

In 2010, the peak of new TB case notification rates for the female resident population in the age group of 25–34 was at least twice as high as the overall regional indicators for women in 27 RF entities (in Penza, Kurgan, Tula, Kostroma, Leningrad Regions, Chukotka AD, the Republics of Bashkortostan, Mordovia and other RF entities). There were 18 such areas in 2009, 14 in 2007 and just 7 in 2002.

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[21] The "mark" with a negative social connotation (from the English "stigma" – brand, label). Stigma is used to exclude individuals from their social environment not because they violate the social standards, but due to certain features (for example, HIV-positive persons) [definition taken from the Russian Encyclopaedia of sociology, 1998].

It should be noted that in a number of the republics in the North Caucasus (Chechnya, Ingushetia, Karachaevo-Cherkessia and Kabardino-Balkaria) the new TB case notification rates for women peak in the age group of 45–64, which may indicate a certain stigmatization of TB patients. At the same time, in the Republics of Kalmykia, Tyva, Mari El and Chuvashia women in the age group of 18–24 are at high risk of TB. This group shows peak rates that are 1.6–1.9 times higher than the average new TB case notification rates for women in the respective area.

2.4. Structure of new TB cases in the Russian Federation

Pulmonary tuberculosis (PTB) – the most dangerous site of the disease from the epidemiological point of view – is the dominant form in the structure of new TB cases.

The proportion of PTB among new cases is 90.4% (Form No. 8, 2010). In 2009, pulmonary TB cases amounted to 89.6% in persons registered at the regional TB facilities, which ensure better quality of diagnosis of extrapulmonary TB (according to Form No. 33 data). The structure and sites of the disease for new TB cases with extrapulmonary forms and respiratory TB (RTB) with extrapulmonary site of the disease will be reviewed in detail in Chapter 6.

The proportion of severe TB forms among new PTB cases reflects the effectiveness of TB case-finding activities. Cases with destruction of pulmonary tissue (TB with cavities) and fibrous-cavernous tuberculosis[22] (FCTB) are registered in the reporting forms. Particular attention is given to the most epidemiologically dangerous cases – laboratory-confirmed TB cases with bacillary excretion (see Section 2.5).

Following a statistically significant decline (from 51.6% to 45.8%) in 2006–2009, the proportion of destructive TB forms among new pulmonary TB cases registered at TB facilities in the RF entities has remained stable (45.9%, 2010, Fig. 2.17a).

However, there are substantial territorial differences in this indicator in the RF (Fig. 2.17b). A considerable share in the destructive forms among new TB cases is traditionally linked with late case detection. Nevertheless, a low value of this indicator may indicate not only successful early detection of cases, but also low effectiveness or limited use of radiological TB diagnostic tools (X-ray diagnostics) for patients' examination.

The share of FCTB in the total new pulmonary TB cases is an important indicator of shortcomings of early case finding (Fig. 2.18). This indicator increased from the late 1980s to the late 1990s, and starting from 1999 a significant overall decrease in the share of this most epidemiologically dangerous PTB cases has been observed. In 2010, the proportion of FCTB among new PTB patients was 1.8% (2.0% in 2009). The decline in the percentage of FCTB cases may reflect the enhanced effectiveness of TB case detection.

Similar to the percentage of destructive PTB cases, the share of FCTB cases varies significantly in RF areas. Although currently there are fewer areas with high FCTB rates compared to 2009 data, in certain RF entities this indicator exceeds 5% (Kursk Region – 6.3%, Nizhny Novgorod Region – 5.2%, Kabardino-Balkaria – 7.5% and Kamchatka Krai – 7.2%). In 2010, there were no registered cases of this TB form in six RF entities, and in four areas its share was 0.1–0.3%. However, this may indicate both effective TB control activities and shortcomings in diagnostics and notification of cases.

2.5. Laboratory-confirmed new TB cases (bacteriologically positive TB cases)

Severity of the epidemiological situation depends first and foremost on the number of the most dangerous sources of infection – cases with excreting TB bacilli (MbT+ TB cases), that is, TB cases with the laboratory confirmation of TB diagnosis.[23] Thus, from the epidemiological perspective, such indicators as notification rates of MbT+ tuberculosis cases and the proportion of MbT+ cases among new TB cases are of particular importance.

Similar to national notification rates, in the recent years some stabilization has been observed in the microbiologically confirmed new TB case notification rates. MbT+new TB case notification rates for cases diagnosed by any laboratory method has remained at 34–35 per 100,000 population, and the new TB case notification rates among MbT+ cases diagnosed by microscopy at 23–24 per 100,000 population (Fig. 2.19). This indicator reflects both changes in the number of these particularly epidemiologically dangerous cases and improvement in the quality of TB laboratory diagnostics, which is assessed by the share of MbT+ cases in all TB cases. The latter indicator (pro-

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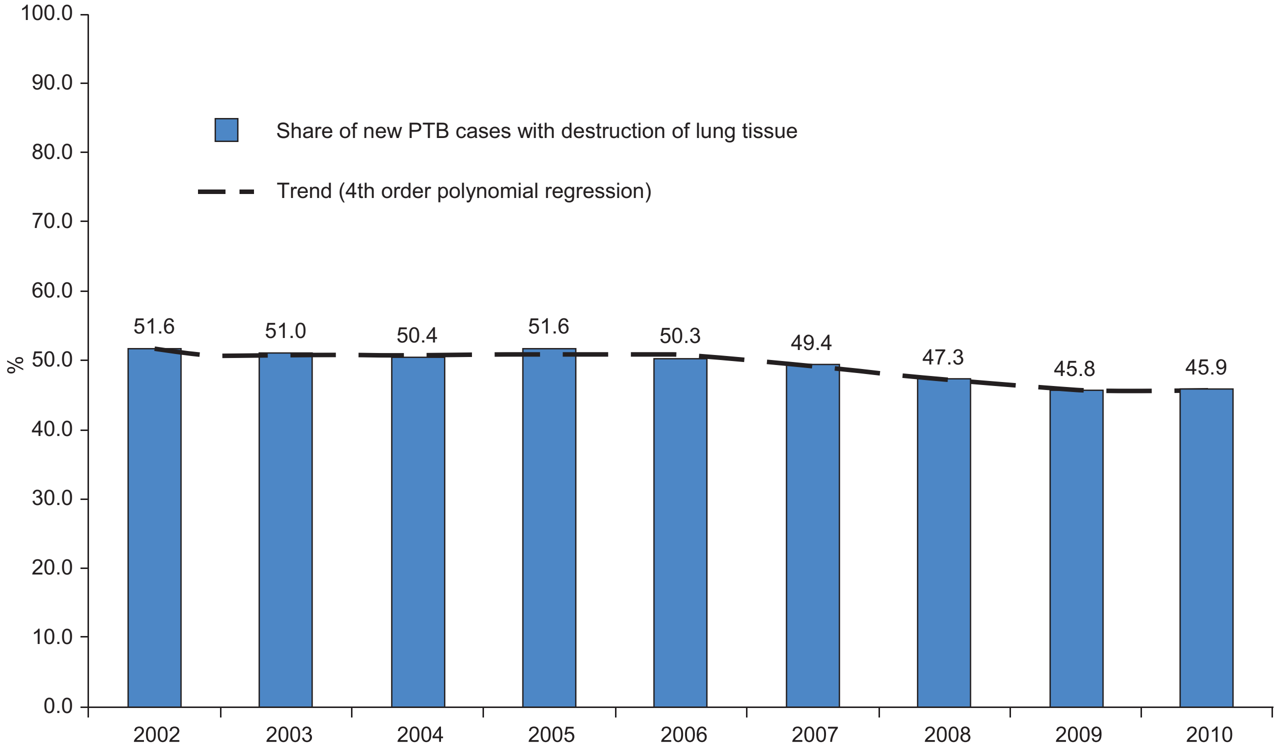
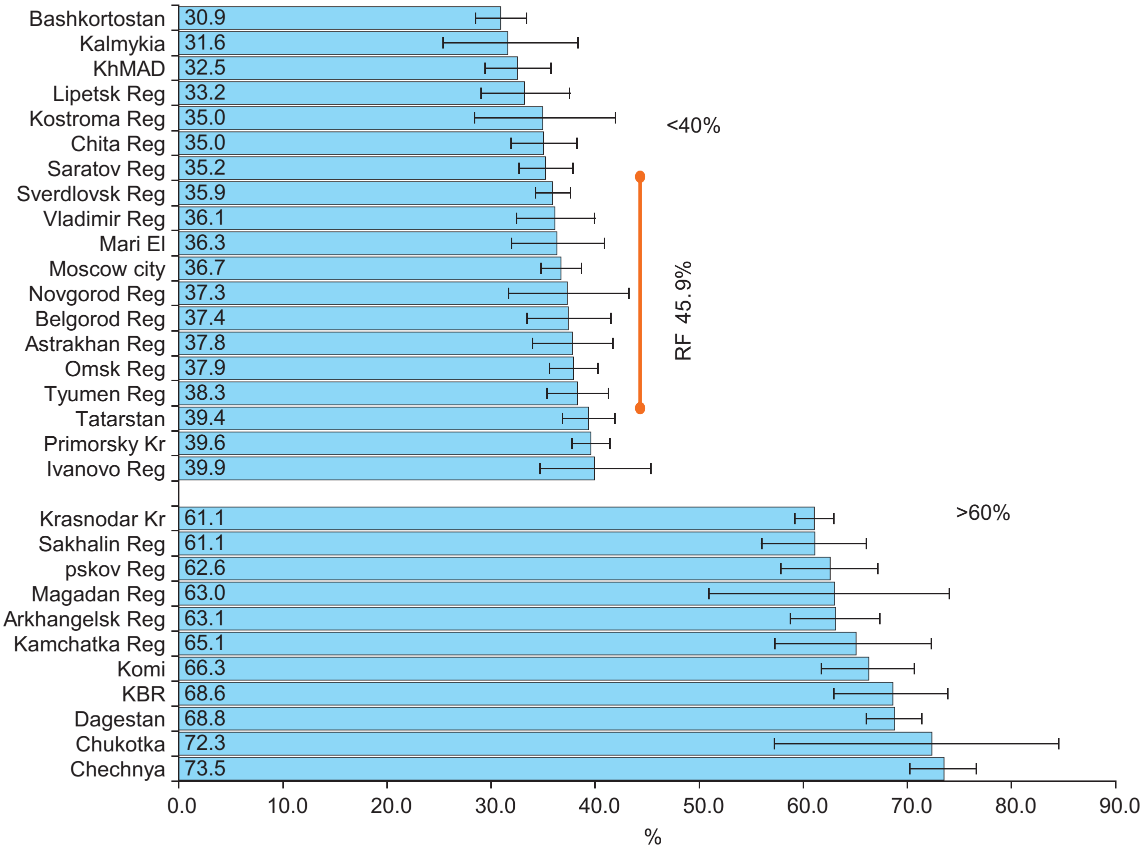
[22] These are the most severe pulmonary TB forms registered in the Russian statistical reports. "Fibro-cavernous" is defined as tuberculosis with chronic course and extended lung cavitations and fibrosis. – note by the translation editor.

[23] According to the Russian TB statistical system, the term "bacteriological positive TB cases" includes TB cases with laboratory confirmation of the diagnosis only by microscopy (ss+) and/or culture (cu+), while "bacteriological positive cases diagnosed by any methods" means laboratory confirmation by microscopy and/or culture only. – note by translation editor



a) Changes in the indicator in 2002–2010.



b) The share of destructive PTB forms among new TB cases in the RF entities with the highest (over 60%) and the lowest (below 40%) values of indicator, Russian Federation, 2010. (Error bars indicate 95% CI)

Fig. 2.17. The share of new TB cases with destruction of pulmonary tissue registered at TBFs in the RF entities, 2002–2010 (Source: Form No. 33)

portion of MbT+ cases in various TB patient groups, for example, new TB cases or retreatment cases) can be used for indirect assessment of the quality of laboratory testing for TB diagnosis confirmation or treatment monitoring.

With TB reporting, which is currently somewhat excessive in Russia, there are several options for calculating the share of MbT+ patients among new TB cases.

Depending on the reporting form (No. 33, No. 8 or No. 7-TB) the calculation can be based on data on various patient groups (those registered at the TB facilities in the RF entities or all registered cases including, *inter alia*, cases in the penitentiary system), on various sites of the detected TB disease (all TB cases, RTB or PTB) and on various methods of laboratory confirmation (all methods, microscopy, culture).

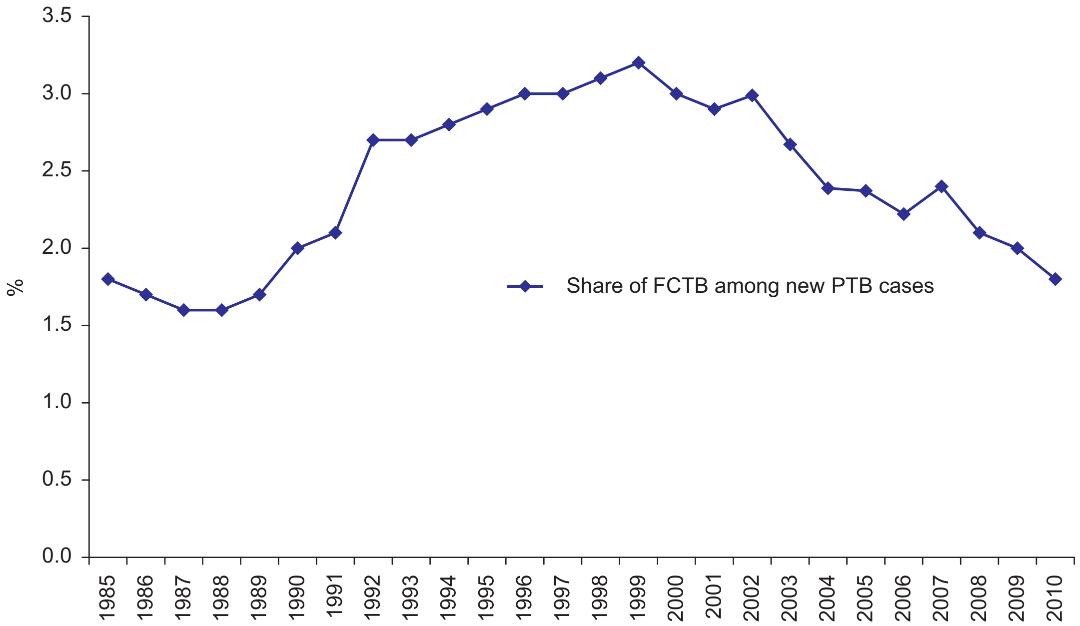


Fig. 2.18. The share of fibrous-cavernous TB (FCTB) in new PTB cases registered at TBFs in the RF areas (Source: Form No. 33 for resident population)

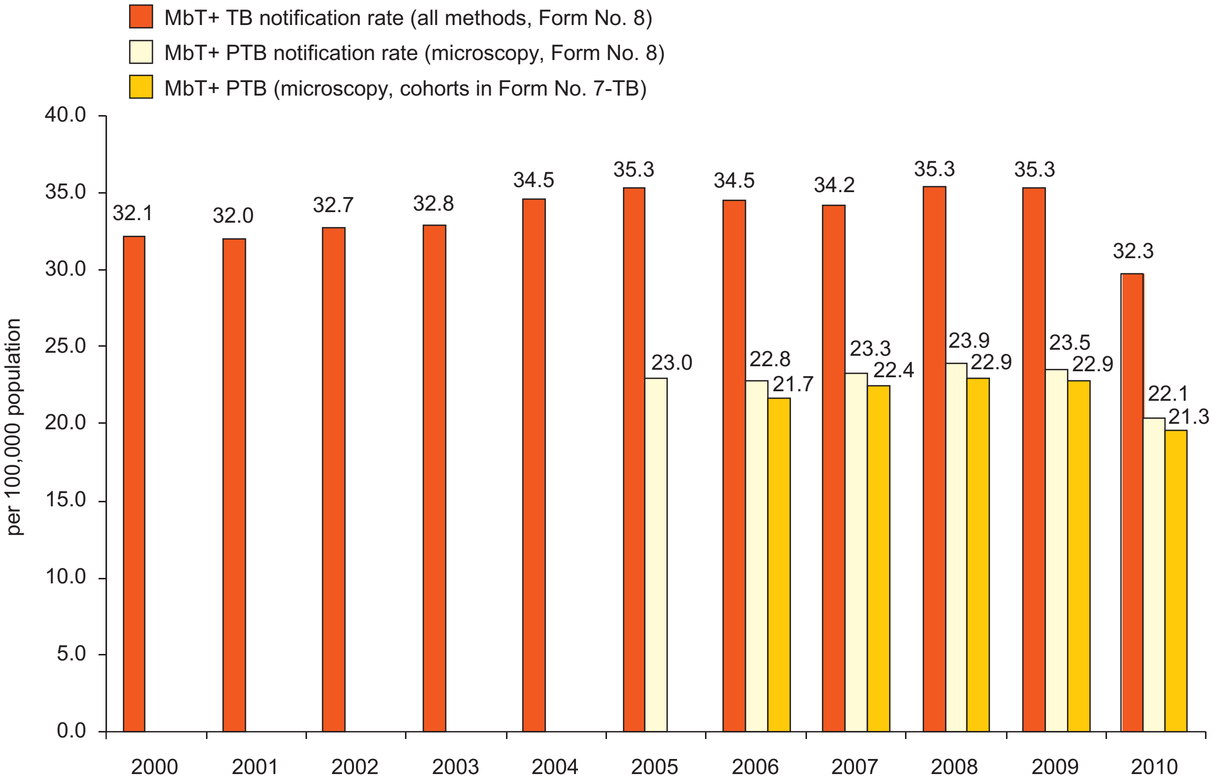


Fig. 2.19. The new MbT+TB case notification rates: (1) all sites, MbT+ confirmed by any method (Form No. 8);
(2) pulmonary TB, diagnosed by microscopy (ss+ PTB, Form No. 8);
(3) pulmonary TB, diagnosed by microscopy (ss+ PTB, Form No. 7-TB, cohorts).
(Sources: Form No. 8, Forms No. 7-TB of MoH&SD and FSIN; population data: Forms No. 1 and No. 4)

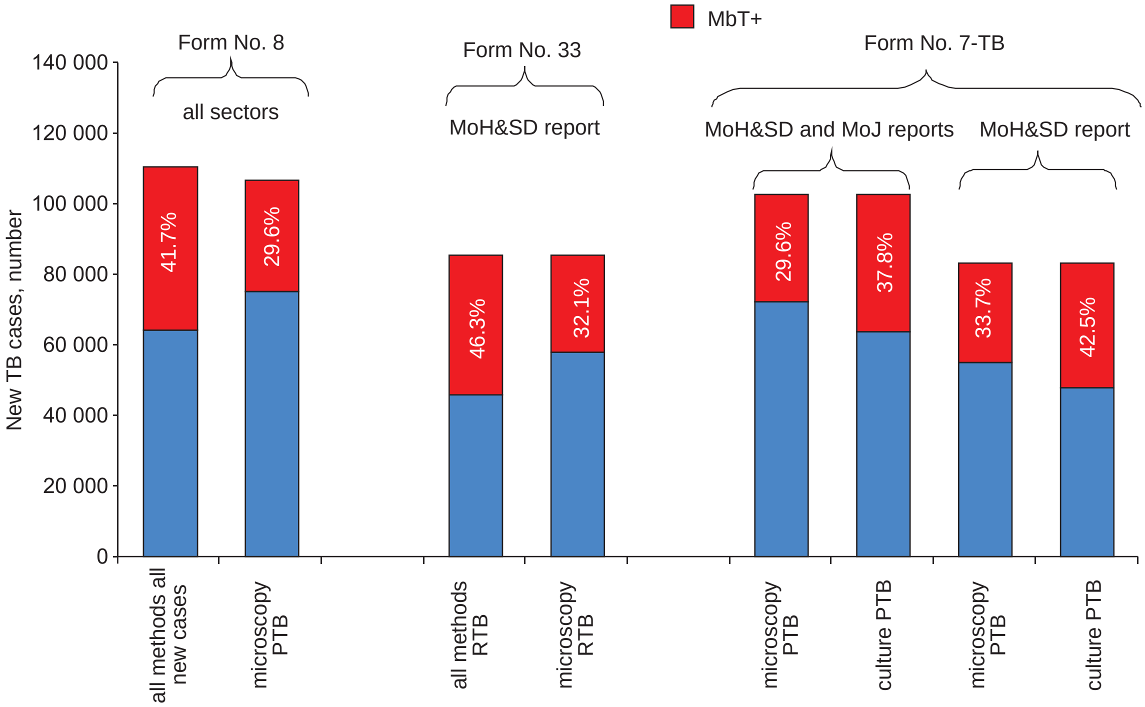


Fig. 2.20. Proportion of MbT+ cases diagnosed by various methods among all new TB cases, new respiratory TB cases (RTB) and pulmonary TB cases (PTB), Russian Federation. Reporting Forms No. 8., No. 33 and No. 7-TB of 2010.

Fig. 2.20 shows that the most commonly used indicators reflected the share of MbT+ patients among new TB cases and their rates in 2010. The data in reporting Form No. 8 make it possible to calculate the proportion of all new MbT+ cases detected in the RF constituent entities that were determined by any method within all sectors, including MoH&SD and FSIN (41.7%).[24] The share of MbT+ cases among pulmonary TB cases diagnosed by microscopy (29.6%) is of particular interest. Form No. 33 provides the data for calculating this indicator for RTB in the resident population, that is, among the cases that were registered at the TBFs inthe RF areas. Among them, the share of MbT+ cases diagnosed by microscopy was 32.1%, by any method 46.3%.

Form No. 7-TB established by the Executive Order of the RF Ministry of Health [35] makes it possible to collect the most accurate and complete results of laboratory tests. The annual reporting Forms No. 8 and No. 33, which have been used for many years by Russian TB services, contain aggregate data that are being collated by the end of December. Therefore these reports do not include the results of culture tests in most of the new TB cases registered in November and December of the reporting year; that is, the data for MbT+ cases in these forms are not complete.[25] Besides, Forms No. 8 and No. 33 include the numbers of new culture-confirmed TB cases only since 2009.

Form No. 7-TB is submitted at the beginning of the second quarter of the year following the reporting year. From the time it was established it may already comprise complete annual data for new MbT+ PTB cases – both microscopy- and culture-confirmed. Form No. 7-TB also contains information about the coverage of new PTB cases by smear microscopy and culture [28] .[26] In most RF regions and in the country as a whole, microscopy coverage of new TB cases has been consistently high: 98.7% nationwide, ranging from 94.3% in NCFD to 99.3% in FEFD (2010 RF MoH&SD reports). On the other hand, coverage by culture examinations relies to a considerable extent on availability of adequate laboratory services. This rate was approximately 80% in NCFD and FEFD (respectively, 82.1% and 75.0%), though it was quite high in other Federal districts: from 91.5 to 97.4%, with the national indicator of 92.6%. Low coverage with culture examinations is characteristic of Amur Region (6.4%), the Republics of North Ossetia-Alania (39.6%) and Chechnya (57.5%), and in Moscow Region (60.6%); the rates in these areas have been consistently low for at least three recent years.

There is another reason that prevents the use of reporting Forms No. 8 and No. 33 for correct calculation of such indicators as “MbT+ TB case notification rate” or “proportion of MbT+ cases among new TB cases.” The existing guidelines for completing the tables in Forms No. 8 and No. 33 (entering the numbers of MbT+ cases

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[24] All percentage values of MbT+ TB cases in describing Fig. 2.20 are based on the data for 2010.

[25] The same also applies to the data on TB drug resistance status; see below.

[26] Form No. 8 does not contain these data, and in Form No. 33 the testing coverage data have been provided since 2009 for RTB cases and require additional checking for accuracy.

among new TB cases) are not specific about the exact time when MbT+ status of a case has to be confirmed (in relation to the case registration date, or, more specifically, to the start of treatment date).

As a result, in some RF areas the laboratory-confirmed data on MbT status are entered in the notification forms of new TB cases not only at the moment of registration, but also after the bacillary excretion is detected during the course of treatment (e.g., in 1–3 months after registration). Consequently, initially MbT− new TB cases, which at a later stage were found to be MbT+, were included in the number of new MbT+ TB cases in Forms No. 8 and No. 33. Moreover, there were subsequent corrections in the data on MbT+ TB cases in the recording documents.

It should be emphasized again that the data on laboratory-confirmed MbT+ TB cases among new TB cases are collected (a) to assess MbT+ new TB case notification rates, that is, to assess the spread of the most contagious TB form – MbT+ pulmonary tuberculosis – in the population; and (b) to evaluate the performance of laboratory services in TB detection. Therefore, a patient has to be registered and notified as a ”new MbT+ case” in Forms No. 33 and No. 8, only if his/her MBT+ status was confirmed before the initiation of treatment.[27] The collected data can be used for the above-stated purposes only if these conditions are fulfilled.

Detection of the bacillary excretion in a patient while on treatment, supervised by a doctor, is not very relevant from the epidemiological perspective. Moreover, a population-based rate (per 100K) that is calculated to include cases with bacillary excretion detected after the notification characterizes one of the prevalence indicators rather than the incidence rate (see more information in Chapters 4 and 9).

Thus, currently the indicators related to the number of MbT+ cases among new TB patients can be most accurately calculated based on the data from sectoral reporting Form No. 7-TB.

According to 2010 data from Form No. 7-TB of MoH&SD [28], among all cases registered at TB facilities in the RF entities the proportion of new sputum smear positive (ss+) PTB cases is 33.7% (33.5% in 2009), and the proportion of new culture-positive PTB cases is 42.5% (41.8% in 2009).

According to the reporting forms (Fig.2.21), the minimum level of TB diagnosis confirmation by laboratory methods was recorded in 2000 (35.5% MbT+ cases diagnosed by all methods for all sites of disease). The growth of this indicator until 2005 against some stabilization of the epidemiological process was a reflection of improved diagnostic practices in the laboratory service. Since 2005, its value has remained virtually unchanged, and the indicator has been within the 41–43% range, which, by definition, is not sufficiently high, since these values are considerably lower than the globally accepted 50% of microscopy-confirmed and 75% of culture-confirmed cases [77]. In 2010, following a slight two-year increase, the proportion of new TB cases with culture-confirmed diagnosis has shown a statistically significant decline to 41.7% (42.7% in 2009, p<0.01).

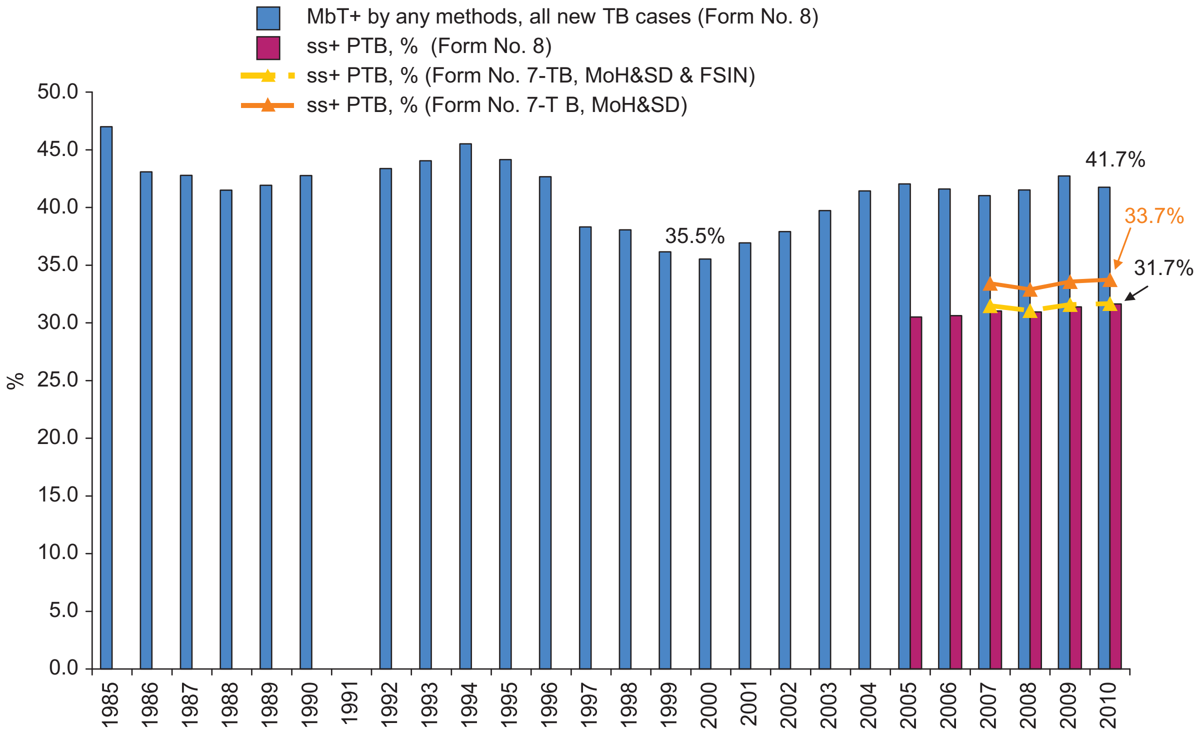

Fig. 2.21. Proportion of new MbT+ TB cases, Russian Federation: bacillary excretion diagnosed by any method among all new TB cases (Form No. 8) and by microscopy (ss+) among new PTB cases (Forms No. 8 and No. 7-TB)

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[27] More precisely, if the collection date of the clinical specimen preceded the date of case registration or treatment initiation.

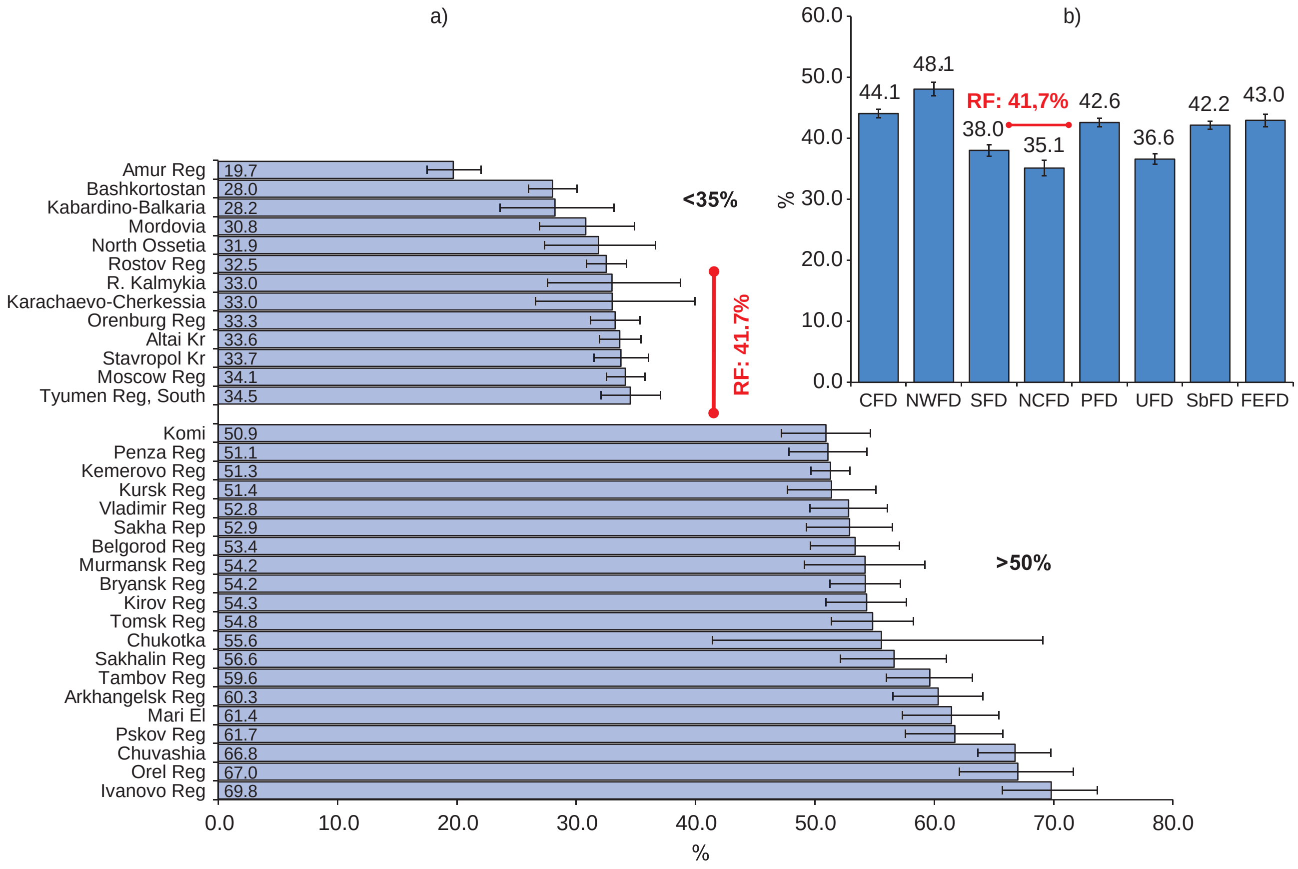

Fig. 2.22. Proportion of new MbT+ pulmonary TB cases confirmed by any method: (a) by RF entity groups with the lowest (under 35%) and highest (over 50%) values of the indicator and(b) by federal districts, the Russian Federation, 2010 (Source: Form No. 8; the error bars indicate 95% CI)

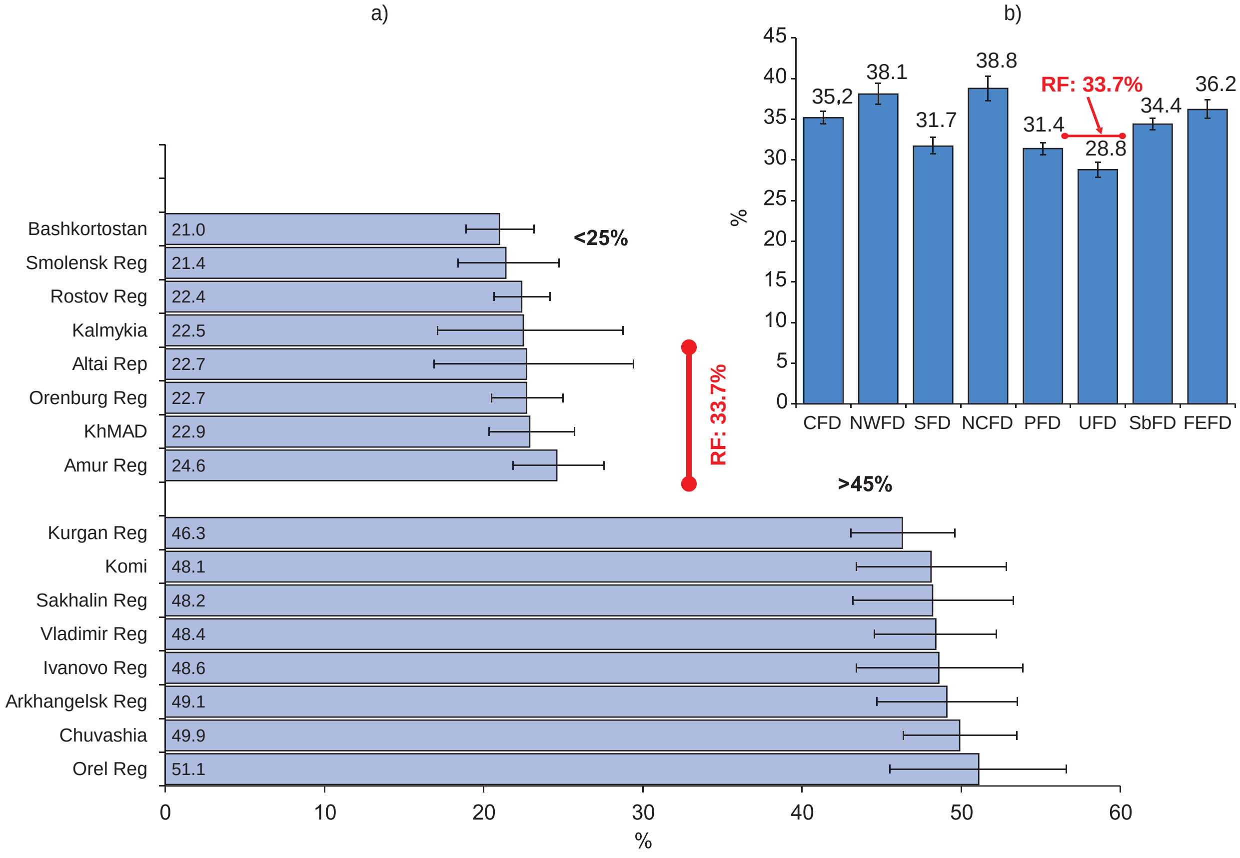

Fig. 2.23. Proportion of new SS+ PTB cases: (a) by areas with the indicator values < 25% and > 45%, and (b) by federal districts, the Russian Federation, 2010 (Source: Form No. 7-TB)

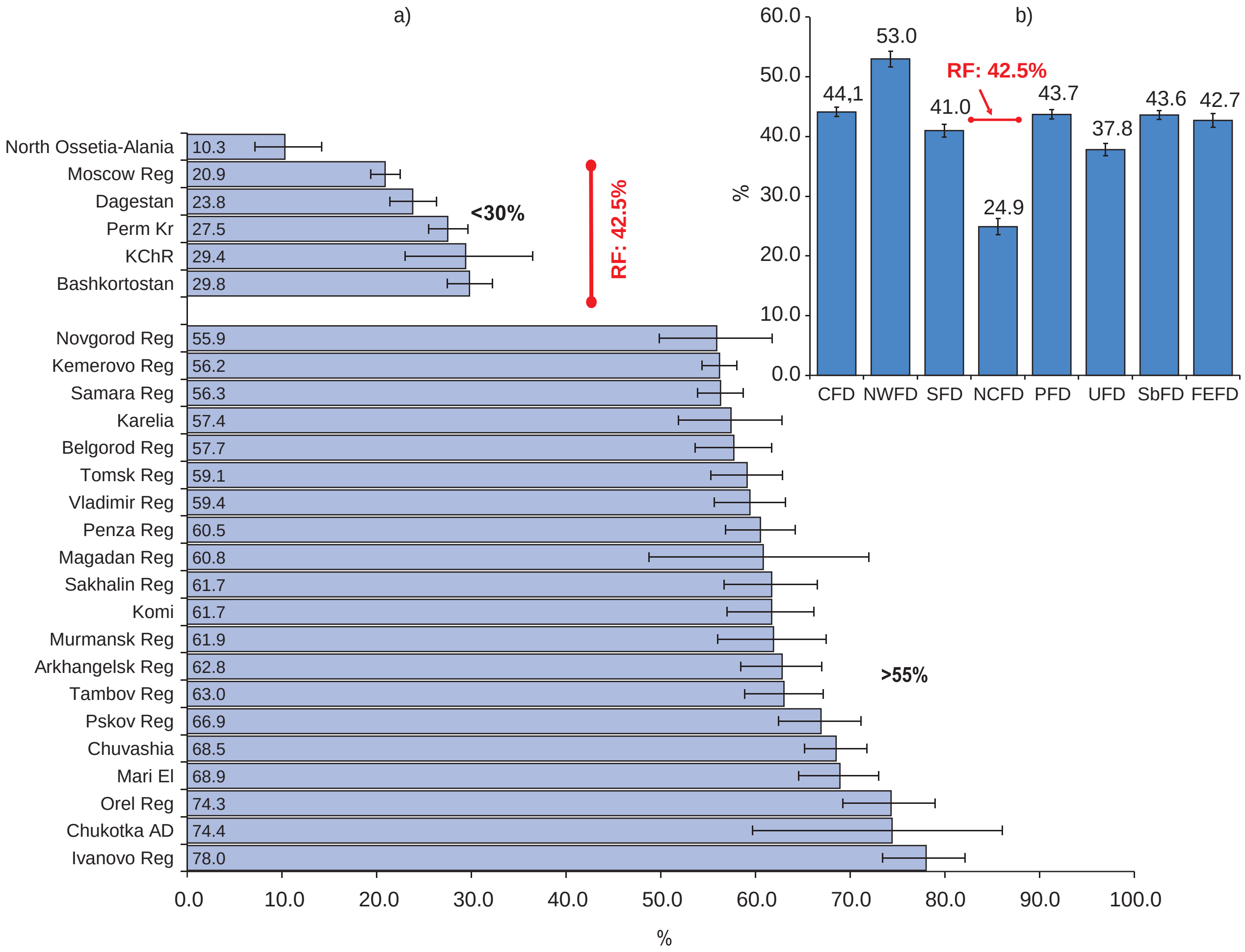

Fig. 2.24. Proportion of new culture-positive PTB cases: (a) by RF entities with the indicator values < 30% and > 55% and (b) by federal districts, the Russian Federation, 2010 (Source: Form No. 7-TB, includes areas with > 50% coverage of new cases by culture testing)

Based on the data in the reporting form for cohort analysis (Form No. 7-TB), the proportion of new sputum smear positive PTB cases remained virtually unchanged over the last two years and was 33.7% (33.6% in 2009)[28] according to the MoH&SD report and 31.7% according to the joint report by the MoH&SD and FSIN (31.6% in 2009).

Only in 20 RF entities (Fig. 2.22) in 2010 did the proportion of new MbT+ cases of pulmonary tuberculosis confirmed by any method exceeded 50%; in 13 entities the indicator was under 35%, and in the Republics of Kabardino-Balkaria and Bashkortostan and the Amur Region it was under 30%.

The percentage of SS+ PTB cases (Fig. 2.23) was above 50% only in the Orel region (in 2008 there were five such areas, and in 2007, eight). In eight RF entities this indicator was below 25%.

The proportion of new culture-positive PTB cases (Fig. 2.24) was over 55% in 20 areas, and in 9 areas this indicator was under 30% (in 2009 the number of such RF entities was 16 and 5, respectively). Not included in this group (nor represented among the areas in the graph) are the Amur region with <15% coverage of culture testing, the Republic of Kabardino-Balkaria with cu+ PTB cases of just 7.1% and lack of data on the number of patients for whom culture testing was not performed, and the Chechen Republic where virtually no culture testing was performed in 2010 due to lack of a bacteriological laboratory.

It should be noted that in 2010, similar to the previous year, coverage with culture examinations remained very low (59.7%, with 64.6% in 2009), just as a proportion of culture-confirmed TB cases (20.9%) in such a key federal entity as the Moscow region. Even excluding the patients who were not culture tested in this area, the proportion of cases confirmed by this method (just 35%) is low. Particular attention should be given to the poor quality of laboratory diagnosis in the Moscow region, a constituent entity of the Russian Federation with a population of

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[28] The results for 2009 cohort analysis were finalized during data processing in 2010; therefore, certain indicators that were included in the 2009 text slightly differ from the values published in the previous edition of the review [A3].

6.7 million, which is the closest neighbouring area to the Moscow megalopolis with the annual detection rate of nearly 3,000 TB cases.

It should also be noted that in some constituent entities a low percentage of Cu+ TB cases (based on reporting Form No. 7-TB) may also reflect incompleteness of reporting data on the coverage and results of culture testing. This may be explained with unsatisfactory interaction of the laboratories and surveillance units at the TB dispensaries.

Altogether the given indicators signal a need of further actions to improve the laboratory services, particularly in the South, Privolzhsky and Ural Federal districts for the microscopy component, and in the South, North Caucasian and Ural Federal districts for the culture testing component. The administrative areas in the NWFD show high rates of the laboratory-confirmed diagnosis (both by microscopy and culture).

One of the key indicators of TB case-finding management is the ratio of pulmonary ss+ TB cases detected at the primary health care (PHC) facilities to those who are diagnosed at the TB facilities [34, 35]. This indicator is determined on the basis of data from sectoral reporting Form No. 7-TB. The national value of this indicator is not very high, but noteworthy is its continuous statistically significant growth in recent years – from 12.5% in 2006 to 18.1% in 2010. Smear microscopy should become a routine method of differential diagnostics performed at the PHC facilities. However, despite its relative simplicity, this diagnostic tool is still insufficiently practiced at the PHC facilities, although the extent of its use broadly varies among the constituent entities of the Russian Federation. In 2010, in 13 RF entities the share of SS+ PTB cases detected at the PHC facilities was at least 40% (Fig. 2.25).

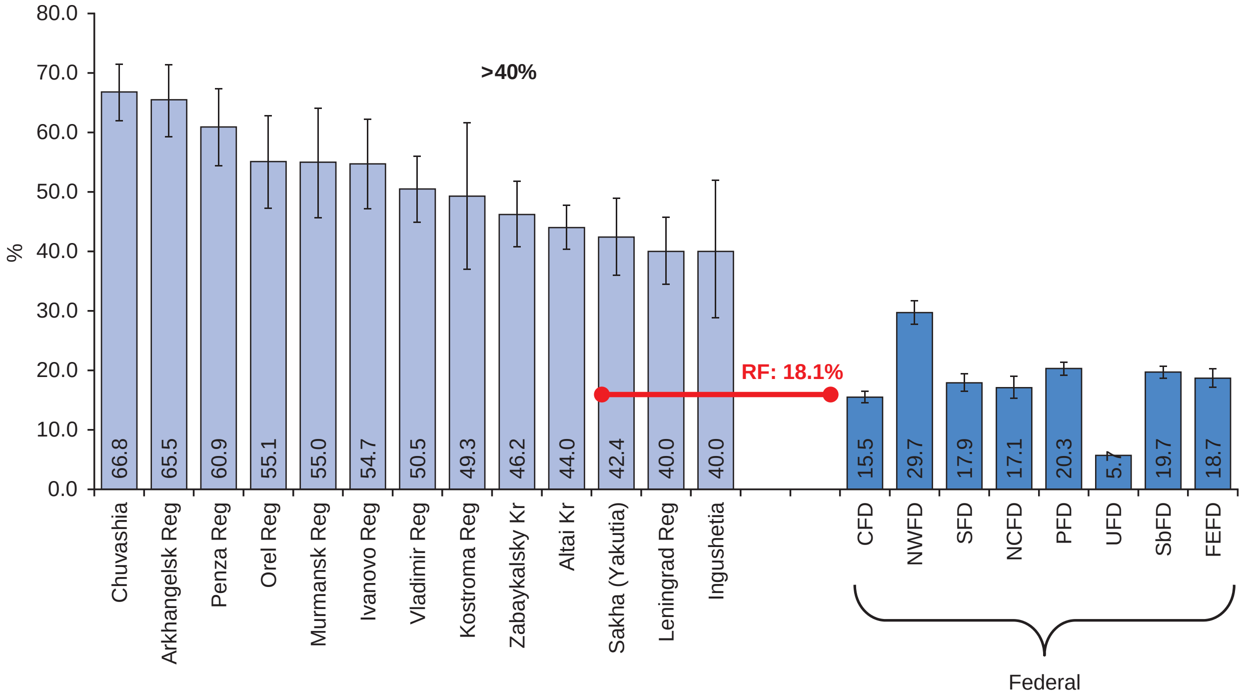

Fig. 2.25. Ratio of SS+ pulmonary TB cases detected at PHC facilities to cases diagnosed at TB facilities. RF entities with the ratio > 40%, and the indicator values in the Federal districts, 2010 (Source: Form No. 7-TB)

The ratio of MbT+ RTB cases to the number of patients with destructive changes in the lungs is an important characteristic of the microbiological laboratories' performance. It reflects the rate of MbT+ diagnosis among the most severe cases of respiratory TB and the adequacy of laboratory service activities in TB case finding and diagnosis confirmation. In recent years (Fig. 2.26) this indicator has reached 100% and even exceeded this value, with a significant increase (from 100.3% in 2007 to 111.8% in 2009) observed in 2008–2009. In 2010, the indicator value remained almost unchanged, with a slight decrease to 108.2%.

Based on Form No. 33 data, this indicator, despite its limitations, suffices for indirect assessment of changes in laboratory confirmation of cavitary pulmonary TB cases over several years.

A more precise evaluation of the quality of TB laboratory diagnostics can be performed using a proportion of MbT+ cases among new TB cases of cavitary PTB, which directly indicates the capabilities of microbiological confirmation of the diagnosis. The values for this indicator became available upon introduction of sectoral reporting Form No. 7-TB [34, 35], and the data became sufficiently complete after 2007.

According to sectoral reporting Form No. 7-TB for cohort analysis, in 2007–2009 the national indicator of pulmonary cavitary TB cases confirmed by microscopy was just 57–59.0% (Fig. 2.26). This is a sign of as yet insufficient effectiveness of diagnostics by microscopy. At the same, time in a number of RF entities this indicator is quite high (Fig. 2.27): in the Republic of Chuvashia, Ivanovo, Orel, Kostroma and Vladimir regions it exceeded 80%. It was below 45% in Lipetsk, Orenburg, Leningrad and Smolensk regions, and in the Republics of Karachaevo-Cherkessia, Altai, Kabardino-Balkaria and Chukotka AD.

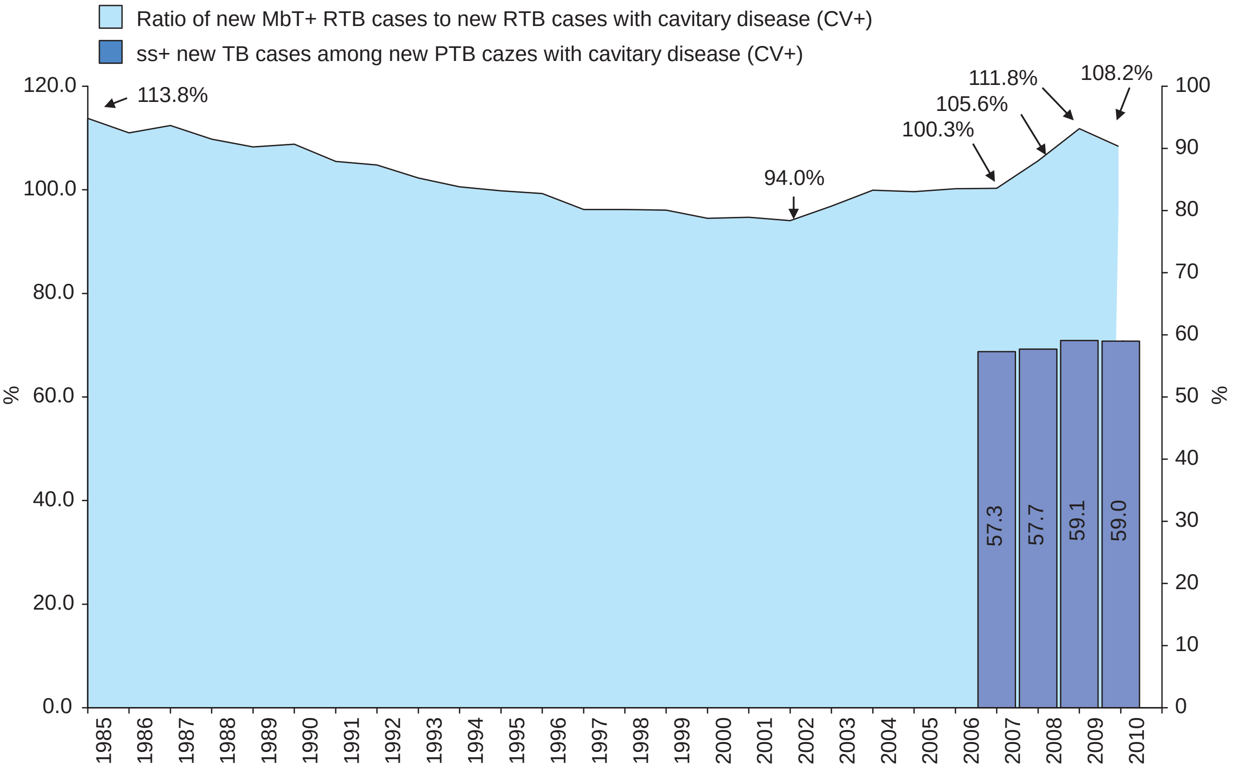

Fig. 2.26. The ratio of MbT+ cases to the number of cases with destructive changes in the lungs among RTB cases (excluding FSIN data, Form No. 33); and the proportion of sputum smear positive cavitary PTB cases (Form No. 7-TB of Russian MoH&SD), Russian Federation.

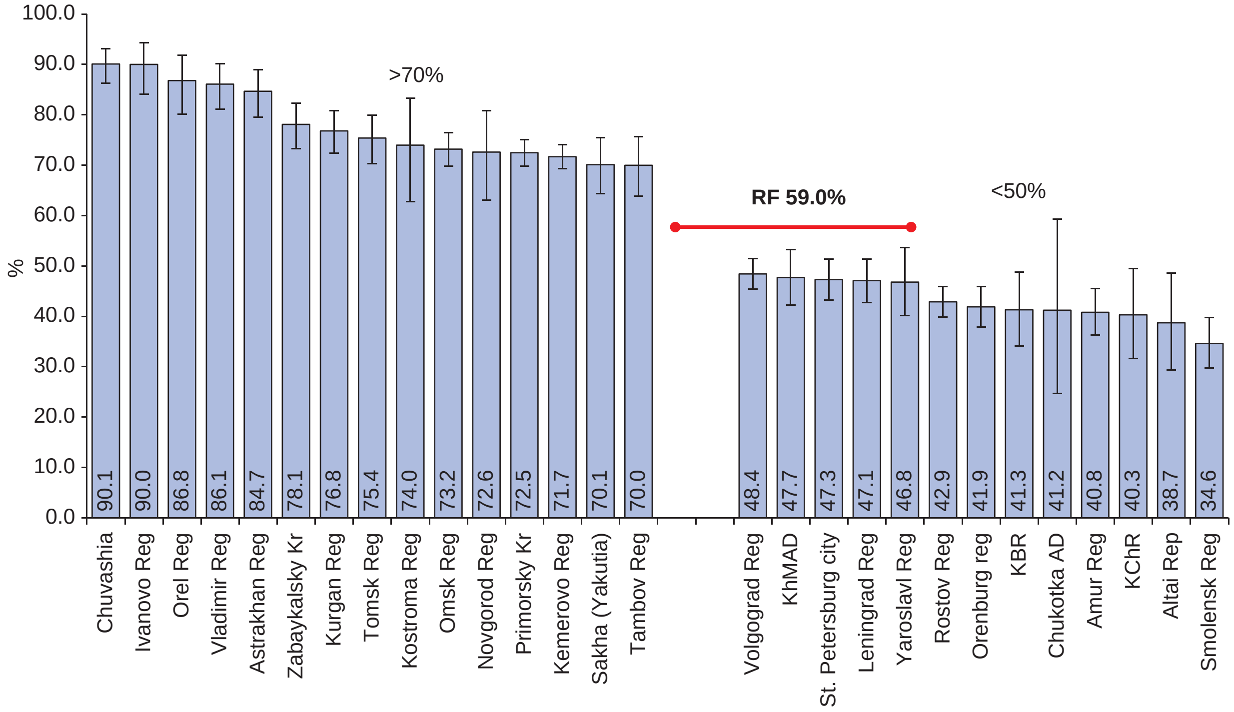

Fig. 2.27. The proportion of SS+ new TB cases in new PTB cases with destructive changes in the lungs, 2010. Two groups of RF entities: with low (under 50%) and high (over 70%) indicator values (reporting data by the MoH&SD, Form No. 7-TB)

Currently the ratio of MbT+ cases to new TB cases with destruction of lung tissue and the proportion of MbT+ cases among the latter indicate the quality of microscopy diagnosis rather than the quality of X-ray examination. Therefore, these values can be viewed as cumulative indicators of microscopy diagnosis as a whole. They are affected by the quality of collection of diagnostic specimens and the laboratory testing techniques that depend on qualification of laboratory staff and availability of proper equipment and consumables. In recent years Russia implemented a system of external quality assurance for laboratory examinations; it is based on panel testing and allows objective evaluation of laboratory capability to perform adequate microbiological testing for TB. However, microscopy is one of the most important – but not the only – component in the process of laboratory diagnostics of TB. The system of external quality assurance is discussed in detail in Chapter 11, "External quality assurance of *M. tuberculosis* detection and drug sensitivity testing in the Russian Federation."

2.6. New TB case notification rates among persons having contact with TB patients

Form No. 33 contains such essential data as a number of new TB cases who had contact with TB patients, both with and without bacillary excretion ("TB contacts" and "MbT+ contacts"). By the beginning of the 21st century the new TB case notification rate among persons who had contact with MbT+ cases exceeded 800 per 100,000 average annual number of registered TB contacts. In recent years it has been declining gradually and reached 777.5 per 100,000 contacts (805.3 in 2006, see Fig. 2.28).

In 2009 Form No. 33 was amended in the part containing data on TB contacts. The collected information (including data on new TB cases who registered as a person who had history of contact with TB patients) now is directly linked to the dispensary follow-up groups (DFG) IVA and IVB (Russian "TB contacts" follow-up group). As a result, TB "transferal" between the follow-up groups and the notification rates are reviewed separately for the following:

– adults "having household or occupational contact" with an MbT+ or MbT− tuberculosis case (IVA);
– adults "having professional contact with a source of TB infection" (IVB);
– children "having contact with an MbT+ tuberculosis patient" (IVA);
– children "having contact with an MbT− tuberculosis patient, in families of cattle breeders or having animals with tuberculosis" (IVB).

These amendments resulted in improved reliability and accuracy of the collected data and, ultimately, enhanced their completeness and quality. For the first time statistical reports include the number of persons in occupational contact with an infectious case (DFG IVB) and those who developed TB. The latter may have been previously included in the number of contacts with MbT+ patients who developed TB. Moreover, adults in occupational contact with TB patients (DFG IVB) have not been sufficiently registered: apparently, until 2009 they were not always included in the group of individuals in contact with MbT+ patients reported in Form No. 33.

All of the above may have caused overestimation in new TB case notification rates for contacts by including persons who developed TB due to occupational contact with TB cases in calculation of the numerator for the notification rates of individuals in contact with MbT+ cases on the one hand, and on the other hand underestimation of the denominator value in calculation of this indicator due to incomplete inclusion of DFG IVB persons.[29]

Therefore, it may be assumed that new TB case notification rates for TB contacts that are calculated on the basis of 2009–2010 data are more precise in reflecting the true value of this indicator than the values published until 2009, which may have been overestimated (see Fig. 2.28).

In 2010, the total number of notified TB cases among persons in contact with MbT+ patients was 1,906 (2,040 in 2009), including 1,110 adults in household and occupational contacts, 200 adults in professional contacts and 596 children aged 0–17.[30] TB cases developed among 355,983 MbT+ contacts registered in DFGs as of the end of 2010 (including 184,432 adults in household and occupational contacts, 82,762 adults in professional contact with infection sources and 88,789 children aged 0–17 years).

There has been a decrease in the overall notification rates for contacts with MbT+ cases and for adults in household and occupational contact with MbT+ cases, similar to the decrease in the overall notification rate. In 2010, they were 529.1 and 593.6, respectively (per 100,000 average number of annual contacts).

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[29] For instance, the latter assumption is supported by the following fact. After the new reporting system was introduced in 2009 for all contacts with MbT+ tuberculosis patients as of the end of 2008 (177,712 persons), their nationwide transferring between DFGs has generally been balanced if based on the registration and removing from the DFR's registers of only MbT+ IVA group cases and not all contacts with MbT+ cases. The resulting number of persons registered as MbB+ contacts if calculated from the initial 177,712 persons with changes in number derived from DFG IVA MbT+ is very close to the number of persons registered in DFG as MbT+ IVA at the end of 2009 (184,432 persons, Form No. 33). This means that in 2008 persons registered in DFG IVB were almost completely excluded from the total number of MbT+ contacts.

[30] See Chapter 5.

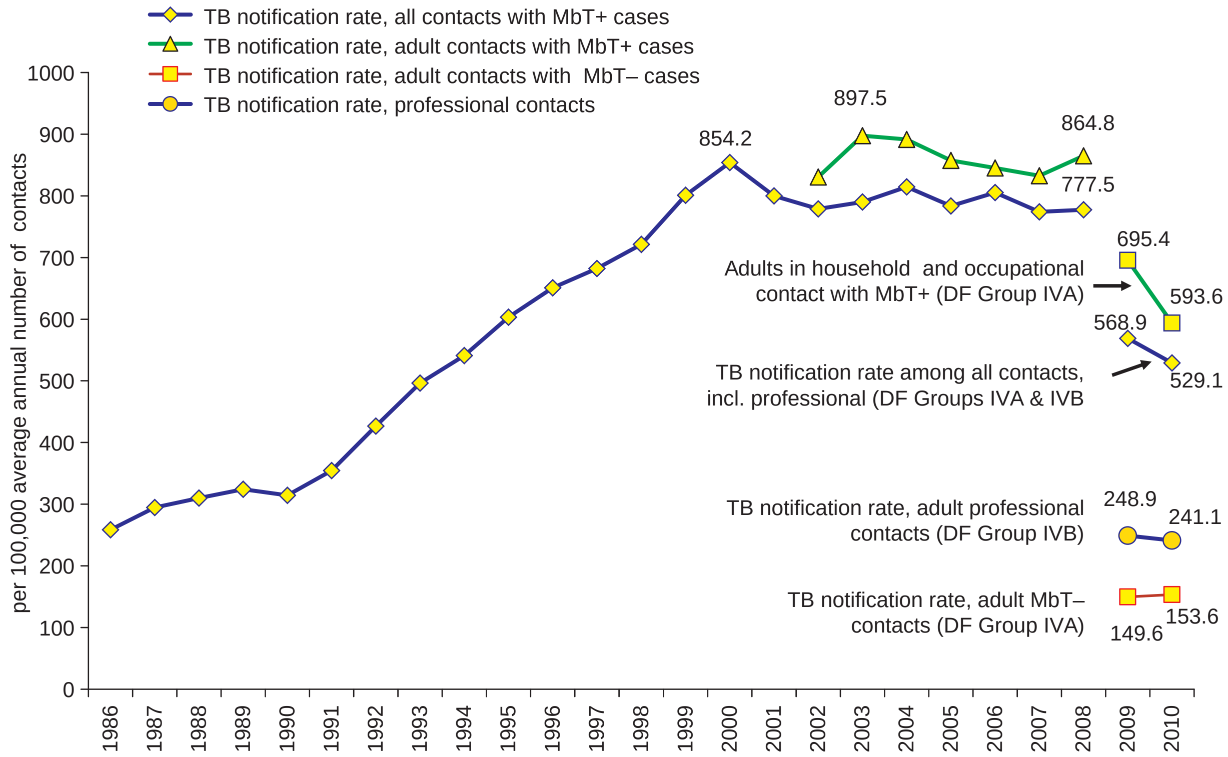

Fig. 2.28. Notification rates among adults, children and all contacts with MbT+ and MbT− tuberculosis patients, the Russian Federation (Source: Form No. 33, data of 2007, excl. the Republic of North Ossetia[31])

As noted earlier, reporting new TB case notification rate among professional contacts of MbT+ cases, which started in 2009, was 241.1 per 100,000 average annual contacts. The value exceeds the national notification rate by more than 3 times, and 2.4 times the notification rate in the economically active age group of 25–55 years of age, indicating certain problems with infection control management in the health care facilities of Russia.

In 2010, the overall notification rate was almost 7 times higher among persons in contact with MbT+ cases than in the resident population.

The new TB case notification rate among MbT+ adult household and occupational contacts (593.6 per 100,000 average annual contacts, 2010) was almost 4 times higher than this rate for MbT− contacts (153.6 per 100,000 contacts in 2010). This once again underscores the need to focus particularly on MbT+ cases as the most epidemiologically dangerous group of TB cases.

2.7. Management of TB case finding in the Russian Federation

The new TB case notification rate and the structure of detected TB cases depend to a considerable extent on how TB case finding is organized within a region [3].

Currently radiology remains the most common method of TB detection in the Russian Federation. Fluorography is conducted for all persons seeking medical help at polyclinics who have not had an X-ray examination in the current year, as well as for populations at higher risk of developing TB (diabetic patients and those on glucocorticoid treatment, radiation therapy etc.).

In 1985–1987 the country achieved its highest TB screening coverage (75% of the population). In the early post-USSR years the situation changed dramatically: the scope of planned and actual preventive screening decreased, and less than half of the persons belonging to the mandatory screening population groups were examined. By the beginning of the 2000s the coverage of the population with active TB case finding increased slightly and leveled off at 57v58%, with the proportion of TB cases detected by screening examinations remaining below 53–54% (Fig. 2.29, Table 2.2).

To increase the scope and quality of TB case finding in the Russian Federation, in 2006–2008 PHC facilities were re-equipped (digital fluorography equipment supplied within the National Health Project) and bacteriological laboratories at TB facilities were modernized (provision of equipment and training of personnel funded from

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[31] The 2007 notification rates for contacts do not include data from the Republic of North Ossetia-Alania, as they need verification (e.g., the number of adult contacts who developed TB in 2007 was 881, although in the previous years it was 0–2).

an IBRD loan and a GF grant). These activities and implementation of the subprograms "Urgent measures for TB control in Russia" within the Federal Targeted Programme "Prevention and control of social diseases (2002–2006)" resulted in a statistically significant growth of both indicators – the population coverage with screening and the share of TB cases found through screening programs, respectively, to 61–63% and 59–61%.

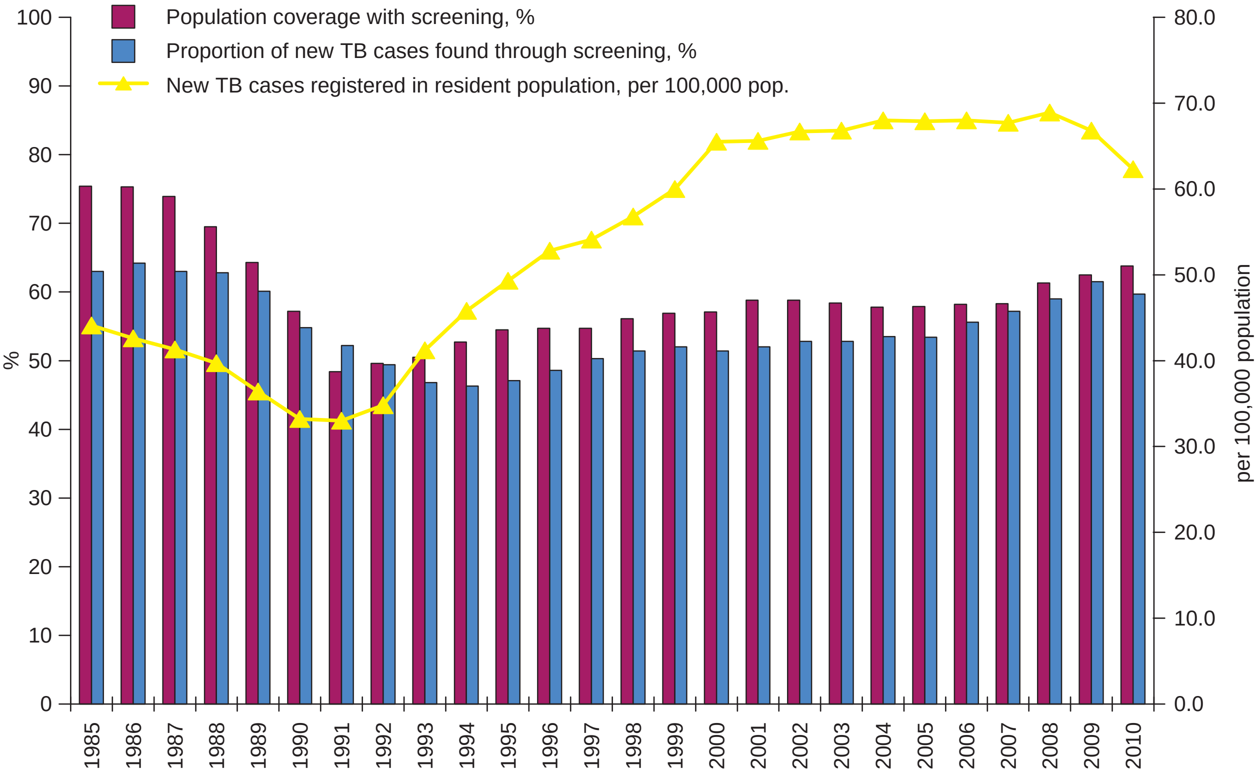

Fig. 2.29. Active TB case finding in the Russian Federation. Population coverage with screening for TB, the proportion of new TB cases detected through screening,[32] the number of registered new cases per 100,000 resident population (Sources: Forms No. 33 and No. 30)

In 2010, the population coverage with TB screening reached 63.8%. After a growth for many years, in 2010 the proportion of cases detected though screening declined to 59.7%[33] (from 61.5% in 2009[34], $p < 0.001$). Meanwhile, as mentioned above, new TB case notification rates had been declining in Russia over the last two years (2009–2010).

In 9 RF entities (their number was 12 in 2009 and 7 in 2008) the proportion of TB cases found through screening (excluding those diagnosed post-mortem) in 2010 was 70%: in the regions of Rostov, Lipetsk, Saratov, Amur, Voronezh and Omsk, in Zabaikalsky Krai and Khabarovsk Krai, in YaNAD. In 2008–2010 in all RF entities (except the Republic of Chechnya) the proportion of new cases found through screening exceeded 40%, although in 2003–2007 a gradual decline was observed in the number of such entities, from 21 to 6.

Overall, 58.7% of new TB cases were detected through active case finding, 39.7% were self-referrals and 1.7% were diagnosed post-mortem (1,509 persons of resident population)[35] in 2010 among the resident population (Form No. 33).

In 2010, the TB case-finding rates in the Russian Federation remained relatively high for populations screened by all methods (0.58[36] per 1,000 screened individuals) and by fluorography examination (0.7 per 1,000 screened). This percentage reflects two processes simultaneously: effectiveness of fluorography service in finding TB-associated pathologies and performance of TB facilities in managing TB suspects and registration of detected TB cases. However, the reporting forms do not provide information that characterizes the performance of each of these processes specifically. The forms lack data on cases found with pathologies requiring additional testing for TB, while a certain proportion of individuals with the detected TB-indicative changes fail to reach TB facilities.

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[32] The row in Form No. 33 "new TB cases detected among those screened for tuberculosis."

[33] The proportion of cases found through screening was calculated from the total cases found, excluding cases diagnosed post-mortem.

[34] In reporting forms for four RF entities an erroneous number of 100% was recorded as the percentage of cases found through fluorography examination (Novgorod region, the Republics of North Ossetia, Chuvashia and Tyva), resulting in overestimation of the national indicator. Following correction of the data from the above areas the overall proportion of TB cases identified through screening in the Russian Federation will be 60.6%.

[35] In 2010 (Form No. 8) 2,015 TB cases in Russia were diagnosed post-mortem. FSIN contribution to this number is small: in 2006 in FSIN (Form No. 4-tub) just 10 TB patients were diagnosed post-mortem (see Chapter 8).

[36] It should be noted that calculation of this indicator is not entirely correct, as the denominator is derived from Form No. 30 (data received from all agencies), and the numerator is derived from Form No. 33 submitted by regional TB facilities.

Table 2.2

Examination of the RF population for tuberculosis, 2005–2010 (Sources: Forms No. 33 and No. 30)

Indicators	2005	2006	2007	2008	2009	2010
Number of people evaluated by all methods for the purpose of early detection of tuberculosis: Total	82833191	82957322	82946167	87121448	88669142	90526779
% of the total population	57.9	58.2	58.3	61.3	62.5	63.8
including those with fluorography examination (X-Ray mass screening): (persons)	59586046	59904093	61054847	63923789	65966287	67112214
% of all evaluated	71.9	72.2	73.6	73.4	74.4	74.1
% of the total population	41.6	42.0	43.0	45.0	46.5	47.3
% of the population 15 years of age and older	49.0	49.3	50.3	52.7	54.6	55.7
including tuberculin skin test diagnostics in children 0–17 years of age: (children)	21149813	20521136	19584049	20524971	20520563	20965040
% of all evaluated	25.5	24.7	23.6	23.6	23,1	23.1
% of the total population	14.8	14.4	13.8	14.5	14,5	14.8
% of the population of 0–17 years of age	73.7	74.7	73.3	77.7	78,8	80.7
including those with microscopy examinations (persons)	973256	919996	980025	1047162	1111538	1059554
% of all evaluated	1.2	1.1	1.2	1.2	1.3	1.2
% of the total population	0.68	0.65	0.7	0.7	0.8	0.7
of those in the general health care system (persons)	600098	627412	732026	833789	939838	910285
% of all people with microscopy examinations	61.7	68.2	74.7	79.6	84.6	85.9
Number of TB patients detected during the occupational screenings	51591	53881	55031	57748	58279	52734
% of patients detected during the occupational screening[*]	53.4	55.6	57.2	59.0	61.5	59.7
detection rate per 1,000 examined individuals	0.62	0.65	0.66	0.66	0.66	0.58
Number of TB patients detected by fluorography examinations (X-Ray mass screening)	48923	51160	52334	52414	52443	47682
detection rate per 1,000 examined individuals	0.8	0.9	0.9	0.8	0.8	0.7
% of all detected during the occupational screening	94.8	94.9	95.1	90.8	90.0	90.4
Number of TB patients detected by microscopy	1851	2242	2123	2170	957	1007
% of all detected during the occupational screening	3.6	4.2	3.9	3.8	1.6	1.9

2.8. TB relapses

In the Russian Federation two approaches are practiced in defining a TB relapse. The first one, applied for almost half a century, is linked with the history of dispensary follow-up [34]. It defines a relapse as an emergence of active TB signs in persons who previously developed TB and were cured, who were followed up in DF Group III or removed from the DFG register due to recovery.

The other definition of a relapse was introduced in Russia after Executive Order No. 50 was issued: it refers to a patient's TB treatment case history, specifically, chemotherapy outcome records ([35], see Annex 1). In this case when starting a patient on chemotherapy, a relapse is recorded as "TB disease in individuals who previously underwent effective chemotherapy course and who again showed signs of active tuberculosis: positive results of sputum microscopy or culture and/or indicative clinical and radiological signs of tuberculosis."

Both definitions refer to previous cure or an effective chemotherapy course during the previous episode of tuberculosis. With the follow-up term after the main course of chemotherapy becoming shorter for patients in DFG I [35], there is now more similarity in both definitions of a relapse. The rate of relapses is a relevant indicator for effectiveness of dispensary follow-up and TB treatment management.

The dispensary follow-up distinguishes between two types of TB relapses: “early” relapses (i.e., relapsed cases who developed TB while being in DFG III [dispensary follow up group for inactive TB cases who are transferred to the DFG III 1–2 years after being cured, see Appendix – *notes by the translation editor*]) and “late” relapses among persons removed from a TB dispensary register.[37]

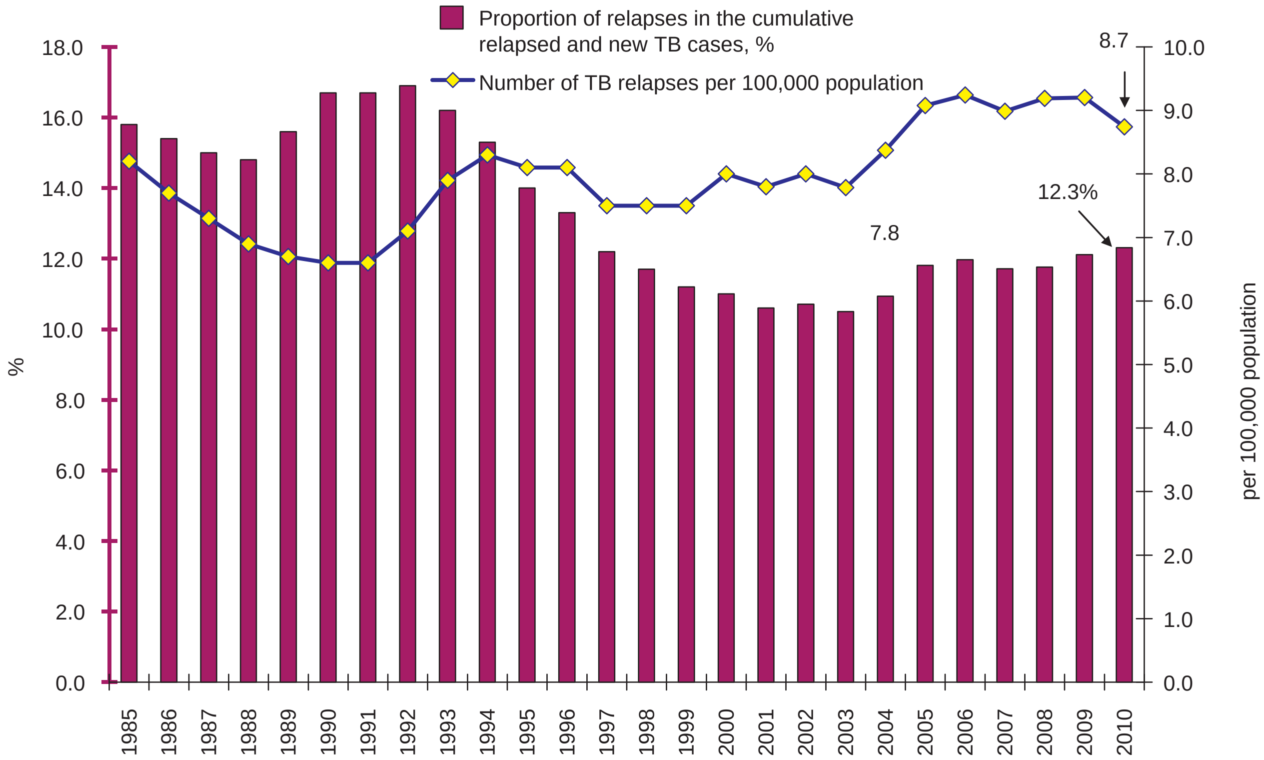

Fig. 2.30. TB relapses. Proportion of relapses in the cumulative relapsed and new TB cases, and TB relapse rate per 100,000 population, the Russian Federation (Source: Form No. 33)

MoH&SD data (Form No. 33, Fig.2.30) show a growth in relapses in 2004–2005 that in 2007 was replaced by a statistically significant decline (from 9.2 in 2006 to 9.0 per 100,000 population, or from 13,171 to 12,771 cases) with subsequent leveling off at 9–9.2 cases per 100,000. Against overall decreasing new TB case notification rates the relapse rates also declined to 8.7 per 100,000 population (12,406 persons), though not so consistently, and in 2009–2010 the proportion of relapses among cumulative relapsed and new TB cases slightly increased from 12.1% to 12.3%.

Similar to the changes in relapses registered in regional TB facilities, the number of TB relapses per 100,000 population, according to the data provided by all agencies,[38] gradually increased in 2005–2009 from 10.3 to 12.0 per 100,000 population, and in 2010 decreased to 11.5 (16,327 patients). With the declining numbers of new TB cases this also contributed to a growing share of relapses in the total notified cases of active TB to 12.9%.

According to the existing data (Fig. 2.31), the growth in the rate in 2003–2006 was due to the increase in early relapses caused both by ineffective treatment and by errors in forming DFG III after dispensary follow-up groups were revised in 2004. Reversal of this trend after 2006 may be explained by the implementation of a broad range of interventions aimed at enhancing the effectiveness of TB care and improvement of the legal framework for TB control, including a shorter follow-up in DFG III [34, 35]. By 2007–2010 the number of early relapses declined to 4,500–4,700 cases annually, with a statistically significant decrease of their proportion in total relapses from 39.7% in 2006 to 37.6–37.4% in 2008–2010 ($p < 0.05$).[39]

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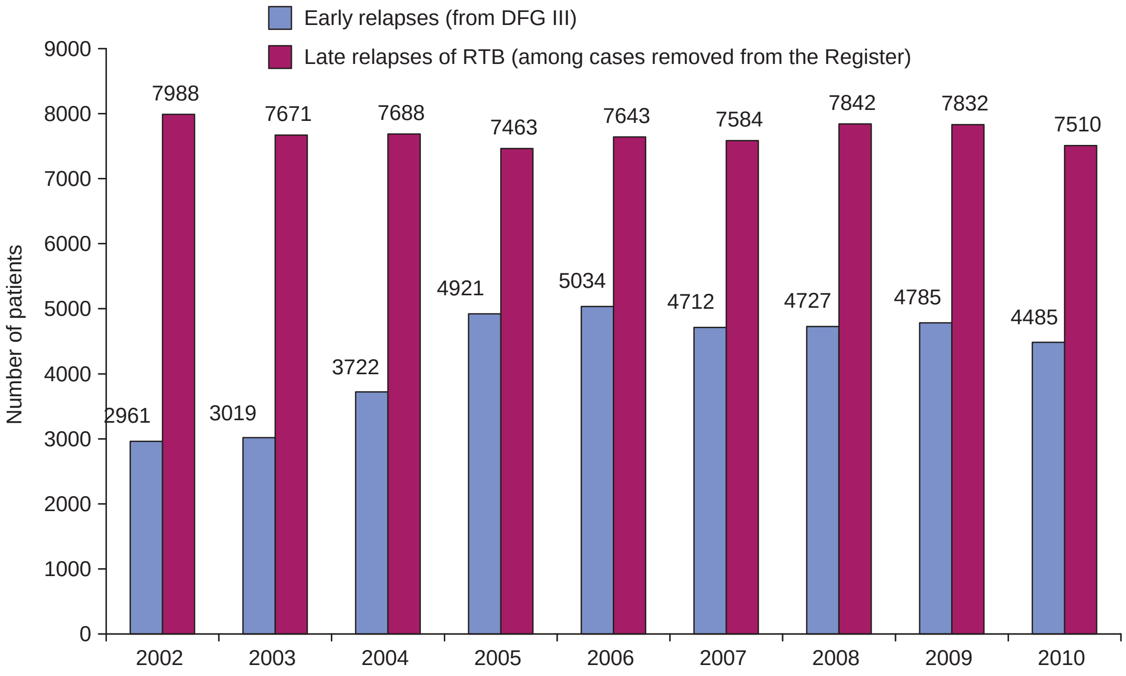
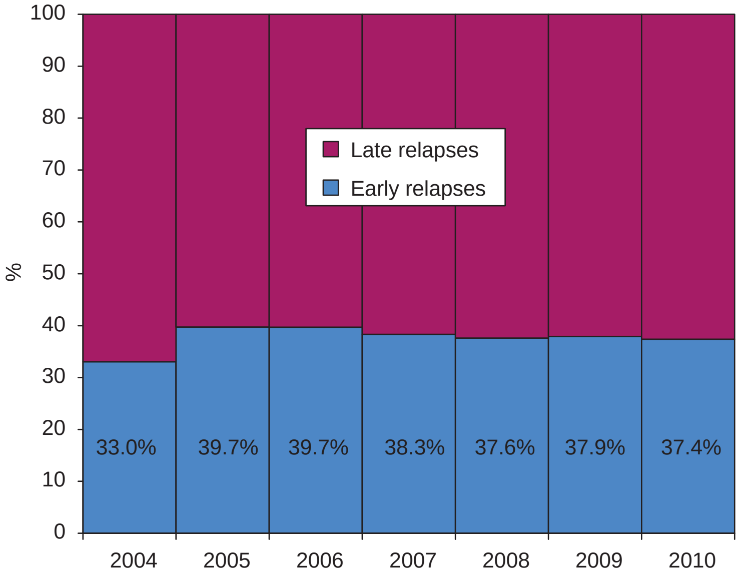
[37] Until 2004 late relapses also included relapsed cases among those registered in DFG VIIA (the group of persons with post-TB complications).

[38] Number of relapses by all agencies has been registered in Form 8 since 2005.

[39] Statistical significance for changes in 2006–2008 was calculated by chi-square.



a) Annual numbers of early and late relapses, absolute numbers



b) Share of early relapses in the total notified relapsed cases

Fig. 2.31. Early and late relapses in respiratory TB cases, the Russian Federation (Source: Form No. 33)

The changes in TB relapse rates in 2004–2008 do not support the assumptions, which are frequently voiced by Russian experts, that modernization of TB case finding and treatment management in line with the Executive Orders of the RF MoH [34, 35] caused an increase in relapses. On the contrary, in 2002–2005, before the actual implementation of actions to improve TB care, a considerable increase in early relapses was observed, which indicates major deficiencies in case management and dispensary follow-up in that period.

The number of relapsed TB cases enrolled in treatment cohorts (relapses determined by previous chemotherapy outcomes, Form No. 7-TB) is slightly higher than the number of relapses identified through dispensary follow-up (respectively 12,893 and 12,406, according to the MoH&SD reports of 2010). It may be argued than in 2007–2010 the number of relapses according to dispensary follow-up and to cohort analysis were showing consistently less discrepant patterns. For example, in 2007 the number of all TB relapse types enrolled in treatment cohort exceeded by 7% the number of relapses assigned to a specific dispensary follow-up group; however, in 2010 this discrepancy decreased to 3.9% (12,893 and 12,406, respectively). This indirectly indicates fewer delays in patients' transfer to DFG of inactive TB (DFG III) after completion of an effective chemotherapy course. In case of considerable delay in transfer to DFG III, a relapse may occur **after** the patient completes an effective course of chemotherapy, but

before the transfer to DFG III. As a result, the patient is included in the retreatment cohort but is not registered as a TB relapse in the dispensary follow-up system.

In 2010 in eight RF entities (Kirov, Tula, Orel, Kostroma and Kaliningrad regions, the Republic of Karachaevo-Cherkessia, Jewish AR and the Moscow city) the number of relapsed cases enrolled in a treatment cohort exceeded by over 20% the number of relapsed cases registered in DFG I. In particular, this may be due to the noted delay in transfer to DFG III.

In eight RF entities (the Republic of Kabardino-Balkaria, Chelyabinsk, Astrakhan, Bryansk, Nizhny Novgorod and Leningrad regions and Krasnodar Krai) some relapsed cases are not included in retreatment cohorts; therefore, the number of relapses, according to Form No. 7-TB, in these areas is (at least by 2%) lower than the number of relapses registered through dispensary follow-up (Form No. 33).

The reporting forms of the cohort analysis can be used to determine the proportion of laboratory-confirmed SS+ TB cases (37.5%; hereinafter the indicators are computed from the data in Form No. 7-TB of MoH&SD, 2010) and Cu+ cases (48.9%) and to calculate the share of TB cases with destruction of lung tissue (54.4%). These data demonstrate that statistically TB forms in relapsed cases are more significantly severe than in new TB cases.

2.9. Comparison of new TB case notification rates in the world, WHO European Region and the Russian Federation

In assessing and comparing TB incidence in countries of the world, account should be taken of the country-specific systems of case finding and TB diagnosis. Besides, the actual TB incidence in any country always differs from its notification rate. This difference can be quite significant and depends primarily on the effectiveness of TB case finding that differs not only between the countries but also within the countries, from one area to another.

This is why the WHO uses the system for assessing values of the key epidemiological indicators (incidence, mortality and prevalence) to estimate the TB data published in annual Global TB Reports and to make country comparisons [66, 78].

International publications (including WHO documents) operate with the estimated TB incidence rate that should stand for the actual number of TB cases in the population. The new TB case notification rate that was discussed earlier in this chapter denotes the frequency of new TB cases occurring in the population that is measured (registered or notified) through the national statistical service or epidemiological surveillance service and always somewhat differs from the actual figures.

Thus, the WHO makes annual estimates of the key indicators, which characterize TB burden (incidence, prevalence and mortality) for all countries, the WHO regions and for the world as a whole. These estimates are made on the basis of data provided by the national surveillance systems (TB case notifications and death registrations) gathered in special studies as well as in consultation with the country experts [77, 78, 80].

The WHO defines TB **incidence** as the number of new and relapse[40] cases of TB (all forms and sites of the disease) occurring in a given year.

In 2008–2009, due to the work of the WHO Global Task Force on TB Impact Measurement, amendments of the methods for estimating TB incidence, prevalence and mortality [67, 90] were provided. Improvements included documented expert opinion to produce better estimates, simplification of models, updates to parameter values, much greater use of VR (vital registration) systems and systematic determination of the degree of uncertainty in the estimates produced [78, 80].

The current WHO publications denote a rather high level of uncertainty in the derived results. Therefore, estimated indicators should be used with a degree of caution. The latest WHO documents offer three values for each estimate: “best estimate” (most probable), and the high and low uncertainty bounds, which reflect the degree of uncertainty for the estimated parameter.

The WHO derives epidemiological indicators for the Russian Federation based on the expert estimate of the proportion of cases detected through the national TB control system out of all people with TB. This share is established for the selected reference year and extrapolated to other years using a specific method.

Currently the expert estimate for the share of new TB cases detected through the Russian TB control system out of all people with TB was revised for a new reference year (2007) and accepted at the level of 85%.[41] This

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[40] According to the WHO definition, a TB relapse is a person who has been previously treated for TB and whose cure was laboratory confirmed or treatment success was documented. Relapse cases may be “true” relapses occurring as reactivation of the disease, or they may be a subsequent episode of TB in this person as a result of reinfection.

[41] Before 2009, a specific value was used to estimate the share of detected TB cases in the Russian Federation; it was established in 1997 through a survey of a group of experts from Moscow and RF regions under the leadership of A.G. Khomenko. The value established for the reference year of 1995 was documented in the joint protocol between Russia and the WHO in 1997. According to Russian experts, in 1995 only 76% of TB cases were notified among individuals who contracted TB in that year.

percentage was proposed by the Russian experts and received a documented approval at the surveillance meeting of the WHO Regional Office for Europe in Berlin (2009).

The Russian experts are now developing a method for a dynamic estimation that may be adjusted every year, depending on the profile and structure of detected TB cases. This approach will make it possible to use the methodology for assessing true incidence not only for the country as a whole but also for individual RF entities.

Needless to say, all currently used approaches are approximate. However, so far there have been no methods of better precision developed, and assessment of the actual incidence is required.

Recent WHO publications [78, 80] provide the following key data for TB case detection worldwide:

- estimated total number of new TB cases and relapses (all forms, all sites of disease, regardless of bacillary excretion status), and the estimated TB incidence rate per 100,000 population;
- estimated total number of new TB/HIV co-infection cases, and the estimated incidence rate per 100,000 population;
- number of notified cases and the corresponding rate per 100,000 for the following TB patient groups:
  - new pulmonary TB cases;
  - new ss+ pulmonary TB cases;
  - new ss− pulmonary TB cases, including those with unknown microscopy result;
  - new extrapulmonary TB cases;
  - pulmonary TB relapses of ss+ cases;
  - other notified TB retreatment cases.
- distribution of notified new pulmonary TB cases by age groups and sex, separately for pulmonary ss+ and ss− cases, and extrapulmonary TB;
- case detection rate defined as the ratio of notified to estimated TB cases (all sites of disease and irrespective of microscopy results).[42]

According to the WHO estimates [78], in 2009 there were 9.4 million incident cases (range, 8.9–9.9 mln.) [43], corresponding to 137 cases per 100,000 population. Of all incident TB cases, approximately 13% are co-infected with HIV (approximately 1.1–1.3 mln.), with 77% of them from the WHO African Region and 14% from South-East Asia.[44]

According to WHO estimate, most TB cases are from the countries of Asian (35%) and African (30%) regions, see Fig. 2.32b. A significantly lower number of tuberculosis cases occurred in the countries of Eastern Mediterranean (7%), European (4.5%) and American (3%) WHO regions.

With the estimated incidence rate for the African region as a whole being 345 per 100,000 population, in Swaziland and the South African Republic this rate is 1,250 and 970 cases per 100K, respectively[45] (Fig. 2.32a).

High incidence is observed also in the countries of South-East Asia (182 per 100,000). In the countries of the Americas this rate is the lowest (29 per 100,000).

According to 2009 data, five countries with the highest numbers of TB incident cases are India (1.6–2.4 mln.), China (1.0–1.5 mln.), South African Republic (0.4–0.59 mln.), Nigeria (0.37–0.55 mln.) and Indonesia (0.35–0.52 mln.). Each year half of global TB cases occur in these countries, with India and China alone contributing 35% of new TB cases and TB relapses.

According to the WHO estimates, Tajikistan had the highest TB incidence in the European Region (202 cases per 100,000 population), followed by the Republic of Moldova (178), Kazakhstan (163), Kyrgyzstan (159), Uzbekistan (128) and Romania (125).

In 1999, the WHO introduced the concept of "global TB burden" [66], "inflicted" by the spread of the disease on the international community. Twenty-two TB high-burden countries (HBCs) were selected [66], having the highest "impact" on the TB "global burden" in the world due to their contribution to the total number of TB cases. This concept – partly economic and partly epidemiological – singles out the countries that from the global perspective are the highest sources of infection for other countries.

Among 22 TB HBCs are those that account for 80% of new TB cases in the world; that is, the absolute number of incident TB cases in the country was considered (according to the WHO estimate) rather than the TB incidence

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[42] Before 2010, the WHO also calculated the number of new ss+ cases and the case detection rate for ss+ TB patients. At present, a decision has been made at the global and regional levels not to use these indicators.

[43] Hereinafter when referring to the WHO estimates, apart from the so-called "best estimate," the range of highest and lowest values is also given in brackets.

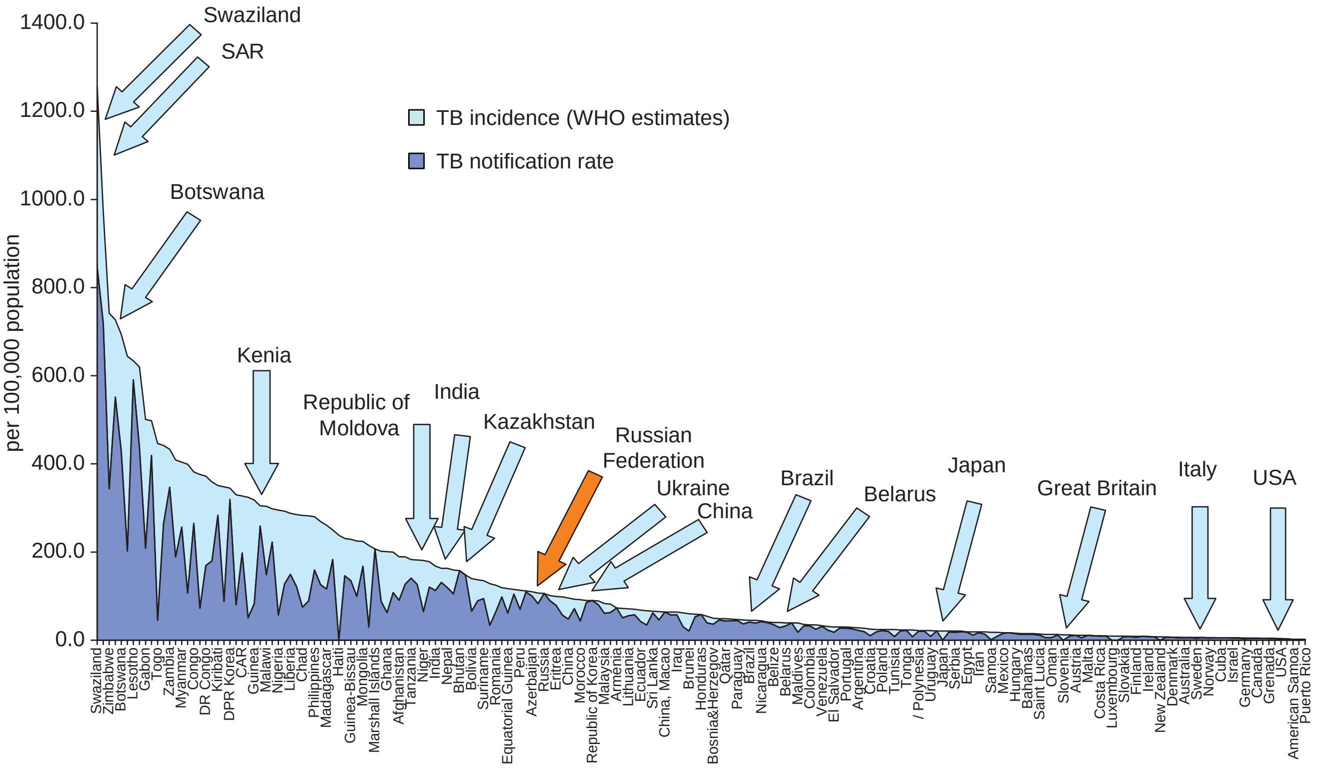
[44] Hereinafter the reference is made to the countries in WHO Regions that may differ from the traditional geographic division. For example, Kyrgyzstan belongs to the WHO European Region, while being a Central Asian Republic.

[45] Hereinafter the given indicators are taken from the official WHO website publication [79] with the corrected data for the WHO Global TB Report 2010 [78]. The numbers may differ slightly from the data in the text of the Report [78].

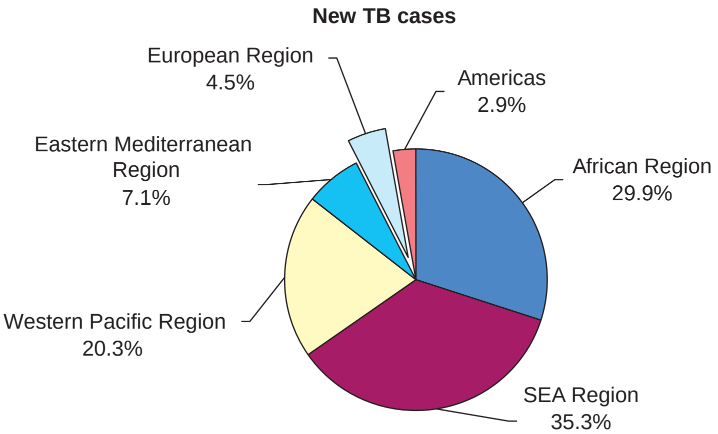
rate per 100,000 population (the latter being relevant as the “local” TB burden for the country itself). Another relevant factor was the fact that TB requires particular attention of the public health system in these countries (see Table 2.3, Fig. 2.32b).[46]

The Russian Federation is one of the HBCs, yet the estimated incidence rate (taking into account the size of the population) for Russia is not among the highest in the world – 110 (91–130) per 100,000 population (see Fig. 2.32a). According to the WHO estimate, in 2009 among 22 HBCs the contribution of Russia to the number of TB incident cases was not too high at 2.0% (of 7,600,000), nor was it considerable with regards to the total TB cases found worldwide – 1.6% (of 9,400,000). However, according to the WHO estimates, the proportion of incident TB cases in Russia is 35.7% of their total number in the European Region.

As stated above, comprehensiveness of TB case notification by the national TB control systems differs from country to country, and by no means does the number of notified cases always precisely reflect the actual incidence rate (see Fig. 2.32a).



a) TB incidence (WHO estimate) and new TB case notification rates in the world, 2009



b) New TB cases by WHO Regions

Fig. 2.32. The WHO estimates for new TB cases [78, 79]

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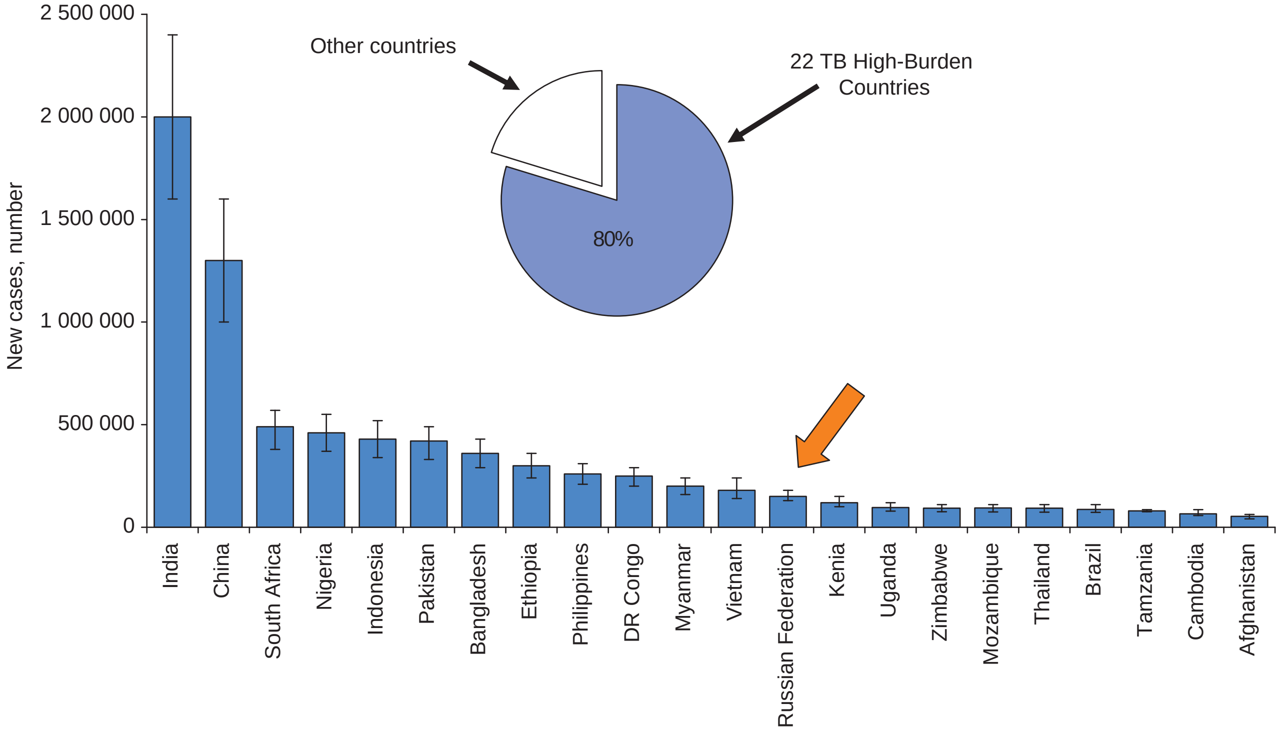
[46] The list of 22 high-burden countries for TB is quite rarely revised. For instance, Peru from the original list has been replaced with Mozambique.



c) 22 High-burden countries for TB (HBCs), 2009. The numbers in the chart reflect the so-called best estimate; errors bars indicate the upper and lower uncertainty bounds.

Fig. 2.32. The WHO estimates for new TB cases [78, 79]

The WHO uses the TB case detection rate[47] ("case detection rate, all TB forms," CDR) to assess the effectiveness of TB case detection by the national TB control systems. This percentage value indicates to what extent the actual TB incidence is higher than the new TB case notification rate. CDR is often used as an integral factor to evaluate effectiveness of measures implemented within the national programme for TB case-finding activities.

According to the WHO data, 5,889,265 new TB cases and SS+ TB relapses were notified in the world in 2009, corresponding to 63% (57%–63%) of the estimated global incidence.

The highest numbers of TB cases are notified in India and China. In 2009 they both contributed approximately 40% of all new TB cases and SS+ relapses notified globally.

The highest new TB case notification rates are observed in African countries:170 per 100,000 population, all forms of the disease, which corresponds to a 49% case detection rate. The highest new TB case notification values were recorded in Swaziland and the South African Republic (807 and 679 per 100,000 population, respectively). High notification rates are also observed in the countries of South-East Asia (119 per 100,000 population). The countries of the Americas show the lowest notification rates (23 per 100,000 population).

In 2009, the Russian Federation notified 90 new TB cases and SS+ relapses per 100,000 population, or 2.1% of the notified TB cases in the world and 2.6% of TB cases notified in the HBCs. Within the WHO European Region the share of the Russian Federation in the total Regional notified TB cases and SS+ relapses is significantly higher – 38.4%. In 2009, the detection rate for all new TB cases was 84% (71–100%).

In the WHO European Region the Russian Federation is one of 18 high-priority countries for tuberculosis.[48]

Russia notifies over one-third (38%) of the total new TB cases and relapses in the region and ranks sixth in the WHO/EURO among countries with the highest notification rates after Kazakhstan (131), Republic of Moldova (121), Georgia (111), Kyrgyzstan (105) and Romania (98 per 100,000 population), Fig. 2.33b. It is noteworthy that among 16 countries with the highest notification rates (over 40 per 100,000), 14 are the former Soviet Union (FSU) republics.

In 1985 Russia ranked 20th according to the new TB case notification rates (Fig. 2.33a).

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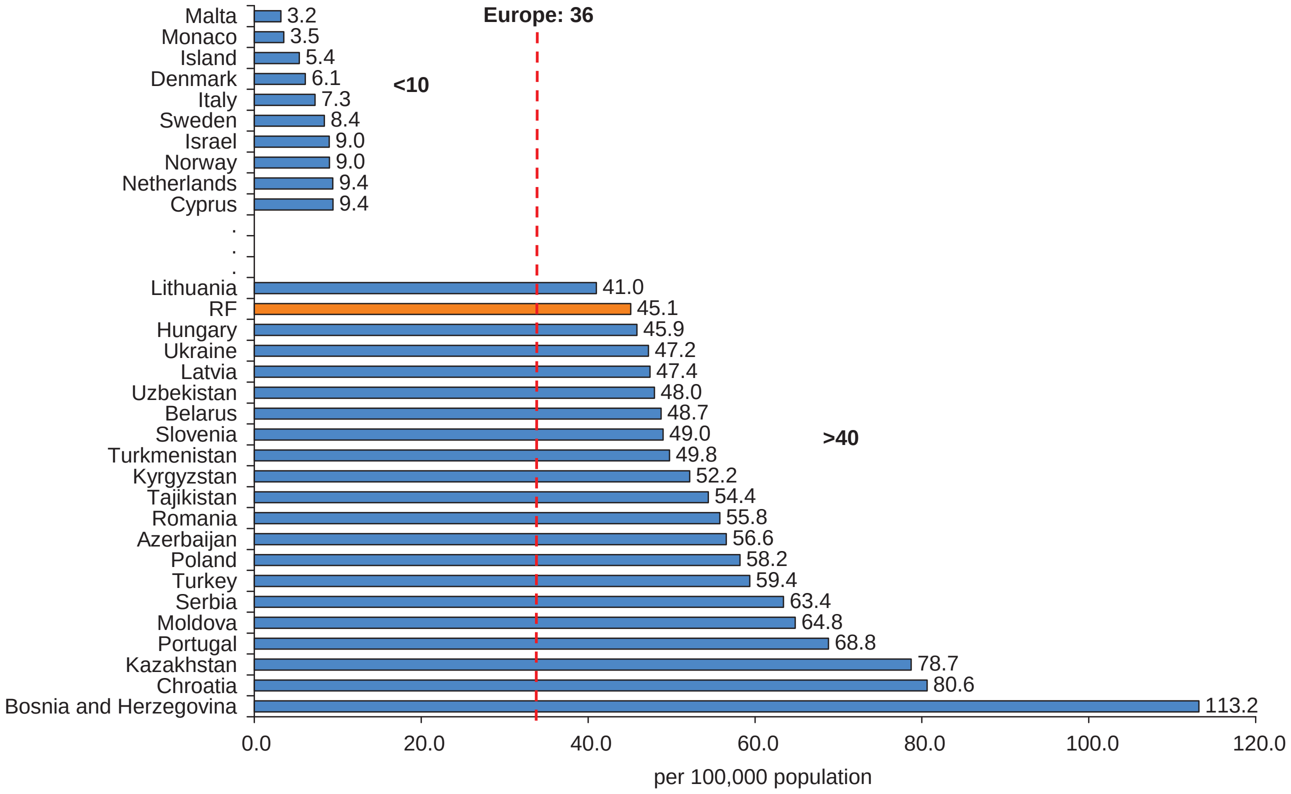
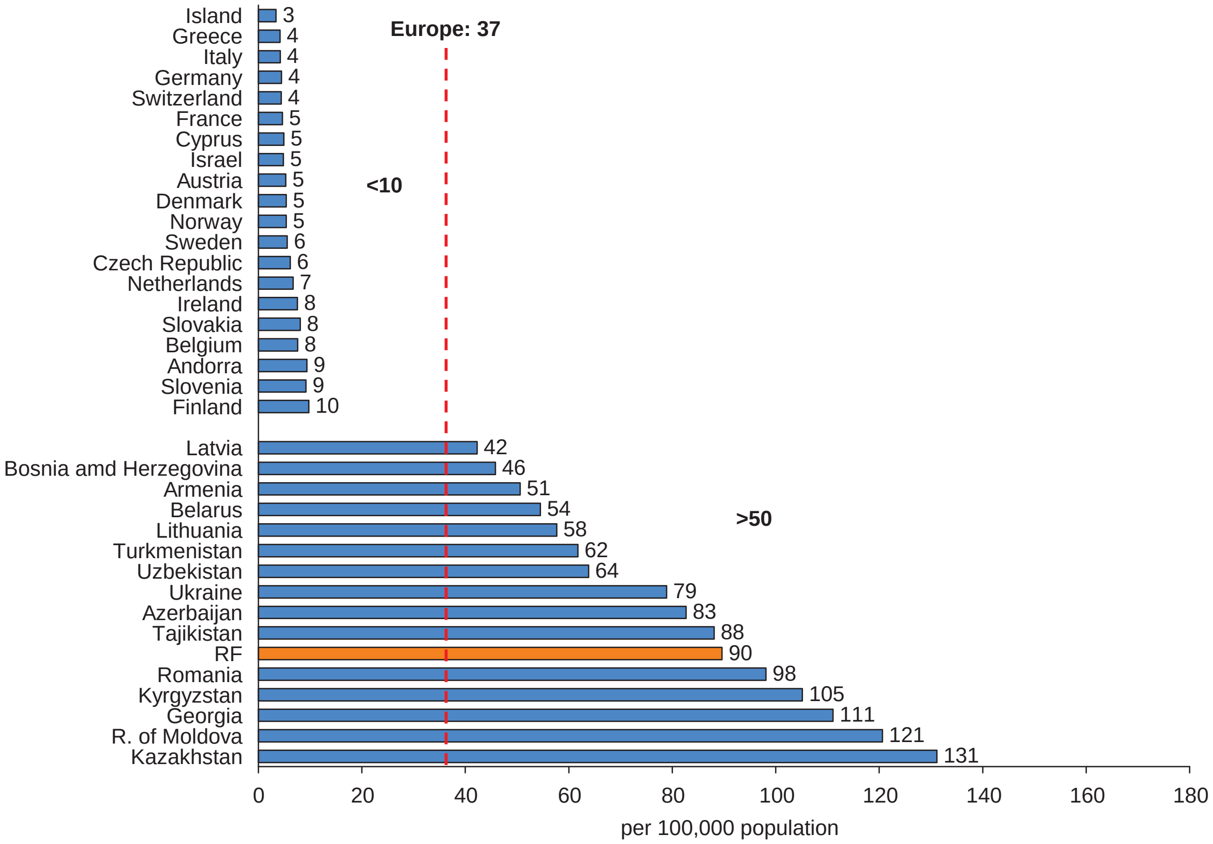
[47] Before 2009 the SS+ case detection rate was also used as an indicator; it is no longer analysed in the WHO publications.

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



a) Data of 1985



b) Data of 2009

Fig. 2.33. New TB case notification rates in countries of the WHO European Region in 1985 (a) and 2009 (b). The rate includes new TB cases and SS+ relapses. Countries with the lowest (below 10) and highest (over 40 in 1985 and over 50 in 2009) notification rates [78, 79].

Table 2.3

TB case detection in the selected WHO regions and countries of the world, 2009
(Source: for the WHO regions – [78], for the selected countries – [79])

Global, WHO regions and countries	New TB cases and ss+ relapses				Case detection rate (CDR)
	WHO estimate		new TB case notification**		
	#	Per 100K	#	Per 100K	
Global	9400000	137	5889265	86	63
Europe	420000	47	3314436	37	79
Africa	2800000	345	1397369	170	49
the Americas	270000	29	216398	23	79
India*	2000000	168	1351913	112.8	67
China*	1300000	96	965257	71.7	75
South Africa*	490000	971	360183	718.8	74
Nigeria *	460000	295	88589	57.3	19
Indonesia *	430000	189	292754	127.3	67
Bangladesh *	360000	225	160875	99.2	44
Ethiopia *	300000	359	148936	179.8	50
the Philippines *	260000	280	146565	159.3	57
DR Congo *	250000	372	111709	169.2	46
Myanmar *	200000	404	128343	256.6	64
Vietnam *	180000	200	95036	107.9	54
Russian Federation*	**150000**	**106**	**126227**	**90**	**84**
Kenya *	120000	305	102997	258.8	85
Uganda *	96000	293	41703	127.5	44
Zimbabwe *	93000	742	42971	343.1	46
Mozambique *	94000	409	43221	188.8	46
Thailand *	93000	137	63975	94.4	69
Brazil *	87000	45	75040	38.7	86
DPRK	82000	345	76336	319.3	93
Cambodia *	65000	442	39202	264.8	60
Zambia	56000	433	44879	346.9	80
Afghanistan *	53000	189	25417	90.3	48
Ukraine	46000	101	36075	78.9	78
Uzbekistan	35000	128	17540	63.8	50
Peru	33000	113	31844	109.2	97
Rumania	27000	125	20868	98.1	79
Kazakhstan	26000	163	20508	131.2	80
Namibia	16000	727	11980	551.8	76
USA	13000	4.1	11545	3.7	89
Tajikistan	14000	202	6125	88.1	44
Botswana	14000	694	8362	428.9	62
Swaziland	15000	1257	10038	847.1	67
Kyrgyzstan	8700	159	5765	105.2	66
Republic of Moldova	6400	178	4347	120.6	68
Georgia	4500	107	4732	111.1	100
Germany	4000	4.9	3659	4.5	91
Czech Republic	910	8.8	638	6.2	70
Estonia	400	30	361	26.9	89
Israel	390	5.4	347	4.8	89

* One of 22 countries with the highest TB burden [78]. ** Aggregate notification rates worldwide and for three WHO regions, and the notification rates per 100,000 population, were calculated based on tables [79], with the WHO estimates of the country population.

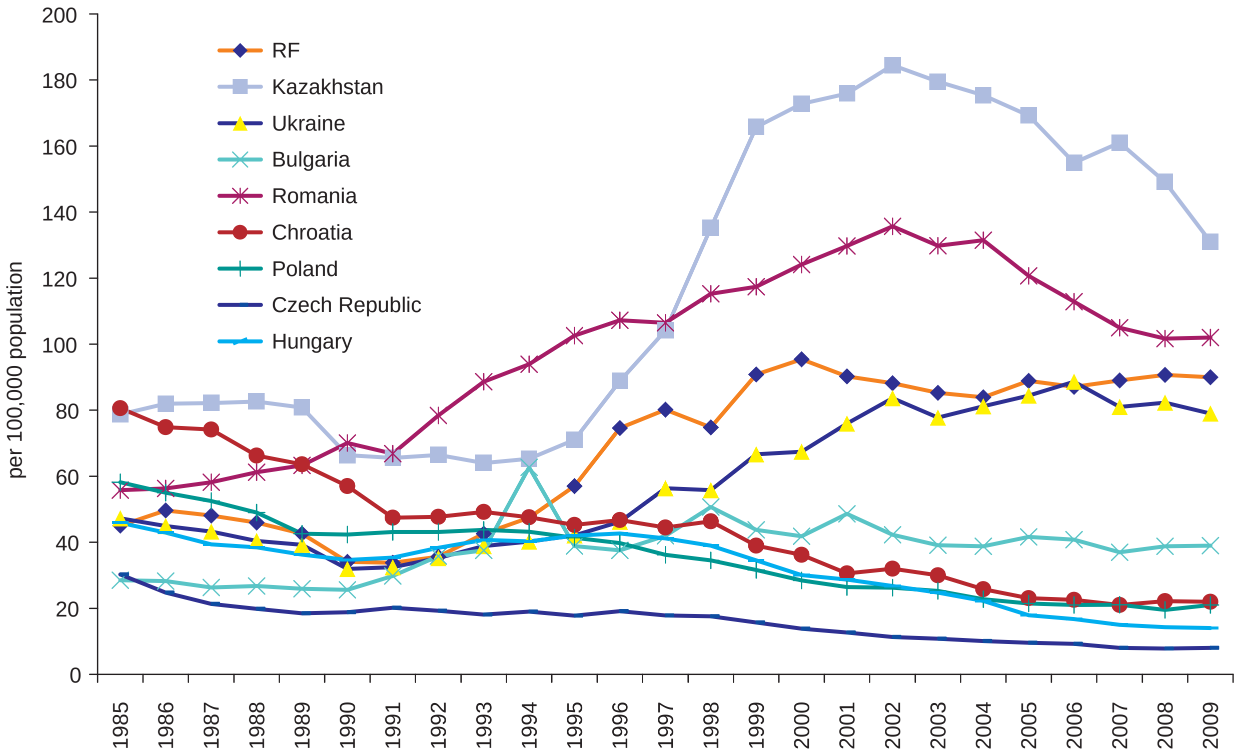


Fig. 2.34. New TB case notification rates in some selected countries of the WHO European Region, 1985–2009, Russian Federation [78, 79]

In the 1990s, new TB case notification rates increased 2–2.5 times in virtually all FSU countries (Fig. 2.34). At the same time during this period in all former Warsaw Pact countries, except Romania and Bulgaria, a marked decline (1.5–2 times[49]) in the new TB case notification rates was observed.

Conclusion

The data reported for 2010 show improvement in the epidemiological situation of TB in the Russian Federation. In the last two years a decline was observed in the new TB case notification rate. However, the rate is still relatively high, thus requiring continuous enhancement of activities for provision of effective TB control services to the population.

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[49] In these years the definition of a TB case in the former USSR and Warsaw Pact countries has not changed much, and therefore could not have had a significant impact on new TB case notification rates.

3. TB mortality in the Russian Federation

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

3.1. Generation of statistical reporting on TB death cases

Information on the number of patients who died of tuberculosis is contained in the forms of the federal and sectoral reporting of the treatment facilities (No. 33, No. 8 and No. 8-TB), as well as in the reporting forms of the federal statistical surveillance, which come from the Civilian Registry Offices (vital registration) to the Federal Service of State Statistics of Russia (FSSS or “Rosstat”) (No. C51 and No. C52). In the latter, there is data on the number of death cases and their distribution by the causes of death, including the information on patients who died of TB (A15-A19, ICD 10) and its remote consequences (B90).[50]

Forms No. C51 and No. C52 (hereinafter No. C51/C52) are the basis for the calculation of mortality rates in the Russian Federation, including TB mortality, with the distribution of data by sex, age, and place of residence (urban or rural). The numbers are calculated on the basis of data in the reporting forms No. 106/y-08 “The medical certificate of death,” which is being sent for state registration to the Civilian Registry offices and then to the Federal State Statistics Service (“Rossat”).

The TB reporting forms provide data on the number of patients who died of TB based on the information collected by central TB dispensaries in the constituent entities of the Russian Federation. Data on each case of death kept in Form No. 106/y-08 in the regional statistics bureaus are copied by central TB dispensaries in the constituents of the Russian Federation to monitor the quality of post-mortem diagnosis and the population of the dispensary follow-up groups.[51]

Form No. 33 contains the information on all patients who died from TB registered at regional TB dispensaries in the constituents of the Russian Federation. The data in this form are presented separately for patients who died of TB and those with other causes of death. This form allows for the calculation of the TB mortality rate for the resident population in the region (taking into account patients with post-mortem diagnosis of tuberculosis) as well as for the monitoring of the mortality rate in the region, considering patients who died of tuberculosis but were not registered at TB control facilities in the system of the RF Ministry of Health and Social Development (see the title of the appropriate box in Form No. 33).Thus, the total number of TB death cases should be close to the data in the state statistical FSSS reports forms. However, some slight difference is allowed due to the difference in the mechanism for completion of those forms.[52]

Form No. 8 contains the information about the TB patients with post-mortem diagnosis regardless of the registration place: TB dispensaries in the RF constituents, sectors (FSIN, MI etc.) with their own TB service or other health care facilities.

The sectoral reporting form No. 8-TB of the cohort analysis contains data on treatment outcomes for pulmonary TB patients including case fatality data among individual cohorts of TB patients. The form also contains the information on patients who died of TB and other causes. A more detailed analysis of data from Form No. 8-TB is presented in Chapter 7.

3.2. TB mortality rates in the Russian Federation. Trends and association with age

It is generally accepted that the emergency of the epidemiological situation of tuberculosis can be defined by the TB mortality rate with a high degree of accuracy. It is supposed that this indicator, to a lesser degree than case notification or prevalence, depends on the subjective factors including the quality of the reporting system.

In the Russian Federation tuberculosis is one of the leading causes of deaths due to the infectious diseases and accounts for at least 65% (2010) of the absolute number of deaths associated “with some infectious and parasitic diseases” (A00-B99 by ICD-10), presented in the reporting forms [19, 20].[53]

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[50] See Chapter 1.

[51] New legislation, which does not allow copying names and address of patients who died, significantly complicated the quality control of post-mortem diagnostics at TB facilities.

[52] For example, if a resident of a different area ,who was registered for follow up dies, he or she can be buried and reported as dead in the Statistics Bureau of a different area. Therefore, this case of death will be reported in Form No. 33 in one area and in Form No. C51/C52 in another area. In addition, FSSS continues recording death certificates during one quarter following the end of the calendar year.

[53] According to the data of 2009, [19], when cases of death due to TB accounted for 70% of all deaths due to infectious and parasitic diseases, the list of the latter also included disease caused by the human immunodeficiency virus (16.5% among deaths caused by the infectious diseases), septicemia (4.4%), viral hepatitis (3.5%), enteric infections (1.0%) etc.

According to the data of FSSS Form No. C51/C52 [20], in the Russian Federation 21,829 cases of death due to TB were reported in 2010, including remote consequences of tuberculosis (A15 - A19, B90) or 15.4 per 100,000 of the population[54] (2009: 23,363 people or 16.8 per 100,000 of the population [50]).

The analysis of trends in the general mortality (all causes of death) and TB mortality in Russia since the 1970s distinguishes three time periods (Fig. 3.1). Prior to 1991, the decrease in TB mortality was parallel to the increase in the overall mortality among the population, which demonstrated a high efficiency of anti-TB interventions during those years. In the 1990s and in the beginning of the 21st century, changes in both indicators followed the increasing trend with the same patterns. In those years, the TB mortality rate had a greater influence from a generally deteriorating socio-economic situation in the country than from activities performed by the national TB control services.

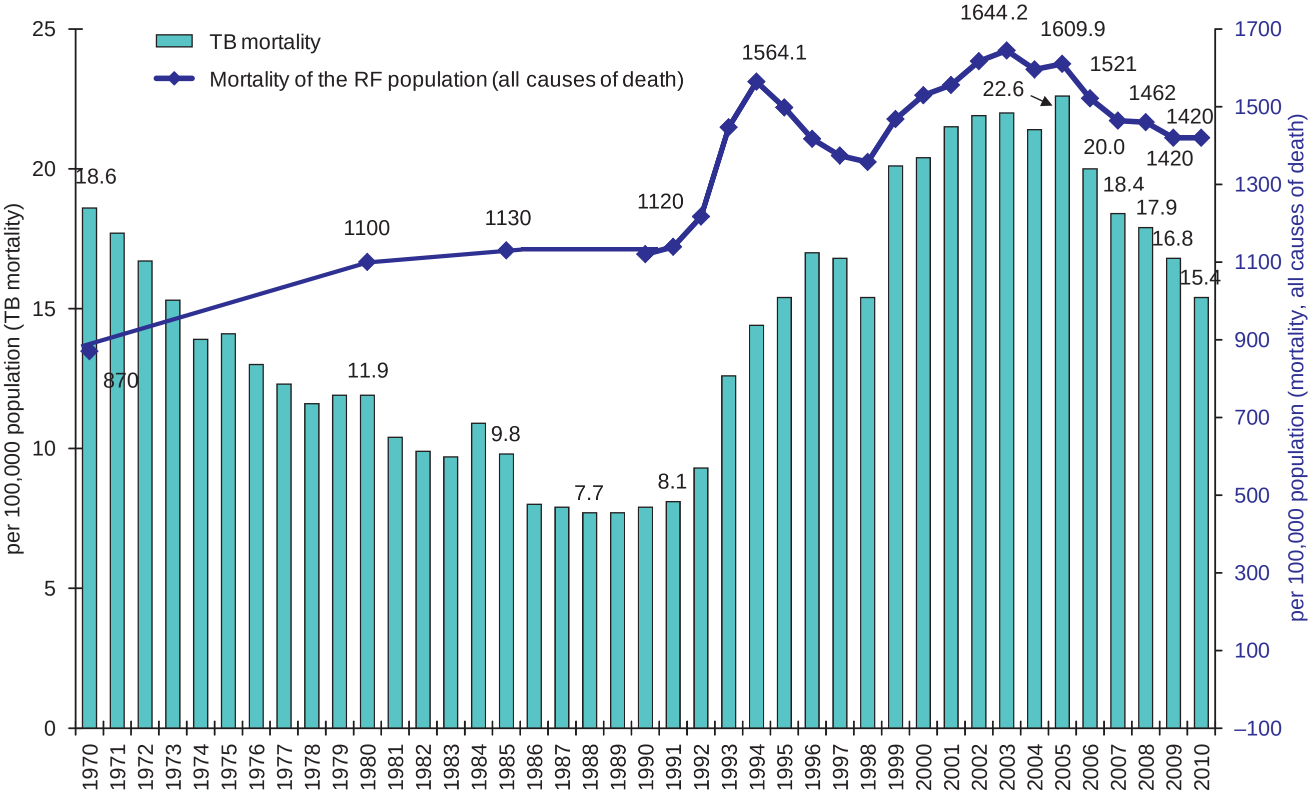

Fig. 3.1. TB mortality and general mortality (all causes of death) in the Russian Federation
(Source: Form No. C51/C52 [16-19, 20, 29])

At that time, after the long-term decrease in the rate, which lasted from the beginning of the 1970s to the beginning of 1990s (from 18.6 to 7.7 per 100,000 of the population), the TB mortality rate was rapidly increasing and reached its maximum in 2005. By 2005, the TB mortality rate increased more than twofold compared with 1991 and was 22.6 per 100,000 of the population.

For the last four years since 2006, the TB mortality rate has been declining significantly (from 22.6 in 2005 to 15.4 per 100,000 population in 2010). In 2006–2007, the reduction in TB mortality rate was synchronous with the decreasing overall mortality rates from 16.1 per 1,000 population in 2005 to 14.6 in 2007). However, in 2008–2009 TB mortality continued to decrease against the same or slightly declining overall mortality rates in the Russian Federation [16, 17, 29, 49, 59]. This may indirectly reflect the growing effectiveness of anti-TB interventions in the country.

The composition of age groups of the TB mortality rate in the Russian Federation proves once again that tuberculosis is a major problem of public health. Persons who died of TB are mostly from the productive (capable of working) age group of population (about 85% of those who died, Fig. 3.2). In all other classes of diseases with the major proportion of deaths in the country, older people prevail (50–70%). Persons who die of external causes[55] (75% of them of productive age) are the only exception.

For quite a long time the peak of TB mortality rates was observed in the age group of 45–54 years of age (35–40 per 100,000 of the population in 2006–2008; Fig. 3.3). In 2009, the peak of the rate became less pronounced, and

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[54] The data of mortality are preliminary; more precise information will be available at the end of 2011.

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

it went down to 30−32 per 100,000 of the population in the age group of 40−54 years of age. Starting with 2006 the decrease in mortality was observed mainly in the age group of 40–65 years of age; in 2009 the TB mortality rate decreased again due to a reported decrease in the age group of 45−54 years of age.

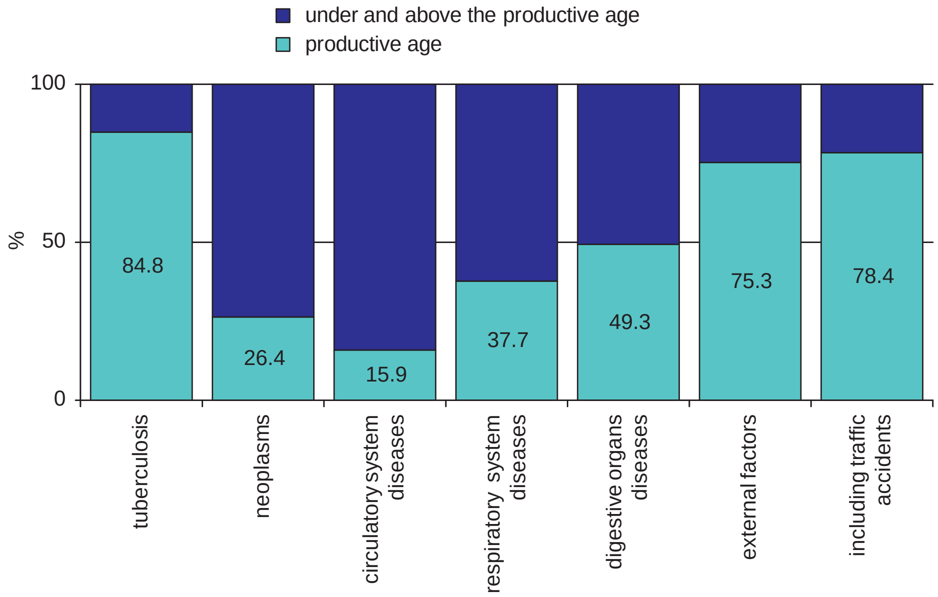

Fig. 3.2. Percentage of persons who died at productive age[56] by the main cause of death, RF, 2009 (Source: [19], population: Form No. 4)

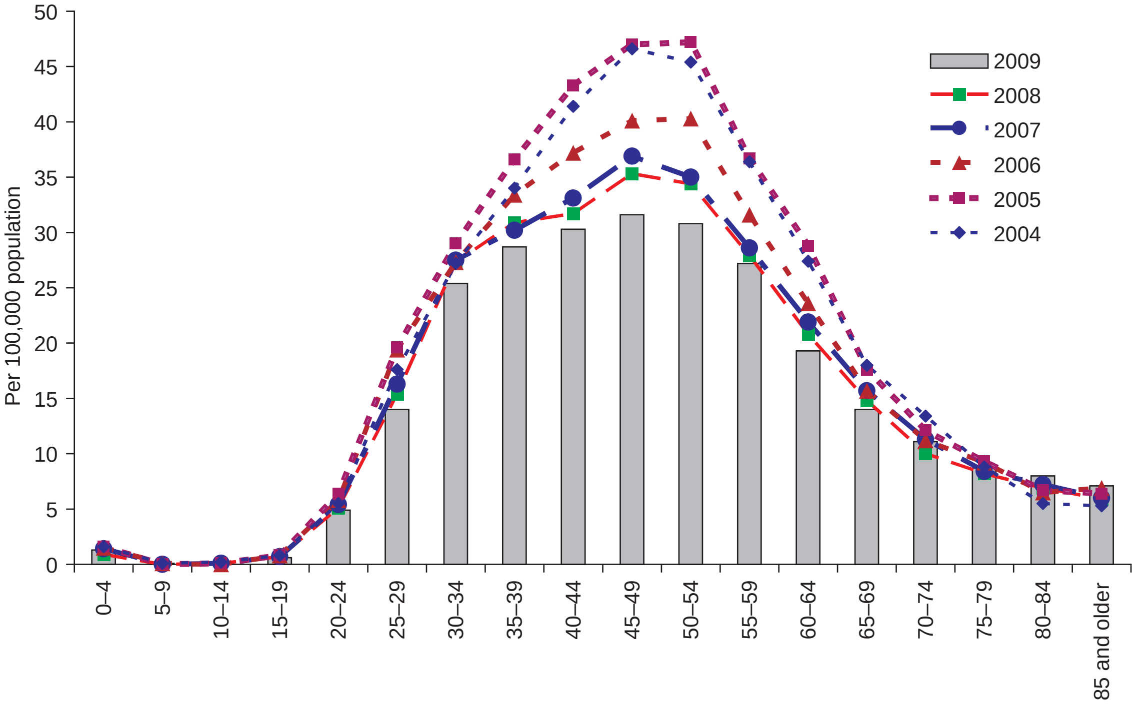

Fig. 3.3. Age-specific TB mortality rates, Russian Federation, 2004–2009 [16–19]

It should be noted that, according to [19], the proportion of TB deaths in the Russian Federation was equal to 1.2% (2009) 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 of age was as high as 6.0% (Fig. 3.4a and b). Therefore, the proportion of TB deaths in the group of 30−34 years of age is comparable with the proportion of deaths in this age group from the leading causes of death in Russia: cardiovascular diseases (15.1%), digestive system diseases (8.5%), and malignant neoplasm (4.7%). Besides, each of these causes of death includes not just one disease, but a set of nosological forms (Fig. 3.4c). If we are to analyze different nosology as causes of deaths, tuberculosis becomes

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[56] Productive age – men: 16–59 years; women: 16–54 years.

one of the leading causes of death in this age group. Thus, among those who died at the ages of 30−34 years old, the proportion of those who died of coronary heart disease (CHD) is only 4%, liver problems is 6.1%, traffic accidents is 6.8% etc.

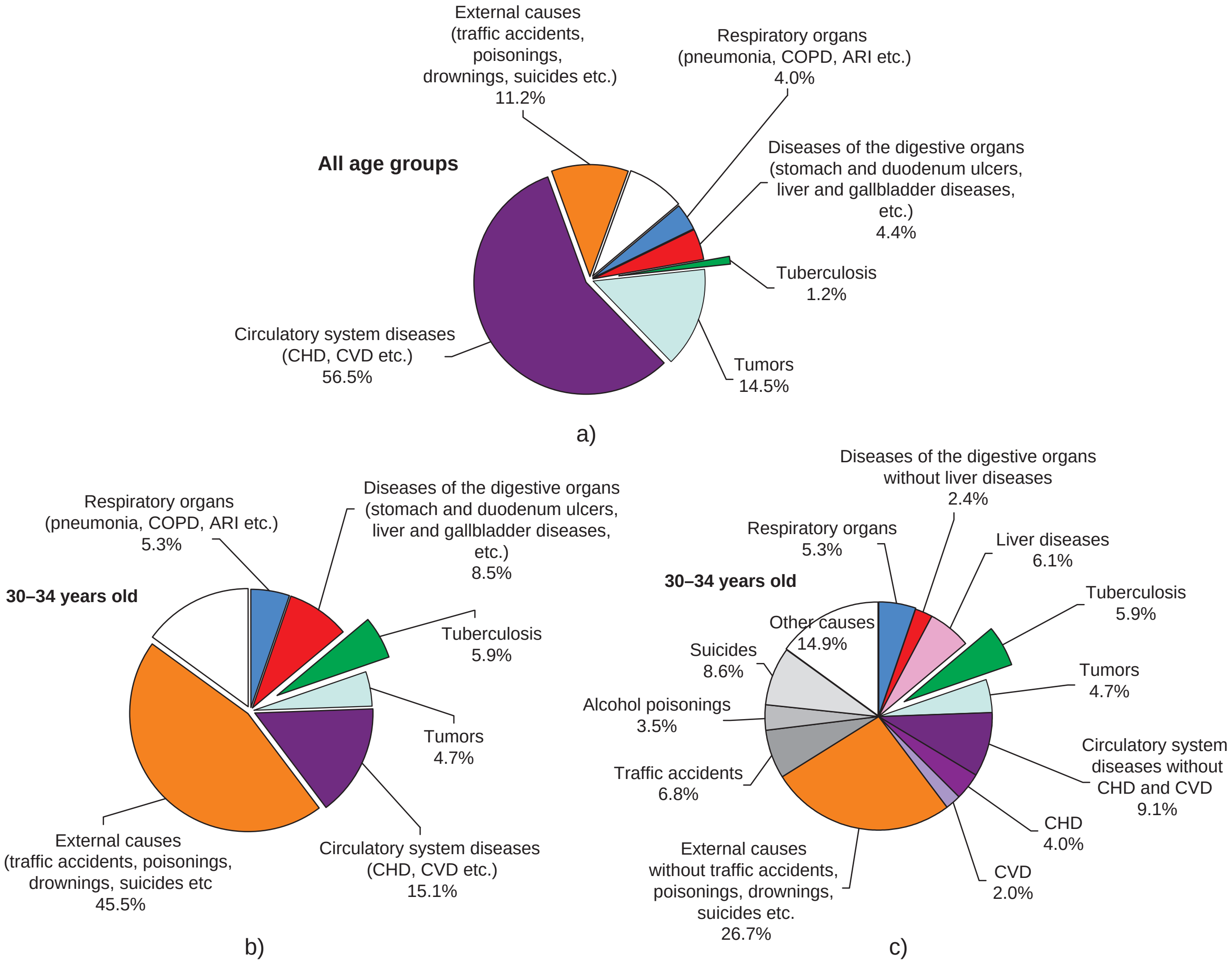


Fig. 3.4. Major causes of death in the Russian Federation, 2009: a) all age groups; b) 30–34 years old, leading causes of death; c) 30–34 years old, with the detailed causes of death. Abbreviation in the graph: COPD – chronic obstructive pulmonary disease; ARI – acute respiratory infection; CHD – coronary heart disease; CVD – cardiovascular disease (Source: [19])

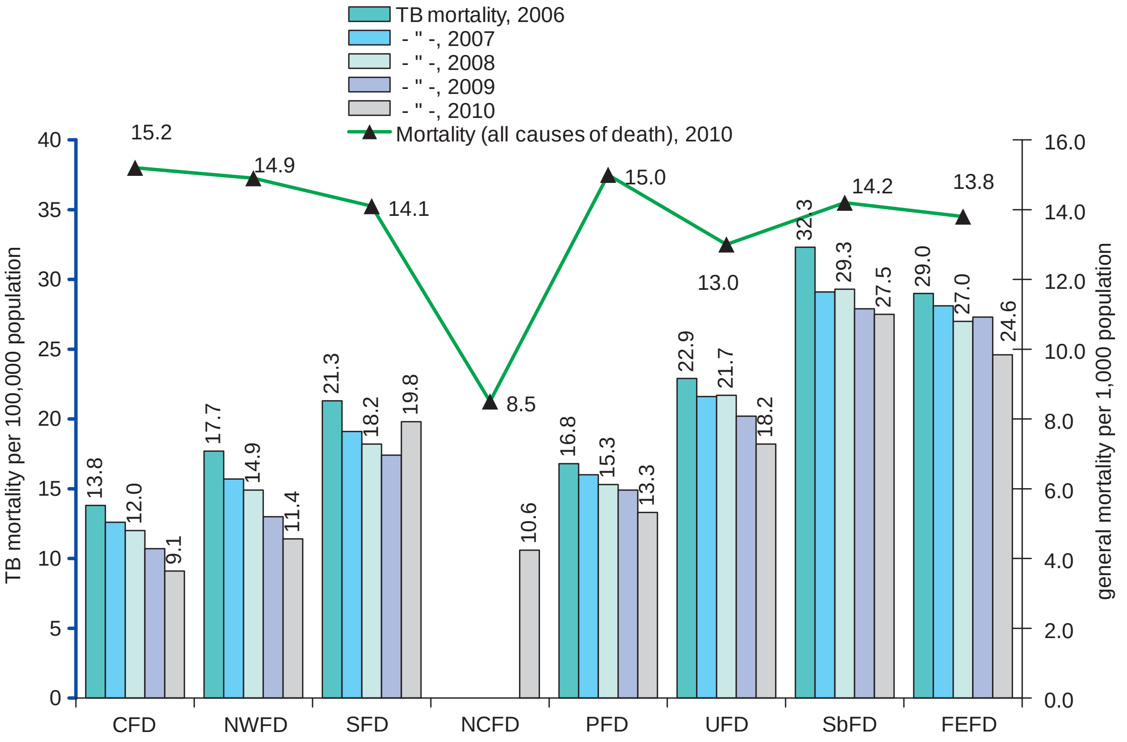
This regularity is observed in many countries of the world. Thus, according to the WHO global estimates for 1999 [60], TB was the cause of deaths in 9% of women who died at the age of 15–44 years, while military conflicts accounted for women's deaths in only 4% of cases and cardiovascular diseases in 3%.

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

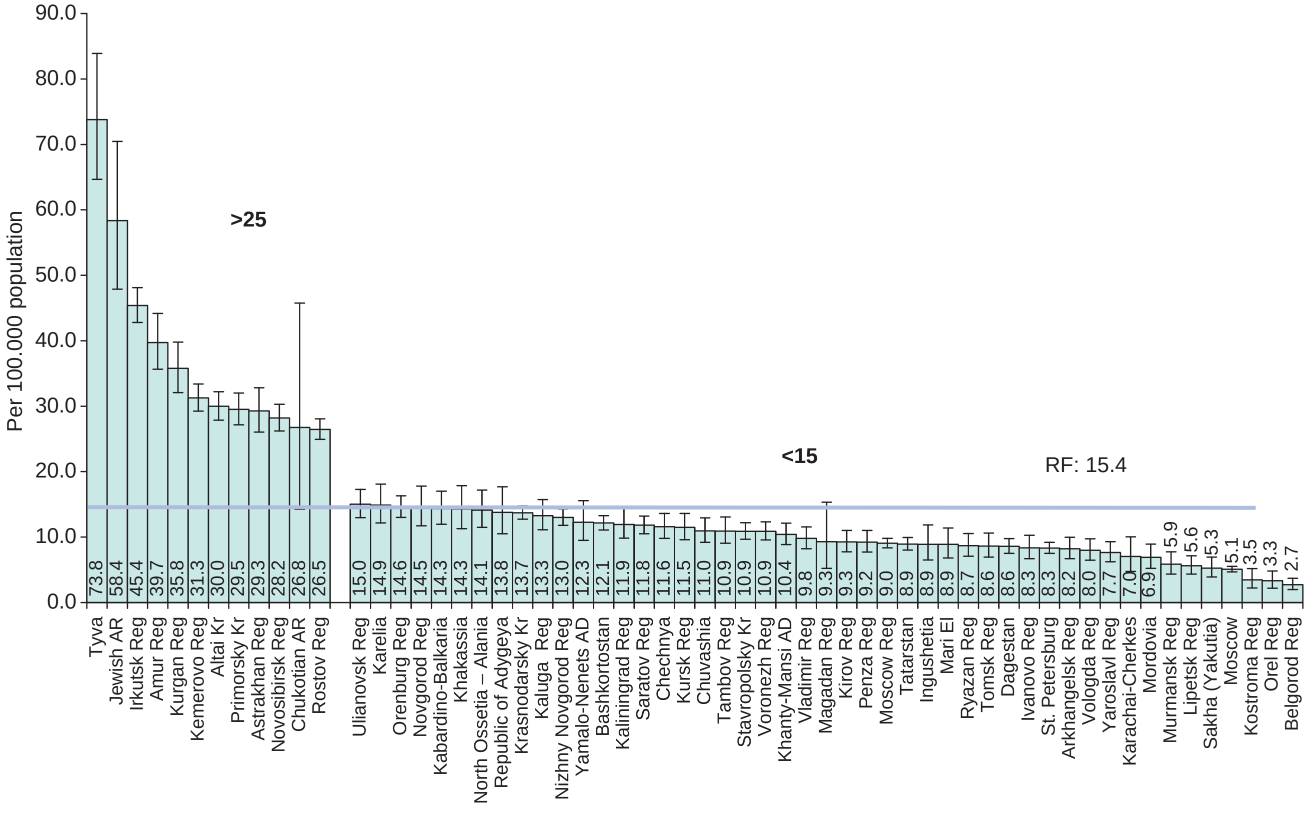
3.3. Regional variations in TB mortality rate

Values of the TB mortality rate in Russia, just like the values of the TB notification rate, gradually increase from the western regions to the eastern regions of the country (from 9–11 in the CFD and NWFD to 25–27.5 per 100,000 of the population in the SFD and FEFD, Fig. 3.5a). The rate of mortality due to all causes of death has a different geographical distribution. Its maximum values are reported in the CFD and NWFD (about 16 per 1,000 of the population). Partially, it can be explained by an unfavorable demographic situation in the majority of RF constituents in those federal districts where the trend of aging of the population is more pronounced [19, 20].

In 2010, a significant dispersion of the reported TB mortality rate remained in RF constituent entities ([19], Fig. 3.5b). The difference in the rate in a group of areas with the lowest values (Belgorod region – 2.4, Orel region – 3.3, Kostroma region – 3.5, Moscow – 5.1, Republic of Sakha (Yakutia) – 5.3, Lipetsk region – 5.6 and Murmansk



a) by federal districts



b) by RF constituents

Fig. 3.5. TB mortality by the federal districts (a) and by RF constituents where the rate is over 25 and less than 15 per 100,000 population (b), 2010. The vertical bounds indicate 95% CI [16-20]

region – 5.9 per 100,000 of the population) and the areas with the high mortality rate due to TB (Republic of Tyva – 73.8, Jewish autonomous region – 56.4, Irkutsk region – 45.4, Amur region – 39.7, Kurgan region – 35.8, Kemerovo region – 31.3 per 100,000 of the population) is almost tenfold. Against the general decrease in TB mortality in the country, in 2010 this rate was over 40 per 100,000 population only in 3 constituent entities of the

Russian Federation, while in 2005 such high rates were reported in 13 constituents. Major variation in the reported TB mortality rates in RF constituents may reflect actual differences in efficiency of TB control intervention as well as drawbacks in the reporting of causes of death in the regions, which is often due to violation of coding requirements according to International Classification of Diseases (ICD-10), the 10th revision (ICD-10).

3.4. TB patients' mortality structure

For a comprehensive analysis of **TB mortality**, it is necessary to consider both the mortality of patients due to **TB** and mortality of TB patients due to **other causes**.

According to Form No. 33, in 2010 forty-six percent of deaths in patients registered at TB facilities were not due to TB but other causes. Over the last two years this rate has slightly increased (in 2009, 43.7%; in 2007, 40.9%, $p < 0.01$). In 2010, the mortality of TB patients due to non-TB diseases and external factors (54.9 per 1,000 TB patients registered at TB dispensaries the in RF, 13,929 cases) was almost four times higher[57] than the general mortality due to all cases of death (14.2 per 1,000 of the population, 2010). Therefore, TB patients belong to the group of high risk of death (all causes), which means that the rate of mortality due to reasons other than TB in a group of TB patients requires special monitoring and analysis.

Decrease in mortality among TB patients should be achieved by decreasing TB mortality and mortality due to other causes of death. These tasks require diverse interventions. Proper management of early TB detection and improved effectiveness of TB treatment is needed for a decrease in mortality among TB patients, while the second task requires effective treatment of concomitant diseases along with ensured social and psychological support of TB patients.

It should be noted that in some cases the general level of mortality is used for the assessment of TB treatment effectiveness regardless of the causes of death. In particular, this approach is used in many countries of the world and in the WHO global reports when publishing the data on treatment effectiveness. This way ("mortality of TB patients," and not "patients' mortality due to TB") the rate is used for monitoring changes in the number of infectious TB patients in the region, who are dangerous from the point of view of epidemiology. In addition, in a number of regions and countries the causes of death are not always registered correctly, which may lead to the erroneous registration of deaths due to TB as deaths of TB patients due to other causes, and vice versa. In this case only this rate can be used for surveillance in order to monitor and assess mortality.

When analyzing TB mortality and defining the ways to decrease it, it is necessary to consider the **structure of the rate,** which can be divided into three main components:[58] (1) diagnosed post-mortem patients who died of TB (previously not registered and followed up); (2) patients who died of TB within one year following the registration and (3) other cases of death due to TB. Different factors have an impact on those components; therefore, specific measures are needed in order to achieve some decrease in each of them.

The number of TB patients **diagnosed post-mortem** depends on the quality and timeliness of TB detection and diagnosis and, in particular, on the performance quality of primary health care facilities and effectiveness of educational activities.

For the resident population, the proportion of patients with post-mortem diagnosis of TB in 2010 amounted to 8.5% (1,509 cases, Fig. 3.6).

The number of **patients who died within a year following new TB case registration** (in 2010, 17.6% – 3,135 patients) reflects the timeliness of detection and treatment effectiveness for new cases.

Finally, the percentage of remaining TB death cases (74%) 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 in general.

Reporting Form No. 33 also includes data on "patients who died of TB and were not registered at the regional TB facilities"[59] (2,742 cases, 2010). The respective column on Form No. 33 includes the number of people who died of TB while not being registered in the TB service, that is, patients who died of TB in penitentiary facilities and other sectors, foreigners, homeless persons and patients diagnosed post-mortem who were not residents of the respective constituency (for the residents with post-mortem diagnosis of TB there is a separate column in Form No. 33).

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[57] A more correct comparison can be performed using the mortality rates among TB patients and among the population in general adjusted by age and sex. However, unfortunately, it is not possible to do on the basis of data from the available reporting forms.

[58] These components are defined according to the data available in the Russian TB reporting forms – note by translation editor

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

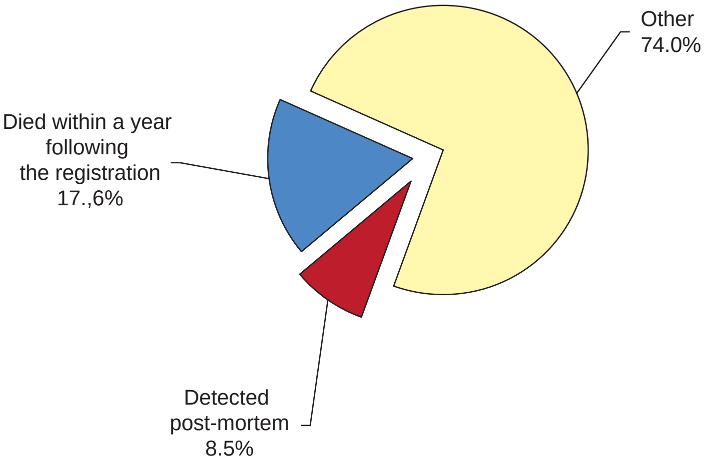

Fig. 3.6. Components of TB mortality rate for the resident population, Russian Federation, 2010
(Source: Form No. 33)

Information on TB death cases can be obtained by the regional TB dispensary from regional statistics bureaus. Therefore, the main TB dispensary in the area can monitor the aggregate mortality rate; the information contained in Form No. 33 should not significantly differ from the Rosstat data (see Section 3.1).

According to the Rosstat data for 2010, the total number of TB deaths (21,829 persons, Form No. C51/C52, Fig. 3.7a) includes persons registered at TB facilities in RF constituents (16,344 persons, 74.9%, Form No. 33), persons detected post-mortem among the resident population (1,509 persons, 6.9%, Form No. 33), persons who died in penitentiary facilities (4.3%, Form No. 4-tub) and death cases among TB patients "who were not registered at the TB facilities of the Russian Ministry of Health and Social Development" (not considering persons who died in the penitentiary system), but monitored by tuberculosis dispensaries (TBDs) through the statistical bureaus (8.2%). Therefore, at least 5.7% of deaths from TB in the constituent entities of the Russian Federation (1,234 cases) remained out of control of the TB service in those constituents.[60]

The proportion of TB deaths registered by the federal statistical service ("Rosstat") but not by regional TB dispensaries widely varies in RF constituents. According to the data from Form No. 33, at regional facilities in 12 constituents of the Russian Federation the information is lacking for more than 20% of death cases reported by the Rosstat (Republics of Kabardino-Balkaria, Karachai-Cherkess, Karlia and Bashkortostan, Astrakhan region, Samara region, Novgorod region, Saratov region, Orenburg region, Rostov region and Kaluga region, Saint- Petersburg). At the same time, in 8 constituents of the Russian Federation the aggregate data on TB deaths from Form No. 33 exceed the Rosstat data by more than 10%. It might be due to a different interpretation of the respective columns in the reporting form since there are no approved recommendations for its completion (see the footnote in the previous paragraph).

It should be noted that the actual number of patients who died of TB-associated diseases (of TB/HIV co-infection, B20.0 by ICD-10), exceeds the Rosstat data by 3,560 cases (see Chapter 8), which is 14% of the total number of deaths (Fig. 3.7b).

The rates calculated as percentages of certain groups of people who died of TB should be used for justification of the differentiated interventions targeted at a decrease in the level of general mortality. They can also be used for identification of resources that should be allocated for timely detection and adequate treatment of patients, which determines their organizational and economic importance.

At the same time, it is not always correct to use rates calculated as percentages of post-mortem diagnosed TB cases or percentages of patients who died within the first year following case registration in relation to the number of all death cases **for comparison of the territories and for the analysis of trends over time**. It should be taken into account that an increase in the percentage of one of the mortality components could occur either when the absolute number of deaths in one category is increased or when the number of deaths in other categories is decreased.

Changes in the TB mortality structure in 2003–2004 in the Orel region can be used as an example. In those years, a considerable decrease in the number of patients who died of TB was reported in the Orel region – from

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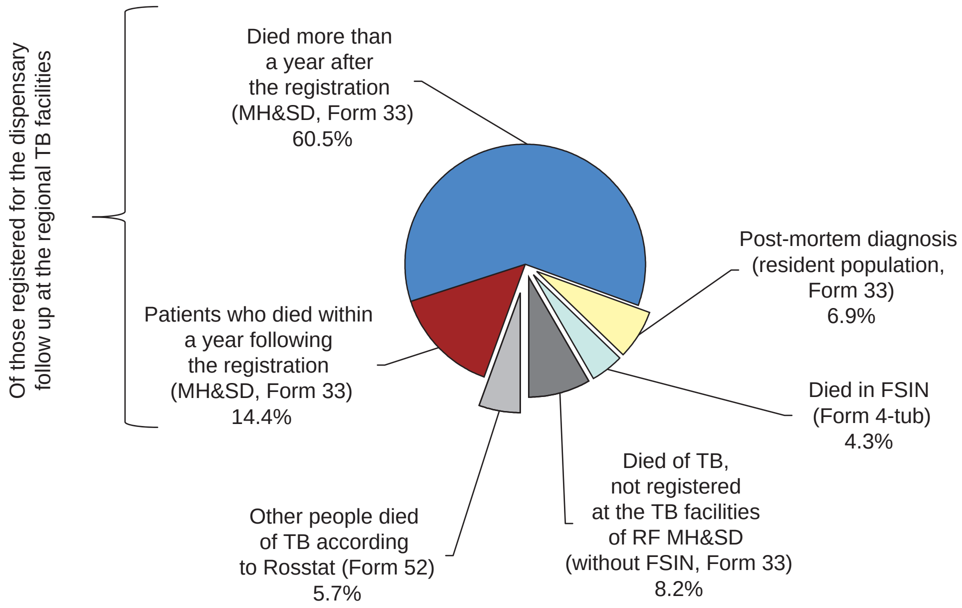
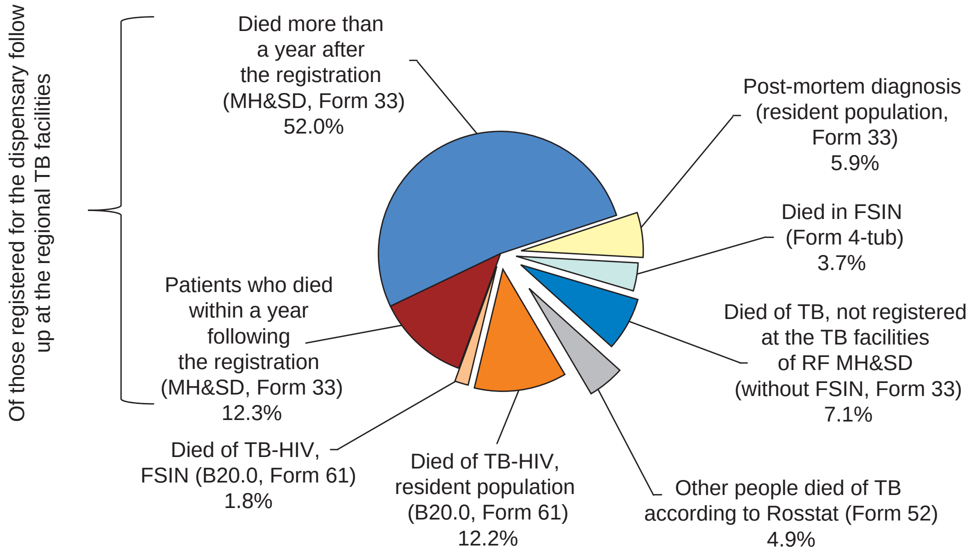
[60] Based on the interpretation of the columns referring to mortality in Form No. 33, which is performed by the Head of Federal Center for TB monitoring in the Russian Federation at the FHCOIRI, "cases detected post-mortem among the resident population" (1,509 persons.) do not belong to the number of "patients died of TB who were not registered at the TB facilities" (2,742 persons). At the same time, a number of constituents consider those persons who were "detected post-mortem" as part of "died TB patients not registered at the TB facilities" due to the lack of the approved regulations. Therefore, it is possible to say that "from 5.7% to 12.6% of TB death cases in the RF constituents were out of control of the TB services."



a) Structure of patients who died of TB according to Rosstat Form No. C51/C52



b) Structure of TB and TB/HIV deaths B20.0 according to Rosstat Form No. C51/C52 and MoH&SD Form No. 61

Fig. 3.7. Structure of TB deaths, including TB/HIV cases, according to the data contained in different reporting forms, Russian Federation, 2010, Federal Penal Enforcement System (FSIN)
(Sources: Forms No. C51/C52, No. 33, No. 61 and No. 4-tub)

40 to 26 persons. This happened due to a 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 their proportion in 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%. The percent age of patients with post-mortem TB diagnosis also rose sharply (from 17.5% to 34.6%), although the increase in the number of such patients was statistically insignificant – from 7 to 9.

This is why later on, in the comparisons of RF constituents, the calculations were made on the basis of these indicators in proportion to the number of new TB cases registered in the same year among permanent residents in their 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 resident population[61] (Form No. 33) demonstrates the effectiveness of TB detection and treatment. After the increase from 4.1% to 5.1% reported in 1999–2005 this indicator gradually decreased

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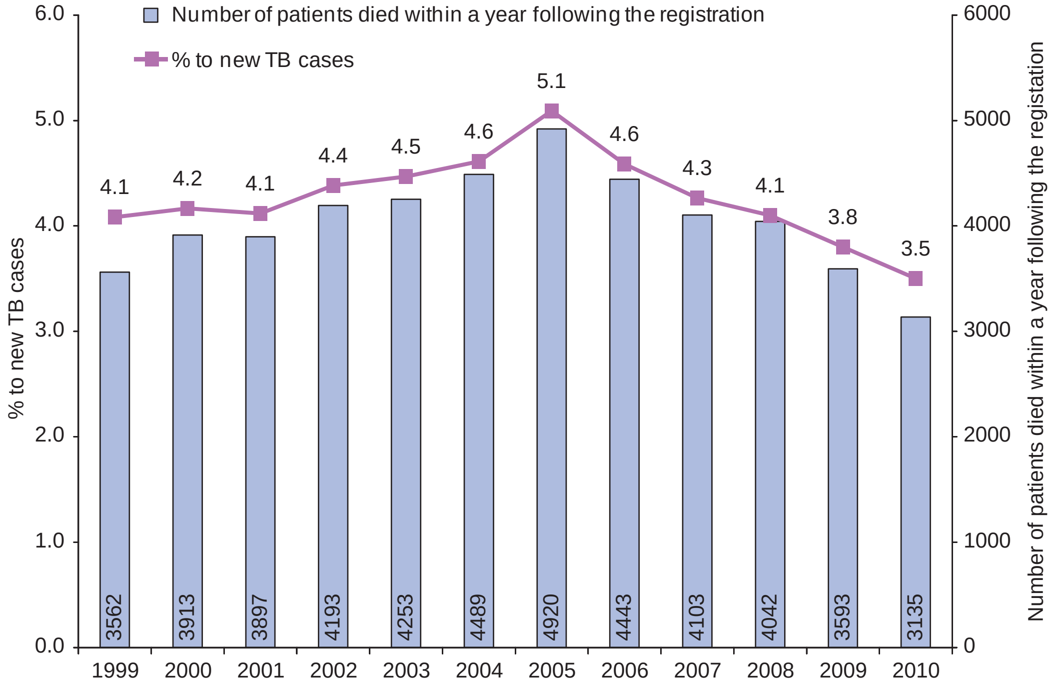
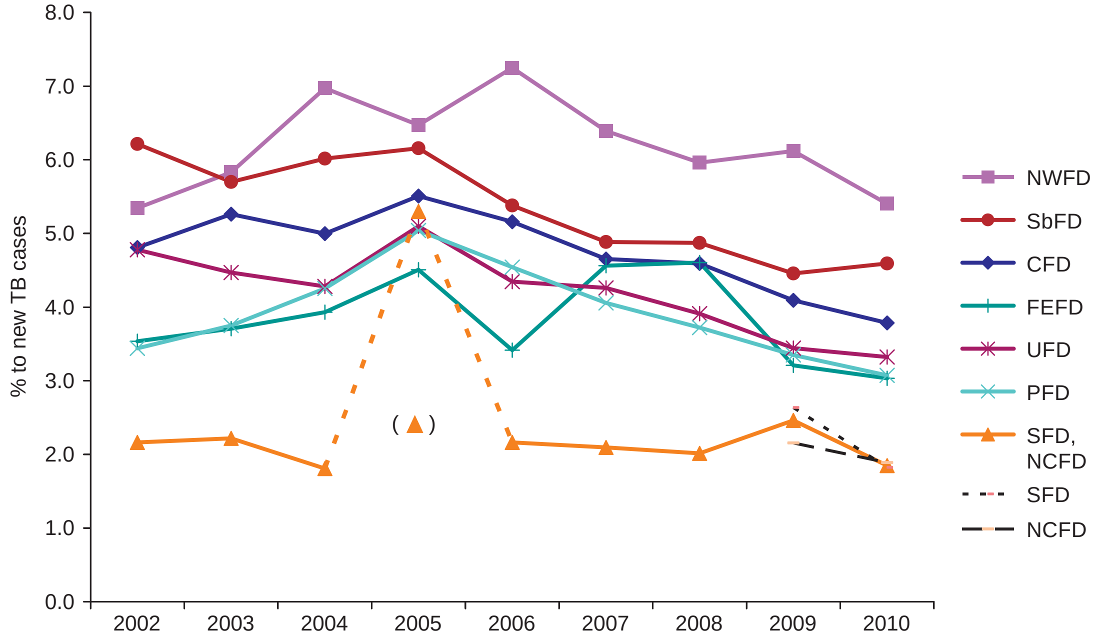
[61] The TB mortality rates for the penitentiary system, see Chapter 6.

over the past five years to 3.5% in 2010 (Fig. 3.8).The decrease in the proportion of patients who died of TB within the first year following case registration was reported in the past two years in all the federal districts except SFD, where there was a slight increase in 2010. In 2010, the highest levels of this indicator were observed in Leningrad (12.7%), Bryansk (8.0%), Tver (7.8%), Irkutsk (7.3%) regions and in the Republic of Karelia (7.4%). In general, half of the territories in Russia have the value of this indicator in the range of 2.2% to 4.8% (25% and 75% quartiles).



a) Russian Federation



b) Federal districts

Fig. 3.8. Ratio of patients who died of TB within one year following case registration and new detected TB cases. Resident population, Federal districts, and the Russian Federation nationwide.[62] The indicator value for the district is given in parentheses after averaging the 2005 data for the Rostov region based on the information for 2004 and 2006. (Source: Form No. 33)

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[62] The 2005 data for the SFD are indicated by a dotted line; that is, the number of deaths that occurred during the first year of the dispensary follow up should be ascertained. The data for the Rostov region in Form No. 33: 2004 – 24, 2005 – 415 and 2006 – 20 cases of death during the first year following the registration. The values of the indicator for the district are provided on the basis of the 2005 data for the Rostov region, calculated as an average value for 2004 and 2006.The RF indicator for 2005 (5.1%) is provided after the above mentioned calculation. In Form No. 33 the 2005 value will amount to 5.5%.

Low values of this indicator might be the result of both successful treatment of TB patients and insufficient quality of information in the registration forms that could be due to the fact that these data are not inherently available in the registration forms currently in use in the Russian Federation.

Such an indicator as "the proportion of patients who died during treatment within the first year following new TB cases registration"(during the course of treatment) can be obtained from 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 (one of the chemotherapy treatment outcomes) is calculated on the basis of reporting Form No. 8-TB. This approach allows for measuring the proportion of patients who died from the fixed cohort of new TB cases. The results of a cohort analysis for the new pulmonary smear-positive TB cases registered in 2009 showed that death of TB occurred in 7.5% of cases in this group of patients and in 3.8% of all new TB cases (MoH&SD Form No. 8-TB, see Chapter 7).

This indicator takes into account only the proportion of patients who died during the first course of chemotherapy provided after the patients' registration as new TB cases. A previously analyzed indicator – "proportion of new TB patients who died of TB within one year following case registration" – obtained as the result of the dispensary follow up, should additionally include deaths that occurred within a year following the primary registration but already in the process of possible re-treatment (after treatment default, failed treatment or due to detected MDR-TB).

Therefore, the TB fatality rates for the cohort of new TB patients calculated according to Form No. 8-TB, should be lower than the dispensary fatality rate. At the same time, the dispensary fatality rate for new TB patients, even for the country in general, is lower than the fatality rate calculated on the basis of data from the first course of chemotherapy provided to new TB patients (3.5% and 3.8% in 2010, respectively; also see Chapter 7). A possible reason for this discrepancy could be due to the fact that in many places the calculation of deaths among new TB cases could be performed during the current calendar year and not "within the year following the registration."

Assessment of the dispensary follow up based on cohort principles would allow improvement in the information content and quality of the indicator "proportion of new TB patients died within a year following the registration."

From 1999 to 2004, there was an increase in the **proportion of new cases with post-mortem diagnosis** (from 2.2% to 2.8%, see Fig. 3.9). From 2006, this indicator started to decrease and stabilized at the level of 1.8% (2008–2010 data, Form No. 8). In 2010, the decrease in this indicator was reported in 44 of 83 constituent entities of the Russian Federation.

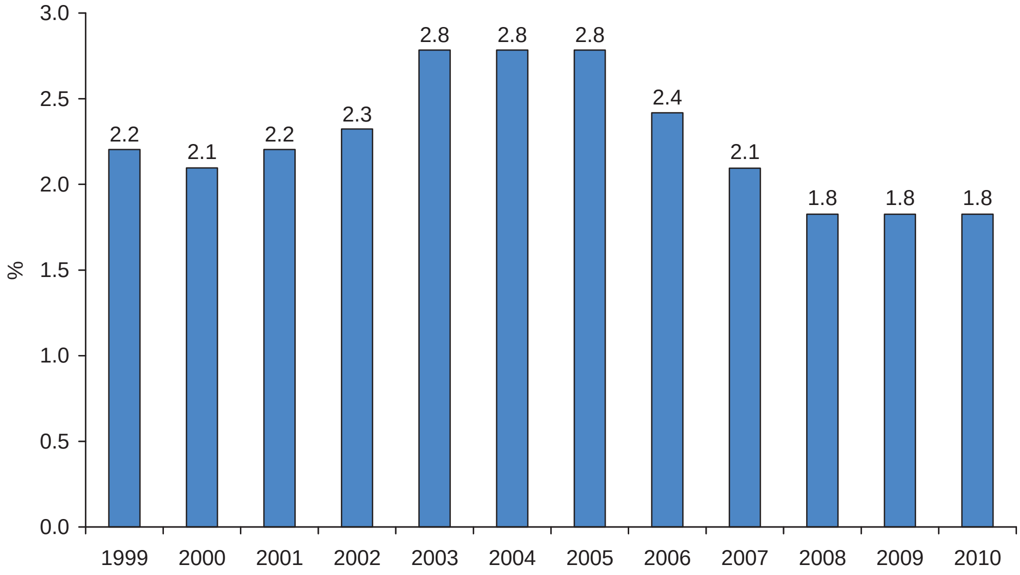

Fig. 3.9. Proportion of patients with post-mortem diagnosis among new TB cases. Russian Federation (Sources: 1999–2004 – Form No. 33; 2005 and thereafter – Form No. 8)

According to Form No. 8, the variation of this indicator is quite high in the constituents of the Russian Federation – from 0% (in seven federal districts, six of them are the republics in the North-Caucasian Federal District) to over 4% in Komi Republic (5.9%, CI 95% 4.3–7.9%), Moscow (5.5%, CI 95% 4.9–6.2%), Arkhangelsk (4.5%, CI 95% 3.1–6.3%), Kaliningrad (4.2% CI 95% 3.0–5.8%), Nizhniy Novgorod (4.1% CI 95% 3.3–4.9%) and Moscow regions (4.0%, CI 95% 3.3–4.7%) as well as in Kamchatka Territory (4.9%, CI 95% 2.6–8.5%). Absence of data on diagnosed post-mortem TB cases in a region may be caused by shortcomings in TB deaths registration.

Figure 3.10 indicates variability in the percentages of diagnosed post-mortem TB cases by the federal districts. It might be supposed that the minimal value of the indicator in the Southern FD and NCDF are associated with the traditionally low proportion of post-mortem examinations (autopsies) of patients in those regions. In addition, we should note a relatively high percentage of post-mortem diagnoses among the resident population in CFD and NWFD, which among other factors could be related to a high quality of monitoring of out-of-the hospital mortality and effective work of pathology services.

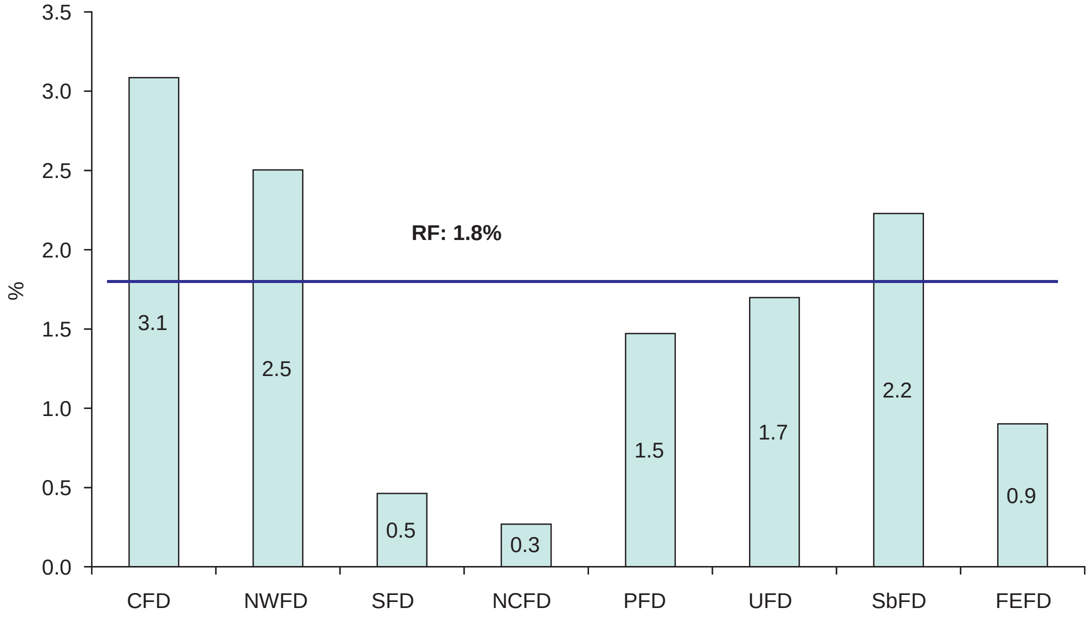

Fig. 3.10. Proportion of diagnosed post-mortem patients among new TB cases, Federal Regions of the Russian Federation, 2010 (Source: Form № 8)

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

3.5. TB mortality rates in the world and in the Russian Federation

In WHO reports, standard treatment outcomes do not distinguish between patients who died of TB and patients who died of other causes (see Chapter 7). For this reason, it is often believed that the general mortality of TB patients is analyzed as the mortality indicator. However, according to the official publication [78], the definition of “mortality rate” used by the WHO basically coincides with the definition used in the Russian Federation. WHO statistical publications analyze the TB mortality rate, which, in line with the causes of death described in the International Classification of Diseases, the 10th revision (ICD-10), is defined as the number of deaths caused by TB excluding deaths of patients with TB/HIV co-infection. The estimation of deaths caused by TB in patients with TB/HIV co-infection is provided separately. The term of “case fatality rate” is also used, and it is defined as a risk to die of TB for people with active forms of the disease.

The WHO pays special attention to the issues of estimation and registration of TB death cases. The Global WHO report [78] says that TB notification cannot be precisely measured by the available diagnostic tools, and the actual TB prevalence will be measured only by means of special population studies, which are planned to be performed in 20 countries of the world by 2015. Only TB mortality – the third of the main indicators used in the Global plan of the Stop TB partnership and for defining the Global Millennium Development Goals – can be measured directly. The collection of data on TB mortality should be ensured by the existing national systems of vital registration using special coding of the causes of death in line with the ICD-10.

Precise calculation of the mortality rates, identification of their trends and proper coding of the causes of death in line with ICD-10 is an important task for public health care.

At the same time, ensuring the quality and complete registration of TB death cases is a great challenge in many countries of the world where deaths of TB patients are registered and analyzed as one of the treatment outcomes. Besides, as it was mentioned earlier, they do not perform a differentiated analysis of causes of death in TB patients (death of TB or other causes) according to the standard treatment outcomes established by the WHO.

By 2009, of 196 countries of the world 89, including those from the list of high-burden countries (Russian Federation, Brazil, South Africa[63] and the Philippines) had well-functioning systems of vital registration that meet the following requirements of the WHO [78]: (1) coverage by the system of more than 70% of the population (RF – 98%) and (2) ill-defined causes of death (ICD-10 codes – R00-R99) no more than 20% of all registered deaths (RF – less than 5%). The majority of those countries is located in the European and American regions of the WHO, and along with the Russian Federation they include most of the former Soviet Union and the socialist camp countries.

Unlike the majority of the countries in the world, in the Russian Federation in addition to the system of vital registration the deaths of TB patients are also registered in the system of the dispensary follow up. This contributes to improving the quality of monitoring and evaluation of mortality among TB patients. The dispensary follow-up allows the differential analysis of death cases in TB patients depending on the duration of TB treatment (also including post-mortem diagnostics) and diagnostic activities performed.

According to WHO Global report data for 2009 [77], the information for the Global database of death cases is provided irregularly and only by a limited number of countries. For example, data for 2005–2006, which met the abovementioned criteria of quality and completeness, were submitted to the Global database only by 35 out of 196 countries of the world (including the Russian Federation).

Therefore, the quality system for registration of TB death cases functions in quite a limited number of countries. That is why WHO publications and the Global reports in particular [77, 78], as well as many other foreign publications, provide and analyze mathematical estimations of the mortality rate rather than the data on registered cases of death caused by tuberculosis.[64]

The recommendations developed by the WHO Global Task Force on TB Impact Measurement, which are related to measuring the progress in decreasing TB incidence, prevalence and mortality, indicate that one of the most important tasks is strengthening and developing the vital registration system in the countries of the world. At present, (as of August 2008) only 10% of death cases from the estimated number of deaths in HIV-negative TB patients are being registered in the world so far. At the same time, when comparing the data of estimation and registration of TB death cases published by the WHO and provided in Table 3.1 and Fig. 3.12, it becomes obvious that a number of countries, including the Russian Federation, already ensure the necessary completeness and quality of data on TB mortality.

According to the WHO estimation, 1.3 mln people died of tuberculosis in the world in 2009 (the estimation precision is within the range of 1.2–1.5 mln.), which corresponds to 20 per 100,000 of the population [78, 80]. This number is related to the population group, which does not include HIV-infected patients. According to the WHO estimation, an additional 0.4 mln people with HIV die of TB (0.32–0.45). In total, about 1.7 mln deaths somehow associated with TB occur in the world, which is 26 per 100,000 of the population. Therefore, the estimation of TB deaths is performed separately for HIV-negative and HIV-positive individuals, since according to ICD-10, death by TB for HIV-infected people is classified as death of HIV infection [77].

According to the estimates for 2009 the highest values of TB mortality were reported for the African countries (Fig. 3.11 and Table 3.1): 52.2 per 100,000 of the population (Fig. 3.11a), while including HIV-infected patients the rate was 93 (2007) .[65] HIV-infection has a major impact on the level of TB morality in the countries of Africa (Fig. 3.11b). According to WHO estimates for 2007, about 380,000 people a year die of TB-HIV co-infection in the African region. If in the African countries the proportion of TB deaths is 32% of all deaths caused by tuberculosis in the world, together with the HIV-associated deaths this proportion increases to 42%. In 2007, over 200 people per 100,000 population died of TB (including HIV-infected people) in Swaziland (317), Zimbabwe (265), Lesotho (263) and South Africa (230). In 2009, the highest TB mortality rates per 100,000 of the population (excluding TB-HIV patients) [79] were reported in Sierra Leone (153), Togo (113), Mauritania (90) and Mali (87) (see Fig. 3.12). The estimated values of TB mortality for those countries are the highest among the countries of the world.

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[63] The WHO does not use vital registration data from South Africa for statistics of TB mortality because a significant number of deaths due to HIV infection in the country are classified as deaths of TB.

[64] Only the data from the countries with the systems of vital registration that met the abovementioned criteria were used for the basis of the WHO estimates of TB mortality. Evaluation of TB mortality value was performed on the basis of annual estimation of the incidence rate and expert estimation of the fatality rate for four subgroups of TB patients: combination of HIV-positive and HIV-negative patients, notified and not notified patients. In 2010 the methodology for calculating WHO estimates for the main TB indicators slightly changed, which led to some minor differences in their values, published in 2009 [77] and in 2010 [80].

[65] The Global TB Control report for 2009 [77] contains the estimates of TB mortality for HIV-negative patients and patients with TB-HIV co-infection for 2007. In further publications of the WHO Global TB Control report [78, 80] the data on HIV-infected patients who died of TB are provided worldwide in general without any rate distribution by countries and regions. Therefore, the most recent estimates of this rate for TB-HIV patients are from the year of 2007 (see Fig..3.11 and Table 3.1).

Table 3.1

Estimates and registration of TB deaths in different countries[66]

Country, region	WHO estimates of TB mortality rates				Source of data for estimation (SVR, I/E – indirect estimation[2])	Number of notified death cases due to TB [97, 79][1]		
	Best estimate, not including TB/HIV patients, 2009 [78, 79]		Estimates of TB mortality, including TB/HIV patients, 2007 [77]			Year	Number of deaths	Per 100K pop.
	Number (x 1000)	Per 100K pop.	Number (x 1000)	Per 100K pop.				
Worldwide	1,300	19.3	1771.7	26.6	–	–	–	–
Africa	430	52.2	734.9	92.7	–	–	–	–
The Americas	20	2.2	40.6	4.5	–	–	–	–
Europe	62	7.0	63.8	7.2	–	–	–	–
India[#]	280	23	331.3	28.3	I/E	NDA	NDA	NDA
China[#]	160	12	200.6	15.1	I/E	NDA	NDA	NDA
South Africa[#]	26	52	111.9	230.4	SVR	2007	76,761	159.1
Philippines[#]	32	35	36.3	41.3	SVR	2003	26,657	36.5
Brazil[#]	4	2,1	8.4	4.4	SVR	2009	4824	2.5
Thailand[#]	12	18	13.6	21.3	/E	2006	5214	8.3
Russian[#]	25	18	25.4	17.8	SVR	2009	23,363	16.6
Armenia	0.4	12	0.3	10.4	/E	2008	172	5.3
Azerbaijan	1.0	12	0.9	10.4	SVR	2007	289	3.4
Belarus	0.5	5.3	0.8	8.2	SVR	2009	765	7.9
Estonia	0.044	3,3	0.08	6.1	SVR	2009	43	3.2
Georgia	0.6	13	0.4	9.3	SVR	2009	143	3.4
Republic of Moldova	0.2	4.8	0.7	19 .0	SVR	2009	736	20.4
Kazakhstan	3.5	22	2.7	17.4	SVR	2009	2,055	13.1
Kyrgyzstan	1.2	22	0.9	17.9	SVR	2009	439	8
Tajikistan	3.4	48	3.1	45.5	/E	2009	440	6.3
Uzbekistan	5.1	19	4.5	16.4	SVR	2009	1,713	6.2
Romania	1.4	6.6	3.5	16.4	SVR	2009	1,523	7.2
Czech Republic	0.06	<1.0	0.1	1.0	SVR	2009	50	0.5
USA	0.5	<1.0	1.3	0,.4	SVR	2007	554	0.2

[#] In the list of 22 high TB burden countries.

[1] The data was obtained from the mortality database of the WHO [97] for the most recent available year. The numbers of TB deaths and TB mortality rate per 100,000 of the population indicated in the table were calculated based on the number of TB deaths and the number of population provided in the same database. For those countries that submitted the data on TB death cases to the WHO Global report 2010 (Brazil, Russian Federation, Belarus, Georgia, Republic of Moldova, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and Romania), the 2009 data are presented according to [79].

[2] Indirect estimation of the TB mortality rate is performed using the ratio of incidence and fatality separately for the notified and non-notified cases depending on the presence of HIV-infection.

NDA – no data available.

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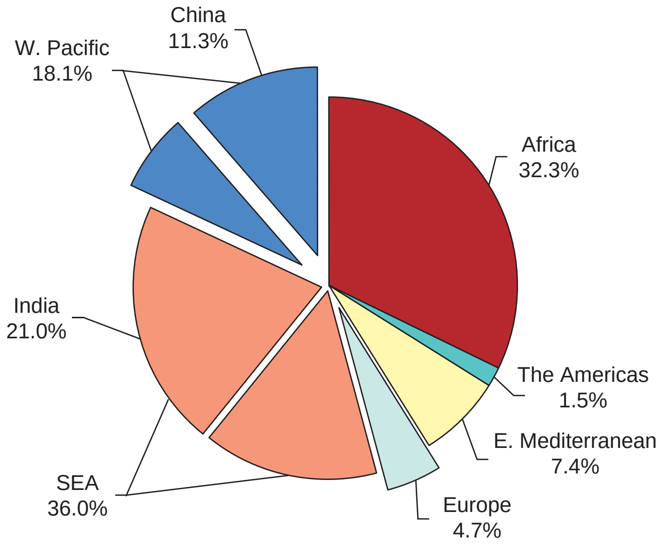
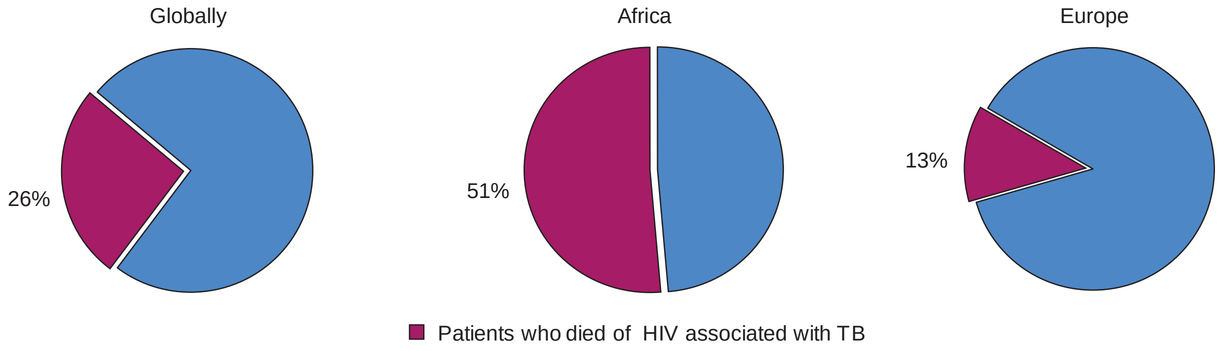
[66] In Table 3.1. data on estimates of TB mortality, which do not include the information on HIV-infected patients, were based on information from the reporting tables attached to the report [77] and published at the official WHO website: http://www.who.int/tb/country/data/download/en/index.html [79]. The data may differ from those in the text and tables of the Global report [78].



a) The WHO estimate of the number of TB death cases by WHO regions and some countries, 2009 (not including cases of TB-HIV) [78].



b) Proportion of patients who died of TB associated with HIV among all patients who died of TB, the African and European WHO regions and worldwide. The WHO estimate for 2007 [77].

Fig. 3.11. The WHO estimate for TB mortality in WHO regions, 2007 and 2009 (Source:[77, 78])

According to the 2009 estimation [79], the highest TB mortality rate in the WHO European region was reported in Tajikistan (48 per 100,000 of the population), Republic of Moldova (26), Ukraine (26), Kyrgyzstan, Kazakhstan and Turkmenistan (22 each), Uzbekistan (19) and the Russian Federation (18).

It should be noted that of 17 countries in the region (out of 53) with the highest TB mortality rates, all 15 republics of the former Soviet Union are included.

In 2000, the estimated TB mortality rate started to decease in the world, for all the countries overall, and in all six regions of the WHO (Fig. 3.13). In general, a 35% decrease of the rate was observed between 1990 and 2009, and if this trend remains, by 2015 we could see the achievement of the Stop TB strategy goal: a 50% reduction of the mortality rate compared with 1990. However, in the recent Global TB Control reports of the WHO [77, 78] it was emphasized that at the regional level only Africa, as it appears, will not be able to achieve the goal by 2015. At the same time, four countries (Brazil, Cambodia, Chia and Tanzania) have already achieved the goal, and six countries, including the Russian Federation, have good chances to achieve it by 2015 [78].

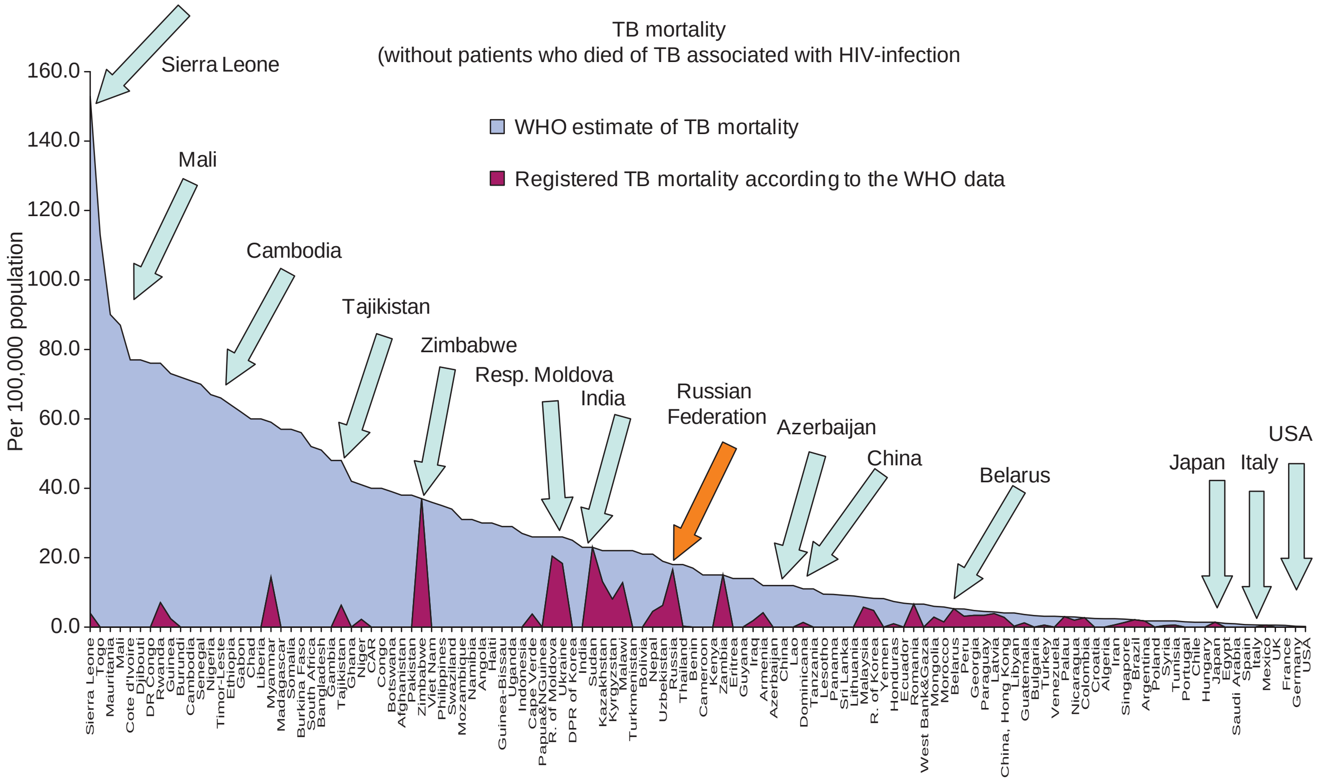


Fig. 3.12. TB mortality in the countries of the world. Estimation and registration according to the data from the WHO Global report, 2009. The data are provided for 122 countries, where, according to WHO estimates, the number of deaths in 1 year exceeds 100 (Source [79]).

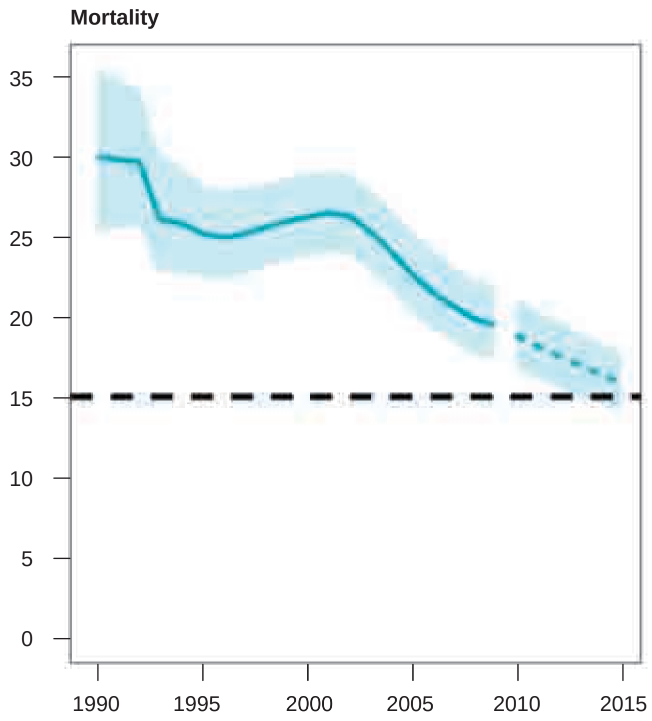


Fig. 3.13. The WHO estimate of TB mortality in the world per 100,000 of the population. The dotted line indicates the target value of the rate according to the Stop TB Partnership plan: to achieve a 50% reduction of the rate between 1990 and 2015. The blue shadow indicates the range of degree of uncertainty of the estimate (see Section 2.9). The data presented in the graph do not include TB mortality among patients with HIV-infection. (Source: [78])

4. TB prevalence in the Russian Federation

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4.1. General information. The indicator values and its trends in the recent years

The TB prevalence indicator reflects the TB spread 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 patients with active TB registered in the 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 [46][67].

When calculating the TB prevalence, the total number of TB patients is considered irrespective of the patients' inclusion in one of the cohorts for treatment.

TB prevalence is an important and integral indicator reflecting the effectiveness of treatment and follow-up activities. In most of the countries, due to the lack of a system for a long-term follow-up of TB cases (follow-up being limited to monitoring the 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 TB prevalence rate is calculated in the country on the basis of the number of patients registered in the 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.[68] Data on the number of cases of tuberculosis among the resident population are reported in Form No. 33, and for the population of FSIN (Federal Penal Enforcement System) in Form No. 4-tub (see Chapter 8). This chapter provides an analysis of the TB prevalence rate in the resident population only.

In Russia, the TB prevalence rate largely depends on 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 [34].

Fig. 4.1 provides data on TB prevalence in the Russian Federation calculated on the basis of patient numbers in the follow-up groups that included patients with active forms of TB in the corresponding years. Thus, until 2004, TB prevalence was calculated on the basis of patient populations in the DFGs I and II that had been defined by the MOH executive orders.

At that time, DFG I included patients under the basic courses of treatment and those under indication treatment (IA) as well as 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 to be at a high risk of relapse or exacerbation of the disease. From the international perspective, such patients would not be considered as TB cases. In 2004, the "abating" TB patient group was abolished and a new system of dispensary grouping was introduced [34] (also see Annex 1). According to this system, TB patients were distributed in the following groups: IA (new TB cases), IB (TB relapse cases), IC (patients with an interrupted course of treatment and those evading evaluation) and, finally, DFG II (patients with chronic TB).

The TB prevalence rate, calculated on the basis of 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 the level of 271.1 cases per 100,000 population, that is, returned to the level reported in 1979 [58].

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

After the revision of the follow-up groups in 2004, the prevalence rate decreased from 271.1 (2002) to 218.3 (2004) per 100,000 population due to the abolished DFG II. During recent years, the prevalence rate steadily declined, and it reached the level of 178.7 per 100,000 population in 2010. At the end of 2010, the MoH&SD facilities had 253,555 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 TB during the DFG revision. DFG II group of "abating" TB cases, abolished in 2004, accounted for one third of the prevalence rate (33.3% in 2001).

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[67] "TB prevalence" in the Russian statistical system reflects "registered TB prevalence" in contrast to "TB prevalence" in WHO reports defined as an estimated indicator or as an indicator that can be found by special survey. See details in the chapter text. – note by translation editor.

[68] 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 the Annex.

After it was abolished, patients from the former group I were transferred (considering detected, transferred in and out and cured patients) to 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.

While analyzing the prevalence rates, it is necessary to take into account the ratio of the prevalence rate and the new TB case notification rate, which reflects the average duration of the disease and, to some extent, the duration and effectiveness of treatment [15, 59]. According to the WHO estimate, the ratio of 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 toward a shorter course of the disease and a shorter duration of treatment. In 2010 in the Russian Federation this indicator was still high at 2.9.

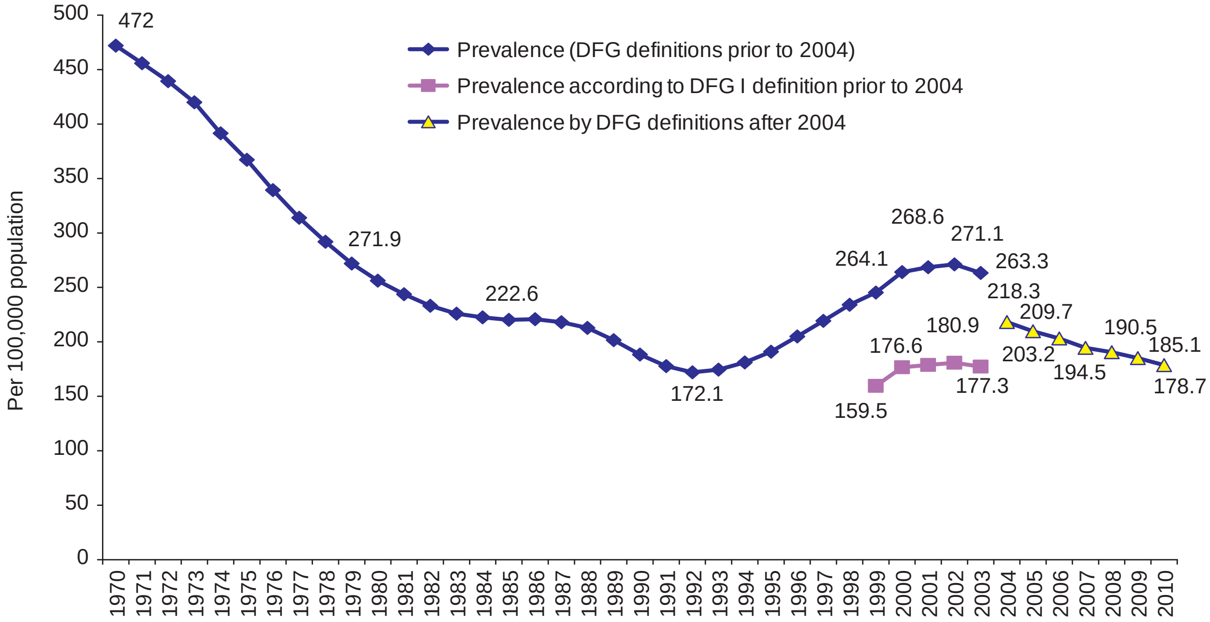


Fig. 4.1. TB prevalence in the resident population of the Russian Federation. Calculations are based on the size of all follow-up groups, which include active TB patients (DFGs I and II), and only on DFG I prior to the 2004 revision of the follow-up groups. (Source: Form No. 33)

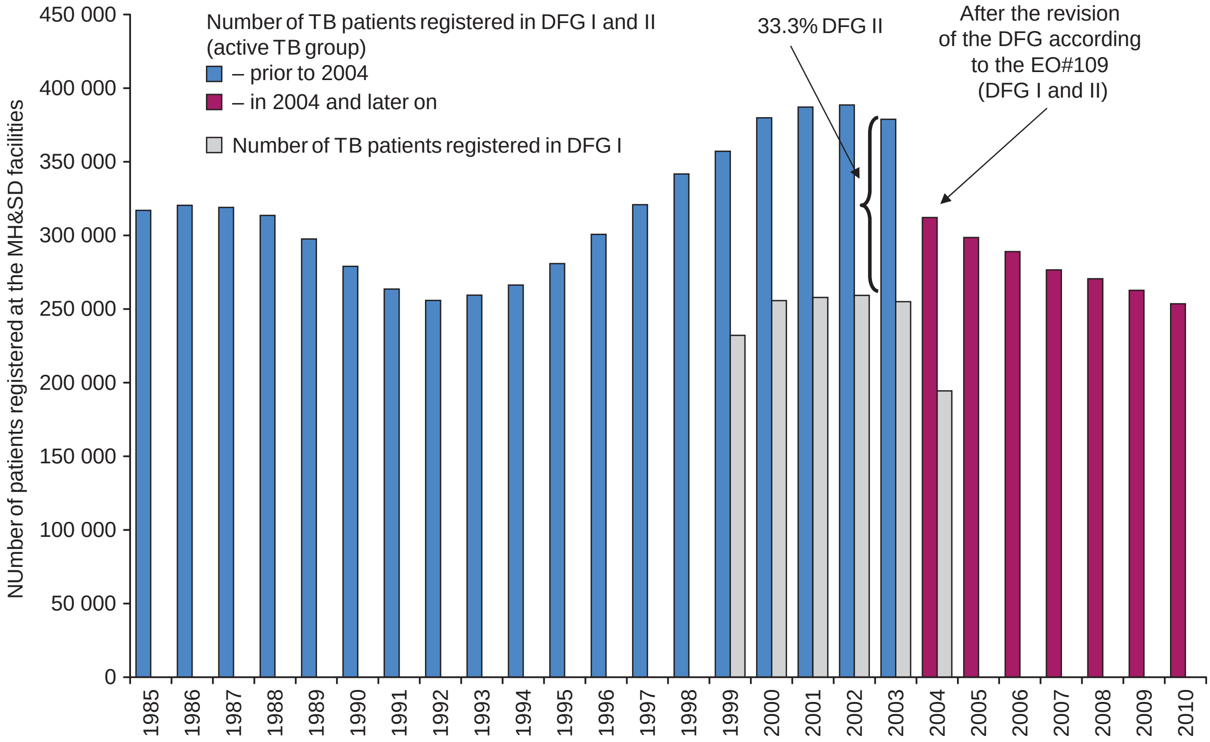
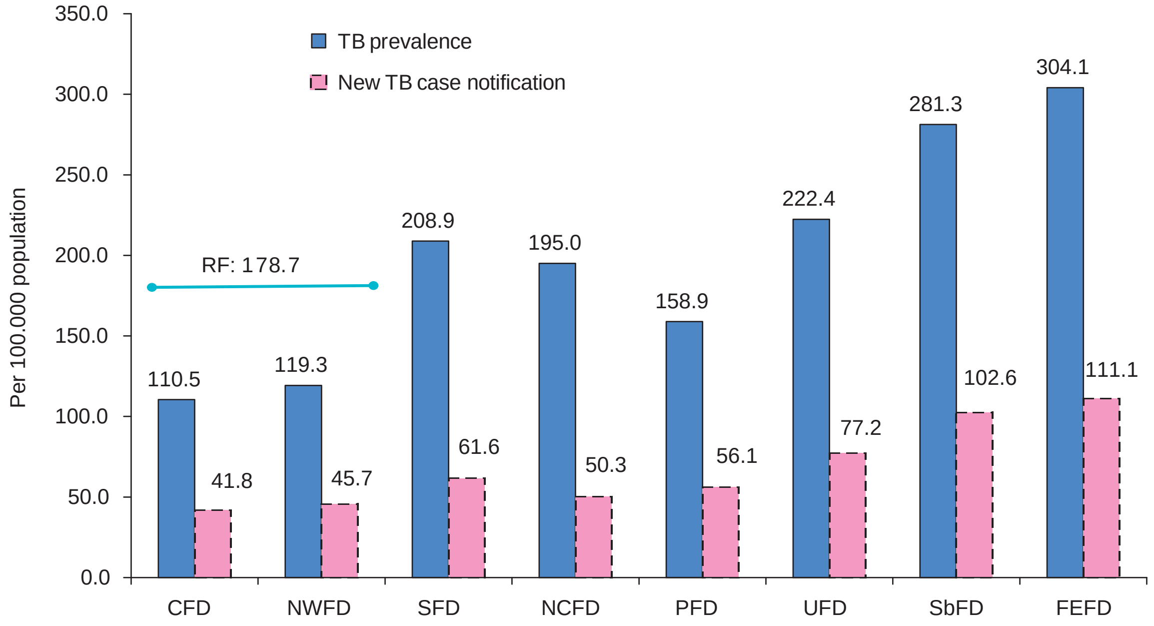


Fig. 4.2. Number of TB patients registered in dispensary follow-up groups for patients with active TB (see text), resident population, Russian Federation. (Source: Form No. 33).

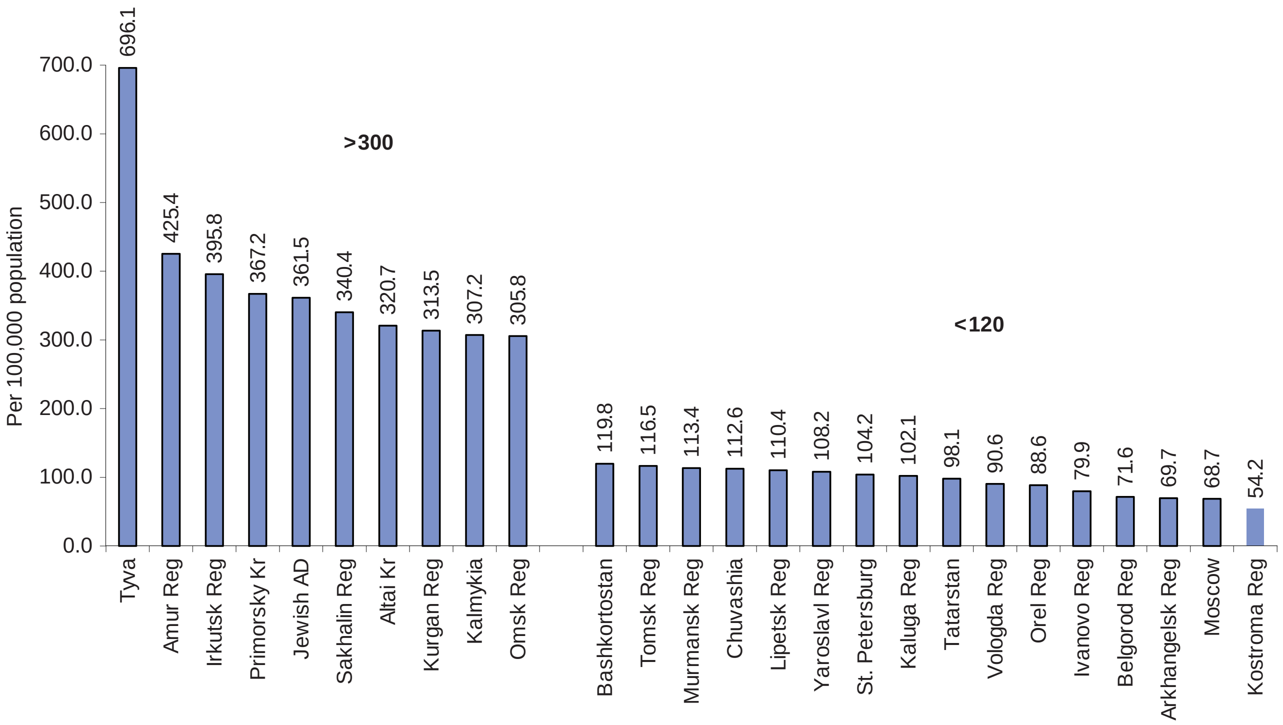
4.2. TB prevalence in the constituent entities of the Russian Federation

Just like other epidemiological rates, TB prevalence rates significantly differ by the constituent entities of the Russian Federation (Fig. 4.3).

As with the TB notification rate, the prevalence of tuberculosis increases from the west (110.5–119.3 cases per 100,000 population, 2010) to the east across the country. In SbFD and FEFR, the rates reach 281.3 and 304.1 cases per 100,000 population (2010), respectively.



a) by federal districts



b) by RF constituents with TB prevalence over 300 and below 120 per 100,000 population

Fig. 4.3. TB prevalence in federal districts and RF constituents, 2010. Comparison of TB prevalence and notification rates for the resident population of the federal districts (Sources: Form No. 33, population: Form No. 4)

A high level of TB prevalence, which significantly exceeds the new TB case notification rates, was also reported in the territories of the Southern Federal District (SFD) and North-Caucasian Federal District (NCFD): 208.9 and

195.0 cases per 100,000 population (hereinafter among the resident population in the RF constituents according to Form No. 33).

If in other federal districts the prevalence rates exceed the case notification rates by 2.6–2.9 times, in SFD and NCFD this proportion was about 3.4 and 3.9, respectively. This may indicate a significant delay of TB patients in the groups of active TB (too long a stay in the DFGs) or, otherwise, insufficient treatment effectiveness for TB patients.

For the last 3 years (2008–2010), a decrease in the prevalence rates has been reported in all federal districts except for FEFD, where for 2 years this indicator has not changed much. In 2011, it was at the level of 304.1 cases per 100,000 population and 304.5 cases per 100,000 population in 2009.

Low prevalence rates (not exceeding 120 per 100,000 population) were reported in 16 constituents of the Russian Federation – in Tomsk, Murmansk, Lipetsk, Yaroslavl, Kaluga, Vologda, Orel, Ivanovo, Arkhangelsk, Belgorod and Kostroma oblasts (regions), in the cities of Moscow and Saint-Petersburg, and in the Republic of Bashkiria, Chuvashia and Tatarstan.

At the same time, in 10 constituents the prevalence rate exceeded 300 per 100,000 population: in the Republics of Tyva and Kalmykia, in Amur, Irkutsk, Sakhalin, Omsk, Kurgan, Omsk regions, in Altai Krai and Primorsky Krai and in Jewish AO (autonomous region). In the Republics of Tyva and Amur region this indicator reached the levels of 696.1 and 425.4 cases per 100,000 population. respectively.

The penitentiary system contributes to the overall prevalence of the disease in the population of the Russian Federation (see Chapter 8). The overall TB prevalence in the country, including FSIN facilities, amounts to 206.1 per 100,000 population. In 2001 TB patients registered at FSIN facilities contributed almost 28%; in 2010 they contributed only 13.3% of the total number of 292,451 patients registered by the end of the year in Forms No. 33 and No. 4-tub.

4.3. Structure of TB patients registered at TB facilities in the constituents of the Russian Federation

Fig. 4.4 shows the distribution of TB patients by DFGs in 2010. New respiratory TB cases (RTB) constitute slightly over one half (49.8%) of active TB patients registered at TB facilities, while the proportion of patients with chronic RTB is still high (34.7% among all TB cases or 34.5% among RTB cases), which resulted from ineffective treatment in previous years[69] [58]. A significant number of patients with chronic TB is a permanent source of TB transmission (first of all, transmission of MDR-TB, see Chapter 8) among the population. This indicates a remaining challenging epidemiological situation of TB in Russia.

It should be noted that against a sharp decrease in the number of new RTB cases reported in 2010, the proportion of patients with chronic RTB, which was decreasing (from 43.1%) since 2006, slightly increased (from 34.3 to 35.2%) in 2009–2010, although 22 entities of the Russian Federation reported the decline.

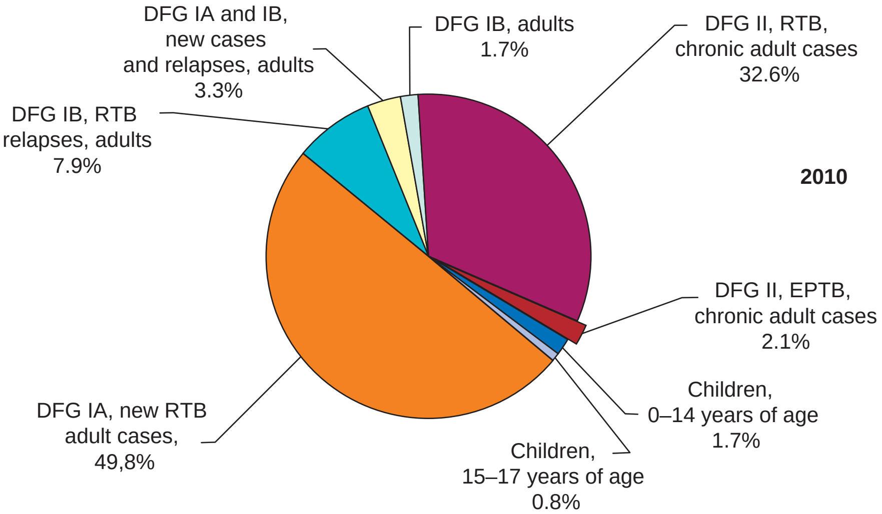


Fig. 4.4. Distribution of all registered TB patients by the dispensary follow-up groups, Russian Federation, 2010 (Source: Form No. 33)

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

In 2010, the proportion of chronic RTB was less than 25% in 18 territories. It was less than 21% in 10 territories – the Republics of Chuvashia, Mari-El, Karelia, and in Orel, Kirov, Belgorod, Tomsk, Ivanovo, Kostroma and Sakhalin regions. In the Lipetsk region, Yamalo-Nents AO and in the Republic of Ingushetia the proportion of chronic RTB forms exceeded 50%.

The prevalence of bacteriologically positive (MbT+) TB cases in the country remains high (see Fig. 4.5). The revision of the dispensary follow-up groups barely had an impact on this rate for MbT+ RTB patients, which has been declining since 2002 (88.0 per 100,000 population) and reached 72.9 per 100,000 population in 2010. The prevalence of MbT+ cases exceeds the case notification rate of confirmed MbT+ cases by 2.6 times in 2010. This ratio has been declining since the end of 1990s, when it was 3.3, but it has not reached the recommended value of 1.5–2.0 [15], which may still indicate the accumulation of the so-called "bacillary patients pool" (registered MbT+ patients). In addition, a significant difference between the TB prevalence and new TB case notification rates indirectly demonstrates the insufficient effectiveness in MbT+ patients management. Noteworthy is that in some territories (Orel and Arkhangelsk regions and the Republic of Mary-El), for patients with respiratory TB this ratio decreased from 2.4–3.0 to 1.1–1.5 in 2002–2010.

A similar situation has been observed among patients with destructive pulmonary TB (Fig. 4.6). After reaching its maximum in 2002 (82.1 per 100,000 population), the prevalence of destructive pulmonary TB forms started to decline, and in 2010 it reached the level of 69.4 per 100,000 population. However, this rate is 2.7 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.

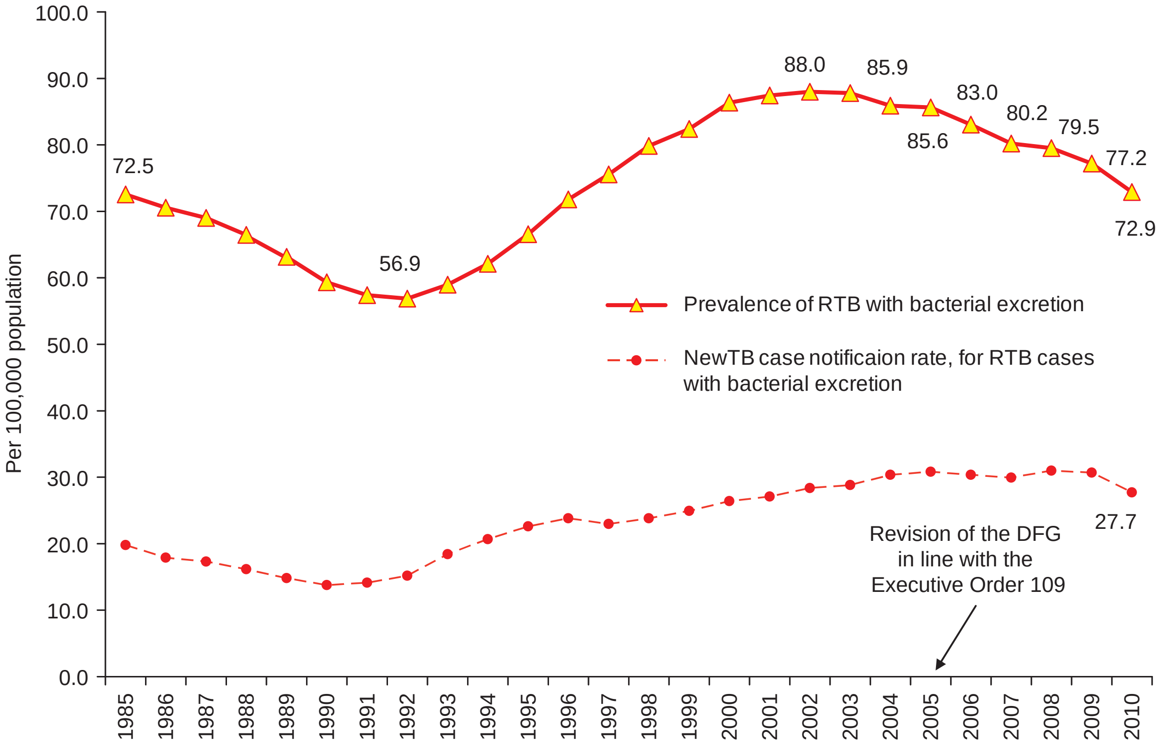

Fig. 4.5. Prevalence and new case notification rates of MbT+ RTB cases, the Russian Federation (Sources: Forms No. 33; population – Forms No. 1 and No. 4)

The percentage of cases with destructive forms of pulmonary TB registered at TB dispensaries varies significantly by the constituent entities of the Russian Federation. The lowest rates in 2010 were reported in the territories of UFD and CFD (36.0% and 39.0%, respectively); the highest levels were registered in NWFD (47.3%) and in the east of the country (SbFD – 46.7%, FEFD – 46.3%). Figure 4.7 shows the territories with the highest and lowest values of this rate (> 50% and < 35%).

In 2004–2010, the proportion of patients with of fibro-cavitary TB (FCTB)[70] among all registered PTB patients remained high – about 13% (12.8% in 2009). The presence of a large number of FCTB cases indicates major problems related to in-time case detection and particularly to TB treatment. In 2010, the overall level of FCTB in the

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[70] These are the most severe pulmonary TB forms registered in Russian statistical reports. "Fibro-cavernous" is defined as a tuberculosis with chronic course and extended lung cavitations and fibrosis. – note by translation editor.

country reached 20.7 cases per 100,000 population. The greatest prevalence rate of this form of PTB is reported in SFD, SbFD and FEFD – 31.7, 37.4 and 40.9 cases per 100,000 population, respectively.

At the same time it should be noted that in 2004–2010 there has been a continuous decline in the absolute number of patients with FCTB in the country (from 36,295 to 29,446 cases) and in the prevalence rate of this form of the disease in the population (from 25.4 to 20.7 per 100,000 population).

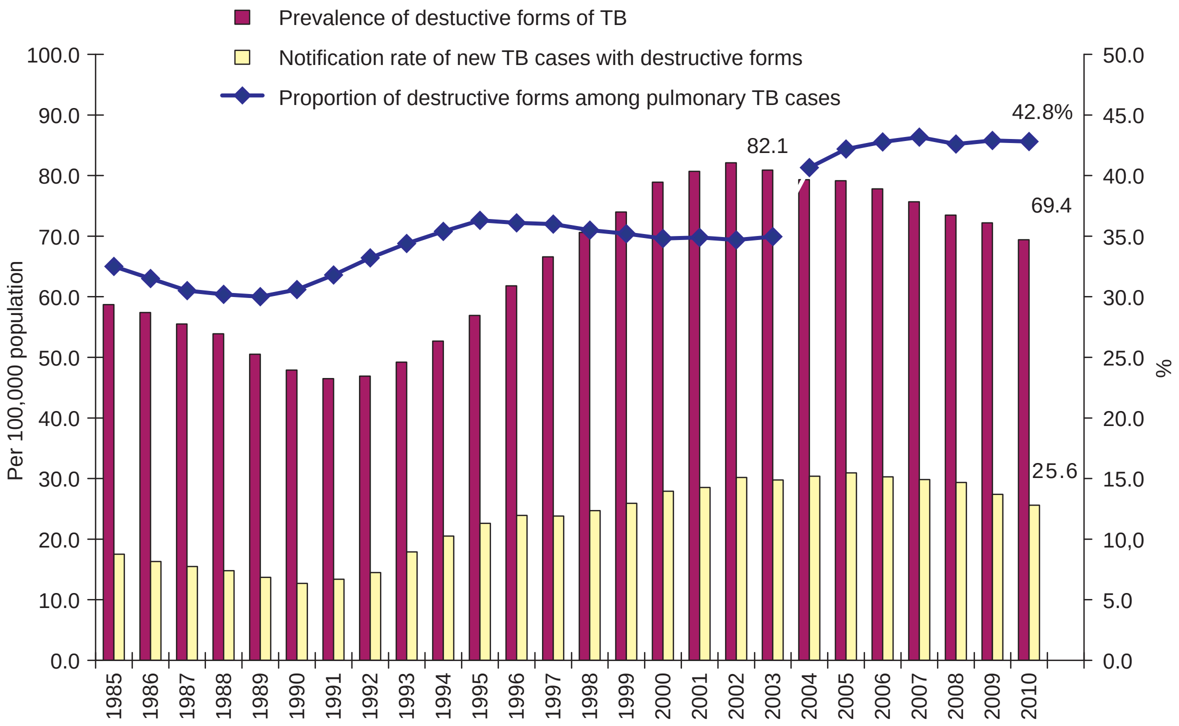

Fig. 4.6. Registered TB prevalence and new TB case notification rates of destructive forms of pulmonary TB and the proportion of destructive forms of TB among all pulmonary TB patients registered at the end of the year, the Russian Federation. Dispensary follow-up groups were revised in 2004 in line with MoH Order [34]. (Sources: Form No. 33; population – Forms No. 1 and No. 4)

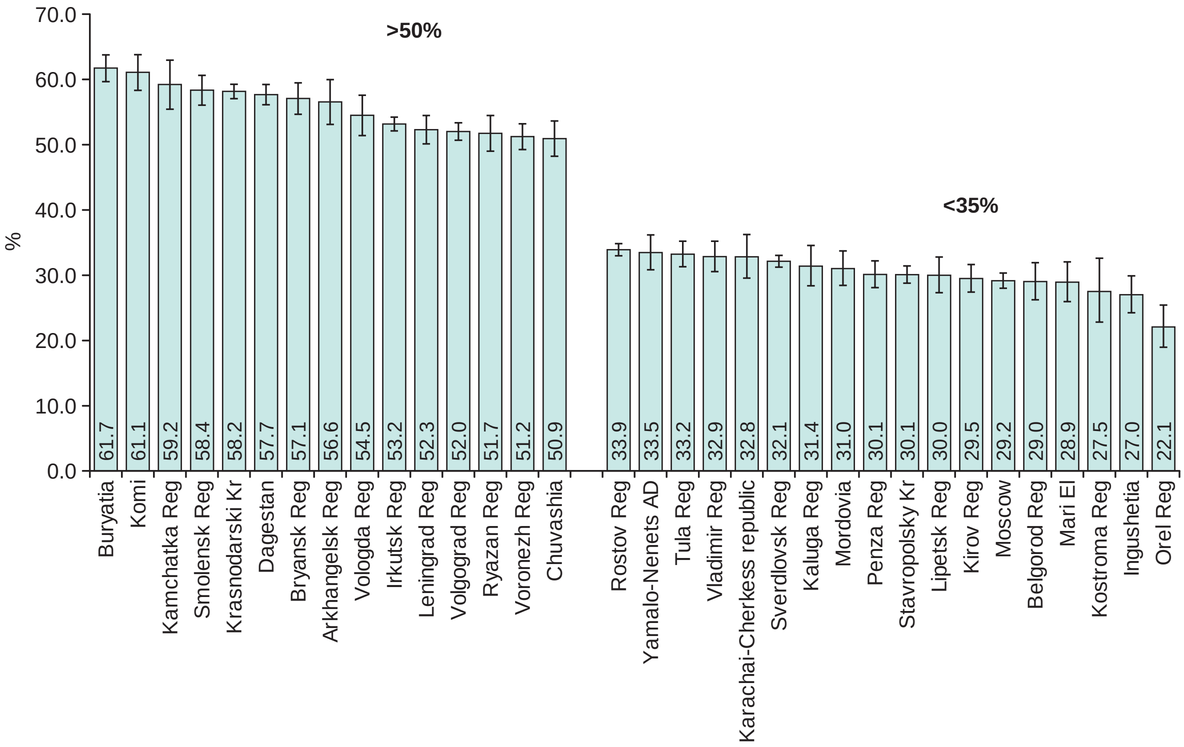

Fig. 4.7. Proportion of pulmonary TB patients with destructive forms of TB among all PTB patients registered at the end of the year in the areas of the Russian Federation with the rates > 50% and <35%, 2009. The error bars indicate 95% CI. (Source: Form No. 33)

The proportion of FCTB cases among pulmonary TB patients is much higher than the proportion of this form of the disease among new TB cases (12.8% and 1.8%, respectively).[71] As demonstrated in [58], a large number of cases with FCTB (up to 70%) among all cases registered at the DFG occur within a year following case detection and treatment initiation. Figure 4.8 shows the prevalence and notification rates of FCTB cases in past years to illustrate the problem of the accumulation of TB patients with severe TB 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 21 times in the recent years. A significant exceeding of the FCTB prevalence rates over the FCTB notification rates was reported in UFD (34 times), SFD (30 times) and NCFD (32 times). The prevalence rates of FCTB exceeding more than 80 times over the notification rates were reported in the following constituents of the Russian Federation where annually no more than 7–12 new cases of FCTB are detected, while 300–770 cases of FCTB are in follow-up register: the Rostov region (659 FCTB patients), the Amur region (481 patients), the republics of Bashkortostan (643 patients), Dagestan (767 patients) and North Ossetia-Alania (309 patients registered by the end of 2010). The smallest difference between the prevalence and notifications rates of FCTB (< 8 times) with a relatively low prevalence (10 and below 10 cases per 100,000 population) was observed in such territories as Tomsk, Orel, Arkhangelsk and Kaluga regions and in the Republic of Chuvashia.

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 [58] and emphasize the need to take additional measures to improve TB treatment in many regions in Russia.

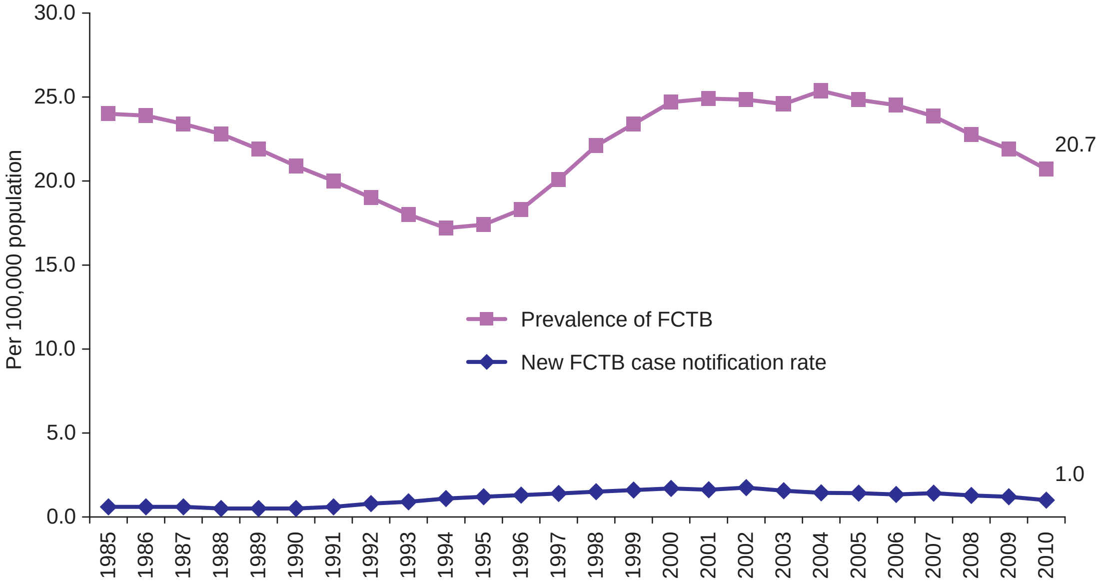

Fig. 4.8 Prevalence and case notification rates of fibro-cavitary TB (FCTB) among the resident population of the Russian Federation (Source: Form No 33; population – Forms No. 1 and No. 4)

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

Changes in the numbers of TB patients in each administrative unit (e.g., the number of patients registered by the end of the year) depend not only on the notified new TB cases and TB relapse cases (see Chapters 2, 5 and 6), mortality rate (see Chapter 3) and cure rate (see Chapter 7), but also on the number of patients transferred into and out of other territories and patients who were detected (notified) earlier in other territories or sectors (e.g., FSIN). This information is very important for the assessment of inter-departmental coordination in performing TB control activities, and it is required to avoid presentation of incorrect data on the number of TB patients (when new TB cases are included in the group of transferred-in patients and the group of transferred-out patients includes patients failing treatment or defaulting from treatment) and to monitor treatment effectiveness.

However, this aspect receives proper consideration only in a limited number of publications (e.g., in [58]).

Overall, in the Russian Federation, without TB patients transferred into and out of the penitentiary (FSIN) system, the number of transferred-in TB patients was by 6.2% less than the number of transferred-out cases – 14,830 and 15,818 cases, respectively. In 2010, transferred-in patients accounted for 12.8% of TB patients registered (or

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[71] Form No. 33.

notified) during the year (i.e., arriving, new TB cases and relapses). This proportion reached 19.9% in SFD, which may be associated with a difficult socio-economic situation in this territory (migration from the neighboring NCFD territories and a high level of stigmatization of TB patients, which makes patients avoid registration at the local TB facilities and seek medical treatment in the neighboring regions, etc.).

High proportions of patients arriving from other territories in relation to all TB cases notified during 2010 is reported not only in some territories of SFD (the Astrakhan and Rostov regions, the republics of North-Ossetia – Alania, and Kalmykia), where they register 23–26% of such patients, but also in territories with other social and economical conditions – in the Republic of Bashkortostan (29.2%), Amur region (24,7%), Novgorod region (22.5%), Tyumen region (21.4%) and Irkutsk region (21.2%).

In recent years (2005–2010), there has been a continuous decrease in the number of transferred-out patients in the country – from 19,514 to 15,818 (without TB patients transferred out to FSIN facilities). This indicates an improved monitoring of patients registered at TB dispensaries due to the implementation of measures on improvement of detection and treatment of TB patients based on the cohort approach [34, 35].

At the same time, as indicated in Chapter 8, the collaboration is still inadequate between MoH&SD TB services in territories and the respective institutions under the jurisdiction of the RF Ministry of Justice (FSIN). As shown in Form No. 33, in 2010 FSIN facilities registered 2.6 times more transferred-in TB patients than the number of patients transferred-out to FSIN institutions from MoH&SD TB facilities (9,695 and 3,718 patients, respectively).

Moreover, it will be shown in Chapter 8 that FSIN facilities detect a substantial number of TB cases not registered at TB facilities in the civil sector. On the other hand, only 60% of TB patients released from the FSIN institutions are being registered at TB facilities in the civilian sector in RF entities.

Therefore, in the Russian Federation, control of patient flow between the agencies and territories is an important component of the epidemiological surveillance of TB transmission in the country.

4.5. TB prevalence in the world and in the Russian Federation

The TB prevalence rate as presented in the WHO global reports and most international publications is an estimate calculated on the basis of mathematical models and data of the sampling surveys. This is because most countries do not use well-developed systems of dispensary follow-up of TB patients similar to the one available in Russia. The dispensary follow-up system allows the assessing of disease prevalence, which is very close to the real values compared to all other methods of estimation, which have considerable degrees of uncertainty.

In the recent WHO global report, the prevalence indicator is determined as the total number of patients with all forms of the disease in a territory at particular time (e.g., by the end of a year, like in the RF, or by a midyear, as in the WHO estimate [78]). It is supposed that a registered TB patient stops being a patient on average three months after the case registration (notification) when most TB cases under treatment have sputum conversion (by sputum culture) and cannot be identified as confirmed TB cases.[72] This formal approach to determination of the disease duration sometimes leads to inconsistent results of TB prevalence estimation in some countries (e.g., to the exceeding values of the estimated incidence over the estimated prevalence, see [A4]).

Therefore, to estimate TB prevalence, WHO experts use both the results of a special population survey on TB prevalence and a formula based on multiplying the estimated TB incidence rate (see Chapter 2) and the duration of the disease course. The latter is calculated based on the expert estimates separately for patients' groups with due account of the following conditions: absence or presence of TB/HIV co-infection, absence or presence of the bacillary excretion confirmed by sputum microscopy, the use of DOTS or the lack of DOTS treatment provided.

According to WHO estimates [78], in 2009 there were 14 million people with TB in the world (with possible estimate inaccuracy from 12 to 16 million people, according to the calculated "degree of the estimation uncertainty"), which indicates the prevalence rate at 201 (169–239) cases per 100,000 of the estimate population. In the WHO European region, there were about 560,000 (from 440,000 to 720,000) TB patients (63 cases per 100,000 population). In the countries of the African region and South-East Asia there were 3.9 million TB cases. The highest numbers of people with TB live in India (3 million) and China (1.8 million). Half of people with TB live in five countries of the world: India, China, Nigeria, Bangladesh and Indonesia. According to WHO estimates, the Russian Federation accounts for no more than 1.4% of the global TB burden and less than 34% 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 190,000, or 132 TB cases per 100,000 population, with the estimated range from 46 to 229 cases per 100,000 population. The high value of estimate divergence and a slight predominance of the estimated TB

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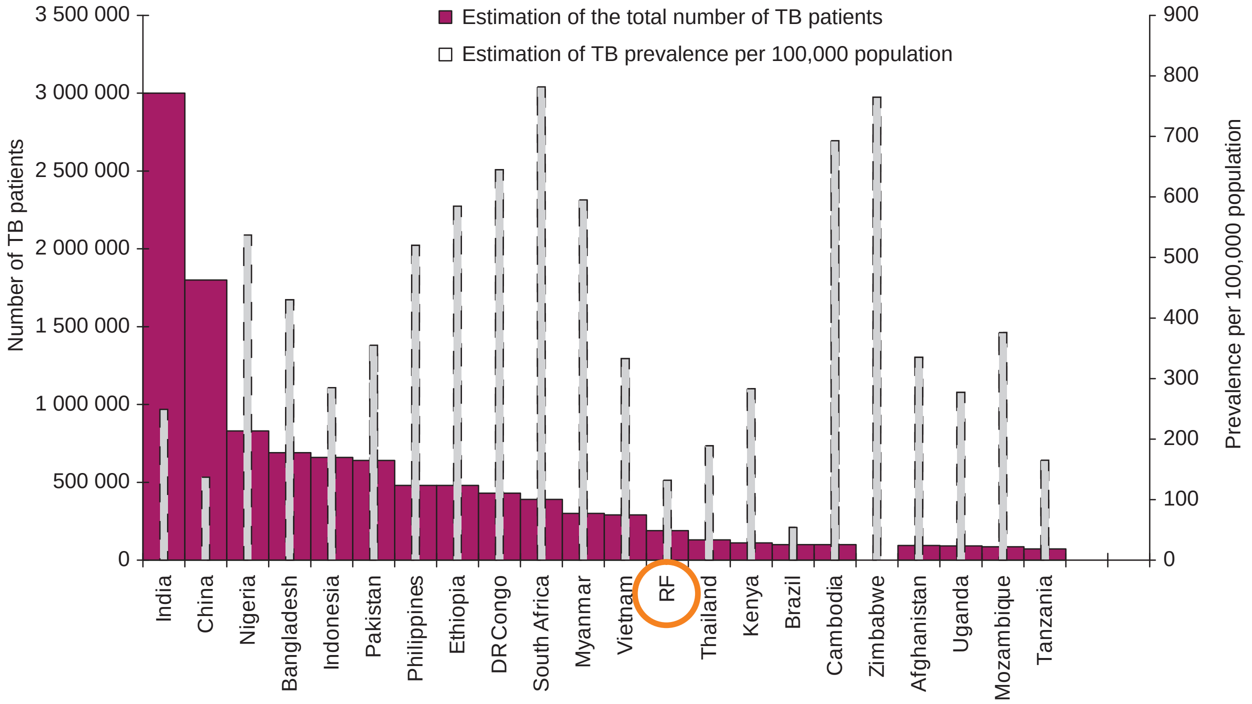
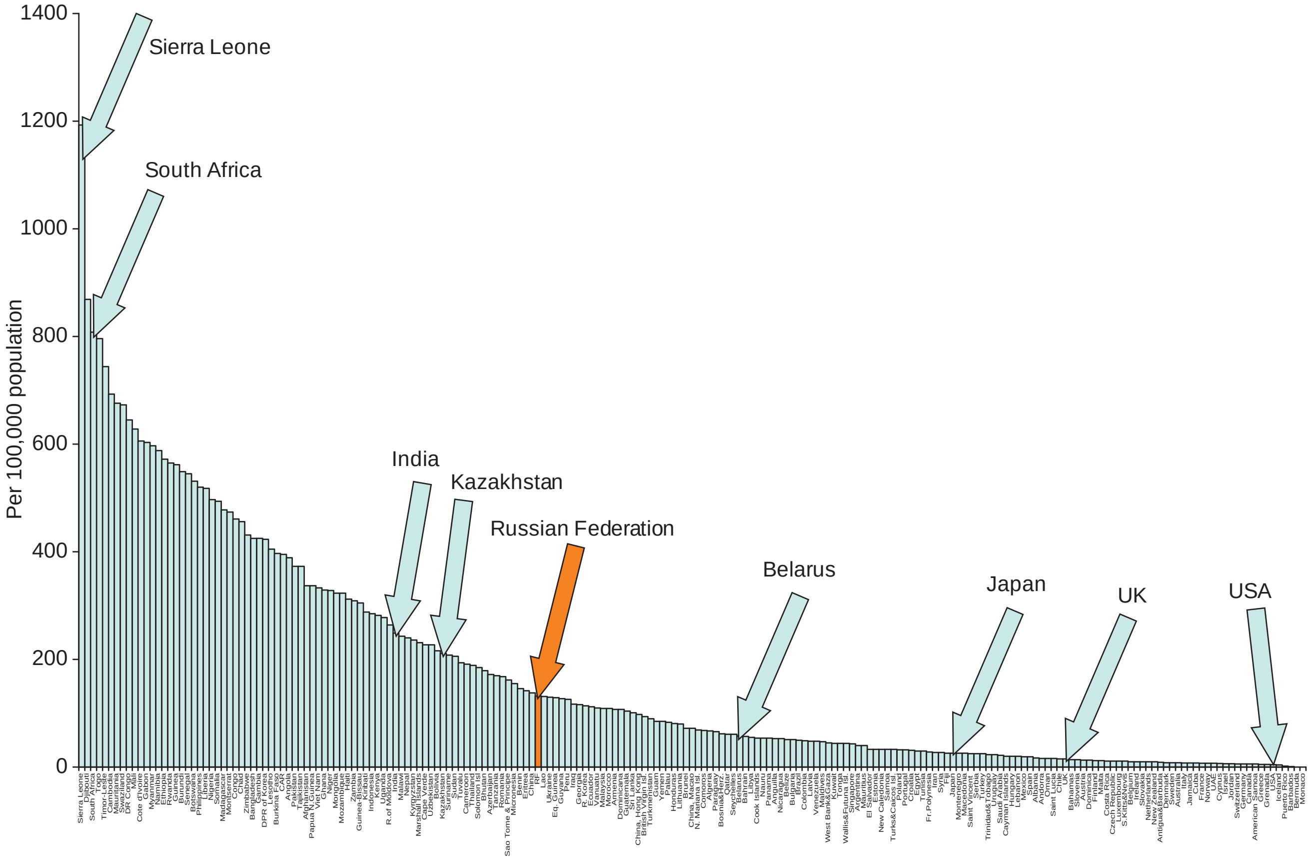
[72] Because the results of special investigations are used to calculate the indicator, the prevalence estimates are assessed based on the case definition used in those surveys, in which a TB case can be detected during not more than three months.

prevalence rate over the estimated TB incidence rate are due to the uncertainty of the estimated supposed average duration of TB disease in the country.[73]



a) Estimates for the number of TB patients and TB prevalence in the high TB burden countries according to the WHO definition. The diagram includes the countries that account for 80% of the total number of TB patients in the world



b) Estimates for TB prevalence in the countries of the world ranged according to the indicator's values [78]

Fig. 4.9. WHO estimates of TB prevalence in the world, 2009 [78]

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[73] After consultations with experts from Russia and WHO HQ, which were organized by the WHO office in the Russian Federation, in 2010 adjustment was made in the estimate of TB disease duration for Russia. As a result, unlike the previous global report [77, A3, A4], the new edition of the WHO Report on Global Tuberculosis Control will contain the estimated TB prevalence rate for RF, which is higher than the TB incidence rate and closer to the real registered values.

Fig. 4.9a shows the WHO estimation of the total number of TB patients and the TB prevalence rates in high TB burden countries that account for 80% of all TB cases in the world. This list includes the Russian Federation. 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 TB Control report [78] (Fig. 4.9b).

In 2009, the highest TB prevalence rates were reported in the African countries: Sierra Leone (1,193 per 100,000 population), Djibouti (869), South Africa (808), Togo (796), as well as Cambodia (693). In the European Region, the highest prevalence rates were registered in Tajikistan (373 per 100,000 population), Moldova (264), Kyrgyzstan (236), Uzbekistan (227), Kazakhstan (211), Azerbaijan (172) and Romania (162).

According to WHO data [77], the ratio of TB prevalence to new TB case 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 toward a reduction in disease duration and in courses of treatment.

Conclusion

The prevalence data indicate insufficient effectiveness of treatment of TB patients in the Russian Federation. With the remaining 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 a growing number of patients with MDR-TB (see Chapter 10). The registered prevalence rate indicator should be used more effectively for assessment of the TB epidemiology and TB burden in the individual areas as well as of the efficiency of TB control activities in the country (with due account of the specificity and accuracy of its calculation in different regions).

5. Tuberculosis in children and adolescents

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

5.1. New TB case notification rates in children and adolescents in the Russian Federation

TB incidence in children is considered to be a major prognostic epidemiological indicator that reflects the general epidemiological situation in the area. This is due to the fact that children most commonly develop TB directly after exposure to the source of infection. However, subjective criteria are often used to diagnose TB in children; therefore, the TB notification rate for this age group relies to a great extent on the management of TB case finding and notification [22].

In international health care practices not related to TB issues, the age group "children" includes newborns to individuals of 17 years 11 months and 29 days of age. It is obvious that from an epidemiological viewpoint this group is quite heterogeneous, and it would not be correct to undertake a general analysis of all paediatric patients without dividing them into narrower age subcategories. In particular, there are considerable differences in both clinical manifestations of the disease and TB diagnostic options for children of different ages. Considering the natural processes of biological growth and hormonal changes in the organism, as well as marked expansion of communication environment and social activities, it is justifiable to single out a group of adolescents 15–17 years of age. The sites of the disease localization are distinctly different in this age. Pulmonary TB forms are notified in the 0–14 age group only in 18–20% of cases, whereas in the age group of 15–17 years of age (adolescents) their share reaches almost 85%. Thus, this section not only provides aggregate data for the age group of 0–17 but also differentiates TB data between the age groups of 0–14 and 15–17 years of age (i.e., adolescents).

The overall new TB case notification rates in the Russian Federation more than doubled in the period of 1992–2001 (from 9.4 to 19.1 per 100,000 childhood population, Fig. 5.1). The dramatic increase of childhood notification rates in 1999–2001, followed by a drop in 2002 cannot be explained by the epidemiological reasons, and it can be associated with TB over-diagnosis after the introduction of computerized tomography [1]. In the following five years the rate changed insignificantly (slight fluctuations in the range of 16.2–16.4 per 100,000 population occurred within 95% confidence interval). In 2008–2009, childhood TB notification rates began to decline, reaching 14.6 in 2009. In 2010, an insignificant increase in the rate was observed: to 15.2 per 100,000 children (3,263 new TB cases in the age group of 0–14). The proportion of children aged 0–14 in the structure of notified cases in the total population (Form No. 8) decreased from 3.8% (1999) to 3.0 in 2010 (2.7% in 2009).

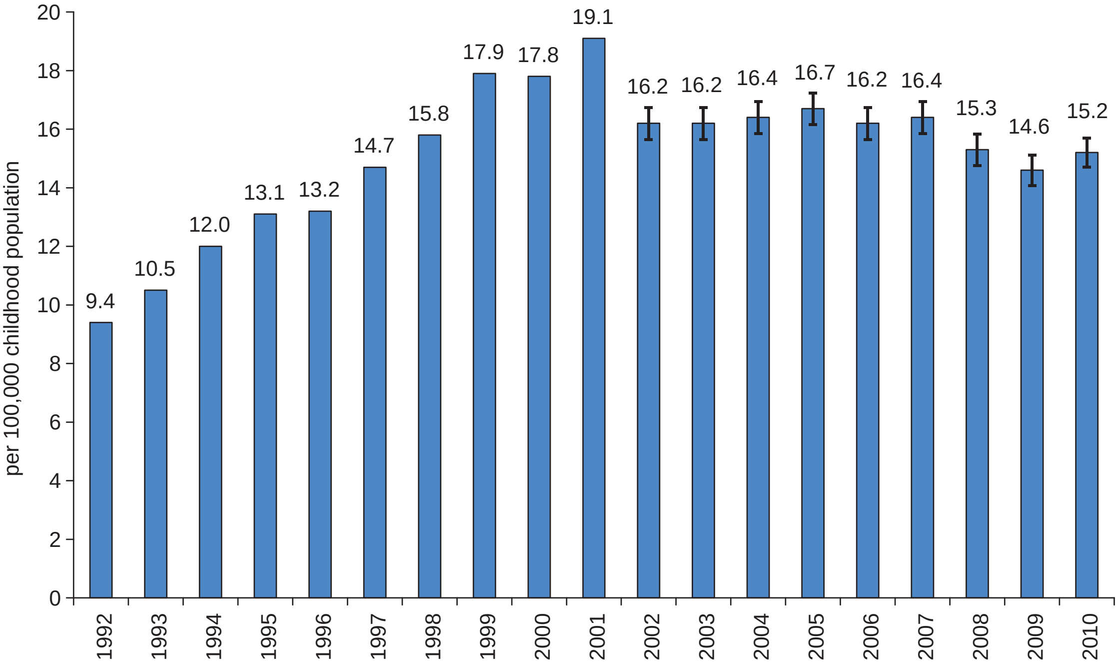
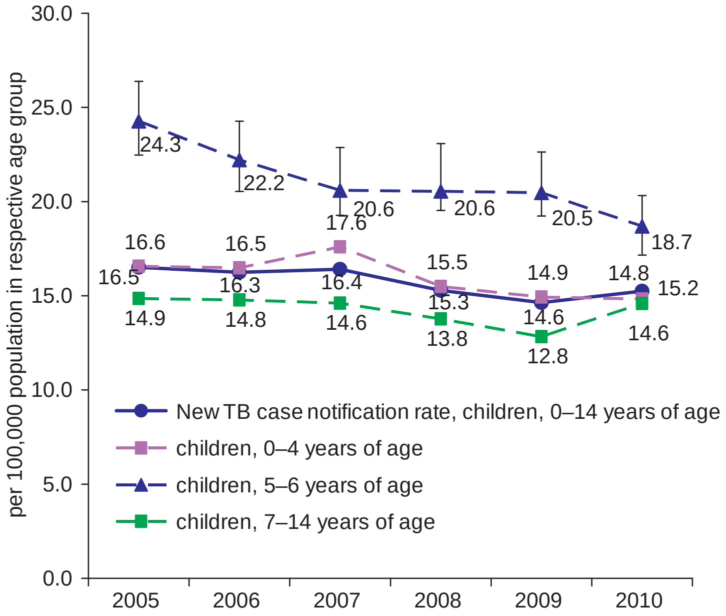
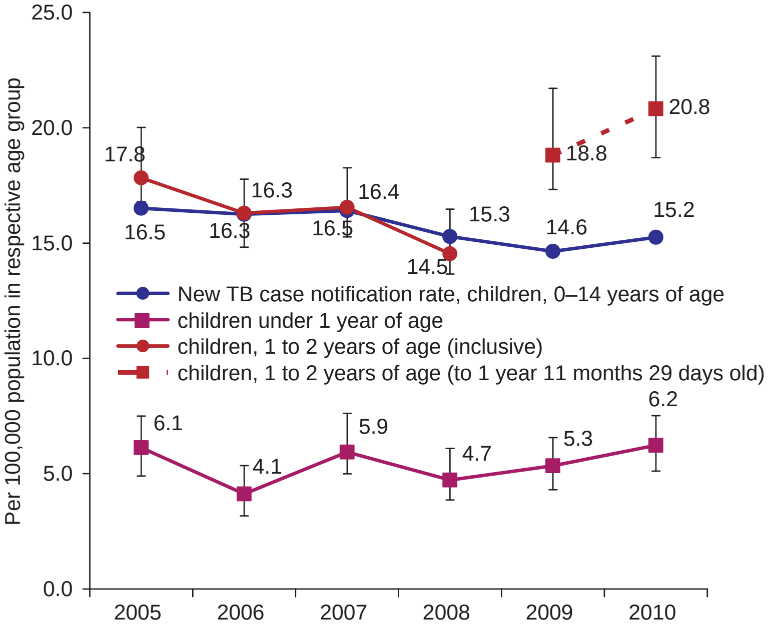


Fig. 5.1. New TB case notification in children of 0–14 years of age, 1992–2010, Russian Federation. Error bars for 2002–2010 indicate 95% CI (Sources: Form No. 8, population data: Forms No. 1 and No. 4)

Different childhood age groups demonstrate different consistent patterns in the changing notification rates over the last years; with some variation in the age-specific indicators as well (Fig. 5.2). In recent years the rates were increasing in the age group of 0–1 from 4.7 to 6.2 per 100,000 in 2008–2010, and in the age group of 7–14 years of age from 12.8 to 14.8 in 2009–2010. The age group of 5–6 years of age, which has always showed the highest TB notification rates among children aged 0–14 years old [58, 59], has registered a decline of the indicator to 18.7 per 100,000 average annual population of this age.[74]



a) Children in the age groups of 0–14, 0–4, 5–6 and 7–14 years of age



b) Children in the age groups of 0–14 years of age, under 1 year of age, 1–2 years of age including 2-year-olds, and 1–2 years of age not including 2-year-olds (see the note in the text)

Fig. 5.2. New TB case notification for children of 0–14 years of age in different age groups, 2005–2010, Russian Federation (Sources: Form No. 8, population data: Forms No. 1 and No. 4, error bars indicate 95% CI)

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[74] The values of TB notification rates in the age group of 1–2 in 2009–2010 are not comparable with the rates of 2008 and earlier, because although they characterize overlapping age groups, these groups are of a different size. The revised Form No. 8 until 2009 provided data on children with TB in the 2-year age interval from 1 to 2 years old inclusively, but starting from 2009 the data are collected for the 1-year age interval from 1 year up to 2 years of age, that is, to 1 year 11 months and 29 days. Moreover, the preliminary analysis of these forms by Russian constituent entities indicate that in 2009–2010 not all local forms were completed correctly in regard to this parameter.

The values of TB notification rates in children of 15–17 years of age are more reliable than in the age group of 0–14, since in the age group of 15–17 TB forms occur predominantly with radiological evidence (pronounced changes visible on X-ray) and bacillary excretion. A considerable part of adolescents undergo preventive screening as a prerequisite for attending educational facilities or the required fitness test for the military service [22]. Unlike the age group of 0–14, the adolescent group showed increasing notification rates until 2005: from 32.7 (2002) to 40.5 per 100,000 in 2005 (Fig. 5.3). Afterward, the rates levelled off at 38–40 per 100,000 adolescent population, with insignificant fluctuations in the 95% confidence range and finally – in correlation with the overall decreasing trend in Russia – declined to 36.3 in 2010.[75]

In the last nine years TB notification rates for adolescents exceeded more than two-fold the rates for the age group of 0–14. On the other hand, the rates for adolescents are two to three times lower than those for the following age groups, despite a higher coverage of this age group with preventive screening (see Fig. 5.3 and Fig. 2.12). The proportion of adolescents among all new TB cases in recent years has been 1.5–2.4% (1.5% in 2010); therefore, their incidence levels did not contribute significantly to the epidemiological situation of TB in the areas of the country. Nevertheless, considering a high coverage of adolescents with preventive screening, the notification rate in this population can be used as a measure of TB case-finding effectiveness in the adult population of a given area.

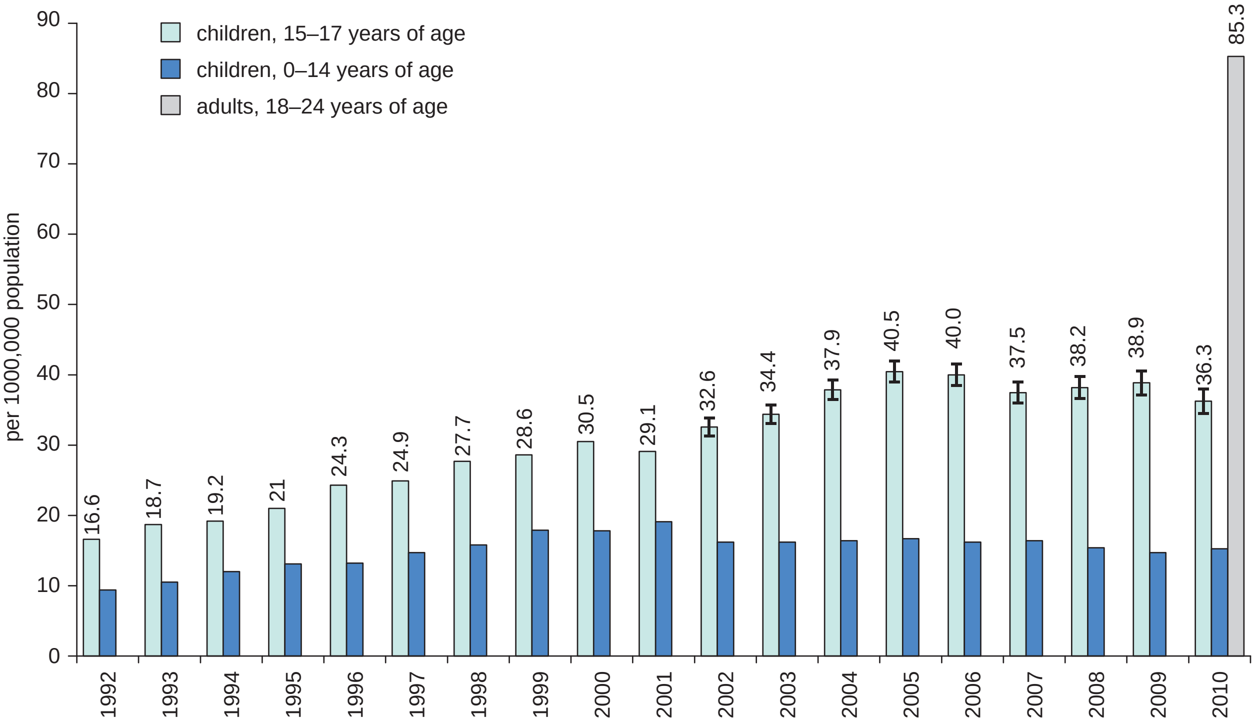

Fig. 5.3. New TB case notification for children of 0–14 and 15–17 years of age (adolescents) and adults of 18–24 years of age, 1992–2010, Russian Federation. The error bars for 2002–2009 data on adolescents indicate 95% CI (Sources: Form No. 8, population data: Forms No. 1 and No. 4)

Overall, following the increase to 22.3 per 100,000 in 2005, the childhood new TB cases notification rates in all age groups began to decline gradually and reached 19.0 in 2010 (Fig. 5.4).

When analyzing childhood TB incidence and its trends in different regions, it is important to bear in mind that the number of children with TB notified in each of RF entity is relatively small: in 2010 in more than half of the constituent entities of the Russian Federation the number of paediatric TB cases detected during a year did not exceed 23, and in 80% of areas it was below 48 cases. There are also significant year-to-year differences in the numbers of paediatric TB cases. Therefore, it is logical to calculate an average childhood TB notification rate for a period of over one year.

In the last two years (2009–2010) compared to the previous two-year period (2007–2008) a decline in TB notification rate in the age group of 0–14 was observed in 51 entities of the Russian Federation. Overall, in the Russian Federation the rate declined by 5.6% in the given year intervals. A decrease in excess of one third was observed in 10 entities (the Republics of Kalmykia, Karachaevo-Cherkessia, North Ossetia-Alania, Vologda, Kaliningrad, Leningrad, Sakhalin regions, Jewish autonomous region and Khanti-Mansi Autonomous District).

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[75] In the recent years the accuracy in calculated notification rates for adolescents may have been affected by a considerable decrease in the size of this age group in 2004–2010 (from 7,462 thousand to 4,580 thousand) used as the denominator for calculating the "average annual population aged 15–17 years."

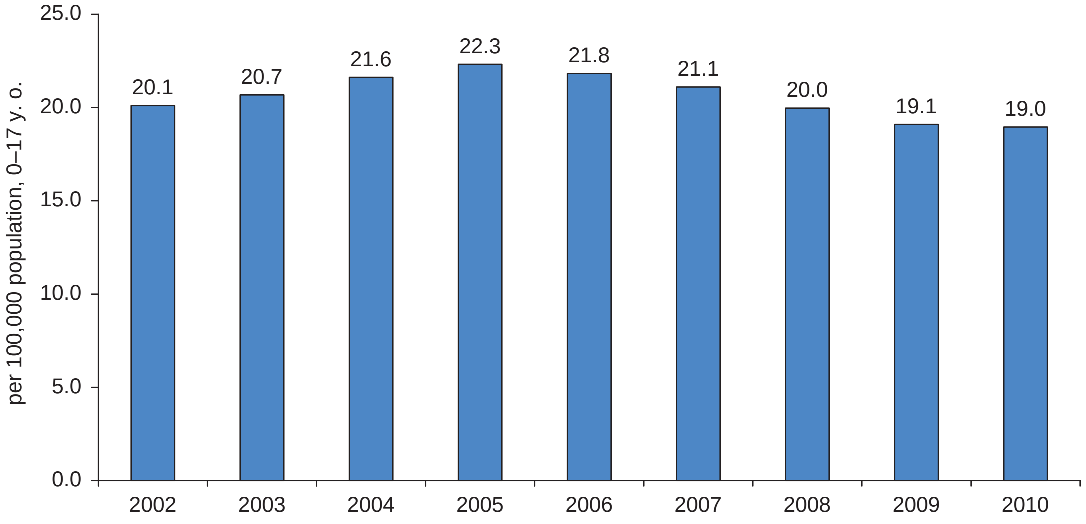

Fig. 5.4. New TB case notification for children of 0–17 years of age, 2002–2009, Russian Federation (Sources: Form No. 8, population data: Forms No. 1 and No. 4)

In 32 Federal entities the notification rates increased in the age group of 0–14, and in 10 of them by over 20% (Altai Republic, Perm Krai, Primorsky Krai, in Ivanovo, Yaroslavl, Murmansk, Pskov, Rostov, Ulyanovsk, Irkutsk, Magadan Regions).

Fig. 5.5 shows the distribution of Russian Federation entities by the level of TB notification rates in children aged 0–14, that was calculated during a two-year period based on the summarized number of new childhood TB cases notified in 2009–2010 and a double (cumulative) average population.[76]

The TB notification rates in the paediatric population ranged from 3.5 (Khanti-Mansi AD) to 66.1 (Magadan region) and 68.1 (Kamchatka Krai)[77] per 100,000 population.

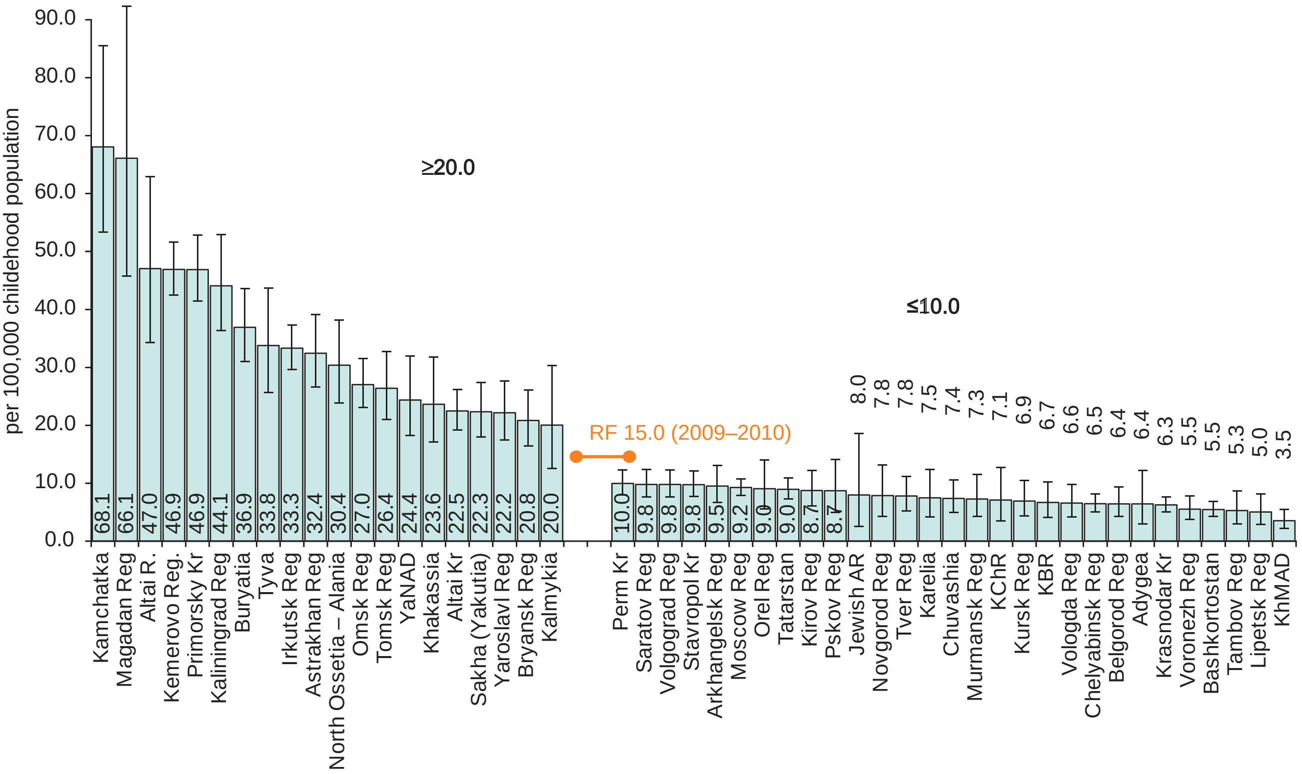

Fig. 5.5. New TB case notification in children in the constituent entities of the Russian Federation calculated for the two-year period (2009-2010). The error bars indicate 95% CI (Sources: Form No. 8, population data: Form No. 4)

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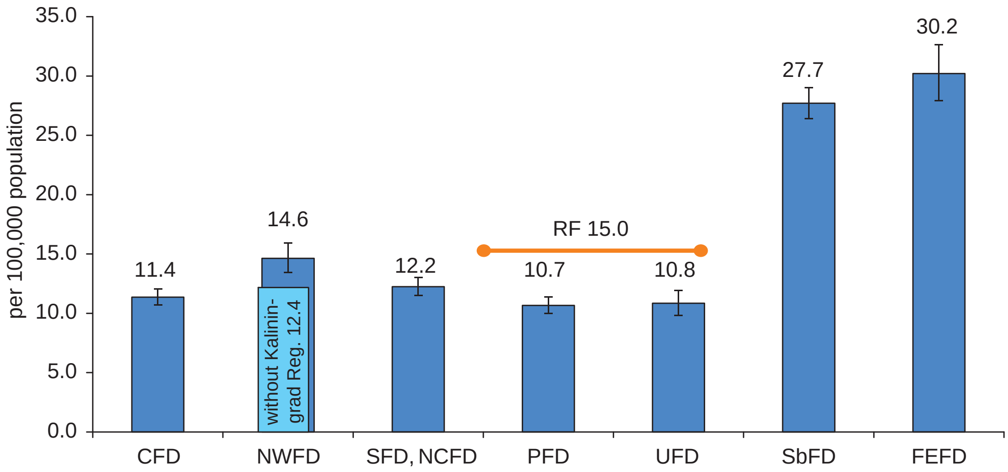
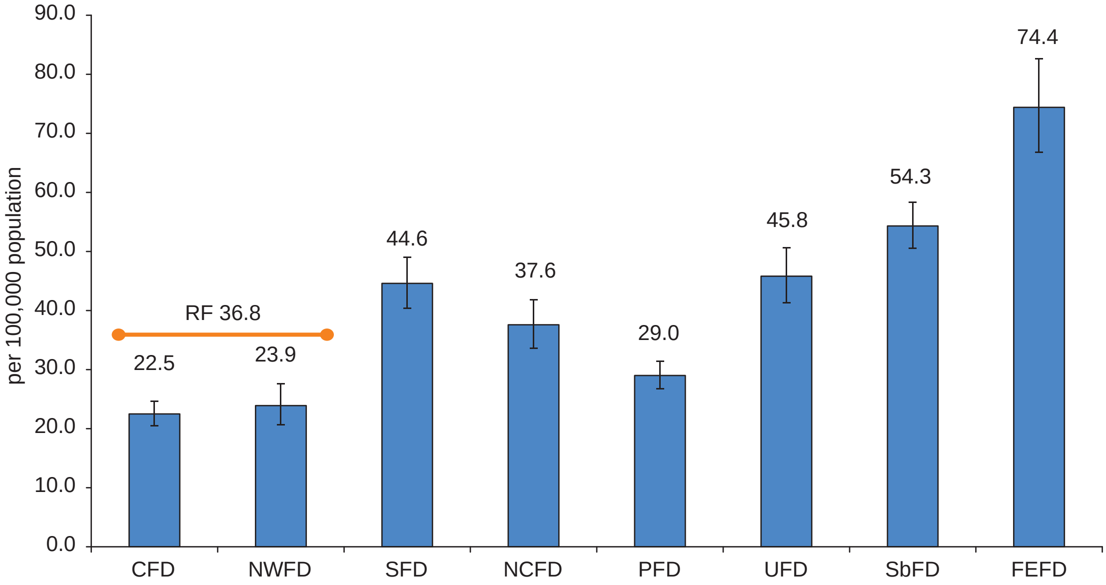
[76] By standard practice, the notification rate is calculated as a number of incident cases to the number of people at risk of getting the disease, multiplied by the total time of being at risk, that is, the number of cases / (number of persons x time). In the given case the formula may be approximately expressed as the number of children with TB divided by the average number of childhood population (that, in turn, is multiplied by two years).

[77] Only those areas with a paediatric population exceeding 25,000 are reviewed.



a) New TB case notification in children of 0–14 years of age



b) New TB case notification in children (adolescents) of 15–17 years of age

Fig. 5.6. New TB case notification in children in the federal districts of the Russian Federation calculated for the two-year period (2009–2010). The NWFD data on children of 0–14 years of age are presented for the entire district and without the Kaliningrad region. The error bars indicate 95% CI (Sources: Form No. 8, population data: Form No. 4)

Fig. 5.6a shows TB notification rates in the age group of 0–14 in the federal districts. In the east of the country, in Siberian and Far East federal districts the rates are almost double the values registered in the Urals, in the Central, Southern and Western entities of the Russian Federation.

These data once again prove that the epidemiological situation of TB in the east of Russia is significantly more alarming than elsewhere in the RF.

As noted above, considering the high coverage of adolescents with preventive screening, the notification rates in this population group can be used as an indicator to compare the quality of TB case finding in adult populations in different areas or regions. Thus, Fig. 5.6b demonstrates high notification rates in adolescents in SFD and NCFD (44.6 and 37.6 per 100,000 adolescents, respectively), which is considerably higher than in CFD, NWFD and PFD, although the differences in notification rates for the total population in those five Federal districts are not so distinct (see Fig. 2.7a in Chapter 2). This fact points out the existence of certain problems in TB case finding and diagnosis in SFD and NCFD.

It should also be noted that it is not always possible to make an adequate comparison of childhood TB notification rates in various federal entities. Significant differences in this indicator among the constituent entities of the Russian Federation often “cannot be explained by specific patterns of the epidemiological process and are not associated with the socio-economic, climatic and geographic characteristics,” but they are determined rather by “specific management and methods used in the system of preventive interventions, diagnosis and treatment” of children and adolescents [54, 44].

5.2. TB structure and sites of the disease in children

In children of various age groups the structure and sites of TB are distinctly different (Fig. 5.8); the structure of new TB cases can be seen as an indicator of the regional performance with regard to TB prevention and early detection of cases among the population of this age group.

In children under 7 years of age respiratory tuberculosis involving the lung tissue (pulmonary TB) occurred in only 9.2%, in children of 7–14 years of age in 29.1%, and in adolescents already in 86.5% cases (2010).

The share of bacteriologically positive cases in children of 0–14 years of age is as low as 5% (174 persons, countrywide data, Fig. 5.7). As shown below, TB in children mostly involves intrathoracic lymph nodes; therefore, bacillary excretion should not be used as the key indicator of disease progression.

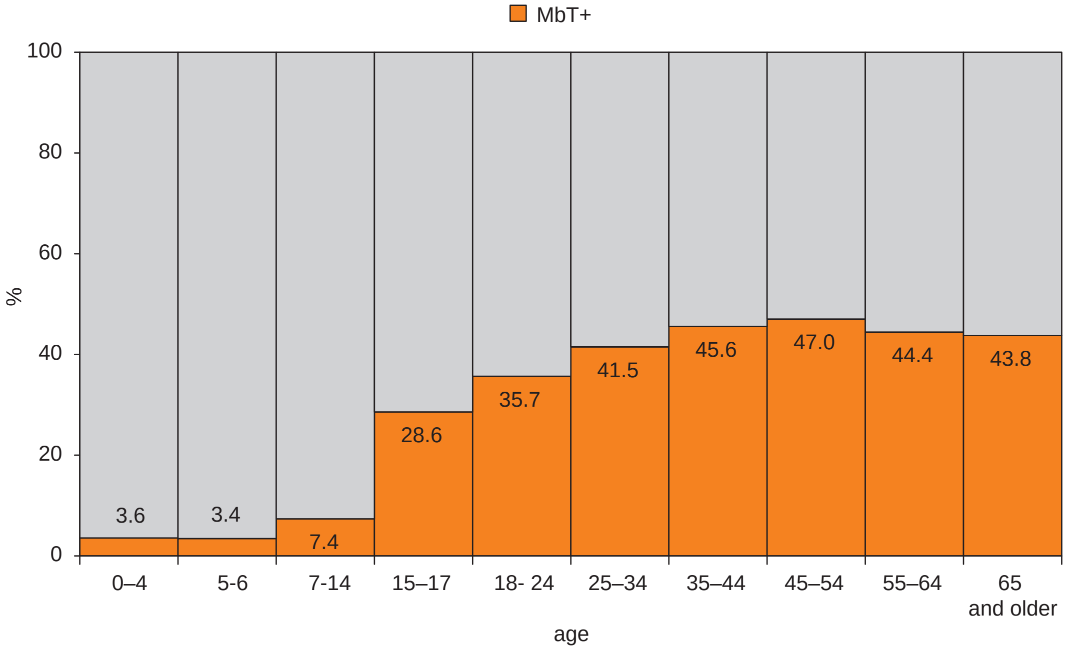


Fig. 5.7. Proportion of MbT+ cases confirmed by any method in different age groups of new TB patients (all sites), Russian Federation, 2010 (Source: Form No. 8)

Despite low numbers of bacteriologically positive cases among children and adolescents (at the end of 2010 the regional dispensary follow-up groups included 173 children and 358 adolescents, Form No. 33), the proportion of those with MDR-TB strains is high: 22.5% and 20.4%, respectively.

The prevalent clinical form of the disease in children under 14 years of age is tuberculosis of respiratory organs involving intrathoracic lymph nodes and not involving the pulmonary parenchyma (approximately 50%).[78]

Extrarespiratory tuberculosis (see Chapter 6) in children is less common – from 6% (7–14 years of age) to 11% (0–4 years of age), depending on the age group. In the last 15 years its share shows a downward trend, and the disease itself is detected mostly by passive detection, when a patient applies for medical care with complaints.

In 2010, tuberculosis of bones and joints remained the prevalent site (40.2%) in children aged 0–14 with extrarespiratory TB. According to data from the reporting forms of 2005–2008 (when this information was available), in 60% of cases this TB form is notified in children under 2 years of age, which can partly be explained by BCG aetiological process (bacteriologically unconfirmed post-vaccination osteitis).

After a decrease in 2005–2006, the new case notification rate of TB meningitis (recognized as an indicator of vaccination effectiveness) in the last four years has remained at approximately the same level (38 cases in 1997, 27 in 2005, and 20–23 cases in 2006–2010, Fig. 5.9).

It should be noted that the distinct difference of the diagnostic structure in new TB cases among children of 0–14 and 15–17 years of age justifies the need for a separate epidemiological analysis of TB spread in the two age groups. TB in adolescents occurs in virtually the same sites as in adults, and the methods of TB case finding, diagnosis and treatment are similar to those for patients aged over 17 years.

A dramatic decline in the total number of new paediatric cases with extrarespiratory TB was registered in 2009–2010 as compared to the previous years (Fig. 5.9). This change resulted from a significant decrease (by

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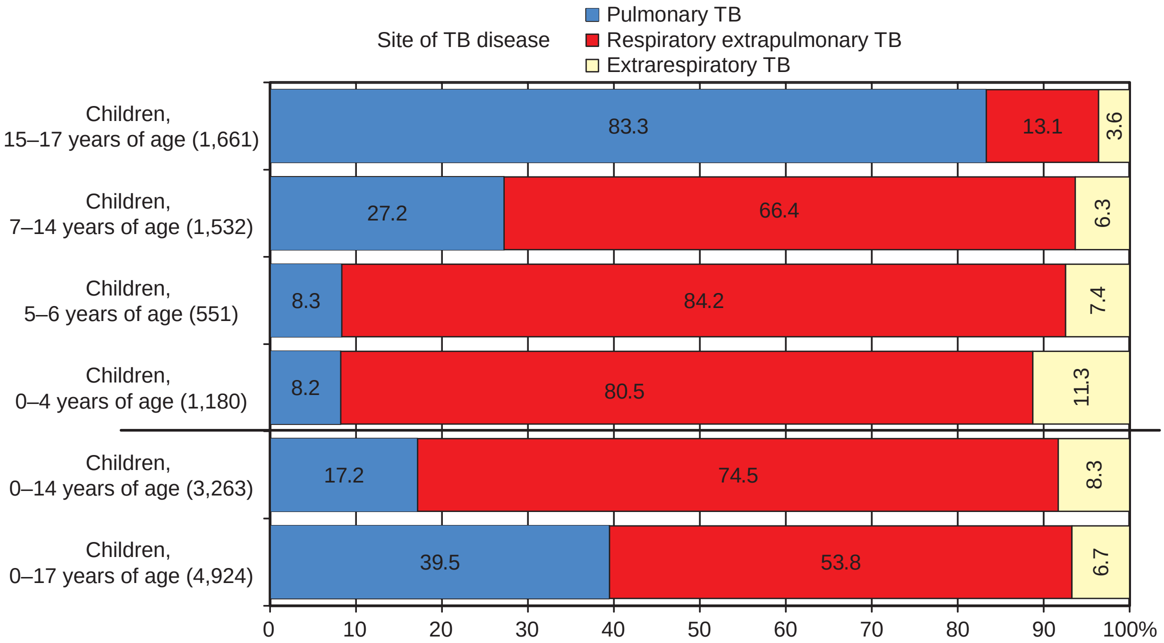
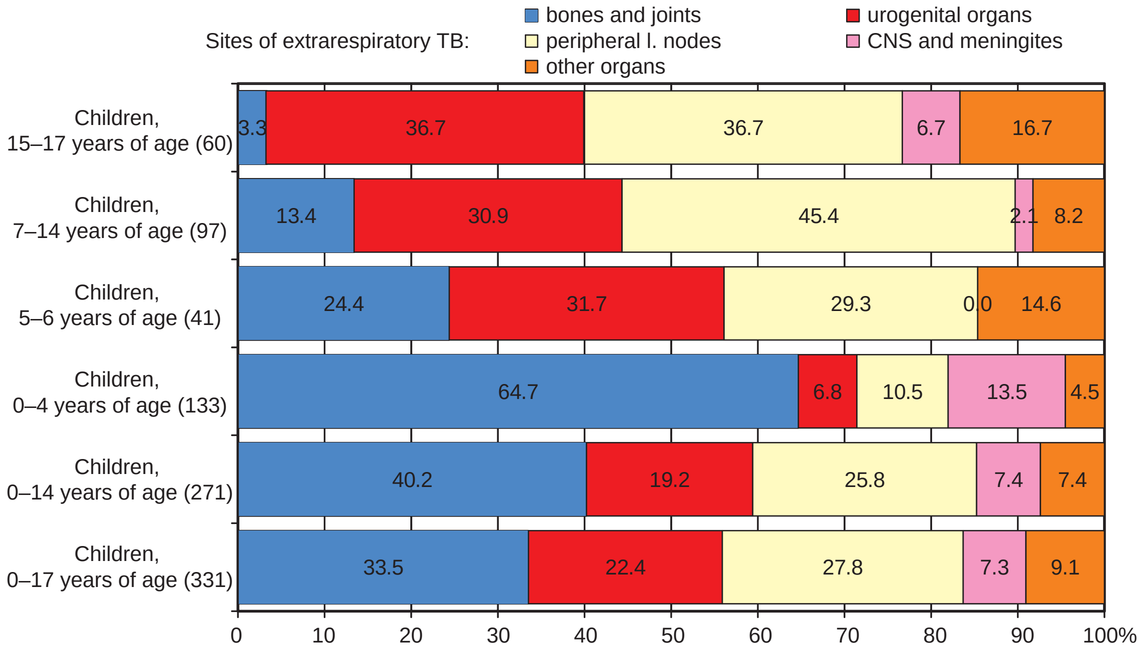
[78] The existing reporting forms do not provide data on specific sites of tuberculosis in patients with tuberculosis of respiratory organs without lung parenchyma involvement. Information was drawn from the case-based SSTM registers provided in [2].

35–40%) of cases with TB of peripheral lymph nodes, urogenital organs and the number of TB patients with “other” non-respiratory sites, except TB of the CNS, the TB meningitis, as well as bones and joints. This fact requires further studying and explication.



a) TB sites in all new TB cases. The number of new notified TB cases in children of the given age groups is indicated in the parentheses of the vertical heading.



b) ERTB sites. The number of new notified ERTB cases in children of the given age groups is indicated in the parentheses of the vertical heading.

Fig. 5.8. Clinical sites, new TB cases in children of different age groups, Russian Federation, 2010 (Source: Form No. 8)

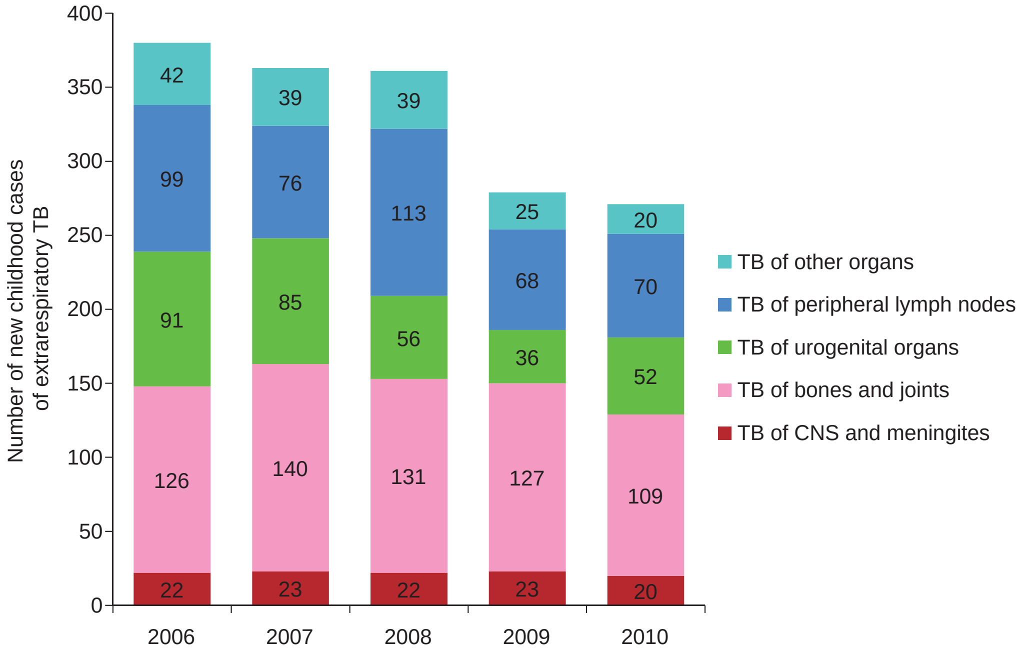


Fig. 5.9. Diagnostic structure of different ER TB sites in new notified cases in children 0–14 years of age, 2006–2010. The number of new cases of tuberculosis in children with the indication of specific sites of the disease is presented in the colored rectangles. Russian Federation (Source: Form No. 8)

5.3. Prevalence and mortality of childhood TB

Changes in TB prevalence rates for children aged under 14 years, as well as the overall TB prevalence, were partly caused by the revision of the dispensary follow-up groups (DFG) in 2004 (see Chapter 4); the rates decreased dramatically from 40.4 (2002) to 23.5 (2004) per 100,000 paediatric population. After 2006 the rates continued to decline, and in 2010 they reached 19.9 per 100,000 of the paediatric population. Overall, TB prevalence in children and adolescents aged 0–17 years in 2010 amounted to 24.5 per 100,000 of the paediatric population. The childhood TB mortality rate was extremely low, at least in the last decade. In 2010 in children aged 0–14 it was 0.1 per 100,000 of the paediatric population, based on 18 deaths among patients in the follow-up registers and 5 cases diagnosed post-mortem.

5.4. Assessment of TB diagnosis and case-finding effectiveness based on the registration data of DFG IIIA and DFG 0

A specific characteristic of a child's organism is its capability of spontaneous recovery by containment of the inflammatory lesion and subsequent petrifaction or fibrosis of the surrounding tissue at the lesion site. This TB outcome is most common with involvement (calcification) of intrathoracic lymph nodes, liver and spleen. Children with post-TB changes are diagnosed by the radiological examination following a positive 2 TU tuberculin reaction or another pathological condition.

Therefore, the ratio of children aged 0–17 years that are registered in DFG IIIA to all new TB cases among children and adolescents may serve as a proxy indicator of TB diagnosis effectiveness for children and adolescents in the Russian Federation [22]. Nationwide each year slightly fewer than 1,000 children aged 0–14 years with the diagnosed residual post-TB changes are registered (873 cases in 2010, without the Chechen Republic).[79] In the past 2 years, the ratio of patients registered in DFG IIIA to all new TB cases among children and adolescents was in the range of 23–27% (26.8% in 2010).

Due to a small number of cases, this rate is subject to considerable annual variations in the regions. Nevertheless, during the last two years high rates (over 60% average) were observed in the Republics of Sakha (Yakutia),

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[79] Here and henceforth the data for the Russian Federation in this review are presented for the second subsequent year (see [A4]) without the Chechen Republic data. In 2009 and 2010 this Russian entity reported respectively 282 and 249 new TB cases with post-TB changes in children aged 0–14. These high reported values require verification.

Mordovia, Kalmykia; in the regions of Novgorod, Lipetsk, Penza, Nizhny Novgorod; as well as in Yamalo-Nenets autonomous district.

Early detection of such cases will cause an almost threefold increase in the official statistical data of childhood new TB case notification rates in the Russian Federation. Recovery from TB with tissue calcification and scarring at the site of lesion is often incomplete. Many children still manifest the signs of tuberculosis intoxication, indicative of a persistent active process. TB notification rates in the paediatric DFG IIIA are very high, reaching 500–1,500 per 100,000 of DFG IIIA population.[80]

The relevant indicators for case-detection effectiveness are the number and proportion of children requiring more specific classification of tuberculin sensitivity, confirmation of active TB process and diagnosis (DFG 0). Every year almost 140,000 children in the Russian Federation are registered in DFG "zero," which amounts to nearly 0.5% of population in this age group. Of this number, approximately 700 TB cases are confirmed (691 in 2010), corresponding to approximately 14% of the overall notification rate in this age group. This relevant information can be used to assess the effectiveness of TB case-finding management in the constituent entities of the Russian Federation.

5.5. TB notification rates among children in risk groups

TB risk groups for children and adolescents that require follow-up by TB specialists include the following individuals:

- new *M. tuberculosis* (MbT+) infection cases (registered in DRG VIA);
- with hyperergic sensitivity to tuberculin (registered in DFG VIB);
- with increasing tuberculin reactivity (registered in DFG VIC);
- children contacted with MbT+ and MbT− TB patients [registered in DFG IVA and DFG IVB], or with sick animals).

At the end of 2010 in the abovementioned risk groups for TB,[81] 630,496 children and adolescents (aged 0–17) were followed up, corresponding to 24 persons out of 1,000 children of the given age. Of those, 1,146 children (0–17 years of age) developed TB (175.0 children per 100,000 average annual populations of the respective DFGs, Table 5.1), which constitutes 23.3% of all notified new TB cases in the age group of 0–17. The TB notification rate in this group is 9.2 times higher than in the total population aged 0–17, namely 19.0 per 100,000 (see Fig. 5.4).

Table 5.1

Dispensary follow-up groups for children of 0–17 years of age at risk of TB, the Russian Federation, 2010

DFG	Registered into DFG during a year		New TB cases in the given DFG		Registered in the DFG as of end of the year	
	Total	Per 100,000 average annual population of 0–17 y. o.*	Total	Per 100,000 average annual dfg population	Total	Per 100,000 population aged 0–17
IVA (contacts of MbT+ cases)	44,433	171.0	596	659.9	88,789	341.8
IVB (contacts of MbT− TB patients, in families of cattle-breeders or those having animals with TB)	55,571	213.9	141	154.4	92,369	355.5
VIA (early stage of primary TB infection)	243,813	938.4	163	51.8	298,347	1,148.3
VIB (previously infected, with hyperergic reaction to tuberculin, from the social risk groups with pronounced reactions to tuberculin)	39,245	151.1	190	355.4	51,412	197.9
VIC (with increasing tuberculin reactivity)	77,340	297.7	56	53.3	99,579	383.3
Total for DFG IV and VI	460,402	1,772.1	1,146	175.0	630,496	2,426.8

* For 2010 data calculation was done per 100,000 population as of 01.01.2010, rather than per the average annual population, because the data as of 01.01.2011 were still unavailable at the time of writing this chapter.

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[80] Considerable variations reported in Russia for several years for this indicator as an aggregate rate do not make it possible to assess its actual value.

[81] Since 2009 reporting Form No. 33 has been providing the aggregate numbers in the reviewed DRGs for children aged 0–17, without any division into groups of 0–14-year-old children and adolescents of 15–17 years of age.

Notification rates are particularly high among the paediatric contacts of MbT+ tuberculosis patients (DFG IVA), that is, approximately 660 per 100,000 average annual population of paediatric TB contacts in the corresponding DFG. In 2010, they constituted a major part (over a half) of TB cases in the risk groups that were registered in DFG (596 cases).

By the beginning of the 21st century, the TB notification rate in children aged 0–17 years who were MbT+ contacts levelled off at 600–700 per 100,000 average annual population of this group (Fig. 5.11). In recent years this indicator showed a gradual decline up to 2009 (605.7). In 2010 this rate grew insignificantly ($p > 0.05$) to 659.9. In 2010 the notification rate among the paediatric contacts (0–17 years of age) of MbT+ cases was 34.7 times higher than the notification rate among the resident population of the given age group.

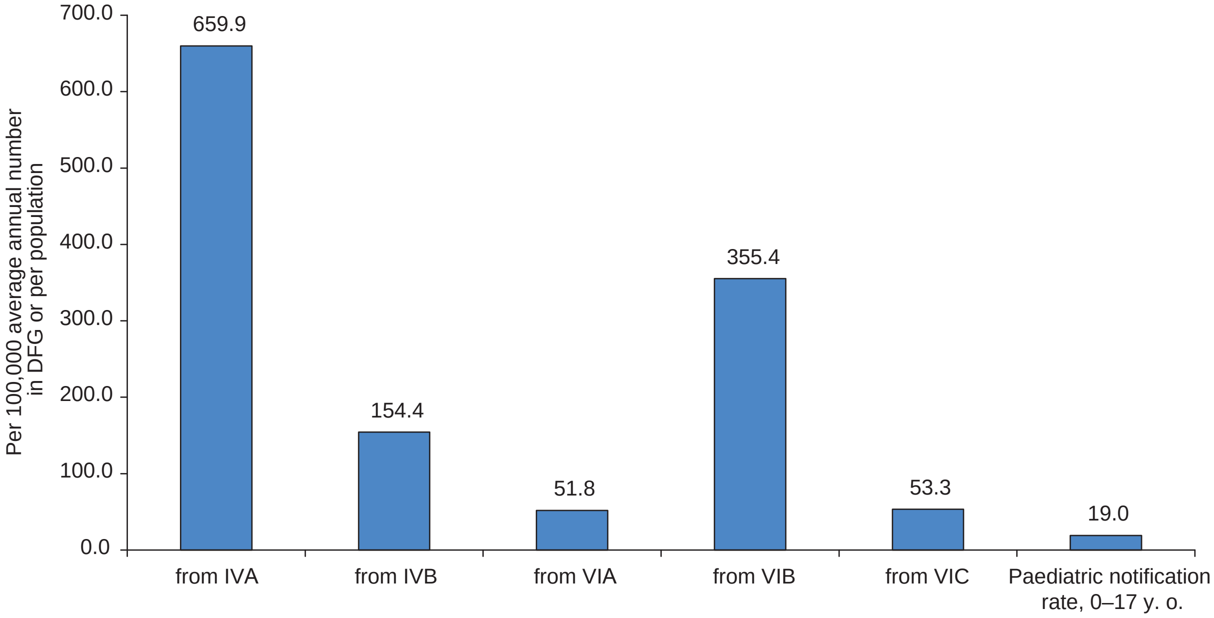

Fig. 5.10. TB notification in children of 0–17 years of age in the dispensary follow-up groups including children in the TB risk groups compared with the overall TB notification in children of 0–17 years of age. Russian Federation, 2010 (Source: Form No. 33, population data: Form No. 4).

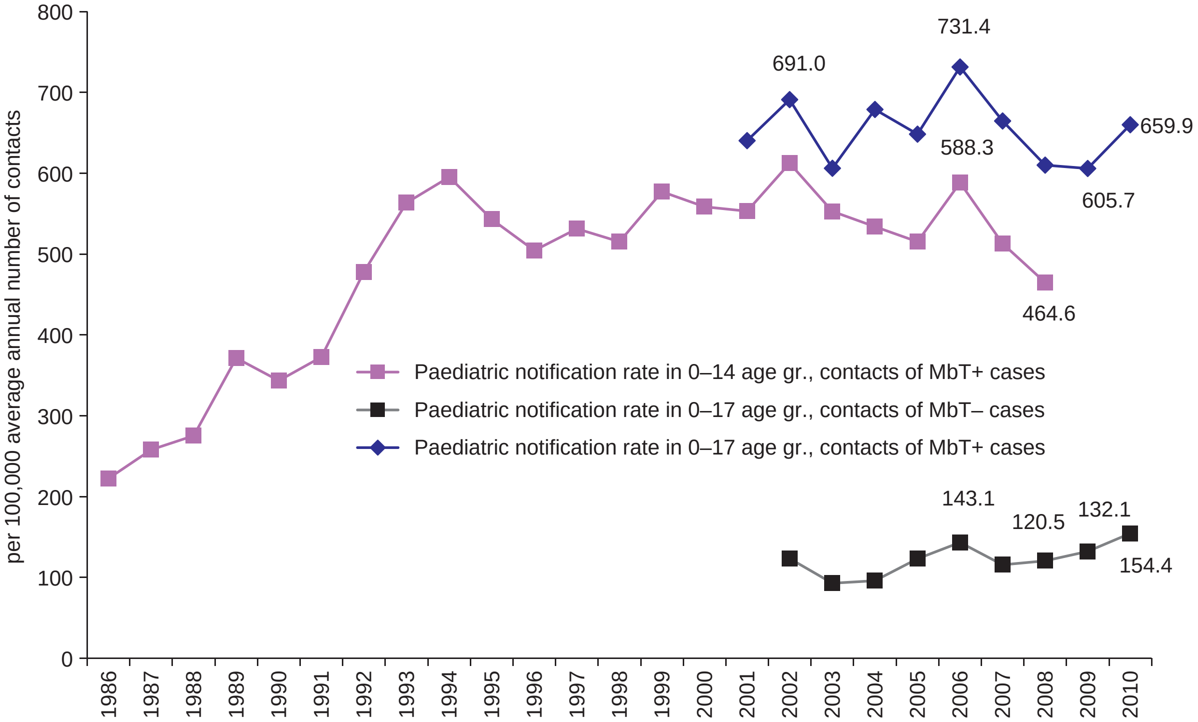

Fig. 5.11. TB notification in children who had contacts with MbT+ and MbT− TB patients, Russian Federation (Source: Form No. 33;[82] after 2008 the number of children 0–14 years of age who had contacts with MbT+ TB patients and developed tuberculosis was not reported in Form No. 33.)

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[82] Data for 2007 do not include the Republic of North Ossetia; see note to Fig.2.28, Chapter 2.

The data collected until 2008 (inclusive) on new TB case notification rates in children aged 0–14[83] who were contacts of MbT+ cases also showed a decline in the indicator since 2007 (464.6 per 100,000 average annual contacts in 2008). In 2008, the notification rate for children 0–14 years of age in contact with MbT+ patients was 30 times (25 times for the age group of 15–17) higher than the overall rate in these age groups in the Russian Federation.

Notification rates in children aged 0–17 years in contact with MbT− patients (154.4 per 100,000 average annual contacts, 2010) are 4.3 times lower than this rate for children in contact with MbT+ patients. This again underscores the need for a special focus on MbT+ patients as the most epidemiologically dangerous TB group.

The persistently high incidence of TB in children and adolescents from TB infection outbreaks should raise concerns among TB specialists and require revision of the methodology for preventive interventions in this group.

Children at risk of developing TB are registered in DFG VIA, VIB and VIC based on the tuberculin skin test results.

The highest risk of developing TB is observed in children 0–17 years of age who are registered in group VIB (with hyperergic tuberculin reaction): 355.4 per 100,000 of registered in DFG[84] (190 children). Slightly over 50 persons per 100,000 develop TB in the DFGs VIA and VIC – 51.8 and 53.1, respectively (Table 5.1). The TB case notification rates in DFGs VIA, VIB and VIC exceed the notification rates in the general paediatric population (0–17 years old) by 2.7, 18.7 and 2.8 times, respectively.

These considerably high new TB case notification rates were reported despite the coverage of these children with preventive activities and regular monitoring performed by TB specialists. All these factors confirm the need to revise the existing approaches in managing TB risk groups both by TB services and general health care services.

5.6. Effectiveness of tuberculin skin testing for children 0–17 years of age

Tuberculin skin test is used as a tool for mass screening of children and adolescents aimed at detecting specific sensibilization. Mass tuberculin skin testing is intended for the following:

- detection of cases with primary MbT infection;
- detection of cases with hyperergic tuberculin reactions and increasing tuberculin reactivity;
- selection of children for TB vaccination with BCG-2 vaccine at the age of 2 months and older (who were not vaccinated at birth), and for BCG revaccination;
- early TB diagnosis in children and adolescents;
- defining epidemiological indicators for TB in special studies (MbT infection in the population, annual risk of TB infection).

Over 100% coverage of 0–14-year-old children with tuberculin testing was observed in Chukotka AD (109.9%), in the regions of Voronezh (108.5%), Moscow (104.5%), Rostov (101.3%), Kurgan (100.3%) and the city of St. Petersburg (100.8%).

Overall in the Russian Federation the tuberculin testing was performed in 91.2% of children aged 0–14 years in 2010. Low tuberculin test coverage of children aged 0–14 years was reported in the Chechen Republic (58.1%), Perm Krai (73.3%) and Kaluga Region (74.4%).

Changes in such major epidemiological indicators as TB incidence and prevalence do not always reflect the spread of TB infection among the paediatric population [22]. The number of children registered in DFG VI allows for the calculation of indicators that are potentially indicative of the spread of latent TB infection (Table 5.1).

The primary TB infection of children with *Mycobacterium tuberculosis* is determined by the proportion of individuals who were registered in DFG VIA during a year. Overall in the Russian Federation, approximately 1% of such children are detected in the population aged 0–17 (0.94%, see Table 5.1). The primary risk of infection (PRI, [46]), calculated as the ratio of children with "veering" tuberculin reactions (determined by those registered in DFG VIA) to the number of children covered with tuberculin skin testing, constitutes 1.2% (2010).

A high proportion of children with primary MbT infection indicates the presence of significant numbers of undetected patients who excrete bacilli. On the other hand, low values of the indicator may reflect inadequate quality of tuberculin skin testing.

The highest PRI value in children aged 0–17 was recorded in Stavropol Krai (3.5%) and Voronezh Region (3.2%). The lowest values were observed in the Republic of Ingushetia (0.1%), in the regions of Pskov (0.1%), Arkhangelsk (0.2%), Murmansk (0.2%). The values of primary infection rates as low as these are clearly suggestive of existing shortcomings in tuberculin skin testing.

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[83] Starting from 2009 reporting Form No. 33 provides the total number of 0–17-year-old children in DRGs (without separating them into groups of 0–14-year-old children and adolescents of 15–17 years of age).

[84] Here and henceforth the notification rates are calculated per average annual numbers in Group VI, that is, per 50% of the total numbers in the groups as of the end of 2009 and 2010.

It should be noted that the frequently quoted allegation that at least 80% of the population in the Russian Federation are infected with TB by the age of 30-40 years [8] cannot be proved by the existing federal and sectoral statistical data. On the other hand, a sufficiently broad population study has to be conducted to assess the spread of infection in various social strata. There is no evidence that such a study has been performed in recent years. Fragmented data are available on the level of infection in some specific risk groups in certain areas of the Russian Federation ([8], or, for instance, the data on 254 undergraduate medical students (4th to 6th year) of the Republic of Bashkortostan,[85] with 68.9% of them being infected; or in Krasnoyarsk Krai,[86] where among 636 students 86.5% were infected).

The overall share of detected individuals with **hyperergic reactions to tuberculin** in the Russian Federation was 0.2% of the population covered by the tuberculin skin testing. The highest numbers of children with hyperergic tuberculin reactions were found in the Republic of Tyva (1.2%), Jamalo-Nenets AD (0.9%), Smolensk region (0.9%), the Chechen Republic (0.6%), Krasnoyarsk Krai (0.5%), Amur region and the Republic of Karelia (both 0.4%).

Low indicator values were registered in the Republic of Ingushetia and Ivanovo region (0.04%). Such considerable deviations from the average Russian values require exploration of the underlying reasons and, possibly, reversal of the causative factors.

The share of individuals with **increasing tuberculin reactivity** in the Russian Federation on average was 0.4%. The maximum value of this indicator was observed in Krasnodar Krai (1.4%), the Republics of Kalmykia (1.4%) and Sakha (1.2%). In the Republic of Ingushetia such children are hardly ever registered for the dispensary follow-up (0.04%).

On average in Russia the effectiveness of tuberculin skin testing as a tool for **TB case finding** in children 0–14 years of age was equal to 0.1 detected TB patient per 1,000 tested children.

The use of tuberculin diagnosis accounted for detecting half (50.1%) of new TB cases among children 0–17 years of age. Notably, over 70% of TB cases (70.6% in 2010) in children 0–14 years of age were found by the tuberculin testing.

5.7. TB Vaccination in children and adolescents

In children the main method of TB prevention is vaccination with BCG vaccine and BCG-M. According to the current Russian schedule of immunization against infections in children, the primary vaccination with a BCG agent is given to all healthy newborns on the 3rd–7th day of life; revaccination is required for children aged 7 or 14 with a persistently negative reaction to Mantoux 2 TU skin test; children infected with MbT are not subject to revaccination. Upon reaching 15 years of age, vaccination against tuberculosis is not administered. All these interventions are carried out in accordance with the schedule of immunization against paediatric infections (Executive Order of the MoH of the Russian Federation No. 229 of 27.06.2001 and Executive Order of the MH&SD No. 673 of 30.10.2007) and Executive Order No. 109 of the MoH of the Russian Federation [34]. Executive Order No. 673 supplemented the preceding orders with a provision that starting from 2007 in the areas with a TB notification rate of over 80 per 100,000 population, newborns are to be vaccinated with BCG vaccine, whereas the population in the areas with lower TB notification rates are to be vaccinated with the BCG-M agent. The first revaccination with the BCG vaccine is given at the age of 7 or 14 (if it was not done at the age of 7); the second revaccination against tuberculosis is abolished.

Federal reporting Form No. 32 is the main source of data on TB vaccination. According to this form, in 2010 the BCG immunization coverage of newborn children in the Russian Federation was 86.0% of children born alive, or 86.1% of children born alive except those who died in the first 24 hours (in 2009, 88.0% and 88.3%, respectively).

In more than 50% of the entities of the Russian Federation, the BCG immunization coverage of newborns was in the range of 86–92%.[87]The vaccination coverage of newborns was insufficient in Ulyanovsk region (60.8%), apparently due to the lack of vaccine.

The most relevant reason of a lower coverage with the BCG vaccination of newborns is the presence of specific medical contraindications to the vaccination, which are listed in Executive Order No. 109 [34].

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[85] R.K. Yagafarova, Kh. K. Aminev, O.V. Pozolotina, N.A. Davydova. TB infection rates in young population. Collection of articles: Tuberculosis in Russia, 2007. Proceedings of 8th Russian Congress of phthisiatricians. M.: “Idea”, 2007. P. 42.

[86] I.A. Bolshakova, N.M. Koretskaya. On the rationale of TB preventive measures for the medical student. Collection of articles: Tuberculosis in Russia, 2007. Proceedings of 8th Russian Congress of phthisiatricians. M.: “Idea”, 2007. P. 12.

[87] Low coverage of newborns with the BCG vaccination was reported in the Republic of Mordovia (37.1%), which was probably caused by a statistical error in completing Form No. 32. According to the main TB dispensary data, 6,699 children were vaccinated at birth in the Republic of Mordovia, or 83% of babies born alive.

The data of statistical reports can be used to calculate the number of children born with insufficient body mass (2,500 grams or less). The information about other contraindications is only partly available, and the data are not included in the present review. Medical contraindications for BCG vaccination are not always taken into account. According to the data obtained from Form No. 32, babies with body mass under 2,500 grams are given BCG vaccination in the regions of Murmansk, Sakhalin, Jewish AR, and Chukotka AR.

Provided there are no contraindications, children who are not immunized with the BCG vaccine at birth are vaccinated at health care facilities (polyclinics, hospitals) at their place of residence.

According to the federal sanitary-and-epidemiologic service ("Rospotrebnadzor") data,[88] 93% (1,625,791 persons) of children under 1 year of age **were vaccinated** in 2010.[89] The lowest BCG vaccination coverage was recorded in the cities of Moscow (77%), St. Petersburg (80%) and in the Republic of Ingushetia (82%).

Under 7 years of age 245,779 children (18%) were given the **first revaccination** in 2010 (population data as of 01.01.2010). Less than 10% of children were given the first BCG revaccination in the city of Moscow (1%), the Republic of Mari El (5%), the city of St. Petersburg (6%), the Republic of Karelia (6%), the regions of Vologda (6%), Tambov and Pskov (7% each), the Republic of Komi (8%), Novgorod and Kirov regions (9% each). Only in 4 entities of the Russian Federation did the first revaccination coverage exceeded 30%:[90] in the Republics of Kabardino-Balkaria (50%), Buryatia (33%), Chechnya (32%) and in Chukotka AR (37%).

As of 01.01.2010, the **second revaccination** was given to 107,891 children under 14 years of age, corresponding to just 8%. The second revaccination coverage of more than 20% of the children under 14 was reported only in the Republics of Kabardino-Balkaria (25%), Chechnya (22%) and Chukotka AR (20%). Other areas reported an insignificant percentage of children covered with the second revaccination.

Thus, in general the BCG vaccination of children in the Russian Federation is implemented adequately, though due to declining numbers of immunized newborns its comprehensive coverage should be increasingly monitored. Overall, the rates are sufficiently high throughout the country and indicate effective performance of the general health care system in providing preventive vaccination against tuberculosis.

Medical contraindications do not present a significant obstacle for BCG immunization activities, as many of these children are vaccinated later, in health care facilities at the place of residence.

One of the challenges regarding the BCG vaccination is a risk of developing post-vaccination complications. Similar to any live vaccine, BCG vaccine and BCG-M may induce tuberculosis development both at the administration site and as generalized forms of the disease. Children with complications following BCG vaccination are treated with TB drugs and therefore should be followed up by a TB doctor. Since 2005 children with post-vaccination complications are followed up in the dispensary follow-up group V.

In 2010, there were 607 new paediatric cases registered with BCG vaccination complications, of them 589 in the age group of 0–14, and 15 persons aged 15–17. Thus, assuming that in most cases complications occur within the first post-BCG vaccination year,[91] the rate of post-vaccination complications constitutes approximately 32 per 100,000 children aged 0–14 years, and 14 per 100,000 children aged 15–17 years who were given BCG vaccination against TB in 2010. Despite the fact that in the age group of 0–14 the rate of complicated BCG vaccination exceeds TB notification rate in this population of children, this cannot be regarded as a rationale for revising the policy of primary BCG vaccination. Severe post-BCG vaccination complications (generalized and miliary BCG infection that requires hospital treatment) occurred in only 159 children (154 aged 0–14 and 2 aged 15–17 years). Other children developed contained and localized lesions only (mostly cold abscesses and lymphadenitis).

5.8. Tuberculosis among children and adolescents in the Russian Federation and in the world

According to WHO estimates [43], children under 15 years of age constitute 11% of all new TB cases, corresponding to approximately 1 million incident paediatric cases a year.

According to the guidelines by the WHO, CDC and other agencies, the evaluation of TB incidence rates for children only includes data on the age group of 1–14 because the diagnosis and progression of TB disease in this

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[88] Rospotrebnadzor, the Russian Federation, Form No. 6 „Information on child populations who were vaccinated against infectious diseases."

[89] The indicator is calculated per a number of children under 1 year of age as of 01.01.2010. Thus, potentially its value could have been affected by a significant increase in the number of children born during 2010.

[90] High coverage rates for the first (over 100%) and second (59%) BCG revaccination in the Orel region indicate a statistical error. According to the data of the Orel regional TB dispensary, the actual coverage of children by the first revaccination was 22% (1,579 children), and by the second 10% (752 children).

[91] For instance, in [Kulcițkaia Stela Răspândirea, Tabloul Clinic, Diagnosticul, Tratamentul Și Profilaxia Complicațiilor Postvaccinale Și Revaccinale Cu Bcg La Copii. Autoreferat al tezei de doctor în medicină. Chișinău, 2007. 24p]

group differ significantly from other groups. In line with the global approach, the age group of 15–17 (adolescents) is analyzed together with the adult population.

The annual WHO Global TB Control reports provide neither the methods for assessing the TB incidence among children, nor the indicator values. However, according to the estimates given in the best-known publications on this issue and to a number of WHO documents [85], in various countries paediatric cases account for 3–25% of the total new TB cases (Table 5.2).

On the other hand, it should be noted that globally the quality of case finding among children is relatively low, and TB cases are underreported due to the following challenges in management of TB epidemiological surveillance in the paediatric population.

First of all, **a high proportion of extrapulmonary TB cases** in children with TB presents a challenge for **verification of TB diagnosis** because the use of laboratory methods for this purpose is not sufficient. The share of children with bacillary excretion is insignificant, which partly explains the **absence of a standardized definition** of TB diagnosis in children. Inadequate notification of paediatric TB cases by the national TB control systems lies in the fact that TB in children is given **low priority in public health care** because most paediatric TB cases are not dangerous from the epidemiological perspective.

Annual WHO Global TB Control reports include the data on notified TB cases in sputum smear-positive (MbT+) children aged 0–14, years which in 2009 constituted just 1.6% of the total new MbT+ cases (despite the fact that many countries do not notify extrapulmonary TB forms and rely mostly on laboratory tests in TB diagnosis).

In recent years more detailed information about the notified new paediatric TB cases has become available on the WHO website ([79] http://www.who.int/tb/country/data/download/en/index.html), where detailed data for WHO Global TB Control reports are provided (for example, [77, 78 and 80]).

Table 5.2

Tuberculosis in children aged 0–14, estimation for high TB burden countries, 2000 [85]

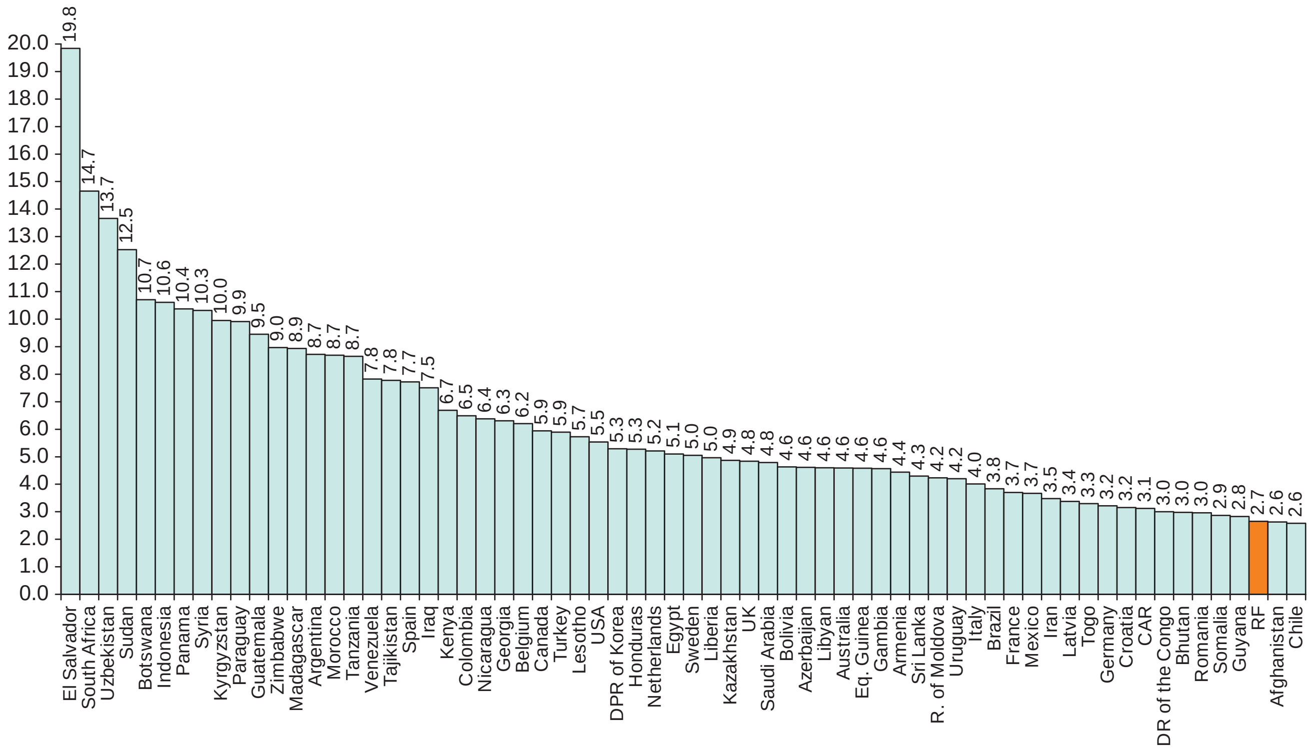
Country	New TB cases in children	% to all new TB cases	TB notification in children*	Overall TB notification **
India	185,233	10.2	53	179
China	86,978	5.3	27	129
Indonesia	15,691	2.7	23	263
Bangladesh	33,166	10.2	61	236
Pakistan	61,905	25.3	103	172
The Philippines	12,167	5.3	43	304
South Africa	35,449	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
All 22 high TB burden countries	65,9397	9.6		

* per 100,000 of childhood population; ** per 100,000 of the total population.

According to these data, recently the notification of new TB cases in the age group of 0–14 has improved significantly. Whereas in 1995 only 55% of countries (which together notified 74% of all new TB cases [69]) provided the data on new pulmonary ss+ TB cases among children, in 2008 their share reached 87.3% (with 98.6% of total TB cases notified). Moreover, in 2008 the data distribution by narrower age group bands (0–4 and 5–14 years) were provided by 63.2% of the countries, and approximately 65% of the countries provided data on ss– pulmonary TB cases and extrapulmonary TB cases in the paediatric population.

It should be noted that in the Russian Federation all abovementioned data have been collected for many years through the national system of statistical reports.

According to the notification data for new TB cases, the proportion of detected paediatric TB cases among 0–14-year-old children varies considerably among different countries (Fig. 5.12). In the Russian Federation the proportion of children among the new TB cases is relatively low at 2.7% (2009). Besides, in certain countries (for example, the USA, Canada, Germany, Italy and SAR) over 50% of children detected with TB are under 5 years of age (Fig. 5.13). In Russia these children constitute slightly over a third of cases (37.5%).



(Countries with > 500 new TB cases and the share of children aged 0–14 > 2.5%)

Fig. 5.12. Proportion of notified new TB cases in children aged 0–14 years in the countries of the world, 2009. The data are presented for the countries with more than 500 notified new cases and with the proportion of children among them over 2.5% (ource: WHO, Global report tables [80])

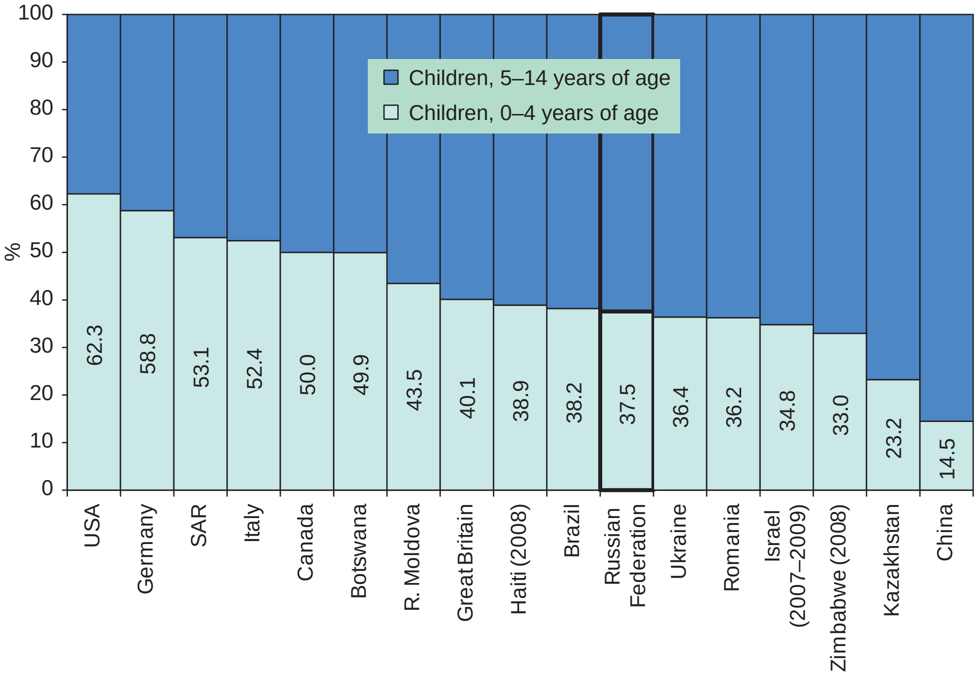


Fig. 5.13. Age composition of new TB cases notified in children aged 0–14 years in some selected countries of the world, 2009 reporting year (for some countries the reporting years are specified in the graph) (Source: WHO, Global Report tables [80])

Diagnostic structure of paediatric TB also varies considerably from country to country (Fig. 5.14).

Thus, as already noted above, although paediatric TB cases in the Russian Federation are observed predominantly without lung tissue involvement (83.7% in 2009), in most countries of the world the share of cases with this site of TB ranges from 20 to 40%; for example, in the USA it is 24.6%, Great Britain 34.8%, and Brazil 23.9%. Notably, in the RF the number of cases with the laboratory-confirmed diagnosis in this age group is very low. Only 1.8% of cases in Russia are confirmed by microscopy (in USA 2.7%, Brazil 24.7%). At the same time, in the USA, in accordance with the definition of a TB case (see [CDC. Case definitions for infectious conditions under the public health surveillance. MMWR 1997; 46 (No. RR-10): 40-41]) in addition to microscopy examination, culture and molecular methods are also used for TB diagnosis (DNA probe assay, nucleic acid amplification test), ensuring confirmation of TB diagnosis in almost a quarter (24.8%) of cases among children aged 0–14.

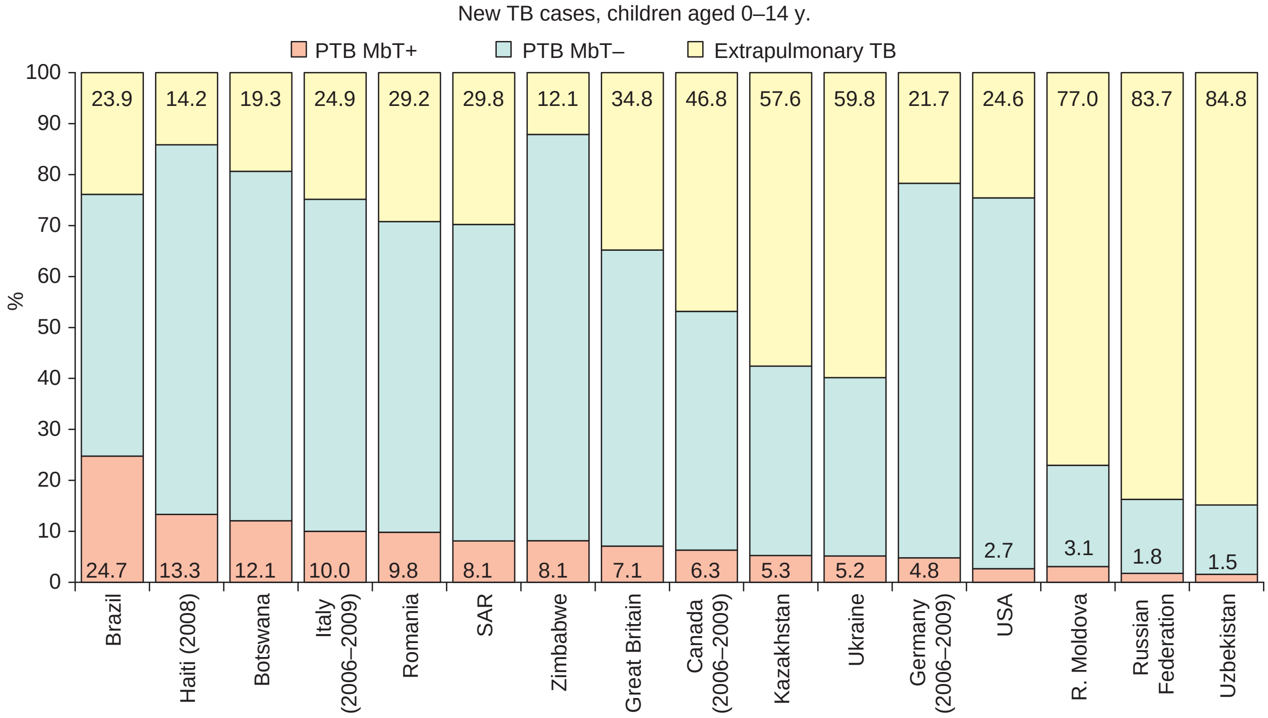
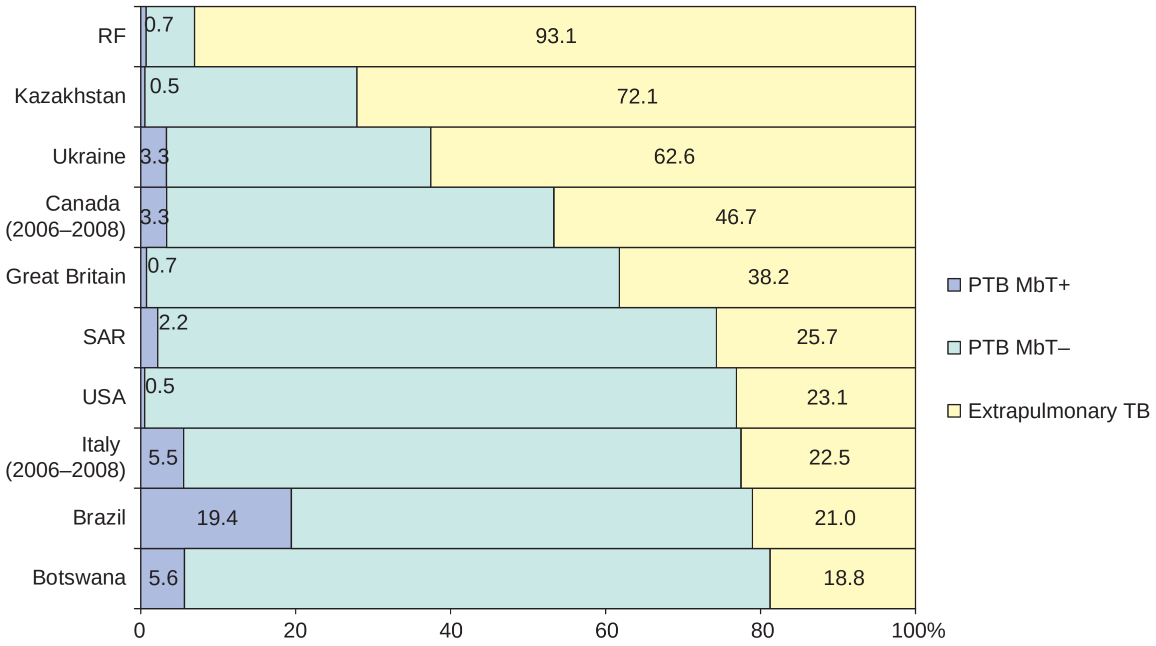
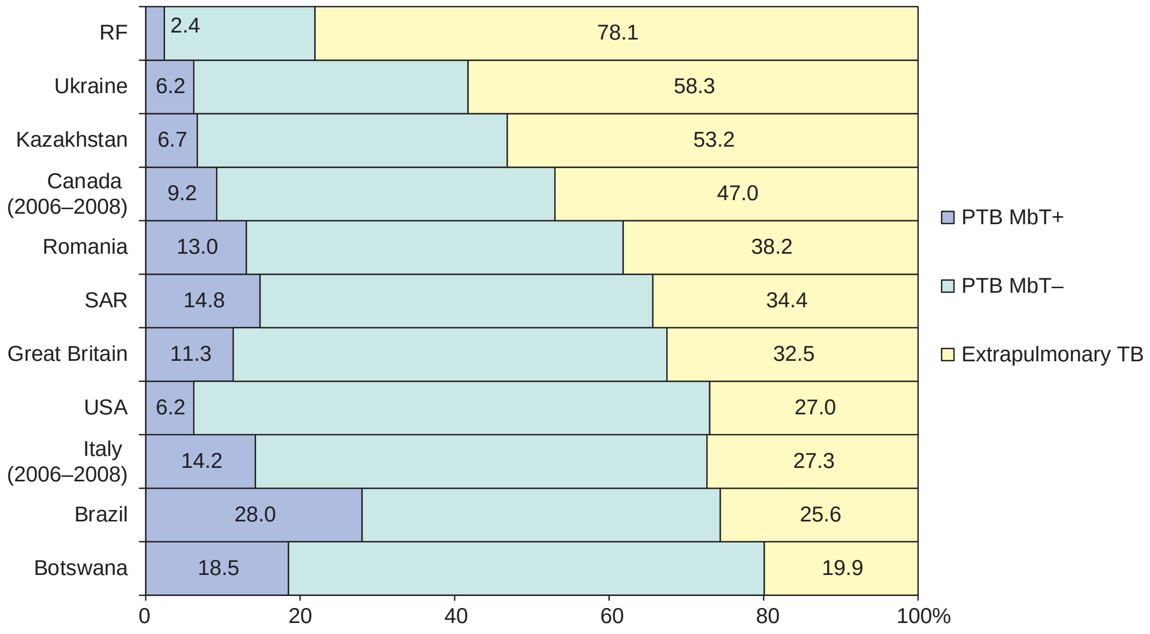


Fig. 5.14. Structure of tuberculosis detected in children of 0–14 years of age in some selected countries of the world, 2009 reporting year (for some countries the reporting years are specified in the graph). In the selected countries this structure is based on the information on the sites of TB disease and MbT status of at least 150 new childhood TB cases of 0–14 years of age (from 160 in the Republic of Moldova to 50,000 in South Africa)
(Source: WHO, Global Report tables [79, 80])



a) children of 0–4 years of age

Fig. 5.15. Structure of tuberculosis detected in children of 0–4 and 5–14 years of age in some selected countries of the world, 2009 reporting year (for some countries the reporting years are specified in the graph)
(Source: WHO, Global Report tables [79, 80])



b) children, 5–14 years of age

Fig. 5.15. Structure of tuberculosis detected in children of 0–4 and 5–14 years of age in some selected countries of the world, 2009 reporting year (for some countries the reporting years are specified in the graph) (Source: WHO, Global Report tables [79, 80])

In the Russian Federation microscopy and culture testing methods are used for the laboratory confirmation of the diagnosis. This is one of the reasons why in 2010 only 5.3% of children with TB had laboratory confirmation of the diagnosis (Fig. 5.7).

Different paediatric age groups show considerable variations in the disease sites (Fig. 5.15), which may be indicative of different approaches to TB diagnostics.

6. Extrarespiratory and extrapulmonary tuberculosis

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

6.1. Extrarespiratory and extrapulmonary[92] TB in the Russian Federation

As indicated in Chapter 2, at present pulmonary TB cases are predominant in TB registration in the Russian Federation (90.4% in 2010). On the other hand, the extrapulmonary 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. Untimely detection of patients with extrapulmonary TB leads to a high proportion of chronic forms and disability of pulmonary patients [42].

Historically, in the USSR and later on in the Russian Federation, the terms of “extrapulmonary TB” and “TB in extrapulmonary sites”[93] were used for specific lesions of organs and systems that did not include the respiratory organs, that is, for TB of bones and joints, genito-urinary organs, CNS etc. At the same time, the concept of “extrapulmonary TB” in the Russian Federation does not include lesions in the upper respiratory tract, bronchi, intrathoracic lymph nodes and pleura, so the term to be used is “extrarespiratory TB.” This definition does not quite meet the literal linguistic meaning of the terms, which are also used internationally. It leads to incomparability of some national and international rates.

In this analytical review the terminology and the analysis approximate to the international ones. For the purpose of bridging the gap between the Russian and international definitions, a special definitional unit of **respiratory TB of extrapulmonary localization (REPTB)** has been introduced in this review. It includes TB of the upper respiratory tract, bronchi, intrathoracic lymph nodes and pleura without parenchyma lesions, as well as **extrarespiratory TB (ERTB).** In the text, these two groups of patients will be defined as **extrapulmonary TB** (EPTB) cases, which meets the international definition and the meaning of the term.

Overall, the notification rate of **ERTB**[94] is not that high in the Russian Federation; it has limited accuracy since it strongly depends on detection at health care facilities in the Russian territories and, therefore, on the proficiency of medical workers at the regional health facilities (urologists, orthopedists, gynecologists, dermatologists, ophthalmologists etc.) and TB specialists – experts in ERTB diagnostics – at the regional TB facilities. As mentioned above, in a considerable number of RF regions there is a shortage of specialists in ERTB, and such positions are either formally occupied by coworkers or do not exist at all [40]. In spite of projections, which were based on the specifics of ERTB pathogenesis (its “delayed” development 3–7 years following an episode of pulmonary TB and, consequently, deferred increase in the ERTB incidence after the crisis of the 1990s), the ERTB notification rate remained stable in 1992–2001 at 3.3–3.5 cases per 100,000 population, and starting in 2003 it began to decrease annually by 0.1 and reached the level of 2.5 per 100,000 population by 2010 (Fig. 6.1). It should be noted that considering cases of REPTB, the notification rate for extrapulmonary TB (in the international definition) is 21.6 per 100,000 population.

The proportion of ERTB among new TB cases in the early 1990s was considerable (10.2% in 1992), while in the 21st century it was not higher than 4% and in 2010 it was reported at the level of 3.3% of the overall number of new TB cases.

The ERTB notification rate also depends on the current dispensary follow-up system in which a TB case is registered by a single (major) site, that is, mostly by a respiratory site. Therefore, even in generalized TB cases, which *a priory* implies the presence of extra-pulmonary lesions, another (i.e., extrathoracic) localization of the TB process is not being registered.[95] The same reason accounts for non-registration of TB-induced multiple lesions in the systems. It should be noted that among patients who receive treatment of 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 RF constituent entities, the proportions of ERTB cases among all new cases of the disease widely varies between the Russian territories (Fig. 6.2). The notification rates did not exceed 1% in the Kamchatka and Khabarovsky Krais, Jewish and Chukotka autonomous regions (AR), while in the republics of North Ossetia, Tyva, Ingushetia, and in the regions of Yaroslavl, Voronezh and Stavropol Krai the notification rates were above 6%.

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[92] As it can be found in the chapter text, the Russian TB statistical system mainly uses “extrarespiratory TB” indicators, but extrapulmonary TB data also can be found in the reports and in the present-day TB data evaluation and analysis – notes by translation editor.

[93] See Form No. 8, which has been in use since 2009.

[94] Hereinafter, in the text of the Russian version of the TB review the word “extrapulmonary” not “extrarespiratory” is used to define extrarespiratory sites, which is traditionally accepted in Russia (not internationally) – note by translation editor.

[95] Cases with the combination of TB of the CNS and meningitis and the respiratory TB or pulmonary TB are the exceptions. Such patients are registered like ERTB and not like respiratory TB or pulmonary TB cases.

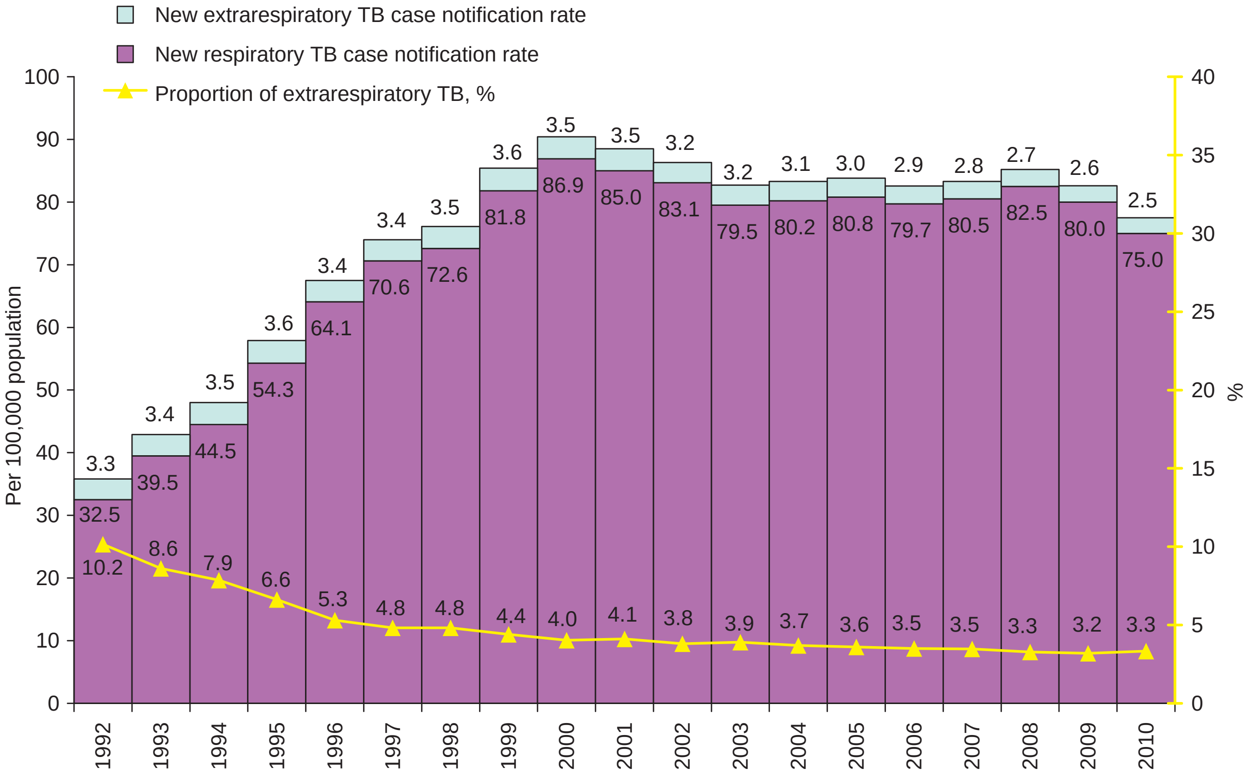


Fig. 6.1. New respiratory TB case and new ERTB case notification rates and the proportion of ERTB in the Russian Federation, 1992–2010 (Sources: Form No. 8, population: Forms No. 1 and No. 4)

Major fluctuations were also registered in the rates of REPTB among all new cases (Fig. 6.2). In the Jewish AR, Sakhalin region, Republic of Chuvashia and Krasnodar Krai the rate was below 3%, while in the regions of Yaroslavl, Vologda, Kostroma and Magadan, Kamchatka Krai, the republics of Kalmykia and Altay, as well as in the city of St. Petersburg it was over 10% (with the national average rate of 6.4%).

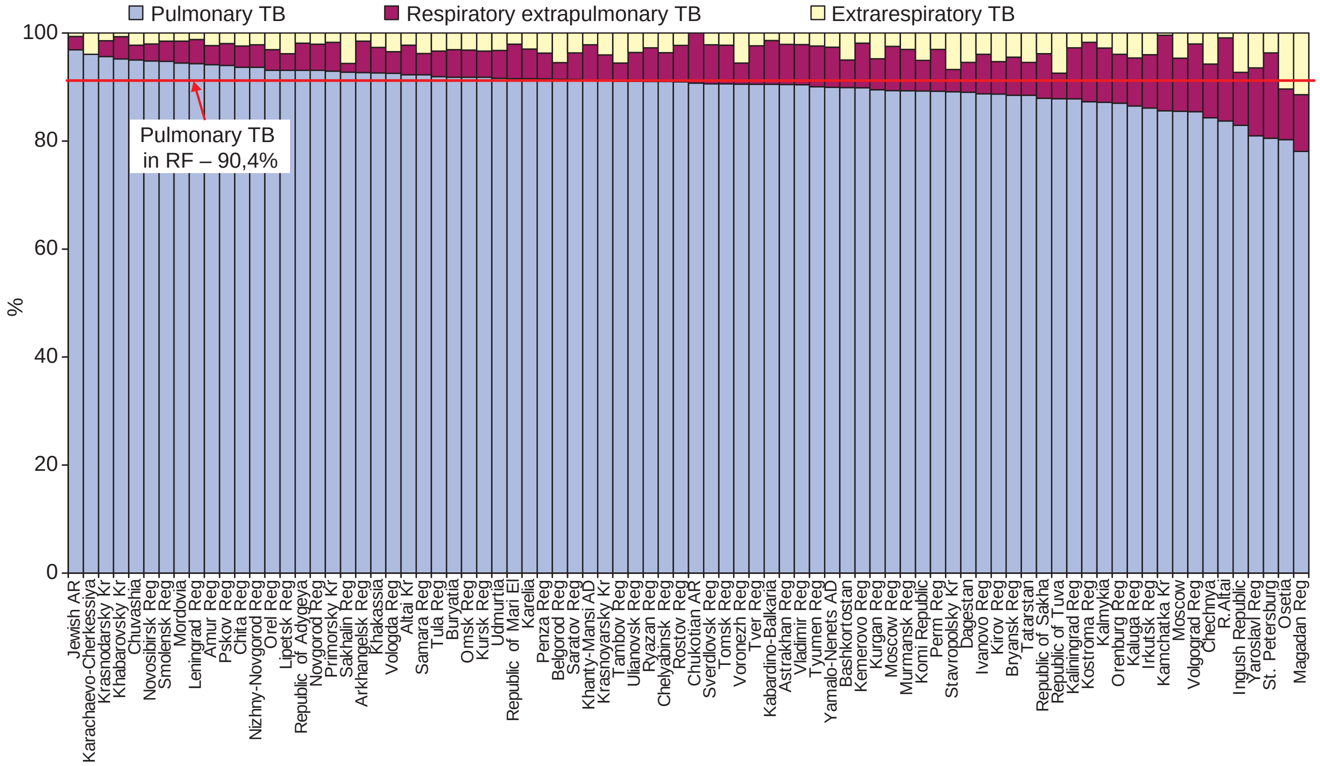
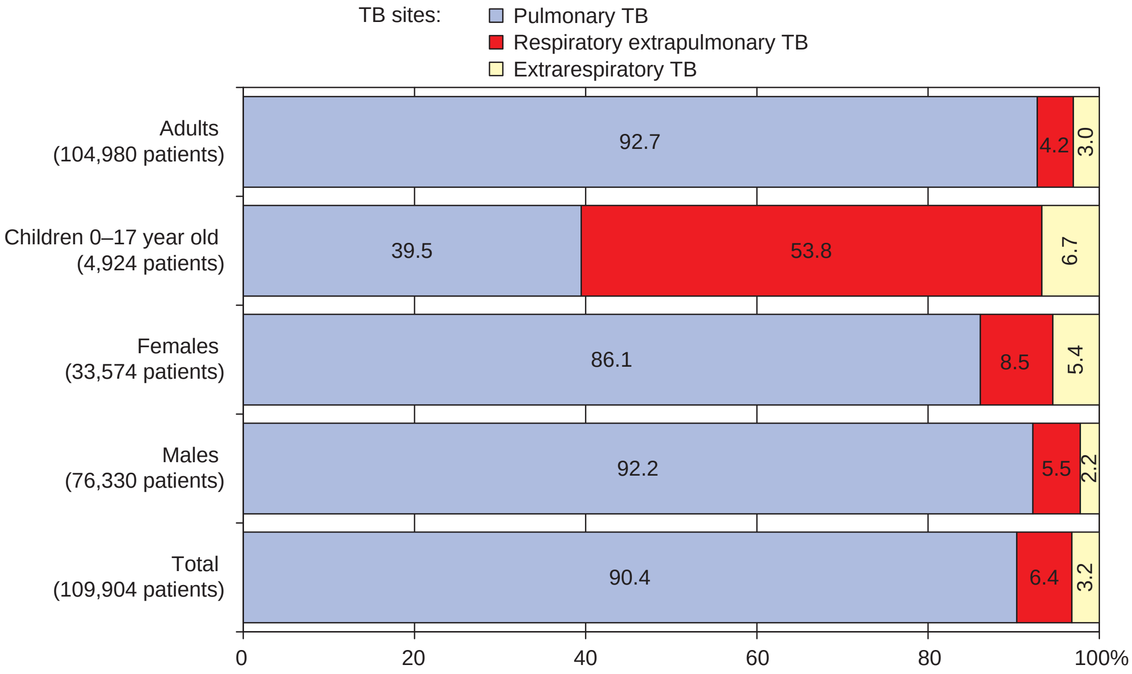
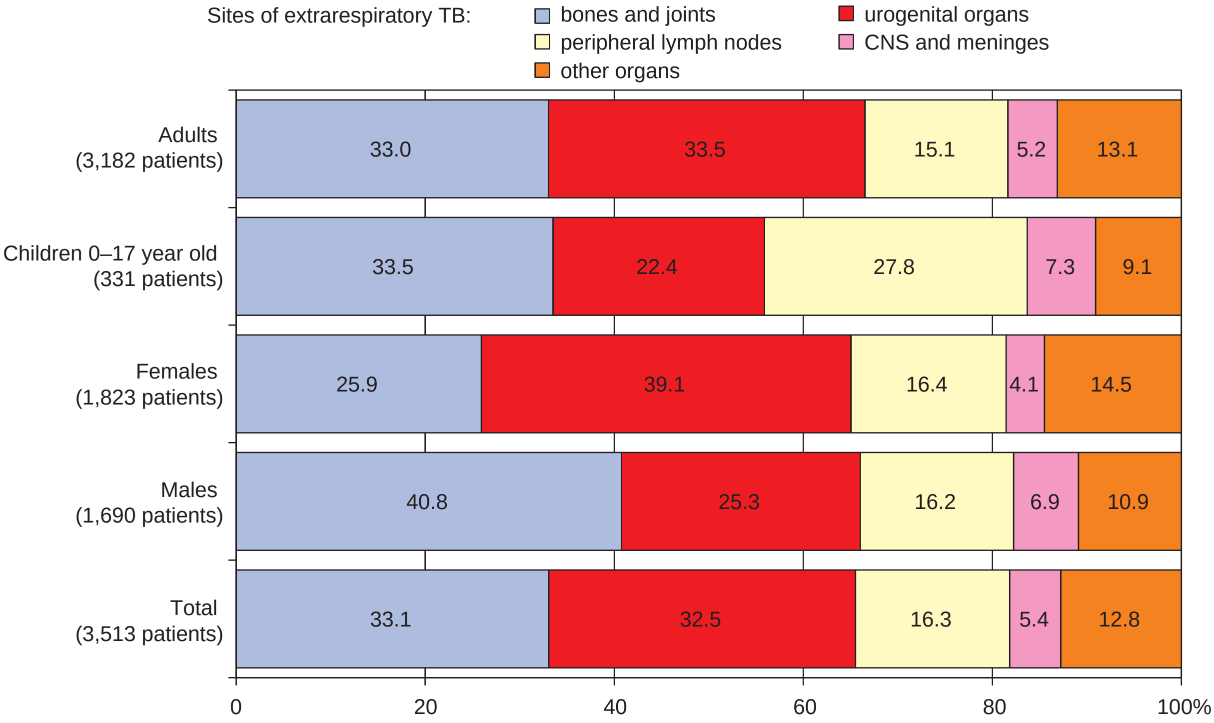


Fig. 6.2 Reported TB sites among new TB cases notified in the constituent entities of the Russian Federation, 2009. Pulmonary TB (PTB), respiratory TB of extrapulmonary sites (REPTB) and extrarespiratory TB (ERTB) (Source: Form No. 8)

The site of the disease also depends to a vast degree on patients' age and gender. Thus, in children and adolescents (0–17 years of age), the proportion of ERTB is registered in 6.7% of cases, while the proportion of the REPTB reaches 53.8% of cases (Fig. 6.3a). In men, respiratory extrapulmonary TB is more frequent, while extrarespiratory TB is more common in women.



a) TB sites in new TB cases



b) ERTB sites

Fig. 6.3. Clinical structure (sites) of new TB cases, the Russian Federation, 2010 (Source: Form No. 8)

The available statistical reports allow for estimating ERTB notification rates by major sites (which is not possible for respiratory extrapulmonary TB cases). For many years, the largest proportion of ERTB cases had TB of bones and joints and genitourinary organs; they account for about one-third of all TB cases. In 2006–2008, the statistically significant proportion of genitourinary TB cases was 4–10% higher than the proportion of bones and joints TB (i.e., in 2008, 29.7% and 35.5%, respectively, $p < 0.05$). But in 2010, the number of new bone and joints TB cases became prevalent – 33.1% (so far statistically not significantly) – compared to other sites of the disease with a high proportion of genitourinary TB (32.4%) and a lower percentage of TB of peripheral lymph nodes (16.3%), specific lesions of CNS and TB meningitis cases (5.4%), and other sites (Fig. 6.3B).

The clinical structure of new ERTB cases in males and females is different. TB of bones and joints is more prevalent among men (40.8%), while genitourinary TB is more common in women (39.1%). The age-related notification rates are also different. In recent years, among children of 0–17 years of age, bone and joint TB has become more common (33.5% in 2010), while TB of peripheral lymph nodes was more prevalent in this age prior to 2006. However, this data should be treated with a certain amount of caution, since there are still contradictions in the differentiation of the foci forms of bone TB and BCG-induced bone complications in young children.

In recent years, some other indicators have also been continuously decreasing, which reflects the general situation of extrarespiratory TB in the country. The prevalence of ERTB declined from 14.2 in 2004 to 9.9 in 2010 per 100,000 population, and its proportion in TB prevalence has been decreasing over the past 15 years. In 2010, it reached the level of 5.5%.

Up until the present time, the system of statistical recording and reporting did not include data on treatment outcomes of patients with ERTB and REPTB, although since 2005 the cohorts of these groups of patients have been registered in the framework of the sectoral statistics [35] in Form No. 7-TB (in 2010, 95.5% of patients were registered in those cohorts). The new draft of the executive order [35] on recording and reporting documentation provides for the evaluation of treatment outcomes of patients with ERTB and REPTB, which is based on the cohort analysis.

The official statistical data confirm that extrarespiratory TB does not significantly influence the overall TB notification rates in the country. Unfortunately, the decrease in all ERTB indicators (the absolute number of new ERTB cases, notification and prevalence rates of ERTB – see Section 2.5.) at present cannot be explained solely by the improved epidemiology. Apart from the factors indicated above – such as insufficient proficiency of physicians in general health care facilities and TB specialists in the field of extrarespiratory TB – which leads to poor case finding and sometimes to ignoring the ERTB problem [11], and along with ineffective case registration due to some specifics of the current TB registration system, two other factors are also noteworthy:

1)The high prevalence rate is four times higher than the notification rate.

2)A special problem, which will inevitably aggravate in the future, is the increasing number of cases with HIV-infection combined with extrarespiratory TB, which often becomes the criterion for the late stages of HIV-infection: such cases are not considered as independent diseases but rather as associated infection with its own registration specifics.

It appears necessary to introduce the concept of “multiple sites” (which include pulmonary TB, REPTB, and ERTB) into the TB recording and reporting forms to assess the actual scope of ERTB spread in the country and the needs for the respective specialists, as well to plan training on diagnostics for physicians from different fields of medicine. It should be noted that the International Classification of Diseases (ICD-10) uses a three-symbol coding (classes A15–A19) for the main TB groups with an additional fourth symbol, which codes the bacteriological and/or histological verification.

According to the Russian clinical classification of tuberculosis, which is “a highly informative… system, which includes all major concepts of the disease, …the methodology of its registration, statistical and clinical analysis” [30], the ICD-10 was complemented with a more detailed coding of pathologies [34]. In particular, the seventh coding symbol was added to designate “TB-induced multiple lesions of human organs.” However, unfortunately this coding is currently not used in the existing statistical reporting forms.

6.2. Spread of extrapulmonary TB in the world

The WHO Global reports annually provide information on registration of extrapulmonary TB cases in the countries of the world, which include tuberculosis localized outside the lung parenchyma, according to the definitions currently in use in the world, that is, respiratory TB of extrapulmonary sites, as well as extrarespiratory TB, which is more frequently used in theRussian TB statistics.

Although in the world there are similar challenges related to detection of EPTB (limited capacity for detection using radiological and laboratory methods of diagnostics, insufficient proficiency of the staff etc.), the methodology for estimation of the actual spread of EPTB is not developed yet.

In 2009, there were 828,124 cases of EPTB registered in the world, or 15% of all new TB cases. The proportion of new EPTB cases varies in the countries of the world, which could be due to the problems of diagnostics of this form of the disease. Fig. 6.3 shows the countries with at least 100 cases of EPTB detected in 2009, and the value of the rate varied from 2–6% (the Philippines, Indonesia, China and Poland) to 50% and more patients with EPTB (Jordan, Algeria and Syria). For the Russian Federation this proportion was relatively small: 9.3%.[96]

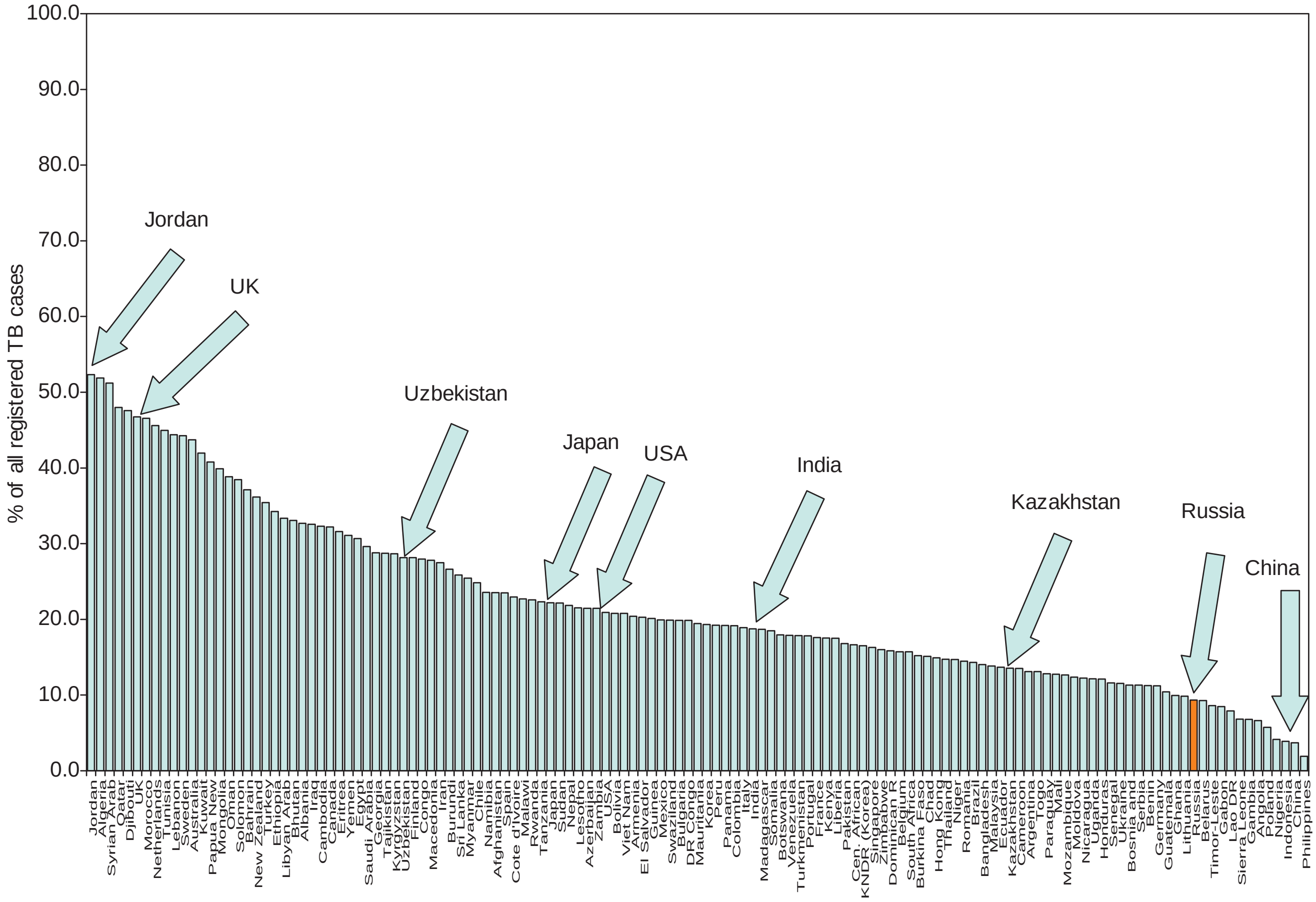


Fig. 6.4. The proportion of EPTB in countries among all new TB cases notified in 2009.
Countries with more than 100 EPTB cases notified in 2009. (Source: Global TB Control 2010, WHO Report [78])

For the last few years the WHO reports also have been providing information on the notification of new EPTB cases with the distribution by sex and age. The proportion of EPTB detected in different age groups also differs significantly in the countries of the world. Fig. 6.4 gives the examples of the cases' age structure in some countries of the world. In the Russian Federation and in the CIS countries young people under 34 years of age (50–60%) are the majority among the patients of this form of TB, while in many countries of the world, such as the USA, Germany and Japan more than 60% of EPTB patients are older than 35.

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[96] Due to the difference in a definition of "extrapulmonary TB," from 1995 to 2004 the Russian Federation presented incomplete data (not including data on EPTB) to the Global report. In 2005–2007 and in 2009 the data presented in the report met the international definition. Therefore, in 2008 the proportion of patients with extrapulmonary TB in the Global report was only 3% (not including data on EPTB), while in 2009 it was already 9.3%.

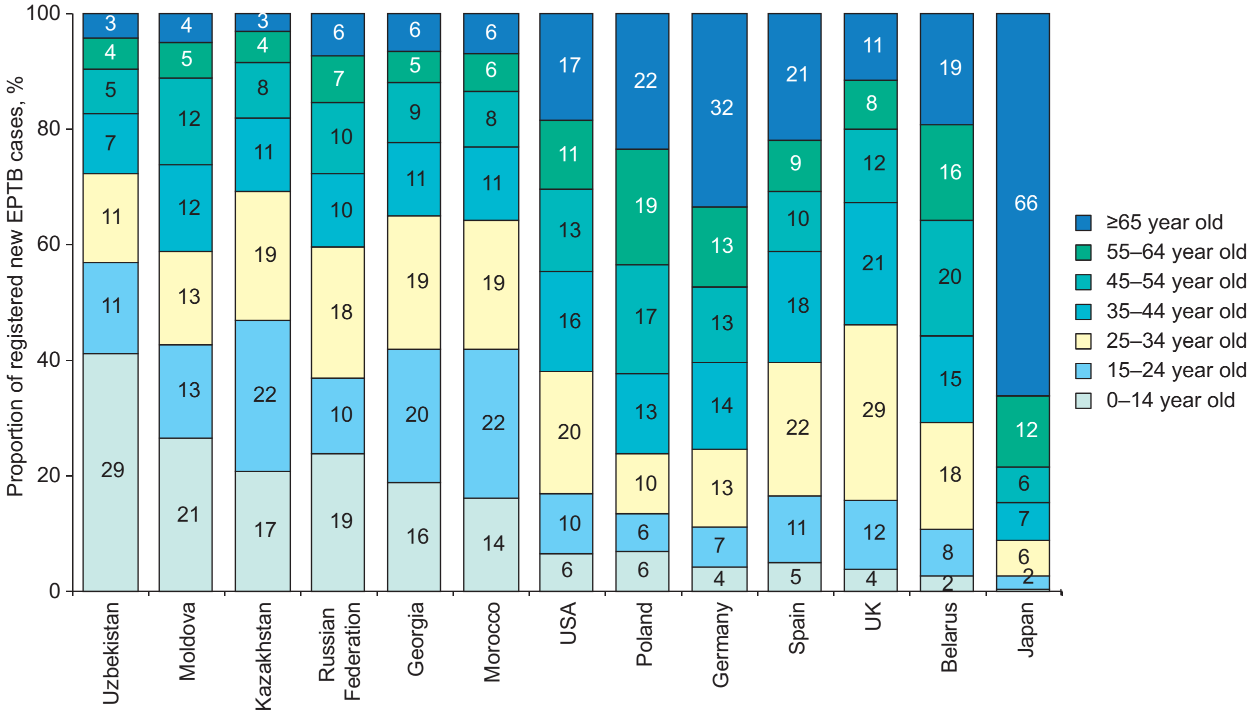

Fig. 6.5. Age composition of the new EPTB cases notified in some countries of the world.
The columns show the proportion of a given age group among all notified EPTB cases, 2009
(Source: Global TB Control 2010, WHO Report [78])

Therefore, the increasing amount of information in world on the registration of EPTB shows the importance of this data for obtaining a better picture of the distribution of this disease in the population.

7. Monitoring of treatment success in the Russian Federation

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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 [15, 34, 35, 46, 58]:

– indicators that reflect outcomes of individual courses of chemotherapy;
– indicators that reflect the effectiveness of individual stages of treatment (in-patient, out-patient and sanatorium treatment);
– indicators that reflect the effectiveness of TB patient management as a whole (of TB patient, not TB treatment case – note by translation editor), from the time of case detection to the completion of the follow-up stage;
– indicators that reflect performance of treatment facility (effectiveness of treatment provided at the in-patient clinics and sanatoriums);
– indicators that reflect the work of regions or clinics on the organization and management of TB patients' treatment as a whole.

Chemotherapy is a major method of TB treatment that ensures cure of a substantial part of new TB cases and TB relapses and contributes to the prevention of TB transmission in the population. At the same time, in addition to ensuring effective and adequate chemotherapy, it is important to consider a number of basic prerequisites of effective patient management, which have to be taken into account in the process of adequate decision making. Among those prerequisites are the following: the availability of adequately trained physicians and effectively performing TB control facilities, as well as adequate quality-ensured TB drug supplies. However, 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 based on the existing system of statistical registration and reporting data.

To assess chemotherapy effectiveness it is necessary to monitor the following parameters of TB patient management:

- **Coverage of TB patients by treatment.** One of the major problems is the patient's initial refusal of treatment, or the 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 the development of the TB situation in the region.
- **Adequacy of chemotherapy (doses and regimens)**. Prescription and administration of the necessary quantity of TB drugs in adequate dosage and with the optimal duration of chemotherapy with due account of the patient group and the previous treatment history (new case, relapse, etc.) are the important elements of treatment success, prevention of treatment failure and subsequent development of drug resistance. The introduction of standardized treatment regimens in 2003 [34] laid a solid base for reduction of errors in the indication of treatment regimens and dosages of drugs.
- **Control over the TB drugs administration.** This component also requires monitoring and evaluation, since treatment under direct supervision of a medical worker guarantees patient's compliance with the prescriptions made by a physician.
- **Uninterrupted treatment.** Patient's compliance with the indicated treatment and motivation to get cured are the major factors influencing treatment outcome. Monitoring of treatment default (interruptions) is the key component that requires permanent control and evaluation. Completion of the prescribed course of treatment without interruption is one of the major factors influencing chemotherapy outcomes and treatment effectiveness in general.
- **Continuity of treatment.** As a rule, several types of facilities (in-patient and out-patient clinics, dispensaries, sanatoriums, TB units, clinics at the specialized research institutes etc.) are involved in planning, implementation and monitoring of treatment. In addition, general health care facilities (such as feldsher-midwife units, rural outpatient clinics, offices of family practitioners, district hospitals etc.) are also involved in the distribution and supervised administration of TB drugs. Besides, TB patients may be transferred to theTB facilities in other territories or between different jurisdictional entities (e.g., transfer from a treatment facility in the civilian sector to one in the penitentiary system, and vice versa). In such cases, it is very important to monitor the actual continuation of treatment and to use standardized recording forms to ensure the continuity of therapy.

- **Intermediate and final evaluation of treatment outcomes**. The outcome of any particular course of treatment should be evaluated. The intermediate evaluation of treatment is especially important in bacteriologically positive (i.e., the most infectious) TB patients. The rate of bacteriological conversion at the end of the intensive phase of chemotherapy allows for the evaluation of the DOT effectiveness, efficiency of TB drugs and the necessary adjustment of treatment for an individual patient and at the level of a treatment facility or a region as a whole.

The system for monitoring treatment effectiveness used by the Russian Federation has changed significantly since 2004. The Russian MoH&SD Executive orders No. 109 of 21.03.2003 and No. 50 of 13.02.2004 [34, 35] contributed to expended potential of treatment monitoring and patient management.

Prior to 2004, four indicators of treatment effectiveness were considered in the Russian Federation [15, 46]:

1) bacteriological conversion confirmed by any method in new TB patients;[97]
2) closure of cavitary lesions in new TB cases;
3) clinical cure of TB patients
4) “abacillarity” or removal from the register of bacteriologically positive patients.

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 cavitary lesions in the lung tissue. Only patients registered within a year prior to the reporting year were considered. The cohort principle (annual cohort) was only partially used in these indicators; that is, 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 of causes other than TB, transferred out, etc.) were excluded from the cohort. By their nature, these indicators reflected only the elimination of one of the signs of the disease in some of the patients rather than the effectiveness of treatment for all TB patients.

These two indicators were aimed at the evaluation of treatment effectiveness for a new TB patient over 12–24 months of treatment, without considering the data on completion of the course of chemotherapy, treatment default, transfer out or death; that is, the information, which would allow better understand the reasons for treatment failure, was lacking. The indicators did not take into account the number of chemotherapy courses provided, which brought them closer to the dispensary follow-up indicators. Finally, these indicators were confined to the evaluation of treatment effectiveness only for a part of the whole cohort of new bacteriologically positive TB cases or new cases with cavitary 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 effective treatment completion in all new TB cases registered in a given year (quarter) was not evaluated.

In 2005, the data used for the calculation of indicators of bacteriological conversion and closure of cavitary lesions were removed from reporting form No. 33. In 2009, the removed data was returned to the reporting form, which now gives an opportunity to perform a retrospective analysis of treatment effectiveness on the basis of dispensary follow-up indicators.

The indicators referring to “clinical cure” and “abacillarity” were used prior to 2004 and are still being used now. They cumulatively reflect the dispensary follow-up work effectiveness in patient management. The indicator of “clinical cure” refers to a proportion of patients from the dispensary follow-up groups (DFG) for active forms of the disease (DFG I and II) transferred after cure to DFG III (for registering cured TB patients) within the reporting year. The indicator of “abacillarity” demonstrates the proportion of patients removed from the register of bacteriologically positive patients upon obtaining a number of negative results of the laboratory tests.

The cohort principle is not applied for both indicators, where the denominator is the average annual number of all TB patients or only bacteriologically positive patients (an average for a number of patients registered by the end of the reporting year and at the end of the year preceding the reporting year), respectively. Patient registered two and more years ago can be applied to a number of patients cured within a reporting year and to a number of patients with the bacteriological conversion that occurred within a reporting year.

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 chronic TB cases. They also help controlling the pool of bacteriologically positive cases, indirectly evaluating the timeliness of TB detection and the results of the complex treatment of some patients with the respiratory TB, and observing the flow of patients and timeliness of their transfers to the respective dispensary follow-up groups.

However, these indicators do not allow for the evaluation of the progress achieved in the basic and possible subsequent courses of treatment for different groups of patients. The effectiveness of separate TB treatment courses can predetermine the success of the dispensary follow-up activities on the whole [5].

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[97] The Russian recording and reporting forms have information about only two laboratory methods of TB confirmation – microscopy and culture investigation.

The lack of the cohort principle in evaluation of the proportion of people who were cured and removed from the register of bacteriologically positive patients to a considerable extent decreases the value of these indicators and makes them incorrect with a dramatic change in the population of patients registered in the dispensary follow-up groups.

Therefore, the registration and reporting system, which was used prior to 2004, was able to provide data only on final outcomes of treatment in all categories of patients and in separate groups of patients.[98] It did not allow for assessing the effectiveness of the main (basic) treatment courses and individual chemotherapy courses; it was unable to monitor the treatment coverage, adequacy, control of drug intake, default rate and continuity.

It should be noted that prior to 2004, the international indicators of treatment (chemotherapy course) outcomes were used only in some regional pilot projects in the Russian Federation. This made it difficult and at times impossible to compare the effectiveness of treatment management activities performed in the Russian Federation with the results achieved in other countries. Moreover, it hampered the use of best practices from abroad in the Russian Federation and vice versa.

The statistical data reviewed in the previous sections of this review indirectly show that in the 1990s the treatment success was low, which was confirmed by a high level of TB mortality and its consequences, a substantial accumulation of bacteriologically positive patients, patients with chronic TB and MDR-TB.

The issuance of the MoH Executive Orders No. 109 and No. 50 [34, 34] initiated a countrywide application of the new approaches to treatment and evaluation of treatment effectiveness. These approaches included approved standardized treatment regimens and a system of new recording and reporting forms for monitoring TB case finding and treatment, which was based on the cohort analysis and evaluation of outcomes of separate courses of chemotherapy. Starting from 2005, a possibility arose to improve efficiency of treatment monitoring including control of outcomes of separate chemotherapy courses. The new statistical data allowed for a detailed analysis of the reasons for insufficient treatment effectiveness [5, 6] (see Annex 1).

The system of treatment monitoring and the sectoral statistical reporting, adopted in Russia in line with these executive orders [34, 35], complies with the main WHO recommendations and supplements the recommendations with the national achievements based on long-term experience and existing capacities of the TB services in the Russian Federation. The system of treatment monitoring currently applied in Russia, in addition to the basic WHO recommendations [75, 91], also includes the assessment of treatment outcomes 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 relapses who were bacteriologically negative at the time of patient registration.

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

The indicators of treatment success should be evaluated separately before and after the revision of the DFG in 2004.

Treatment effectiveness in new TB cases, as defined by the criteria of **closure of cavitary lesions** and **bacteriological conversion** [58], after the decline in the early 1990s stabilized at the turn of the century at the level of 73–74% and 62–63%, respectively (Fig. 5.1). Closure of cavitary 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).

Due to the changes in the calculation method, in 2009–2010 the value these indicators decreased. In 2010, the bacteriological conversion rate was 66.4% (66.2% in 2009), and the rate of closure of cavitary lesions was 58.8% (56.0% in 2009). Prior to 2004, the cohort of TB cases detected in the previous year did not include cases of death (causes other than TB) and transferred-out patients, but it included the transferred-in TB patients. Starting in 2009, the denominator included the entire annual cohort, which allowed for the real cohort analysis of treatment effectiveness in the framework of the dispensary follow-up, that is, treatment effectiveness that could include one or several courses of chemotherapy.

The **“abacillarity” rate** practically did not change until 2004 (Fig. 7.2), and the **clinical cure rate in the respiratory TB patients** after some decline in the early 1990s started increasing slowly after 1998. After the revision of the dispensary follow-up groups in 2004, when part of the dispensary follow-up groups was abolished and duration of the follow up of the bacteriologically positive patients was shortened (see Chapter 4), these rates

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[98] Preliminary results of treatment of MbT+ patients could be partially assessed on the basis of 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 the microscopy method). However, the use of these data without the cohort analysis substantially reduced their value.

automatically increased,[99] indicating more precisely the effectiveness of patient management in a group of bacteriological positive TB cases and TB cases with destructive changes of the lungs.

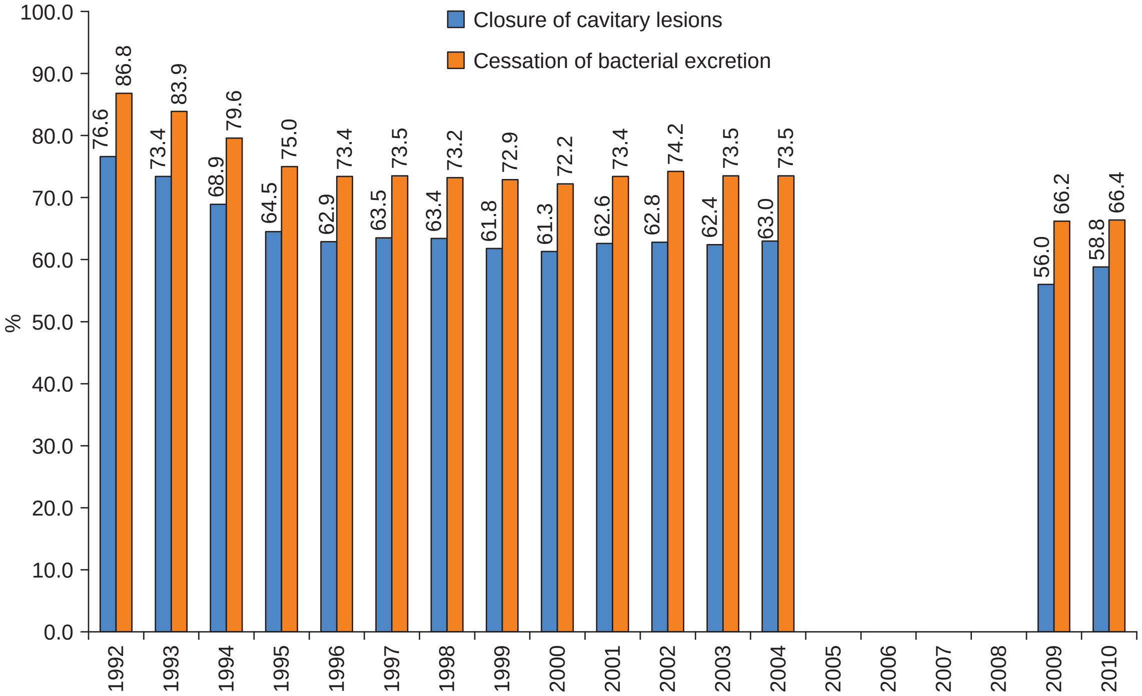

Fig. 7.1. Treatment effectiveness in new respiratory TB patients in 1992–2010. Data for 2005–2008 were lacking in the reporting forms (Source: Form No. 33)

It should be noted that both indicators were steadily increasing after 2005 with a particularly rapid growth in the “abacillarity” rate in the group of registered respiratory TB patients. In 2010, this indicator reached 40.6% of all registered RTB patients, which was 33% higher than in 2005 ($p < 0.01$). In 2010, 33.1% of RTB patients were transferred to the DFG III, which is the group of clinical cure.

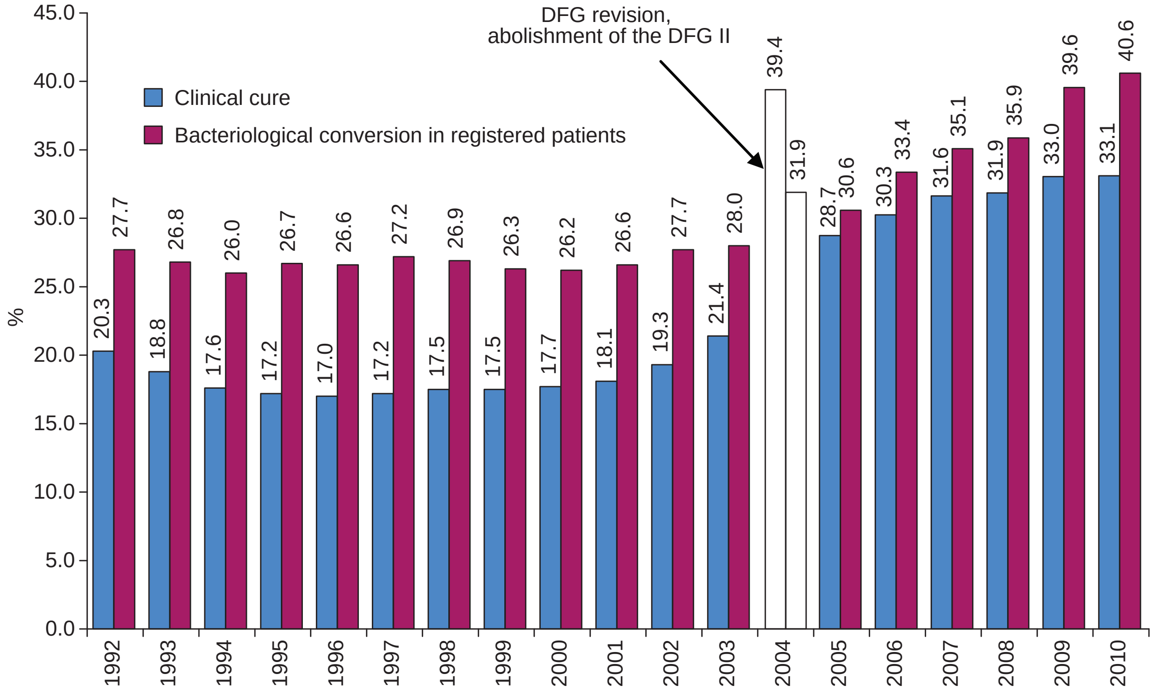

Fig. 7.2. Clinical cure and abacillarity in respiratory TB patients in the Russian Federation, 1992–2010 (Source: Form No. 33)

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

In 2006–2008, in new TB patients included in DFG IA, this indicator was 46–47%. In 2009–2010, the summarized clinical cure for new TB cases and relapses was 46.3% and 43.7%, respectively.[100]

It should also be noted that the indicator of clinical cure reflects both the fact of patient's cure and the timeliness of patient transfer to DFG III [5]; therefore, in areas with inadequate follow-up management the value of this rate as an indicator of treatment effectiveness is going to be underestimated.

The development and implementation of the equivalents for treatment effectiveness indicators (clinical cure and abacillarity) based on the cohort principles will significantly increase their practical value.

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 indicators for patients' coverage by this type of treatment. Evaluation of surgical treatment effectiveness based on the existing statistical forms does not seem possible.

In 2001–2009 (see Fig. 7.3), there was a statistically significant increase in the proportion of RTB patients who received surgical treatment – from 2.6% to 5.3% (12,804 patients in 2010) – and it remained unchanged for the last two years. The proportion of surgically treated patients with fibrocavitary TB (FCTB) has remained unchanged since 2005 (4.5–4.8%). In 2010, the proportion of surgically treated patients remained relatively high among patients with TB of bones and joints (15.0%, 679 patients), urinogenital TB (9.2%, 510 patients), and TB of peripheral lymph nodes (31.0%, 407 patients).

Starting with 2005, the reporting forms allow for the calculation of the percentage of RTB patients treated surgically within one year after the diagnosis. In 2010, of new RTB patients 5.9% received surgical treatment (5,001 patients).[101]

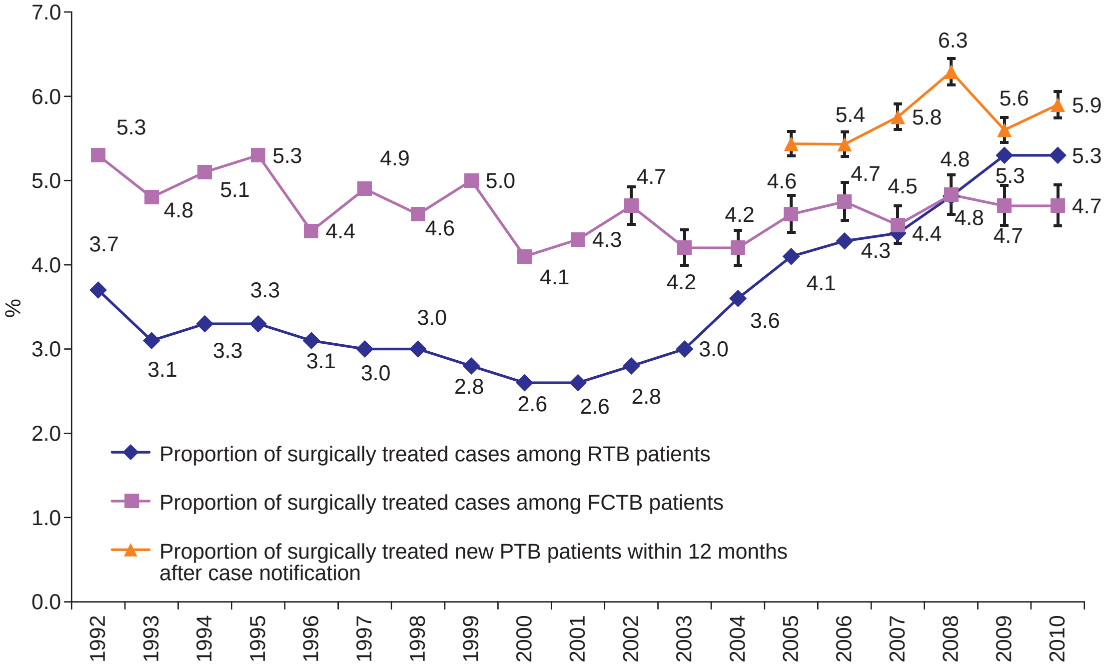

Fig. 7.3. Proportions of the respiratory TB cases (RTB), fibrocavitary TB (FCTB) and new respiratory TB cases surgically treated within 12 months after case notification, the Russian Federation, 1992–2010 (Source: Form No. 33, see a footnote at the bottom of the page)

Surgical interventions have uneven distribution in different areas of the Russian Federation (Fig. 7.4). On the whole, surgical treatment of TB patients is more actively used in the Central, Privolzhsky and Far-East federal districts (5.6%, 6.6% and 7.2% of all RTB patients, respectively, and 5.6%, 7.6% and 7.9% of new RTB patients,

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[100] Starting in 2009 reporting Form No. 33 included only the summarized data on transfers from the DFG IA (new TB cases) and DFG IB (relapses) to DFG III (cured TB patients).

[101] 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 "surgically treated new patients <with respiratory TB> not later than 12 months after the diagnosis was made," while starting in 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 time period after diagnosis within which the 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.

respectively). New TB patients are more often operated on in the Central, Povolzhsky and Far-East federal districts (6.6%, 7.3% and 8.0% of patients, respectively). Over 10% of new TB patients received surgical treatment in the Penza region (where this rate reaches 33.5%), in the republics of Mordovia and Sakha (Yakutia), in the regions of Tambov, Voronezh , Lipetsk, Kursk, Kirov, as well as in Zabaikalsky, Primorsky and Krasnodarsky krais. The highest rates of surgical interventions (over 10%) in all RTB patients were registered in the regions of Penza, Tambov, Belgorod, Kirov and in the republic of Sakha (Yakutia).

In 12 constituent entities of the Russian Federation less than 2% of all RTB patients were covered by the surgical treatment. The low level of surgical interventions in a number of areas of the country is due to the lack of medical staff and poor physical infrastructure.

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

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

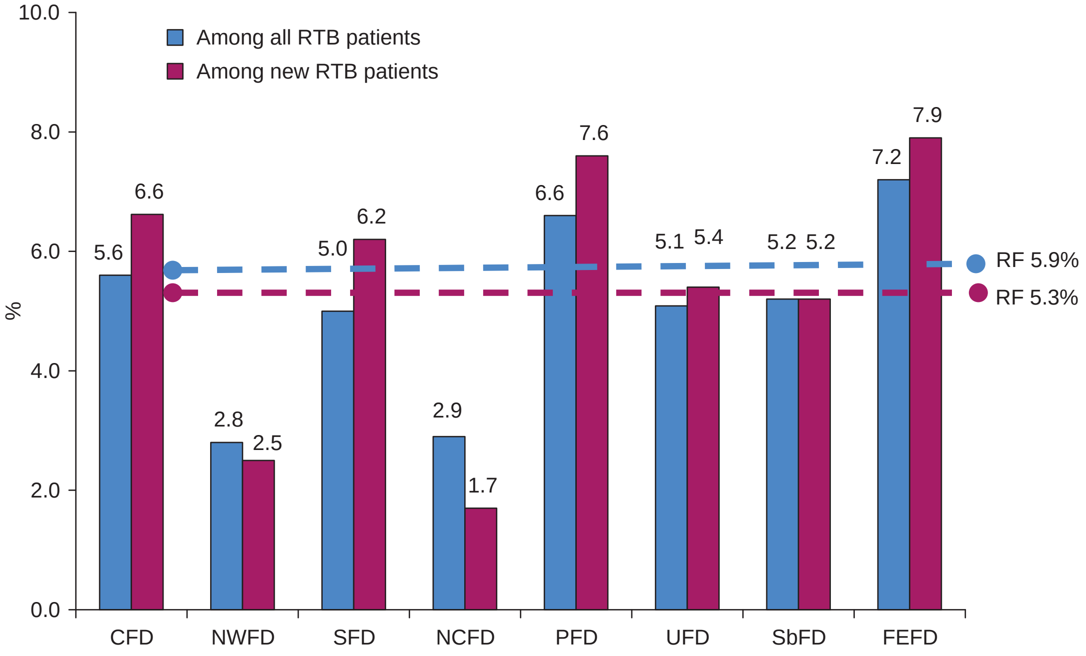

Fig. 7.4. Proportion of surgically treated respiratory TB cases (RTB) and new respiratory TB cases by the federal districts of the Russian Federation (RF), 2010 (Source: Form No. 33)

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

The analysis of such information from a representative sampling of RF constituent entities could ensure an efficient monitoring and evaluation of effectiveness of the surgical methods in TB treatment in the Russian Federation. It may have a significant impact on the managerial decision making aimed at enhancing the effectiveness of surgical treatment of TB patients in the context of M/XDR-TB spread in the country.

7.4. Evaluation of chemotherapy outcomes for patient cohorts registered in 2005–2009

In 2005–2008, a new methodology and statistical system of treatment monitoring based on the cohort analysis [35] was introduced throughout the country. 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 [33].

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 the First Moscow State Medical University of I.M. Sechenov (RIPP), Novosibirsk TB Research Institute, St. Petersburg Research Institute of Phthisiopulmonology, Central TB Research Institute of Russian Academy of Medical Sciences, and the Urals Research Institute of Phthisiopulmonology. The WHO Office in the Russian Federation provided consultative and technical support to the implementation of the new system.

According to data [28] referring to the 2009 TB treatment cohort at TB facilities in Russia (MoH&SD reporting forms, civil sector), the main chemotherapy course for **all new PTB cases** (regardless of MbT status) was successful in 68.9% of cases (see Figure 7.5), which is less than for the cohort of 2008 (69.9%). Earlier in 2005–2008, a statistically significant increase of this indicator was reported (from 63.9% to 69.6%, $p < 0.05$). At the same time, there was a decrease in the proportion of patients with failed courses of chemotherapy, treatment defaults as well as transferred-out and died patients.

In the cohort of 2009, there was a continued decrease in the proportion of new pulmonary TB patients who died of TB (down to 3.8% [in 2005, 5%]), defaulted (7.7% [in 2005, 10.3%]), and were transferred out to the unknown destination (3.8% [in 2005, 4.5%]).

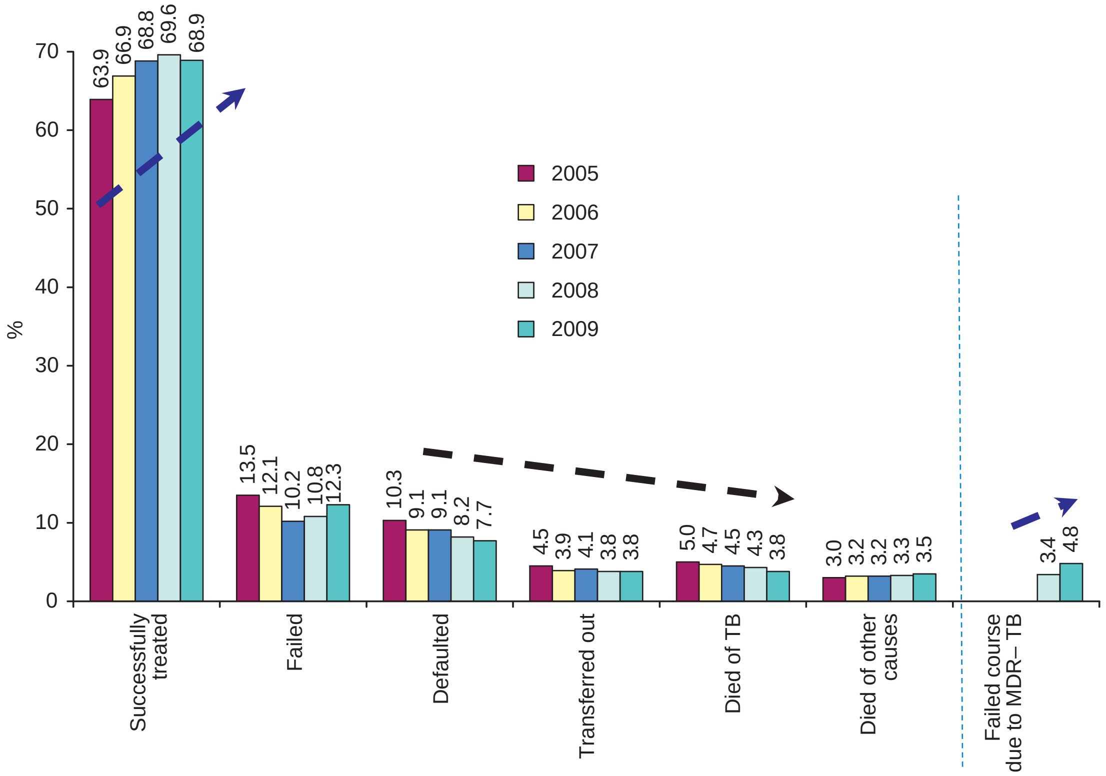

Fig. 7.5. Chemotherapy outcomes in the cohorts of new pulmonary TB patients registered in 2005–2009. The sizes of cohorts in 2004–2008 were 74,078; 85,322; 88,011; 90,132 and 87,589 patients, respectively. The arrows indicate trends in the main changes of treatment outcomes (Source: RF MoH&SD Form No. 8-TB, civil sector)

Slowdown of the increase with a subsequent decrease in the proportion of successfully treated patients in the cohorts of 2008 and 2009 could be due to changes in the evaluation of the chemotherapy courses considered ineffective (unsuccessful outcomes) and therefore due to the increase in the proportion of such outcomes. In 2008, it became a requirement to register a treatment outcome as failed when a patient was diagnosed as an MDR-TB case and to indicate treatment regimen IV according to the drug susceptibility of a patient.[102] Although these requirements for treatment outcome registration came in force in 2008, the actual application started only with the cohort of patients registered for treatment in 2009. In the cohort of 2009 the course of new cases treatment was considered as failed in 12.3% outcomes; at the same time almost 40% of failed outcomes were the result of detected MDR-TB. In 2008–2009, the proportion of patients with a "failed course of chemotherapy, MDR-TB" increased from 3.4% in 2008 to 4.8% in 2009 ($p < 0.01$).

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[102] In line with the comments to the Information of 19.12.2008, developed by the Federal Research Institute for Health Care Organization and Information (FHCOIRI) and RIPP, and signed by the external chief TB expert of the Russian Ministry of Health and Social Development.

According to the available data, it can be supposed that treatment outcome “failed course of chemotherapy” is reported mainly due to detection of MDR-TB in the specimens collected prior to treatment initiation,[103] so it is not the result of ineffective treatment during the given course of chemotherapy, but the result of initial infection of a new patient with MDR-TB mycobacteria. Taking this assumption into account and based on the data from Form No. 8-TB, it is possible to estimate treatment effectiveness in the cohort of patients susceptible to at least one of the main first-line drugs, excluding from the calculation a cohort of patients with the abovementioned outcome (“failed course of chemotherapy, MDR-TB”). In this case, treatment success rate in the cohort of 2009 turns out to be even a bit higher than in 2008: 72.4% and 72.1%, respectively.

The treatment success rate above 80% was reported in seven constituent entities of the Russian Federation (in the regions of Orel, Astrakhan, Belgorod, Lipetsk and Novgorod, in Stavropolsky krai and in the Republic of Mordovia). The treatment success rate below 50% was reported in new pulmonary TB patients in four constituent entities of the Russian Federation (in the regions of Smolensk, Murmansk and Amur and in the Republic of Tyva).

Among **new pulmonary TB cases with bacterial excretion confirmed by sputume smear microscopy (ss+)** registered in 2009, in the civilian sector the main course of treatment was successful in 55.8 cases (57.6% in 2008, Table. 7.2., Fig. 7.6) considering all clinical and radiological evidence (MH&SD reporting forms).

It should be noted, that in the world practice treatment success in this cohort of patients (new ss+ pulmonary TB cases) is the main indicator of treatment effectiveness. 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% treatment success rate for new ss+ PTB cases is one of the targets for national TB control programs (see Section 7.5).

Overall, in the past eight years, there has been a rapid decline followed by a minor decrease in the rate of treatment success. Recently, it has stabilized at 56–58%. It should also be noted that prior to 2006 the decrease in treatment success rate in the cohorts of new ss+ PTB cases was due to the involvement of the additional RF constituent entities in the implementation of MoH Executive Order No. 50 [35]. These territories did not have enough experience in patient treatment with standard regimens and in the cohort analysis as compared with the pilot project territories, which had been adapting the methodology to the Russian system of TB care since 2005 (Fig. 7.6).

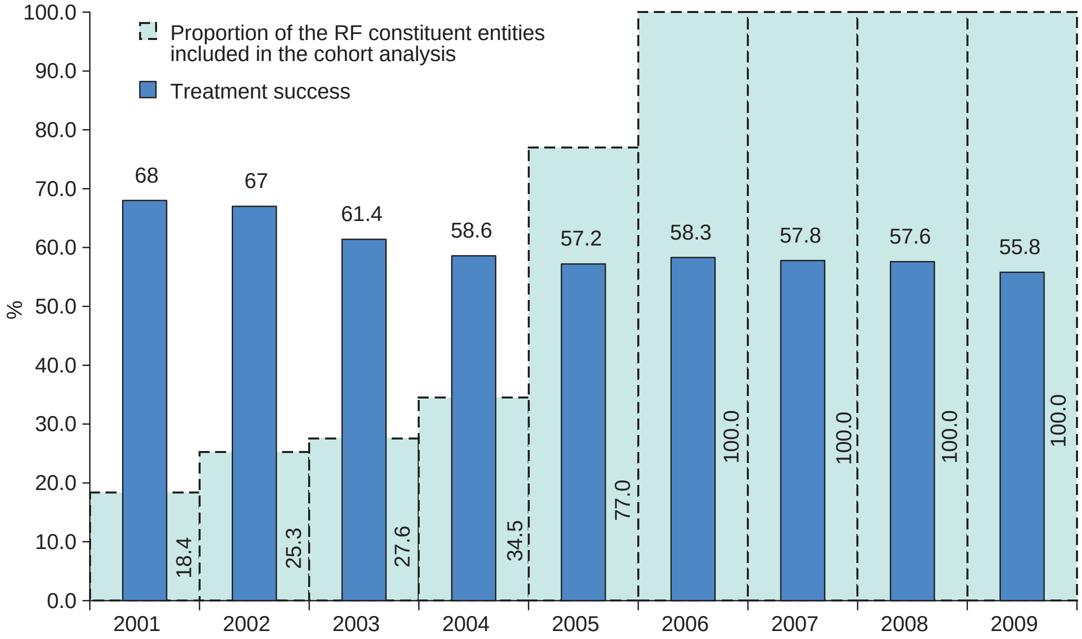

Fig. 7.6. Successful treatment outcomes reported in the constituent entities of the Russian Federation that used the cohort analysis of treatment effectiveness. The 2001–2008 cohorts of new ss+ pulmonary TB cases, civilian sector. The green columns indicate the proportion of territories implementing the cohort analysis (Source: MH&SD Form No. 8-TB)

In the civilian sector of health care the treatment failure was reported in the cohort of ss+ new pulmonary TB patients in 20.1% (in 2008, 17.3%), bacteriologically confirmed treatment failure was reported only in 6.9% of treatment outcomes, and 13.2% of failed courses of treatment were confirmed by clinical and radiological data.

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[103] The number of these outcomes for new TB cases was even less than the number of MDR TB cases diagnosed prior to treatment initiation among new TB cases: 4,196 and 5,353 cases, accordingly (Report of MoH&SD, 2009).

The proportion of patients with treatment outcome “detected MDR-TB” increased for the cohorts of 2008–2009 from 6.3% to 9.1% ($p < 0.01$), while the proportion of failed courses of treatment not including treatment outcome “detected MDR-TB” has been unchanged (11%) for the last two years.

In the past two years a statistically insignificant decrease has been observed in the proportion of defaulted patients (from 8.9% to 8.5%) and patients who died of TB (from 8.3% to 7.5%).

Overall in the Russian Federation (according to the summary report of the civilian sector and Federal Penal Enforcement System or “FSIN”) treatment effectiveness in the 2009 cohort of new ss+ pulmonary TB patients remains low: 55.3% (Table. 7.1). In the civilian sector it was due to a high proportion of failed courses of chemotherapy (20.1%), including treatment outcomes of “detected MDR-TB” (9.1%) and treatment default (8.5%). At the penitentiary facilities the main reasons for low treatment effectiveness are the following: high proportion of such treatment outcomes as “failed course of chemotherapy” (25.2%) and “transferred out” (17.2%), see Chapter 8.

Table 7.1

Treatment outcomes in the cohort of new ss+ PTB cases notified in 2009.

Sector	Cohort size, number of patients	Successfully treated, %	Failed course of treatment, %		Died of TB, %	Died of other causes, %	Defaulted, %	Transferred out, %
			Total	Including detected MDR-TB, %				
MH&SD	29,832	55.8	20.1	9.1	7.5	4.4	8.5	3.7
FSIN, Russia*	2,484	49.1	25.2	9.1	2.1	3.0	3.4	17.2
The Russian Federation, overall	32,316	55.3	20.5	9.1	7.1	4.3	8.1	4.7

* Data from 78 constituent entities of the Russia Federation.

It should be noted that the treatment success indicator in the penitentiary sector does not influence significantly the treatment success rate across the country, due to a small proportion of TB patients registered in the FSIN system.

In the civilian sector of health care, of 44.2% of “unsuccessful” treatment outcomes from the managerial and clinical points of view (i.e., treatment outcomes that do not include treatment successful outcomes) the actual treatment failure was 24.8% (Fig 7.7b). Furthermore, 27.6% of “unsuccessful” outcomes is due to managerial reasons (treatment default or transfers out), 20.6% of “unsuccessful” outcomes is related to the registration of the outcome “Detection of MDR-TB” and 16.9% is due to death caused by TB. The latter outcome has been lately associated to a considerable degree with untimely detection and delayed treatment initiation. Therefore, even though it is important to ensure effective chemotherapy through the application of the adequate treatment regimens, at present the management activities aimed at timely detection of patients and increasing treatment coverage and improving patients’ compliance with treatment are of the paramount importance.

Treatment outcomes differ significantly at the level of Russian constituent entities and at the level of the federal districts (Fig. 7.8 and Fig. 7.9).

In the civilian sector of health care [28] the highest treatment success rate was reported in the NCFD (69.7%), SFD (60.0%) and PFD (59.2%), and the lowest success rate was reported in the SbFD and FEFD – 49.4% and 48.1%, respectively. At the same time, it should be noted that the high level of treatment success rate in new ss+ PTB patients in the NCFD and SFD is combined with high proportions of failed courses of chemotherapy that did not include the outcome of “detected MDR-TB”[104] (12.5% and 14.6%, respectively), and for new ss− PTB patients the proportion of these outcomes reported in those federal districts is the highest in the country – 10.5% and 7.2%, respectively.

The highest proportion of patients with a failed course of chemotherapy is reported in the FEFD (25.3%). In the northwest of Russia treatment outcome of “detected MDR-TB” has a major contribution to the rate of failed treatment (31.9% from the total number of unsuccessful treatment outcomes or 14.7% of all treatment outcomes). In the Far East and in Siberia treatment success went down substantially due to level of the default rate (13.5% and 11.6%, respectively).

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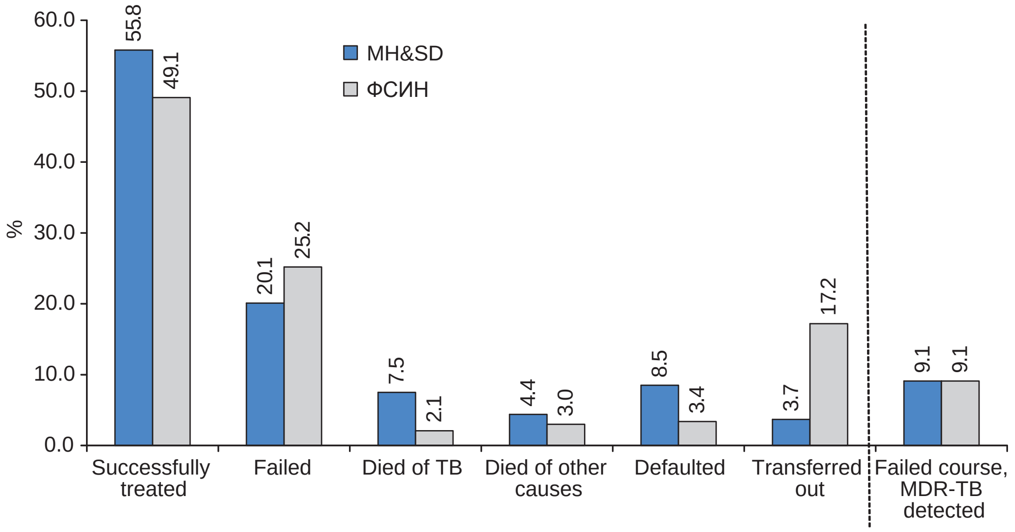
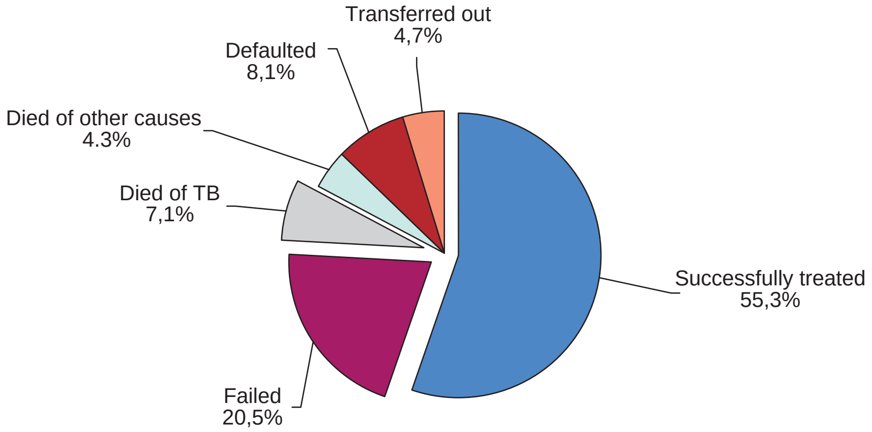
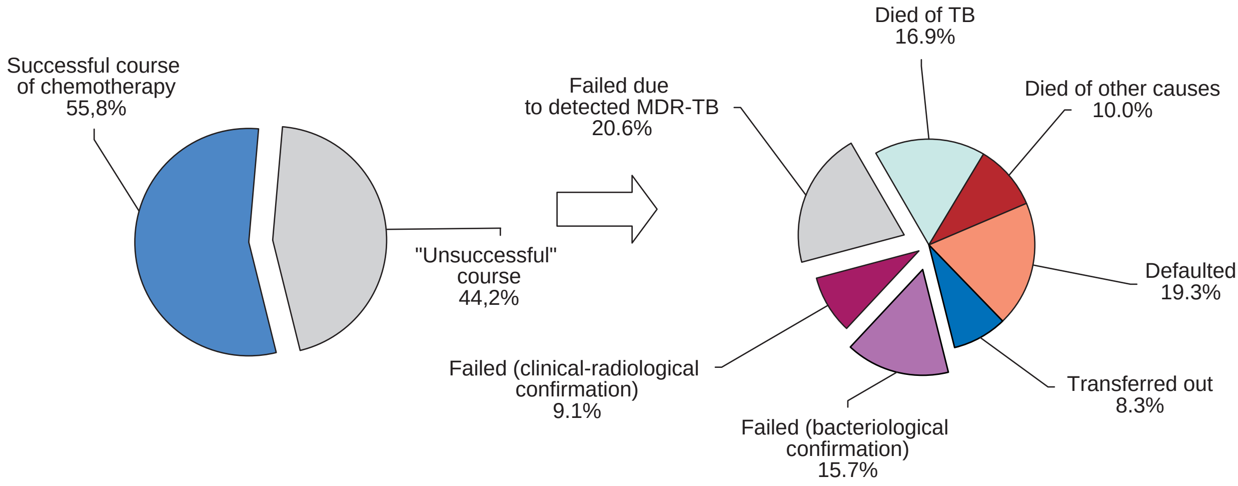
[104] The quality of MDR-TB registration in those federal districts is not very high in general (see Chapter 10).



a) treatment outcomes in the civilian sector and FSIN, Russia



b) Russia as a whole



c) distribution of unsuccessful treatment outcomes in the civilian sector of health care

Fig. 7.7. Chemotherapy treatment outcomes in new ss+ pulmonary TB cases, the 2009 cohort.
MoH&SD report – 29,832 patients, FSIN – 1,034 patients (Source: Form No. 8-TB)

Fig. 7.9 presents data by the constituent entities of the Russian Federation, indicating the highest and lowest rates of treatment success, failure, default and TB death in the cohort of new ss+ pulmonary TB patients.[105]

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[105] This analysis includes only the area with annual cohorts exceeding 50 cases.

As seen from the data presented in the graphs, only in the Orel region and Republic of Dagestan did the treatment success rate exceeded 80%, which is close to the international target indicators. In 2006, there were four such territories; in 2007 and 2008 there was only one (the Orel region).

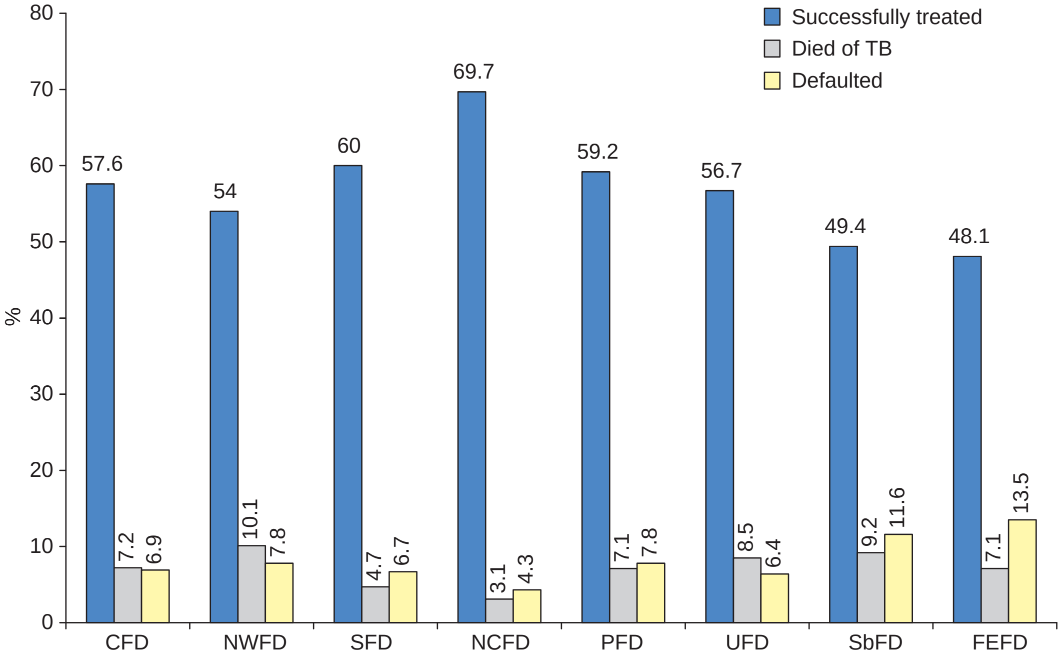


Fig. 7.8. Treatment outcomes by the federal districts, the 2009 cohort of new ss+ pulmonary TB patients. Civilian sector of health care: 29,832 patients (Source: MoH&SD Form No. 8-TB)

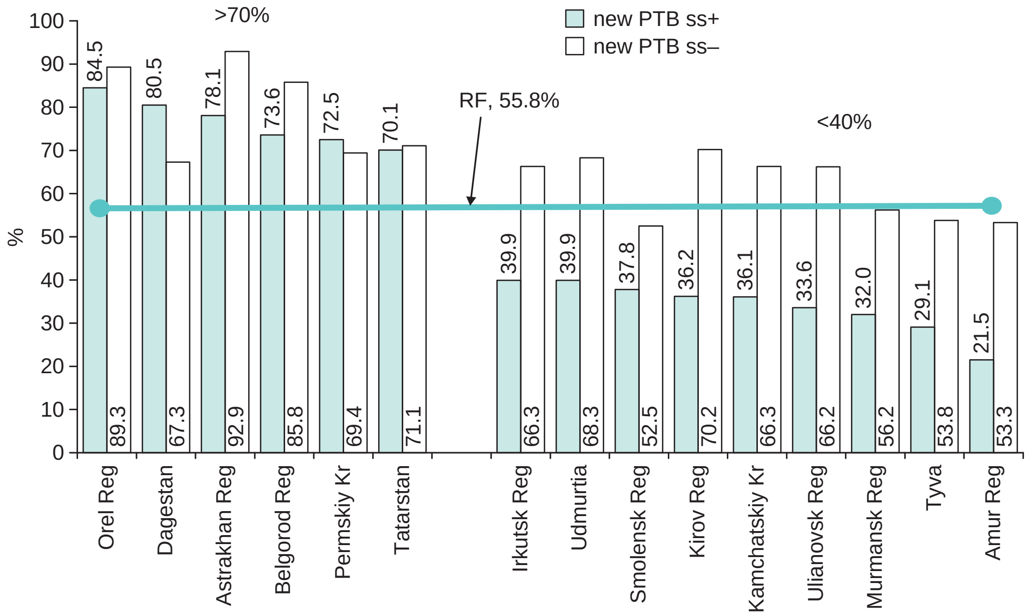
It should be noted that in the Republic of Dagestan where the proportion of successful treatment outcomes for new ss+ pulmonary TB patients is 80.5%, for patients with negative microscopy results (a cohort of new ss− pulmonary TB cases) these rates are extremely low; 67.3%. While in almost all constituent entities of the country high treatment success rates for new ss+ pulmonary TB cases correspond to just as high treatment success rates for new ss− pulmonary TB cases (for example, in the Orel region – 89.3%). In addition, the proportion of treatment failures among new ss− pulmonary TB cases in Dagestan is the highest in the country: 28.6% (followed by the Smolensk region – 19.8%). It means that the results achieved in Dagestan should be verified; most likely methodological assistance will be need to this area in order to improve the quality of the cohort analysis.

In 23 constituent entities of the country, the proportion of patients with failure outcome of chemotherapy (including the outcome of “detection of MDR-TB”) exceeded one quarter of all patients registered in the cohort. Furthermore, in 12 constituent entities failed course of treatment in 50% of cases was due to detection of MDR-TB (Fig. 7.9b).

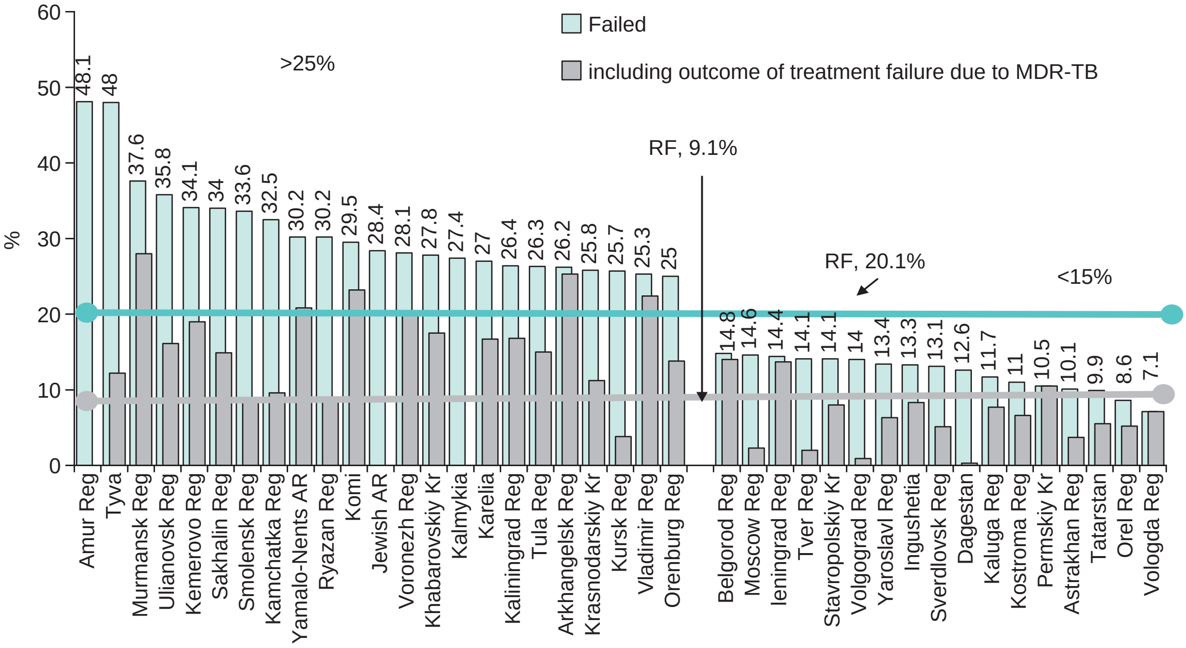
In two entities of the Russian Federation the proportion of new ss+ pulmonary TB defaulted patients exceed 20% of all patients enrolled for treatment (the Kirov region – 22.8%, the Amur region – 20.6%), in 2008 there were 5 constituent entities like that, in 2007 there were 6 and in 2006 there were 11. In the cohort of 2009 the level of treatment default less than 5% was reported in 22 entities of the Russian Federation. According to the data of the 2008 cohort, there were 26 constituent entities like that, in 2007 there were 17 and in 2006 there were 14.

The highest TB fatality rates (Fig. 7.9) were reported in the regions of Vologda (19.1%), Irkutsk (14.7%), Murmansk (14.4%), Leningrad (13.7%), and the republics of Udmurtia (13.1%) and Altai (12.9%). In these six entities of the Russian Federation in the 2009 cohort of new ss+ pulmonary TB cases more than 12% of patients died of TB, that is, almost every eighth or even every fifth patient. In the cohort of 2008 there were 11 entities like this, and in 2007 there were 13. In 23 Russian entities, the proportion of patients died of TB in the cohort of 2009 was no less than 5% (in the cohort of 2008 this occurred only in 13 Russian entities).

In the Russian Federation as a whole the total number of patients with causes of death other than TB is almost 50% of all patients died in the cohort, but there are some territories where the proportion of patients with other causes of death exceeds the proportion of those who died of TB. This ratio could be a result of either quality treatment (in the areas with high proportions of successfully treated patients) or incorrect evaluation of the causes of death not related to TB.



a) The proportion of patients with successful courses of treatment. The RF constituent entities with the proportion of new ss+ pulmonary TB cases with successful treatment above 70% or no less than 40%



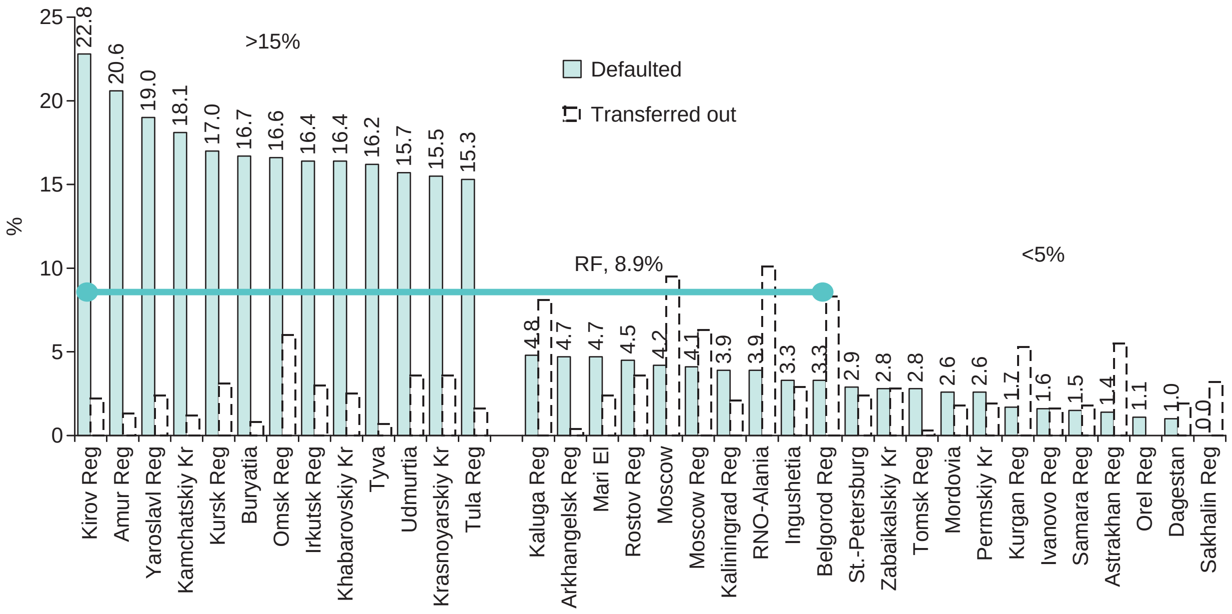
b) The proportion of patients with the failed courses of treatment. The RF constituent entities with treatment failure rates above 25% and below 10%; the grey columns without any values indicate the proportions of treatment failures due to the diagnosis of MDR-TB

Fig. 7.9. The constituent entities of the Russian Federation with the highest and lowest values of proportions of patients with different treatment outcomes. The cohort of new ss+ pulmonary TB cases notified in 2009. Territories with the annual cohorts of new ss+ pulmonary TB cases exceeding 50 cases. Civilian sector. (Source: MoH&SD report, Form No. 8-TB)

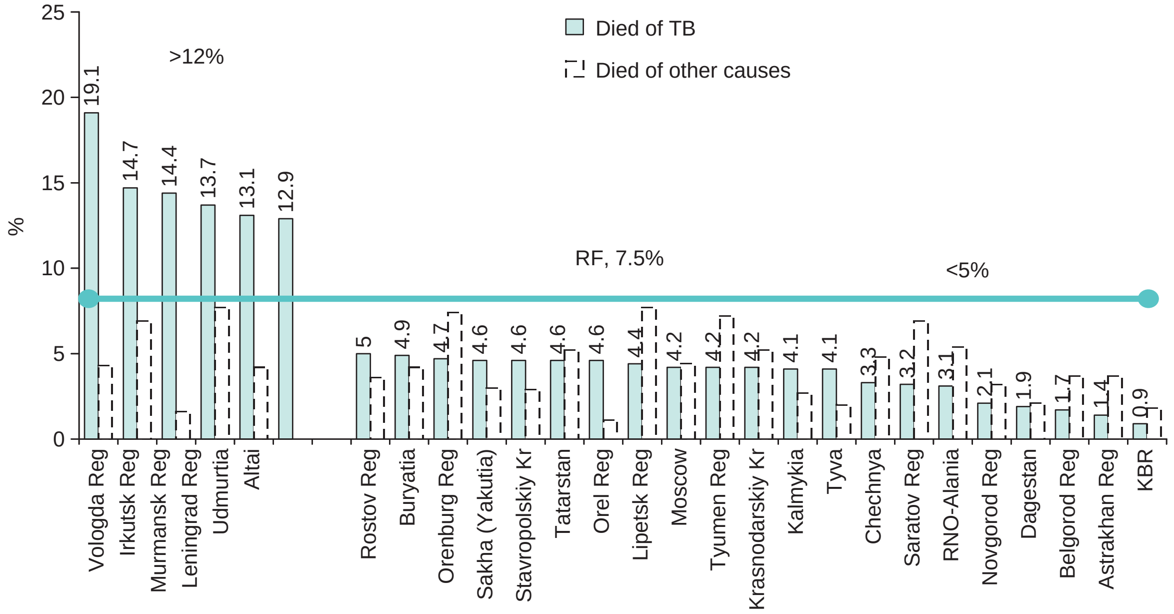
In the cohort of **new pulmonary TB patients with positive cultures** (37,232 patients) successful treatment was reported in 59.1% of patients (MH&SD report, civilian sector). In 2008, 60.0%; and in 2007, 60.3%.

The effectiveness of treatment in **retreatment pulmonary** TB cases is much lower than in new cases (Table 7.2, Fig. 7.10).

In the civilian sector, treatment success in the cohorts of TB relapses (MH&SD reporting forms) that included both ss− and ss+ patients has been continuously decreasing since 2006 (from 55.9% in 2006 to 51.7% in 2009). At the same time, the proportion of patients with treatment outcome of “failed course of chemotherapy, registered MDR-TB” increased from 7.9% to 11.6% ($p < 0.01$).



c) The proportion of patients with treatment default and transferred out. The RF constituent entities with treatment default rates above 15% and below 5%



d) The proportion of patients died of TB. The RF constituent entities with the TB death rate over 12% and less than 5%. Columns with dotted lines indicate the proportions of deaths due to other causes

Fig. 7.9. The constituent entities of the Russian Federation with the highest and lowest values of proportions of patients with different treatment outcomes. The cohort of new ss+ pulmonary TB cases notified in 2009. Territories with the annual cohorts of new ss+ pulmonary TB cases exceeding 50 cases. Civilian sector. (Source: MoH&SD report, Form No. 8-TB)

In general, for the cohorts of pulmonary TB relapses (including FSIN) the treatment success amounts to 50% (in patients with positive smear results at the time of registration it amounts to 39.5%).

The trend of 2006–2008 to improvement of treatment outcomes in the group of pulmonary TB patients of "**other ss+ cases of retreatment**" (the reported increase in the success rate for the civilian sector in 2005–2008 was from 25.4% to 33.6%) ceased in 2009 most likely due to the increase in the proportion of patients with MDR-TB (see above). For the cohort of 2009, treatment success, although statistically unreliable, decreased to 32.3%, while the proportion of patients with the treatment outcome of "failed course of chemotherapy, registered MDR-TB" increased from 5.8% in 2008 to 7.6% in 2009 ($p < 0.05$).

For the entire cohort of pulmonary TB patients "other ss+ cases of retreatment" (including FSIN) the chemotherapy courses were successful in 30.8% of patients. Compared to other groups of patients, the proportion of "failed courses of chemotherapy" was quite high here (24.5%); patients defaulted from treatment (14.4%) and were transferred out to an unknown destination (10.0%) more often.

Table 7.2

Treatment success in the cohorts of retreatment patients.
The cohort of 2009, the civilian sector (MH&SD report) and FSIN data

Cohort	Size of a cohort, number of patients	Successful treatment, %	Failed treatment		Died of TB	Died of other causes	Treatment default	Transferred out
			Total	Including detected MDR-TB				
		%						
Relapses	17,552	50.0	23.9	10.4	4.7	3.7	9.4	8.5
(including the MH&SD report data)	12,852	51.7	23.5	11.6	6.0	4.5	10.9	3.3
Of them ss+ relapses	5,878	39.5	32.9	17.7	8.5	4.4	8.4	6.3
(including the MH&SD report data)	4,848	40.7	32.1	18.0	9.7	4.9	9.2	3.4
Other retreatment cases, ss+	10,848	30.8	31.8	7.3	9.4	3.6	14.4	10.0
(including the MH&SD report data)	8,458	32.3	28.9	7.6	11.0	4.1	17.0	6.6

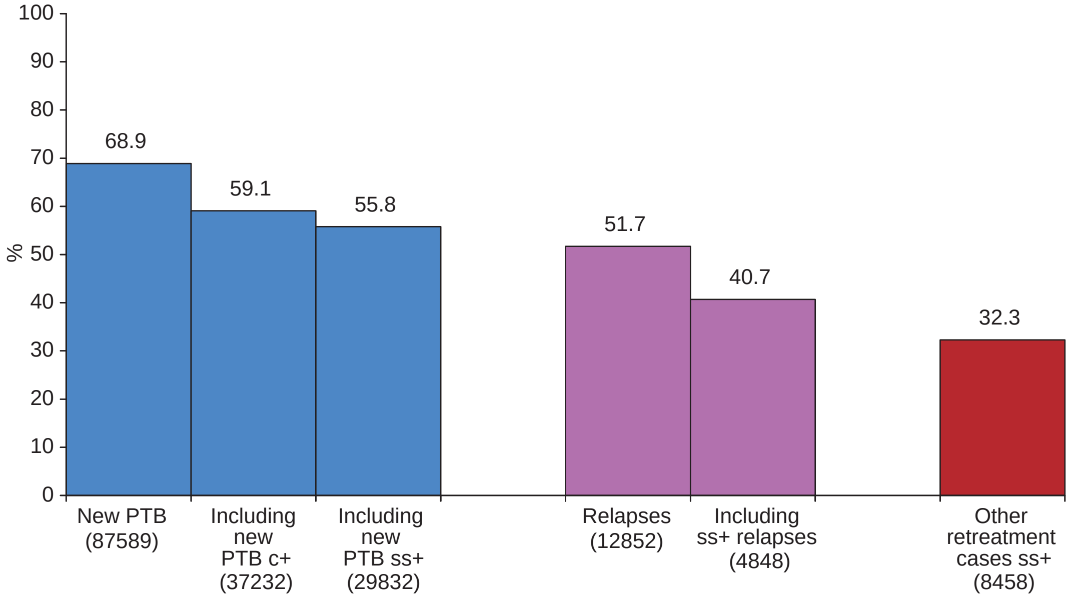


Fig. 7.10. Treatment success in different groups of pulmonary TB patients: proportion of effective courses of chemotherapy for the cohorts of 2009, civilian sector. In the title for a group of patients the size of a cohort is given in parentheses (Source: MH&SD Form No. 8-TB). Abbreviations: NC PTB – new cases, pulmonary TB, ss+ – positive sputum smear result at treatment start, C+ – positive culture result at treatment start.

In conclusion it should be noted that the insufficient treatment success rate among pulmonary TB patients in the Russian Federation is associated not only with a high proportion of patients defaulted from treatment and MDR-TB patients but also with inadequate compliance of physicians with the established standards of treatment and poor management of directly observed treatment.[106]

7.5. Treatment success in other countries of the world and comparison of the rates with the Russian Federation

The WHO reports [77, 78, 80], as well as other international statistical data, contain information on treatment outcomes in the cohorts of ss+ and/or culture positive new pulmonary TB cases, as well of ss+ retreatment TB cases. Like in the Russian Federation, in a number of countries the cohorts of retreatment TB cases are also subdivided into relapse cases and other groups of retreatment patients. Treatment outcomes of patients registered for treatment in 2008 in the WHO regions and individual countries are shown in Tables 7.3 through 7.5.

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[106] According to the data of the independent monitoring visits involving the authors of this chapter, it was observed in more than 70 constituent entities of the Russian Federation.

The 2010 update of the WHO Global Report [78] indicates that in general for all countries, in 2008 the treatment success rate reached 86% (including the rates for sputum conversion or "cured" and treatment completion) in the cohort of 2.6 mln new ss+ pulmonary TB cases, which meets the World Health Assembly targets established in 1991.

Furthermore, the proportion of pulmonary ss+ TB patients defaulted from treatment did not exceed 4.6%, and the proportion of patients who died (regardless of the causes of death) did not exceed 4%. The highest levels of treatment success rate were reported in the WHO Western Pacific Region (92%), with a proportion of treatment failures in only 1% and deaths of all causes in 2% of TB cases.

The lowest treatment success rate (67%) was reported in the European region of the WHO. It should also be noted that the lowest cure rates (bacteriological conversion) were reported by the American region of the WHO: 56%, where a considerable proportion of patients completed treatment (21%). It could be due to a broad application of the culture examinations and other laboratory methods for evaluation of treatment outcomes in the leading countries of this region.

In the world in general, the treatment success rate for the retreatment cohorts of ss+ patients reaches 72% with 5% of treatment failures, 7% of deaths and 10% of treatment default.

Compared to other countries, the TB treatment success 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 the 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, although not the lowest in comparison with other countries, are still insufficient. As shown above, this is primarily due to significant proportions of default cases and treatment failures, as well as high fatality rates. Treatment failures are associated to a large extent with high rates of MDR-TB detected among new TB patients.

At the same time, the relatively low treatment success rates in the Russian Federation can be explained not only by the shortcomings in patient management in Russia, but also by the differences in the evaluation approaches used in other countries.

First of all, the cohort of new TB patients in the Russian Federation includes all new patients (i.e., TB cases not registered before) irrespective of whether or not they start the course of chemotherapy.

Furthermore, it may also be assumed that the high proportion of treatment failures in our country can be explained by the current practice when, in spite of sputum conversion (by smear or culture), treatment outcome is considered as treatment failure because clinical and radiological evidence shows no improvement. This approach "formally" worsens the treatment success rate for Russia as compared to other countries. However, the proportion of TB cases with reported treatment failure established based on unsatisfactory clinical and radiological signs against sputum conversion is relatively small. For the cohort of new ss+ TB cases registered in 2009 in Russia, the outcomes of treatment failure were reported only on the basis of clinical and radiological evidence (while sputum conversion was registered and excluding cases of MDR-TB registration) in only 4.1% of outcomes with the overall rate of treatment failure amounting to 20.5%. If these cases are included in the number of successfully treated patients according to the results of laboratory examinations only, the treatment success rate in Russia would increase only from 55.3% to 59.4%, which is still below the levels reported in many other countries.

When comparing or conducting a joint analysis of treatment outcomes data and the rates that characterize the TB burden, certain discrepancies in data presented by some countries can be disclosed, which requires clarification or explanation.

First of all, in many 100% DOTS-covered countries with a high level of TB mortality rate, which is 15–20% and more in relation to the TB incidence rate, the fatality rate in ss+ patients under treatment does not exceed 1–4% for new cases and 5–7% for retreatment cases.[107] For example, in 2009 in the countries of South-East Asia, the TB mortality rate was 27 per 100,000 or 14.8% of the TB incidence rate, and the outcome of "died, all causes of death" is reported only in 4% of cases. In Bangladesh these percentages amount to 27% and 4%, respectively, while in Russia the corresponding rates are 15% and 12%, respectively (Table 7.3). It is evident that these two indicators (TB fatality and the ratio of TB mortality to TB incidence 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 differ substantially. Therefore, it is important to know why there is such a combination of high treatment success rates and high TB mortality rates in those countries.

Secondly, even considering certain challenges in interpretation of the recently published data on the spread of MDR-TB (see Chapter 10), it is difficult to explain the reason for such a low proportion of treatment failures among new ss+ cases with the existing rates of MDR-TB spread among new cases, as seen in the publications for a number of countries (see Table 7.3).

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[107] The relation of mortality to incidence rate is calculated for deaths caused by TB, and the fatality rate is calculated for all causes of death reported in TB patients. Therefore, the difference will be even greater if the mortality–incidence ratio is compared with the fatality rate for TB only.

For example, in China, Peru and Republic of Moldova the proportions of treatment failure among new ss+ pulmonary TB cases are 1%, 1% and 7%, respectively, while the prevalence of MDR-TB in new cases reaches the levels of 5.7%, 5.3% and 20%, respectively.

In Russia, the rates of treatment success and TB burden are quite compatible even with each other. This may indicate a sufficiently high validity of the statistical data presented by the Russian Federation. It can also be assumed that in the Russian Federation unlike in some other countries, there is a more complete cohort coverage for new TB patients regardless of present MDR-TB and patient's intention to receive treatment.

Table 7.3

Treatment outcomes for new ss+ pulmonary TB patients registered in 2008, and the TB burden rates in the WHO region, some selected countries of the world and in the Russian Federation [78, 79, 83]

Regions / Countries	Registered		Treatment outcomes in the cohort, %					Estimated TB burden, 2008–2009*				
	New cases in 2008 г.**, persons	In a treatment cohort***, persons.	Successful treatment	Died (all causes of death)	Failed treatment	Treatment default	Outcome is not evaluated	TB incidence per 100,000	TB mortality per 100,000	Mortality–incidence ratio, %	Proportion of MDR-TB cases registered among new TB cases with DST performed,%	Estimation of MDR-TB among new cases
Globally	2656147	2603605	87	4	2	5	4	137	20	14.6	11.5	3.3
Africa	595,184	576,473	80	6	2	7	6	345	52	15.1	9.6	1.5
SEA****	1007382	1011353	88	4	2	5	1	182	27	14.8	1.1	2.3
Western Pacific	661,923	656,546	92	2	1	1	4	107	13	12.1	21.2	4.8
Americas	119,862	108,965	77	5	1	7	10	29	2.1	7.2	8.6	2.1
Eastern Mediterranean	166,558	166,719	87	2	1	5	4	111	1	15.3	4.5	2.5
Europe	105,238	83,549	67	9	12	7	5	47	6.9	14.7	11,7	12
China	462,596	464,151	94	1	1	1	3	9	6	12.5	n/d	5.7
Bangladesh	106,373	106,089	91	4	1	2	2	225	51	22.7	n/d	2,2
Peru	17,989	14,805	82	3	1	6	8	113	5.2	4.6	42.8	5.3
USA	4,742	3,709	85	9	0	2	5	4.1	0.5	12.2	1,2	1,1
Belarus	1,060	1,902	71	9	7	3	10	39	5.3	13.6	22.4	12.5
Moldova	1,533	1,533	56	10	7	12	14	178	22	12.4	22,5	19.4
Ukraine	14,574	14,407	62	12	12	9	5	100	14	14.0	12.0	16
Russia	33,949	32,356	57	12	18	9	4	106	18	17.0	15.8	15.8
Japan	8,995	8,999	48	19	1	4	28	21	1.4	6.7	n/d	0.7

* TB **incidence and TB mortality is presented for 2009 based on** [78] the **proportion of MDR-TB patients registered among new cases** with the DST results is presented for 2009 based on [79], data for the WHO regions are based on the summary data presented for the Global report by the countries located in those regions; **estimation of MDR-TB among new cases** is presented for the regions on the basis of data from [78] for 2009, and for the individual countries it is based on data from [83] for 2008. ** "Notified". *** "Registered". **** SEA – South-East Asia.

Table 7.4

Treatment outcomes in retreatment ss+ pulmonary TB cases registered in WHO regions in 2008, selected countries and in the Russian Federation [78]

Cohorts	Patients registered for treatment in the cohort	Treatment outcomes in the cohort				
		Successfully treated, %	Died (all causes of death), %	Failed treatment %	Default, %	Not evaluated %
Retreatment cases ss+						
All countries worldwide	569,496	72	7	5	10	5
Africa	87,999	71	7	4	8	10
The Americas	15,482	52	8	2	20	17
Eastern Mediterranean	14,990	76	4	3	11	6
SEA*	323,435	75	7	4	12	2
Europe	52,257	47	11	21	12	8
Russia	18,070	36	13	29	14	7

* SEA – South-East Asia.

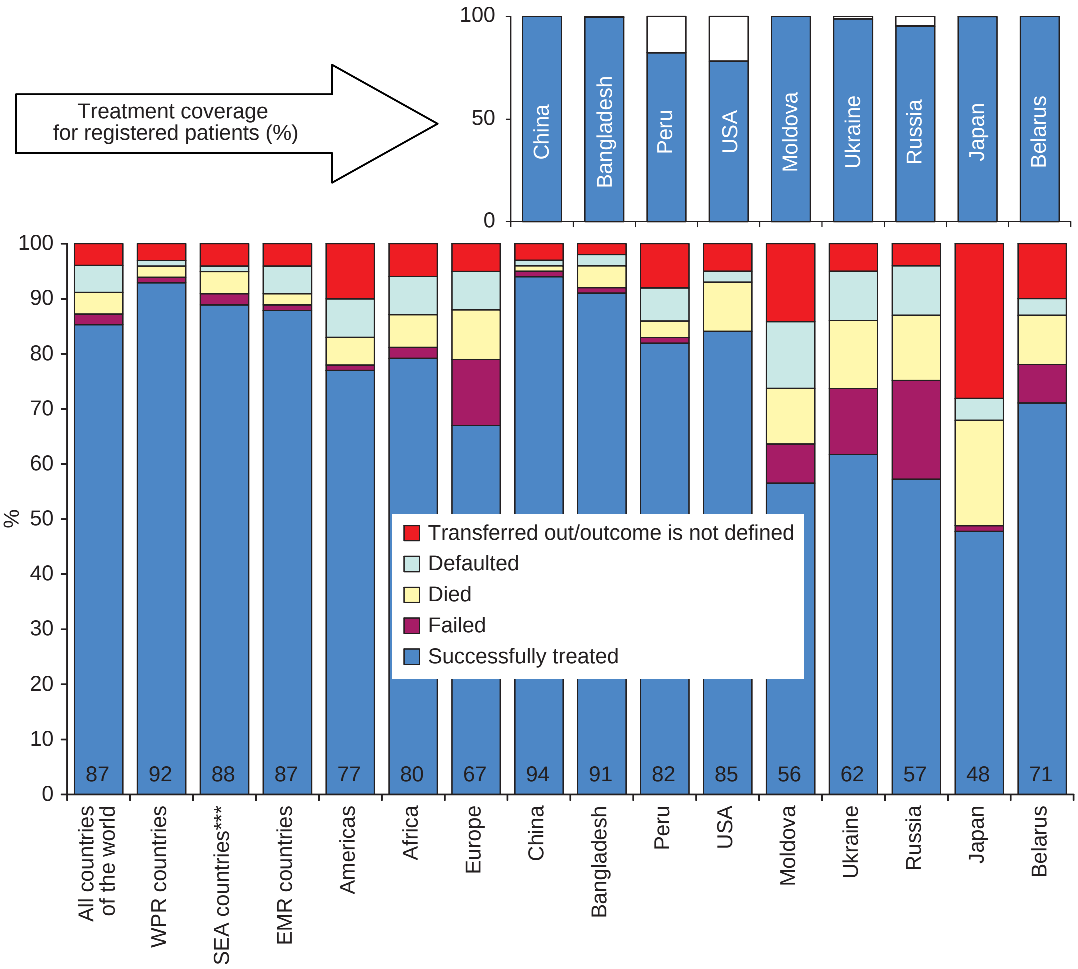

Fig. 7.10. Treatment outcomes for the cohort of 2008, new ss+ pulmonary TB cases, the WHO regions and some selected countries in the world. The upper chart shows the proportion of patients included in the cohort for treatment [78]

In the update to the 2009 Global Report [80], for the first time the WHO published country-specific data on TB treatment outcomes for countries, which provide separate information on treatment success based on microscopy, culture and microscopy and/or culture results. However, unlike the practice established in the Russian Federation for culture examination, it is not possible to single out the results of certain methods used for the confirmation of treatment effectiveness from the tables of the WHO Global report.

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, some significant problems still remain in the organization and management of anti-tuberculosis chemotherapy in all constituent entities of the Russian Federation, which contributes to insufficient treatment success in the country.

At present, the proportions of treatment defaults and failures among ss+ TB patients are still high. The presented data stress the need for reinforced monitoring of TB treatment, in particular, for strengthening patient compliance with the prescribed chemotherapy regimens and a broad involvement of other methods of treatment as well as for ensuring a complex approach to the treatment management. The statistical data received from different sectors and departments in line with the MoH Executive Order No. 50 provide a solid basis for managerial decision making and for improving targeted interventions to improve the effectiveness of TB treatment in the country.

8. TB control in the penal enforcement system

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8.1. TB control system in FSIN. The main epidemiological TB indicators used for TB control in FSIN facilities

The current epidemiological situation with TB in the facilities of the penal enforcement system (hereinafter the Russian abbreviation FSIN will be used) of the Russian Federation can be deemed challenging, yet stable and controllable.

Nevertheless, the increasing number of HIV patients among prison inmates and the challenging spread of drug-resistant TB in prisons sets forth the task of ensuring effective and qualitative TB surveillance in the penitentiary system of the Russian Federation.

There are obvious reasons why health indicators of suspects, defendants and prisoners held in FSIN facilities, similar to those of the penitentiary population in other countries, differ from the corresponding nationwide indicators [A3, A4].

TB control activities in the FSIN are performed in close collaboration with the Ministry of Health and Social Development, health care authorities of the RF entities, health care facilities of the civilian sector and specialized research institutes as well as with technical support of the World Health Organization.

The system of statistical recording and reporting on tuberculosis in FSIN facilities is implemented pursuant to the relevant Executive Orders of the MoH&SD and MoJ of Russia ([34], [35], and the Executive Order RF MoH&SD/MoJ No. 640/190 of October 17, 2005).

FSIN facilities, just like TB facilities within the MoH&SD structure, have a strict system of registration of new TB cases (based on Form No. 089/u-tub), treatment monitoring (Forms No. 1-TB and No. 3-TB) and dispensary follow-up. Considering that suspects in detention and convicts face a high risk of developing TB, prison inmates undergo fluorography examination every 6 months, and all persons in pre-trial detention facilities (SIZO) undergo the examination upon admission and then every 6 months. Thus, extensive use of active TB case-finding methods in FSIN facilities potentially ensures a rather high level of TB case detection.

The key data about TB spread in penitentiary institutions and the effects of TB control activities are contained in the annual Form 4-tub and, since 2004, also in reporting cohort analysis Forms No. 7-TB, No. 8-TB, No. 2-TB and No. 10-TB that were established pursuant to the Executive Order No. 50 of the RF MoH&SD [35].

Medical boards (departments, units) of regional FSIN bodies and TB management and surveillance departments of the central TB dispensaries of RF entities complete Form No. 8 for all new TB cases; this form provides aggregate data from FSIN facilities, the civilian sector and other agencies involved in TB control activities. These data are transferred to the MoH&SD of Russia and FRIHCOI (the Federal Research Institute for Health Care Organization and Information) for processing and analyzing the situation of TB.

In 1999 new TB patients who were detected in penitentiary facilities constituted up to one-fourth of all new TB cases in the Russian Federation. During the last five years, 2010 included, the proportion of all new TB cases diagnosed in FSIN facilities was 12% of the total number of new TB cases in Russia (see Chapter 2).

In addition to the overall estimation for FSIN facilities, it is prudent to separately calculate and analyze the incidence rates in correctional facilities (hereinafter CFs) and pre-trial detention centers (hereinafter SIZO), because – as will be shown later – in each of these FSIN facility groups the spread of tuberculosis may be influenced by particular factors. Besides, the management of case finding in these facilities has its specifics, and different approaches are practiced for computing the incidence.[108]

According to RF FSIN reporting forms, the number of new TB cases and the notification rate in penitentiary facilities decreased more than threefold within the last 10 years (Fig. 8.1, Table 8.1), from 4,347 in 1999 to 1,302 per 100,000 penitentiary population in 2010 (13,378 new cases; of them 4,697 found in SIZO and 8,681 in CFs).

Table 8.1

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

FSIN facilities	Years									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SIZO			5,201	5,344	6,229	6,092	5,863	5,636	5,347	4,697
CFs			12,361	10,887	9,248	9,131	9,564	9,217	8,889	8,681
Total for FSIN	24,500	21,718	17,562	16,231	15,477	15,223	15,427	14,853	14,236	13,378

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[108] In CFs notification and mortality rates are calculated per average annual number of prisoners, and the prevalence rate is calculated per number of prisoners at the end of the year. In SIZO the notification rate is calculated per number of new remand population in the given year.

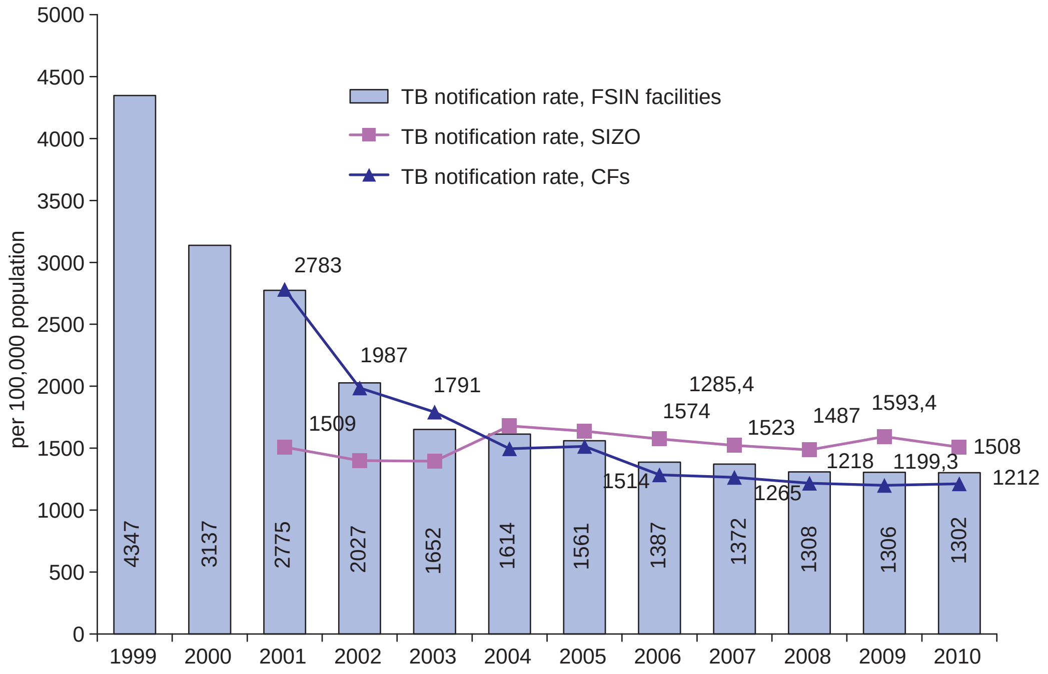

Fig. 8.1. TB notification rate in FSIN facilities, the Russian Federation (Source: Forms No. 1-MED and No. 4-tub, calculation of notification rate. See footnote on the page.)

The TB detection rate in SIZO depends to a great extent on TB spread in the population. Notably, the share of TB cases found directly upon admission to pre-trial detention centers is considerable. Individuals who developed TB before incarceration constitute a major part of incident TB cases in SIZO.

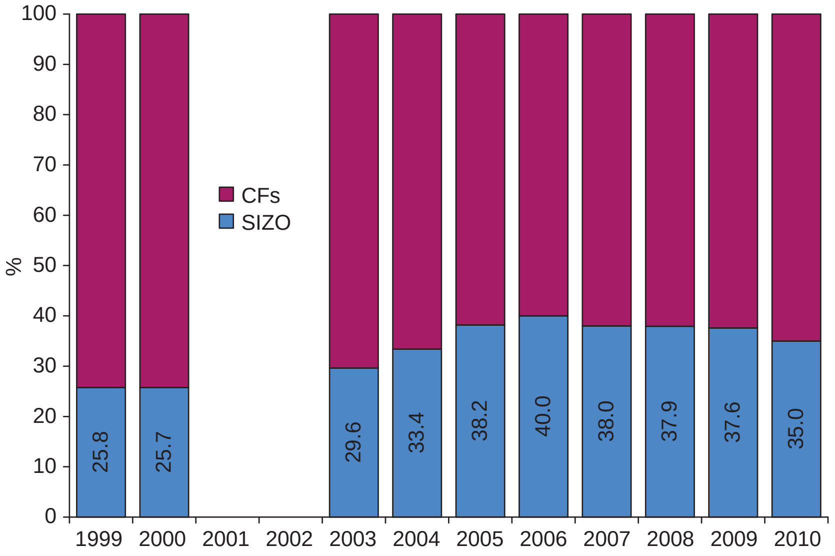

Fig. 8.2. The proportion of new TB cases found in SIZO and CFs (Source: Forms No. 1-MED and No. 4-tub)

From 2000 to 2006 a growing share was observed of TB cases that were found in SIZO, compared to the number of patients found in RF FSIN correctional facilities – from 25.8% (1999) to 40.0% in 2006 (Fig. 8.2). Over the last five years this indicator has decreased to 35%. It should be noted that in 2010 the number of new cases detected in pre-trial detention centers has statistically significantly declined to 13.8% ($p < 0.01$) compared to 2009.

As noted earlier, TB incidence in SIZO is an unconventional marker of TB incidence in the civilian sector [A3]. In 2010 the highest value of TB notification rate in SIZO was recorded in facilities of SFD, FEFD and PFD, with the indicator exceeding the overall FSIN notification rate 1.5, 1.4 and 1.2 times, respectively.[109] The high notification rate in SIZO of FEFD associates with the high notification rate among the resident population of this federal district (see Chapter 2). At the same time, the high TB notification rate in pre-trial detention centers of SFD,

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[109] Preliminary data computed per 100,000 average SIZO population in federal districts.

against relatively low levels of this indicator among the resident population (Fig. 2.7), may suggest inadequate TB case-finding activities in the civilian health care sector.

The highest notification rates at correctional facilities are registered in facilities of FEFD and UFD (1,830 and 1,467 per 100,000, respectively, see Fig. 8.3).

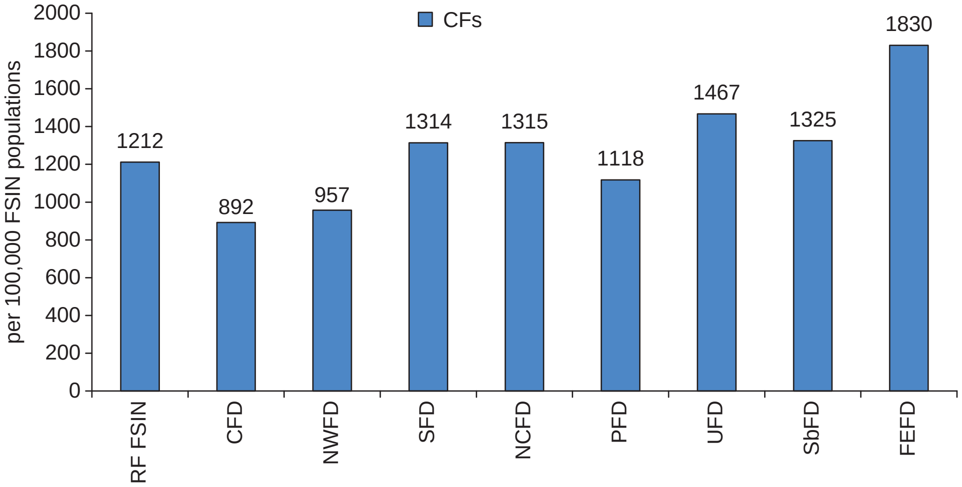

Fig. 8.3. TB notification rate in CFs by federal district of the Russian Federation, 2009 (Source: Form No. 1-MED and No. 4-tub, and data on the numbers of the FSIN population)

Since 1999 TB mortality rate in the FSIN (SIZO and CFs) decreased almost threefold, dropping to 79.1 in 2006 and staying at approximately the same level until 2008 (80.1 per 100,000). Since 2009 the indicator began to increase, and in 2010 it reached 92 per 100,000 (Fig. 8.4), which was primarily due to an increase in patients with multidrug-resistant tuberculosis and a bigger number of TB patients with HIV co-infection.

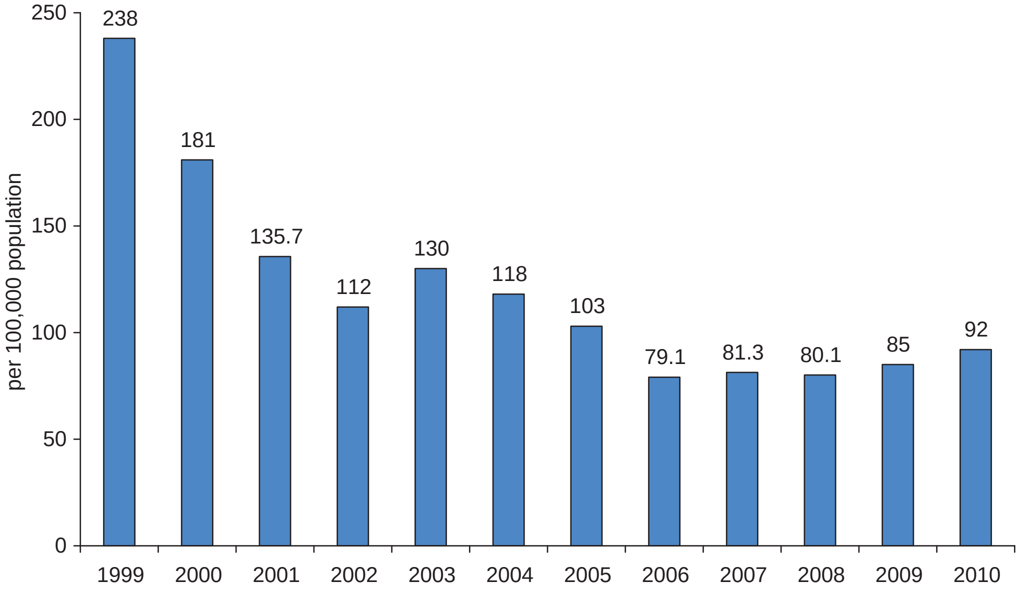

Fig. 8.4. TB mortality rate in FSIN facilities (Source: Form No. 1-MED)

The highest TB mortality rates in CFs were recorded in 2010 in FSIN facilities of the Southern and the Northern Caucasus federal districts – 284 and 339 per 100,000, respectively (Fig. 8.5).

Over recent years TB prevalence in the FSIN has declined from 8,408 in 2002 to 4,677 in 2010 per 100,000. Notably, the number of patients with active TB decreased more than twofold from 98,767 to 38,896 (Fig. 8.6, Table 8.2).

With the continuously growing spread of HIV infection among the FSIN population (since 2005 the number of HIV-infection cases has increased 1.7 times), the spread of TV/HIV co-infection is a relevant issue. Fig. 8.7 shows that over recent years the share of cases co-infected with TB and HIV has increased from 3.7% in 2002 to 13.3% in 2010.

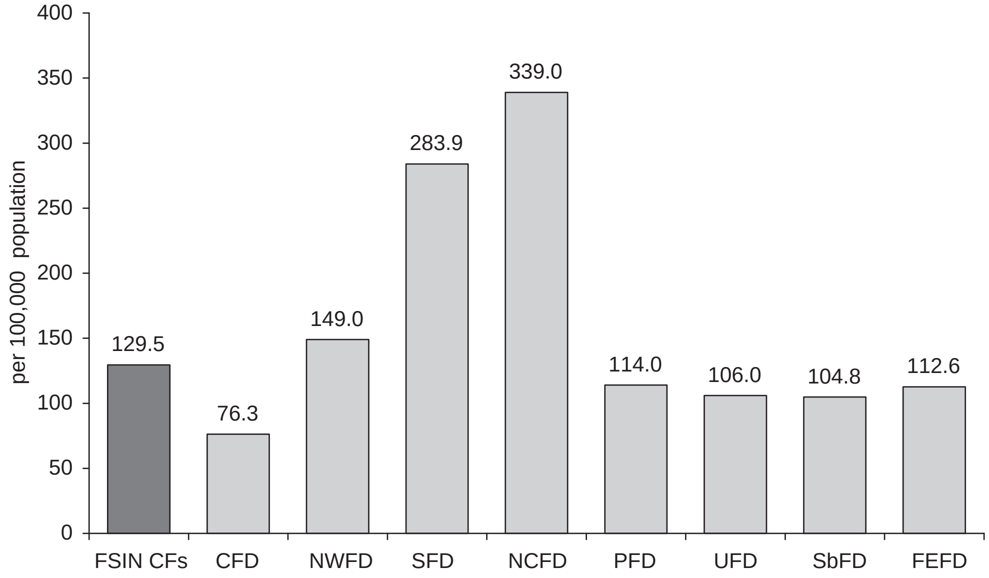

Fig. 8.5. TB mortality rate in FSIN correctional facilities by federal districts (excluding SIZO), 2010
(Source: Form No. 1-MED)

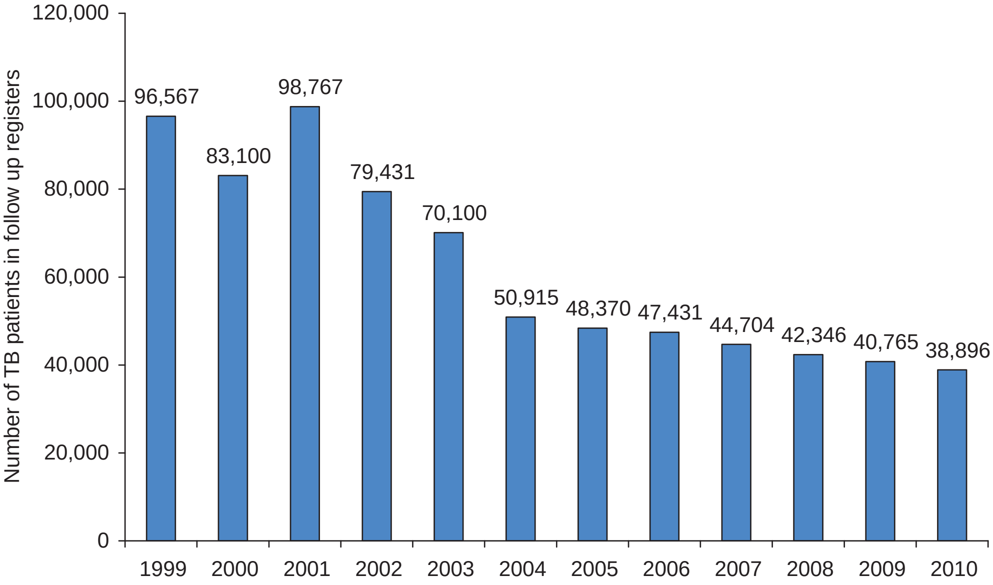

Fig. 8.6. Number of TB patients in the follow-up register of FSIN facilities
(Source: Form No. 1-MED)

Table 8.2

Number of TB patients registered in FSIN facilities
(Source: Form No. 4-tub and No. 1-MED)

FSIN facilities	Years									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SIZO	12,138	6,072	6,011	5,392	5,061	4,969	4,830	3,762	3,706	3,535
CFs	86,629	79,068	64,089	45,523	43,309	42,462	39,874	38,584	37,059	35,361
Total FSIN	98,767	85,140	70,100	50,915	48,370	47,431	44,704	42,346	40,765	38,896

At present collaboration between the civil and the penitentiary systems in general is not sufficiently effective. At least a third of almost 14,000 persons who are released from penitentiary facilities (13,970 in 2010) do not get registered at TB dispensaries of the RF entities (Fig. 8.8).

On the other hand, each year four times as many TB patients are admitted to FSIN facilities (primarily, to pre-trial centers) as are officially transferred from TB facilities of the RF entities, according to the reporting forms of MoH&SD (respectively, 13,996 and 3,718 patients in 2010).

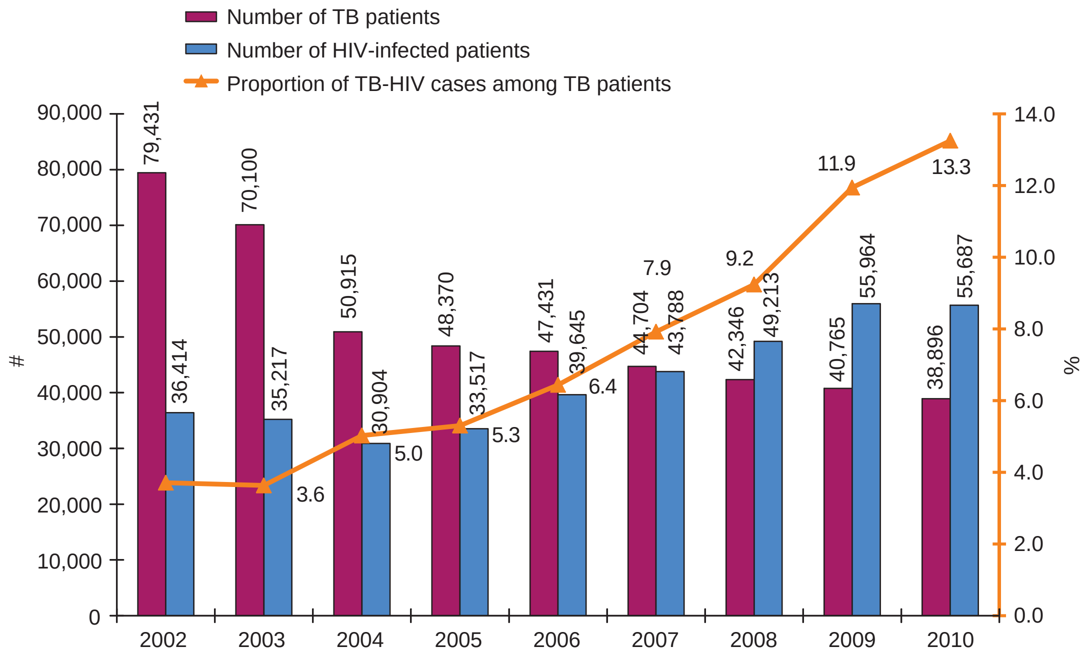

Fig. 8.7. Number of TB patients co-infected with HIV, and the share of HIV patients among TB cases, FSIN facilities (Source: Forms No. 4-tub and No. 1-MED)

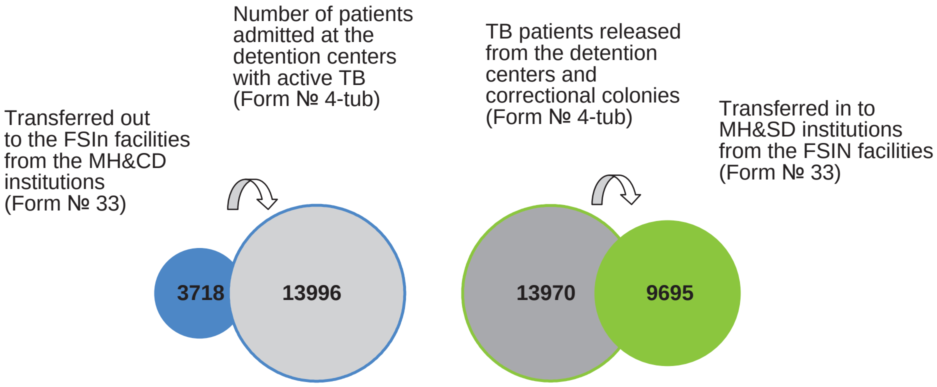

Fig. 8.8. TB patients' flow between TB facilities of the RF entities and FSIN facilities, 2010 (Sources: Forms No. 33 and No. 4-tub)

8.2. The structure of new TB cases found in FSIN facilities

A relatively low proportion of new RTB cases with destructive changes in the lungs is observed in the structure of new TB cases registered in FSIN facilities (Fig. 8.9). In 2010 among new patients with tuberculosis of respiratory organs, 25.3% cases had cavities in the lung tissue. Notably, in SIZO the proportion of CV+ patients is smaller than in CFs (22.6% and 26.6%, respectively, $p < 0.05$). After a decrease for this indicator in 2006–2008 ($p < 0.05$) both in CFs and in SIZO, the share of destructive PTB forms remained virtually unchanged in the last two years.

Such a low proportion of new cases with destructive TB forms in FSIN facilities may be linked, in particular, with the extensive use of fluorography screening in the management of early TB detection.

According to Form No. 4-tub data, in 2010 the share of extrarespiratory TB forms among new cases was insignificant at 0.6%, with the value decreasing as compared to 2009 (0.9%). Low values of this indicator may highlight the need to increase involvement of experts in extrapulmonary TB for supervision of TB diagnosis in extrapulmonary sites.

Development of laboratory service in FSIN facilities allowed an increase in the number of bacteriological examinations for active TB cases in 2004–2010 from 58% to 97.3%, and of new TB cases in that group from 55.7% to 97.9% (Table 8.3[110]). These improvements were made possible, in particular, with procurement of laboratory

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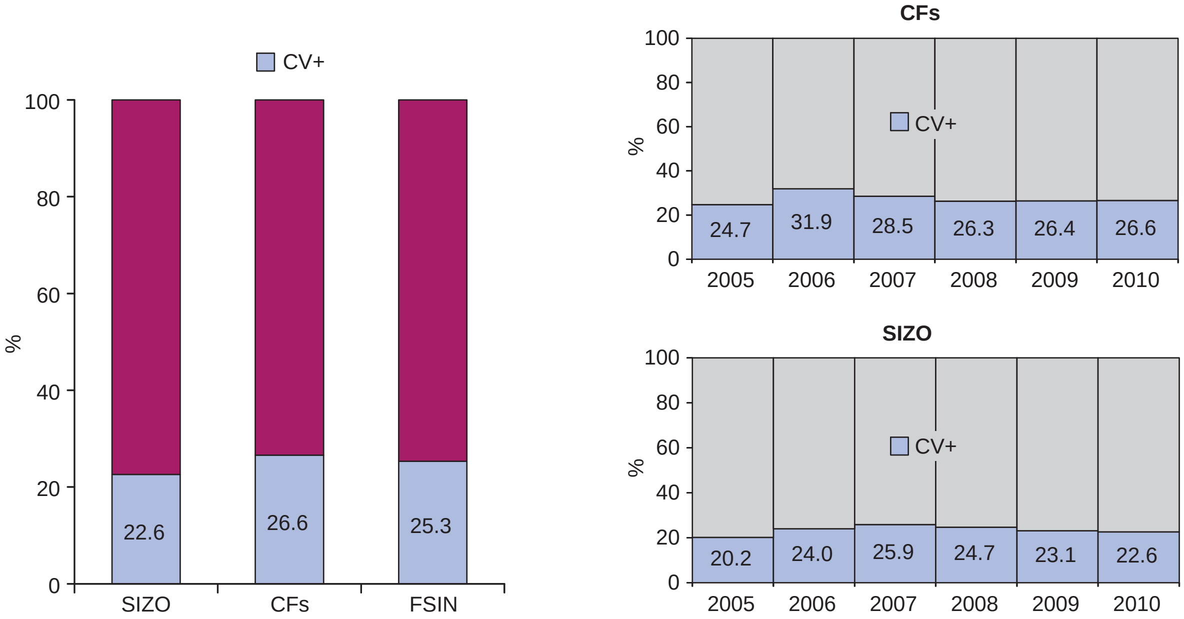
[110] Information about performance of the laboratory service is collected by the chief bacteriologist of the FSIN of Russia in accordance with the approved methodological guidelines [21].

equipment funded by an IBRD loan in 2005–2008. The funds ensured re-equipment of 518 clinical diagnostic laboratories in CFs and SIZO and of 65 regional bacteriological laboratories for TB diagnosis. Federal budget allocations, international projects, and the Global Fund grant were all used in 2005–2010 to upgrade the equipment of all 89 regional bacteriological laboratories that perform microbiological examinations for TB in medical correctional facilities (MCFs) and health care facilities (HCFs) of the RF FSIN, as well as of one central bacteriological laboratory for TB diagnosis.



a) 2010 b) 2005–2010

Fig. 8.9. The share of destructive TB forms among new cases of RTB in FSIN facilities (Source: Form No. 4-tub)

FSIN bacteriological laboratories have active participation in the system of external quality assessment performed by the Federal Service for External Quality Assurance of Clinical Laboratory Tests (FSEQA). Over 40 FSIN laboratories undertook proficiency assessment in the sections “MbT detection by Ziehl-Neelsen microscopy,” “MbT detection by culture testing” and “MbT drug susceptibility testing” and showed sufficiently high results (see Chapter 12).

Due to the fact that until 2010 the sectoral reporting forms No. 7-TB did not provide data of adequate quality in the sections of case finding and laboratory diagnosis, FSIN used customized internal forms to assess the data related to laboratory testing results that were collected by the chief bacteriologist of the Russian FSIN in accordance with the approved methodology guidelines of 2001 [21].

According to the submitted data (Table 8.3), in 2010 bacillary excretion was confirmed in 44.3% of patients with active TB who were tested by bacteriological methods. Among new TB patients in 2010 bacillary excretion (MbT+) was confirmed in 35.2% of cases (32.8% in 2009).

Table 8.3

Bacteriological testing of TB patients in the FSIN system of Russia. Data from FSIN facilities (Source: RF FSIN internal laboratory testing forms)

	2005	2006	2007	2008	2009	2010
Proportion of patients tested by microbiological methods, (%)	75.3	94.0	96.8	97.8	96.4	97.3
Of them, new cases, (%)	62.7	91.5	90,8	91.1	97.6	97.9
Confirmation of diagnosis by bacteriological methods, (% of tested)	42.2	51.8	40	37.7	37.6	44.3
Confirmation of diagnosis by bacteriological methods among new cases, (% of tested)	37	44	35.5	38.1	32.8	35.2
Drug resistance to any first-line drugs among new cases, (%)	51	49.6	52.7	51.0	54.4	47.4
MDR-TB among new cases (abs. number)	755	875	879	807	958	1,014
MDR-TB among new cases (%)	17.8	20.3	21.2	18.6	21.9	22.0
Drug resistance to any first-line drugs among all patients, (number of patients)	9,978	11,720	11,023	12,557	14,968	13,718
MDR-TB among all patients (abs. number)	4,243	5,720	5,229	6,801	7,817	8,400
MDR-TB among all MbT+ patients (%)	42.5	48.8	47.4	37.6	41.2	48.7

The spread of tuberculosis with resistance to TB drugs remains a challenge for FSIN facilities. For instance, in 2010 drug resistance to any first-line TB drugs decreased slightly and was 47.4% in new TB patients with bacillary excretion. At the same time, MDR-TB rates have not changed. MDR-TB strains were detected in 1,014 (22%) new MbT+ cases (in 2009, 858 patients or 21.9%). Overall, in 2010 drug resistance was detected in 13,718 TB patients, of whom 8,400 (48.7%) had MDR-TB (in 2009, 7,814 patients or 41.2%).

8.3. Evaluation of the effectiveness of TB case finding, diagnosis and treatment in penitentiary system facilities according to sectoral statistical reports

The cohort analysis based on the reporting forms for sectoral statistical monitoring – No. 2-TB, No. 7-TB and No. 8-TB that were established by the Executive Order of the RF MoH – are used to generate a number of indicators for assessing effectiveness of TB case finding, diagnosis and treatment [35]. The use of the given forms of TB patient cohort monitoring allows the analysis of the effectiveness of the main stages of TB diagnosis and TB chemotherapy courses for making appropriate management decisions.

Collaborative activities for coordinating the efforts in TB monitoring between civil and penitentiary sectors resulted in improving the quality of data generated from recording and reporting forms for cohort analysis.[111] In 2010 virtually all regional FSIN bodies (78 areas) submitted the required data according to reporting Forms No. 2-TB, No. 7-TB and No. 8-TB, and currently the quality of data in the reporting forms allows for adequate analysis of TB case finding, diagnosis and treatment.

In 2010 in FSIN facilities 12,745 new TB cases were enrolled in a treatment cohort, corresponding to 96.9% of the total number of registered cases in FSIN structure, according to Form No. 8 (13,153 persons). Over the recent three years there has been a statistically significant increase in the proportion of new TB cases registered for treatment; in 2008 and 2009 it was 90.0% and 94.0%, respectively.

According to sectoral reports, as compared to 2009, a statistically significant growth has been recorded in the coverage of new TB cases (12,501 persons) with AFB microscopy – from 97.6% to 98.4% – and the coverage with culture testing was 98.8% in 2010.

In 2010 TB diagnosis was confirmed by the positive result of sputum smear microscopy in 17.8% (2,229 persons) of new pulmonary tuberculosis cases, and it was confirmed by positive culture test in 27.7% (3,457 persons). Only 41.1% of patients with destruction of lung tissue had confirmation of bacillary excretion by microscopy (in the civilian sector, 59.0%), with this indicator remaining virtually stable since 2009 (41.7%).

According to FSIN data, the coverage of new TB cases and relapses with pre-treatment drug susceptibility testing was 86.5% and 88.1%, respectively. DST revealed multidrug resistance (MDR-TB) in 605 (20.2%) new TB cases and in 512 (37.1%) relapses. These values are higher than the respective indicators in the civilian sector (17.1% and 34.7%, respectively; see Chapter 10). According to Form No. 7-TB data, the trend for a slight (statistically insignificant) growth of these rates has been observed in the FSIN since 2008 – from 19.4% and 34.9% for new cases and relapses, respectively [26–28].

Among new pulmonary TB cohorts of 2008 and 2009 the proportion of patients who had successful outcome of chemotherapy has declined from 64.9% to 59.4% (Figure 8.10a).

The proportion of patients who failed chemotherapy grew from 14.1% to 15.2%. This may be explained with the changed definition of an outcome of “treatment failure.” For the 2009 cohort this outcome was registered also for patients who were found with MDR-TB upon registration or during treatment. The share of such outcomes among patients with failed treatment was 19.7%.

The TB fatality (death) rate among new pulmonary TB cases in the penitentiary sector was low at 0.8%, while the fatality rate from other causes was 1.4% (in the civil health care sector, 3.8% and 3.5%, respectively).

The default rate of new pulmonary TB patients is also quite low: 3.5% (7.7% in civilian TB cases). However, in 14 regions the default rate for new TB cases exceeded 5%, and in 9 of them it was over 10%. This underscores the urgent task of decreasing the number of defaulted new TB cases also in FSIN facilities.

The main factor undermining chemotherapy success among new pulmonary TB cases is the transfer of patients from the facility where they were registered and followed up. The proportion of new pulmonary TB cases with the outcome “transferred out” increased from 15.6% to 18.9% compared to the previous year. This may be explained by including the areas where patients do not receive treatment in the cohort analysis. A significant part of “transferred-out” patients do not leave FSIN facilities, but actually move within the system.

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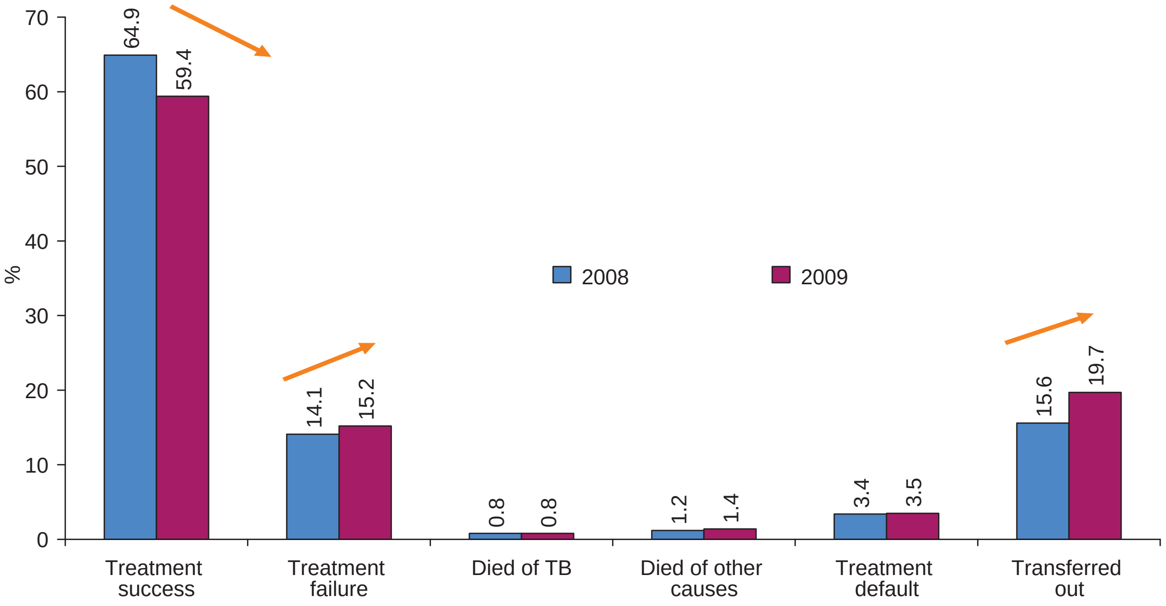
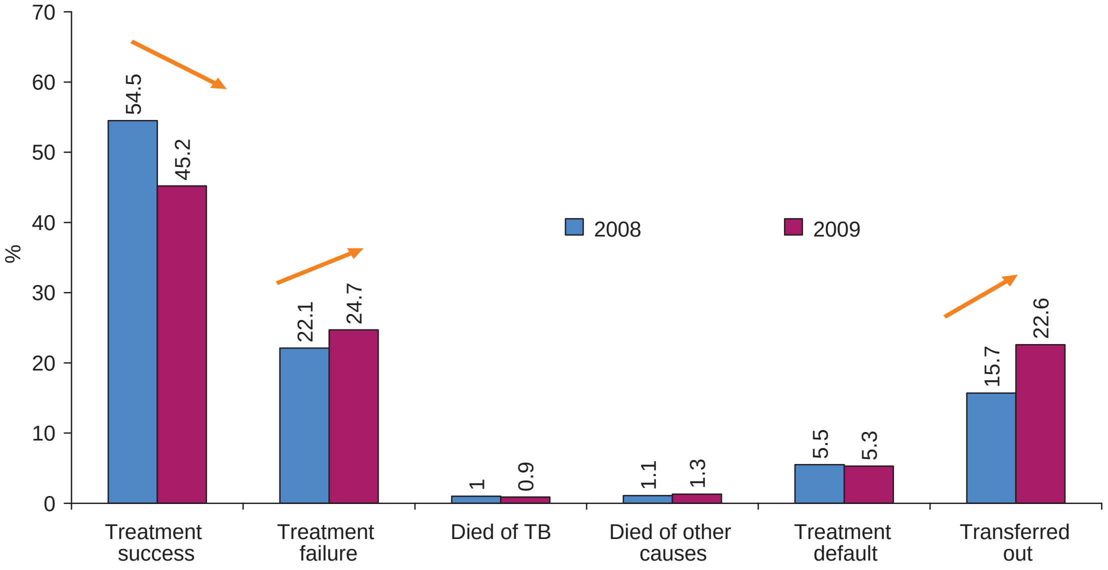
[111] In particular, the 2009 case notification data were corrected retrospectively; therefore, in the present review certain data may differ from those in the previous edition of the analytical review.



a) cohorts of new PTB cases



b) cohorts of TB relapses

Fig. 8.10. Chemotherapy outcomes in new TB patients and relapses registered in 2008 and 2009 (Source: FSIN Form No. 8-TB)

One of the key indicators of treatment effectiveness is the proportion of patients with treatment success in the cohort of new sputum smear-positive (ss+) patients, which also declined from 54.2% to 49.1% (cohorts of 2008 and 2009, respectively; see Chapter 7).

Treatment success in patients with pulmonary TB relapses is significantly ($p < 0.05$) lower than in incident TB cases. Notably, the above-mentioned statistical reasons (primarily, registration of the “MDR-MbT detected” outcome among patients who failed chemotherapy) had an even bigger impact on this group than on the new TB cases (Fig. 8.10b).

For the treatment cohort of pulmonary TB relapses the proportion of patients with treatment success was 45.2% (in the similar category of patients in the civilian sector it was 51.7%; $p < 0.05$). Meanwhile the share of patients with the outcome of failed treatment (including those with the outcome of “MDR TB detected”) differed insignificantly: 24.7% and 23.5% in the penitentiary and civilian sectors, accordingly ($p > 0.05$). The “MDR TB detected” outcome was registered in almost one-third (28.9%) of patients whose chemotherapy failed. In a similar group of patients in the civilian sector, the share of this outcome in the general outcome of “chemotherapy failure” was nearly one-half (49.2%; see Chapter 10). Taking the outcome “MDR TB detected” separately, in patients with pulmonary TB relapse it was 7.1% and ranked third among major outcomes that have a negative impact on treatment success in this category of TB patients.

The default rate of pulmonary TB relapse cases in the 2009 cohort has not changed significantly over the last two years; currently it is considerably lower than in patients of the civilian sector (5.3% and 10.9%, respectively; $p < 0.05$). A high default rate for TB relapse cases is reported mainly in those areas where default rates are high among new pulmonary TB cases. This is indicative of the shortcomings in the system of treatment incentives or motivation for TB patients in the given areas and requires tailored guidelines for decreasing the scope of this phenomenon.

The TB death rate among pulmonary TB relapses has hardly changed, and in 2009 it was 6.4 times lower than in the corresponding categories of civil sector patients (0.9% and 6.0%, respectively).

When analyzing treatment success for penitentiary patients it is worth noting a considerable share of patients transferring out of the facility where they were registered. In particular, in the treatment outcome structure for civil and penitentiary patients this factor underlies the fact that in treatment cohorts of the penitentiary sector the share of patients with treatment success is considerably lower than in the civilian sector. Unfortunately, currently there are few options to facilitate a decrease of patients in this category of treatment outcomes. Nevertheless, further interventions are planned in this respect.

On the other hand, the growing trend of MDR TB cases suggests the need to implement several measures for introducing second-line treatment regimens and procurement of molecular genetic testing devices for rapid diagnosis of TB and drug-resistant TB, which will allow choice of an adequate treatment regimen for MDR TB patients.

8.4. Global TB control in prisons

People who are held in penitentiary facilities represent a high risk group for tuberculosis in any country of the world, due to behavioural characteristics and a particular profile of most convicts, specific features of their environment (overcrowding, lack of space, poor nutrition, inadequate ventilation, stress, etc.), as well as limited access to health care and links with the general health care system [76]. Altogether, in the world approximately 9 million people are held in penitentiary facilities, and their mobility – both inside and outside prisons – is relatively high, partly because prison inmates are predominately men aged 15–44 years. Therefore, prisons function as a kind of “pump” that “injects” TB infection into the civilian population, the spread being fuelled by released convicts, custodial staff of penitentiary facilities and visitors who come to see incarcerated persons.

A number of guidelines published by the WHO, the International Federation of Red Cross and Red Crescent Societies, CDC (USA) and other international and government agencies [76] highlight the fact that the TB incidence rate in the penitentiary population is 10–50 times higher than the overall population rate.

On the other hand, in its main statistical publications the WHO does not provide data on TB prevalence in the prison population, due to major shortcomings in the TB surveillance management in the penitentiary system.[112] And, despite one of the principles (2c) in the “Stop TB Strategy” emphasizing the need to address TB among prisoners as a high-risk group for TB, assessment of the spread of the disease in this population, as well as effectiveness of the implemented activities, can be done only based on several research papers or reports of a few national systems of routine surveillance that function mostly in developed countries [61, 64, 65].

Table 8.4 shows the data of TB notification rate in prisons of selected countries generated in a series of country surveys, as compared to TB incidence in the total population [61, 76].

It should be noted that even with the shortcomings discussed in this chapter, in the global comparison of countries the Russian Federation has one of the most developed systems of TB surveillance (at least compared to the 22 so-called “High-TB burden countries”). This system functions as an adequately balanced component in the overall system of statistical monitoring or epidemiological surveillance of the country. The registration and follow-up system for TB patients in FSIN facilities is the same as in the civil health care system, and it includes data on case finding, diagnosis, treatment and dispensary follow-up. FSIN data are combined with the corresponding civilian sector data and submitted in joint federal and sectoral reporting documents to MoH&SD and specialized research institutes. In FSIN facilities the penitentiary laboratory service was established and is now developing; it provides laboratory testing of satisfactory quality (see Chapter 12). The fact that the penitentiary system in Russia has long-term experience of extensive use of active TB case-finding methods (radiological examination methods) enhances the quality of routine TB surveillance in penitentiary facilities. Active TB case finding in prison settings is now broadly recommended in the international guidelines [76].

Therefore, it can be assumed that the system of routine TB surveillance in the Russian penal enforcement system provides data of sufficiently good quality as compared to other countries. However, this fact is generally

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[112] The most recent WHO Global TB report [78] does not mention the issue of TB prevalence in prison settings at all.

overlooked outside the country, since there is lack of relevant publications in the leading international sources. It is advisable to conduct a special study to prove the quality of the surveillance system and the reliability of the generated data in the penitentiary system of Russia, based on internationally accepted methodology. In the future it will facilitate dissemination of the Russian experience of TB control in penitentiary facilities.

Table 8.4

TB notification rate in prisons compared to overall TB spread in the country [76]*

Country	Year	TB notification rate in penitentiary facilities, per 100,000		TB incidence as estimated by the WHO, per 100,000
		By passive case-finding methods (self-referrals)	By active case-finding methods (screening)	
France	2006	41.3		8.6
Spain	1997	2,283		18.2
Azerbaijan	1995	4,667		94.2
Moldova	1997	2,640		149
Thailand	2004	1,226		208
Georgia			5,995	107
Brazil	2005–2006	1,439 (Rio de Janeiro)	3,532	77
USA	1994	156 (New York)		10.4

* The given table does not list data for the Russian Federation, because in [76] they were given for one region only and for 1997. These data are of no relevance considering the information in this chapter and in Chapter 2 of this review. The information in these chapters shows a virtually fourfold drop in TB notification rate in facilities of the Russian penitentiary system from 1999 to the mid-2000s. This fall was recorded alongside significant progress in the evolving TB control system in the penitentiary system.

9. HIV-infection in the Russian Federation and its impact on the spread of tuberculosis

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9.1. The system for recording and reporting of TB-HIV co-infection in the Russian Federation

HIV infection was first reported in Russia in 1987. The data on cases of tuberculosis among HIV-infected individuals have been reported to the national statistics since 1999 when the FSSS reporting form No. 61 "Data on patients with HIV infection" was introduced (hereinafter Form No. 61).

The basic information for analysis of the epidemiological situation of HIV-infection as well as TB 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 parentheses):

1. The number of patients **enrolled for the dispensary follow-up of the infection disease specialists due to HIV infection**.

   This section contains information about the number and flow of patients and their distribution by the stages of HIV-infection. In particular, the section contains the following information:
   - the total number of the followed-up persons with HIV infection (includes the number of persons enrolled for the dispensary follow-up by the end of the previous year plus all persons registered for the follow-up in the reporting year) (372,893);
   - the number of persons registered for the follow-up in the reporting year (57,214);
   - of those registered for the follow-up, the number of persons who died in the reporting year (death caused by any reason) (12,740);
   - including persons who died of HIV-infection (4,970);
   - the number of followed-up persons by the end of the reporting year (354,469).
2. Information on the **total number of HIV-infected people**.

   This section provides the information on the total number of people in the RF constituent entities who have **antibodies to HIV-infection identified in blood by the results of the immune blotting**. This number includes persons with HIV **enrolled for follow-up in the health care facilities** and **people from other population groups located in the administrative areas of the Russian Federation**, which include the homeless, persons followed up in other health care facilities including FSIN, residents of other territories, and foreigners. This section provides information on
   - the total number of persons with identified antibodies to HIV by immune blotting, including those who died in the reporting year (509,734 persons[113]),
   - the number of new cases of HIV infection notified in the reporting year (62,581),
   - the number of deaths among people with HIV infection registered during the reporting year (15,888).

Therefore, the data presented in this chapter will distinguish between "the total number of patients" and "the number of patients enrolled for the follow-up of the infectiologist due to HIV-infection."

It should be noted that prior to 2008, in Russian publications for the analysis of HIV and TB-HIV co-infection prevalence the total number of patients in the register or the number of people registered during the reporting year was used; that is, this number included those who died and those who were transferred out within the reporting year until December 31.[114] Starting from 2008, the number of TB patients alive by the end of the year with identified antibodies to HIV by immunoblotting was used for the estimation of HIV prevalence.

Since 2005, the data on coverage of TB patients screened for HIV and results of HIV screening have been included in Form No. 33 "Data on TB patients."

To assess the significance of the problem of TB-HIV co-infection in Russia, a uniform system of registration of TB cases in patients with positive HIV status was established in 2004 [10]. Since then, in accordance with the RF Ministry of Health Executive Order No. 547 of 13.11.2003, a new recording form, "Personal registration card

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[113] In Form No. 61 adopted by the MH&SD the value of this rate was 503,724 patients. After the form was introduced and the information on the Leningrad region entered by mistake was corrected, the total number of people "with antibodies to HIV identified by the results of immunoblotting in the reporting year" was changed to 509,734. This information was submitted to the Center of TB care of HIV-infected patients at the RF MH&SD.

[114] The epidemiological statistics uses two types of prevalence: (a) number of patients registered at a specific time (i.e., at the end of a year), and (b) number of patients who were registered (or ill) at least once during the reporting period (i.e., reporting year). The first indicator shows the epidemiological pattern of the 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, that is, the total number of sources of infection in the territory during the reporting period.

of patients with TB-HIV co-infection," has been used in the country (RF MoH registration form No. 263/u-TB). This form is to be completed for all cases of TB-HIV co-infection (regardless of a place where the diagnosis was made) and submitted to a TB specialist responsible for management of patients with HIV infection in the respective area of the Russian Federation. These cards are also to be completed for cases of death reported among patients with TB-HIV co-infection (Fig. 9.1).Generally, a TB specialist responsible for these activities is an employee of the TB service (in other cases he or she is an employee of the AIDS center). Typically, the functions are assigned to a TB physician by the regional executive order.

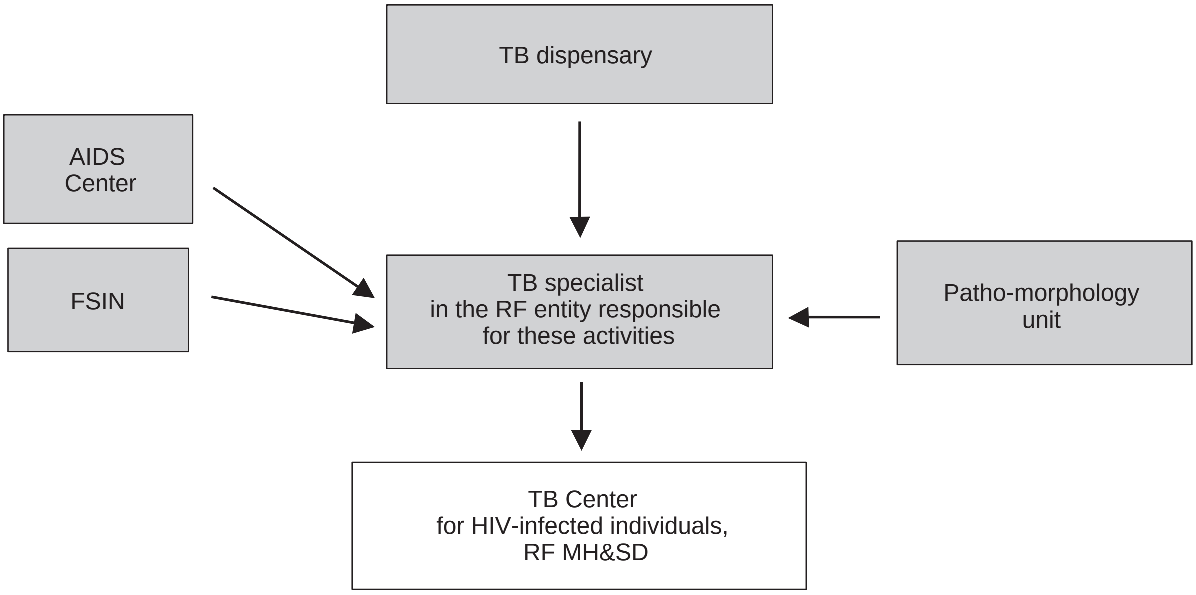

Fig. 9.1. Flow chart for the registration forms containing the information on TB-HIV cases of co-infection in the Russian Federation

In line with the MH&SD Executive Order No. 547 of 13.11.2003, TB specialists responsible for the joint activities send copies of the registration cards of TB-HIV co-infection cases with codes instead of patients' names to the TB Center for HIV-infected individuals, RF MoH&SD (TB-HIVC). Based on the recording forms (cards) the TB-HIVC manages the common register of HIV-infected TB cases (TB-HIV co-infection cases). Results obtained during the processing of the registration cards are used for the evaluation and correction of TB-HIV control activities in the territories and for the analysis of patient groups with TB-HIV co-infection and emerging trends in the structure of those groups.

Starting from 2005, sections referred to TB-HIV co-infection in the annual national reporting form No. 61, generated by the AIDS centers, are to be completed in the RF entities based on data from recording form No. 263 obtained from the regional TB specialists responsible for the coordination of TB care for HIV-infected patients.

In 2006, the FSIN administration sent the circular letter (No. 1022–471 of 22.02.2006) to the institutions within its jurisdiction, which obligated the responsible TB specialists in the RF constituent entities to fill in and submit registration forms 263/u-TB on TB-HIV cases to the common registration system.

The implementation of the joint system of registration and coordination of TB care for HIV-infected patients led to an increase in the number of notified cases of TB-HIV co-infection (Fig. 9.3).

9.2. Challenges of data collection and management of TB-HIV surveillance

Ways and means of obtaining information on the number of cases with TB-HIV co-infection are quite complex worldwide and do not fully reflect the true situation of TB-HIV spread among the population. Primarily, this is due to the fact that such cases are being registered separately by the respective institutions (responsible for prevention, detection and treatment) dealing with TB or HIV infection. Therefore, these institutions notify cases of co-infection independently from each other. It has been observed in almost all countries of the world. The notification of those cases is challenging due to the need to ensure confidentiality of data referring to people living with HIV and, in particular, to HIV testing and its results.

As a rule, the information on TB patients tested for HIV infection is more available than the information on TB screening among HIV-infected individuals.

This is why the data on HIV testing among TB patients and not vice versa are used mainly for the assessment of TB-HIV prevalence in the world. Although, as will be shown below, the total number of cases with TB-HIV co-infection notified at the TB facilities in Russia account for only 40% of all TB-HIV cases registered among the resident population.

In addition, the challenge of TB-HIV registration is partly due to 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. At the same time, “AIDS” and “HIV/AIDS” are not included in ICD-10 as nosological units, and they do not have clear definitions in the clinical classifications proposed by the WHO and RF MH&SD. Therefore, data on TB spread among HIV-infected patients or HIV spread among TB patients in Russia and other countries are often incomparable (see below).

9.3. General information on TB-HIV prevalence in the Russian Federation

According to Form No. 61, as defined by immune blotting with antibodies to HIV in the blood, 509,734 HIV-infected individuals were registered in Russia in 2009 (ICD-10 code Z21, B20-B24); of them 15,888 cases died during the year. According to the same reporting form, 64,094 persons (13.0%)[115] were located in the penitentiary system as of the end of 2010.

In 2010, new HIV infection was detected in 62,581 persons, which accounts for 44.1 per 100,000 population. Of them 14.3% were detected at RF FSIN facilities (8,926 persons).

Figure 9.2 demonstrates the trends in HIV infection notification rates from 1999 to 2010, Form No. 61 for 2007–2009).

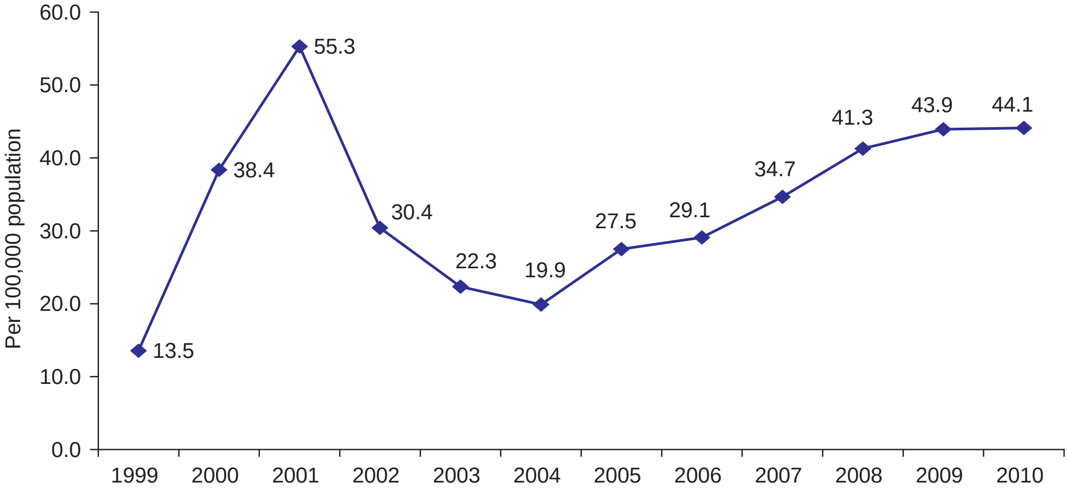

Fig. 9.2. HIV notification in the Russian Federation, 1999–2010 (Source: Form No. 61)

The analysis of data contained in reporting form No. 61 shows that the number of TB patients with HIV infection has been growing in Russia (Figure 9.3). In 2010, there were 10,617 new registered cases of TB-HIV co-infection (2007 – 5,985, 2008 – 7,387 and 2009 – 9,253 cases), of which 18.3% (1,945) cases were diagnosed in the penitentiary system.[116] At present, TB is the most common secondary infection in HIV-infected individuals [14].

The total number of patients with TB-HIV co-infection reached 24,963 persons in 2010, and among the resident population[117] it reached 19,738 (79.1%). Data on co-infection should be evaluated as a whole and separately for the resident population and the population of the penitentiary system (see Chapter 8). For example, in nine constituent entities of the Russian Federation the proportion of patients with TB-HIV co-infection in FSIN facilities exceeds 50% and sometimes reaches 90% and higher. Therefore, high overall TB-HIV rates in some constituent entities may not necessarily reflect the epidemiological challenges in the area, but rather factors related to the issues of management and TB control (presence of correctional facilities for HIV-infected convicts in the area, etc.)

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[115] The calculation is made for a number of HIV-infected individuals as of the end of the year, that is, not including those who died during the year. According to the current regulations, in Form No. 61 the data on homeless HIV-infected individuals as well as HIV-infected persons located in other facilities, including the FSIN, are provided as of the end of the reporting year.

[116] The information about TB-HIV co-infection in the penitentiary system is presented in Chapter 8.

[117] Here and later on in the chapter, the term “resident population” means population of the entities of the Russian Federation not including the FSIN population.

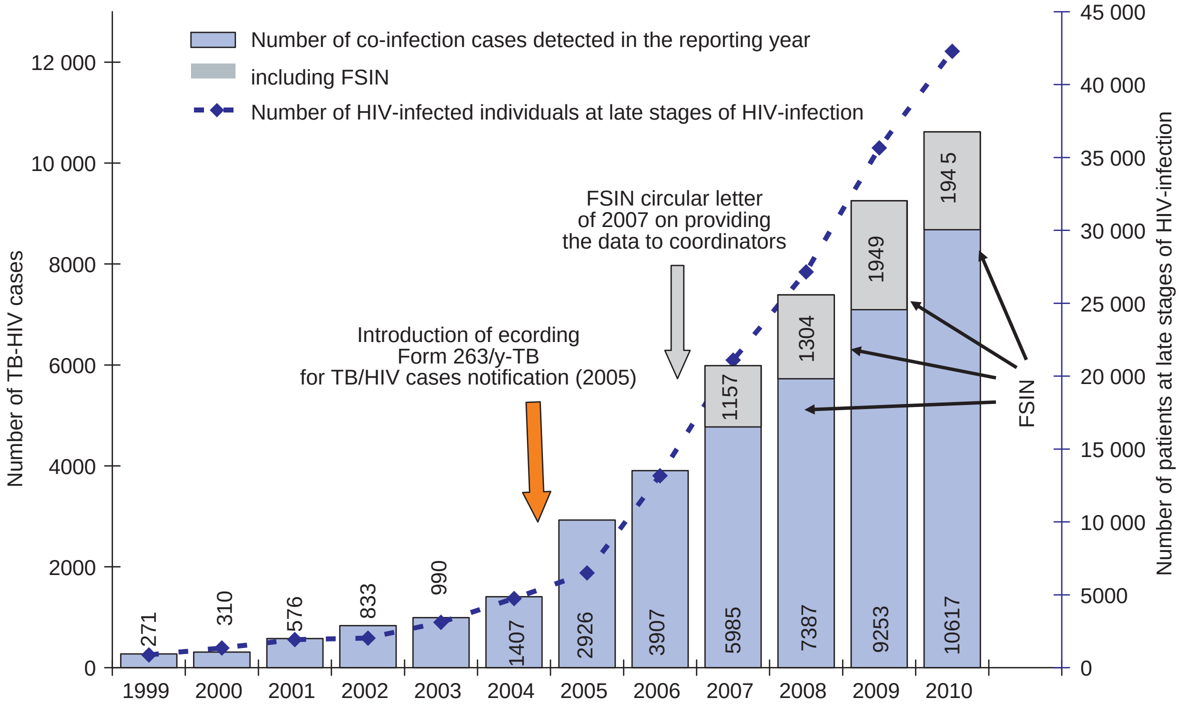

Fig 9.3. New cases of TB-HIV co-infection and the number of patients in late stages of HIV infection in the Russian Federation. The portion of TB-HIV cases notified in the FSIN is presented for 2007–2010 (Source: Form No. 61)

Therefore, of the total number of TB patients (253,555 patients according to Form No. 33) registered at TB facilities in the Russian Federation as of the end of 2010, the proportion of patients with TB-HIV co-infection was 6.0% (Fig. 9.4). In the country as a whole, including the penitentiary system (292,451 registered TB patients according to Forms No. 33 and No. 4-tub; see Chapters 4 and 8) this proportion amounts to 6.8%.[118]

The most important factor influencing TB incidence among HIV-infected individuals is the growing number and proportion of people with late stages of HIV-infection (stages 4B, 4C and 5 [37]) (Fig. 9.3). The proportion of people in late stages of HIV-infection followed-up at the AIDS centers progressively increases from 3.5% in 2005 to 11.4% in 2010.

In 2010, TB was registered in 32.8% of patients at late stages of HIV-infection (13,887 persons).

On the other hand, the proportion of late stage of HIV infection in patients with TB-HIV co-infection is about 60% (55.6% in 2010).

Another factor, which led to an increase in the number of notified patients with co-infection, was the improvement of the recording system achieved through coordinated data collection in the civilian and penitentiary systems (Fig. 9.3).

In total, 4,526 patients with TB-HIV co-infection from the resident population died in 2010 (taking into account an additional 5,137 deaths in the FSIN), which is 23% of all notified cases of co-infection (in 2009, 4,169 or 25.4%). Of this number, in 3,104 cases or 68.6% (not including the FSIN) patients died due to a disease caused by HIV with some manifestations of TB infection[119] (stages 4B, 4C and 5, ICD-10 code B20.0).

According to the data collected in recent years, in about 60% of people who died of HIV-infection the actual cause of death was the manifestations of TB infection[120] [14] (Fig. 9.5). At the same time it should be noted that the majority of deaths among HIV-infected people (61%, 2010) in Russia was not due to HIV-infection but other factors such as traumas and poisonings by the drugs.

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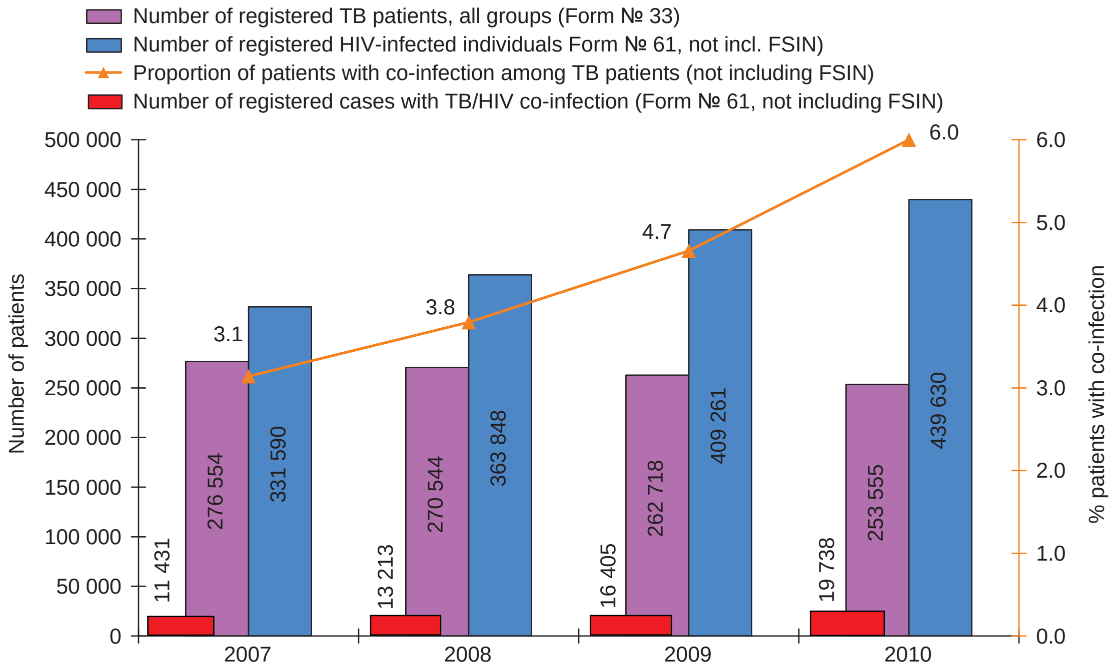
[118] Here and later on in the text the methodology used for the calculation of the proportion of TB-HIV cases is different than the one applied in the previous editions. Since the number of TB patients in the register by the end of the year is used as a denominator for the calculation of the rate, the nominator should include the number of patients with co-infection in the territories as of the end of the year. For this purpose, the number of patients died within a year is subtracted from the number of patients with TB-HIV co-infection in Form No. 61.

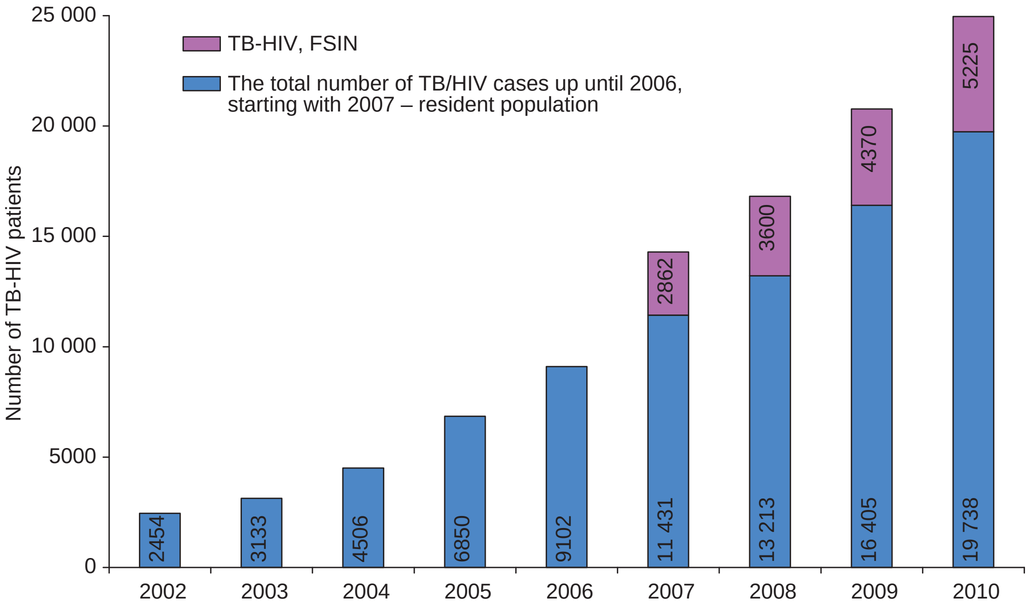
[119] In Form No. 61 this information is provided in the section "died of the disease caused by HIV, with the manifestations of mycobacterial infection (stages 4b, 4c and 5) (ICD-10 code - B20.0)." According to the directions and methods recommended for filling in the form, this column includes only cases of death caused by the manifestations of TB infection.

[120] After 2006, Form No. 61 does not include the information on patients "died of HIV-infection, including those who died of the manifestations of mycobacterial infection" for those under the follow-up due to HIV-infection. This is the reason why it became impossible to precisely calculate the proportion of people died of HIV-infection with the manifestations of TB infection. However, since the majority of patients with TB-HIV co-infection is registered by the infectious disease specialists, it is possible to calculate an approximate proportion of patients died of B20.0 among all registered patients who died of HIV-infection.

When assessing the TB epidemiology, it is important to note (see Chapter 3) that the data on deaths due to TB provided by the Rosstat (21,829 cases in 2010, ICD-10 code A15-A19) do not include cases of death with ICD-10 code B20.0 (3,560 cases including the FSIN data). The overall number of deaths caused by "TB" and "HIV-infection with the manifestations of TB infection" is about 14% higher. The increase in the number of patients with HIV-infection at the late stages and the number of patients with TB-HIV co-infection allows the prediction of an increase of the above mentioned proportion in the nearest future. Once again these facts confirm that TB-HIV co-infection is a significant problem for Russia.



a) TB and HIV-infection among the resident population (not including the FSIN), Form No. 61 and No. 33[121]



b) Number of patients with TB-HIV co-infection under the follow-up, including the FSIN, starting from 2007, Form No. 61

Fig. 9.4. TB and HIV-infection in the Russian Federation (Source: Forms No. 61 and No. 33)

Every year the proportion of registered HIV-infected people covered by TB testing increases. Between 2005 and 2010 the testing coverage increased from 38% to 75%.

The data on HIV screening of TB patients has been provided in Form No. 33 since 2005. This form is being filled in by TB facilities (Table 9.1). The screening coverage among new TB cases in 2010 was 95.8% (in 2009,

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[121] The proportions of patients with TB-HIV co-infection among TB patients for 2007–2009 differ from previously published data due to the application of adjusted calculation methodology (see the note above).

93.3%). The presence of antibodies to HIV was confirmed by immune blotting in 4.3% cases or in 3,633 patients (in 2009, 3.9%).

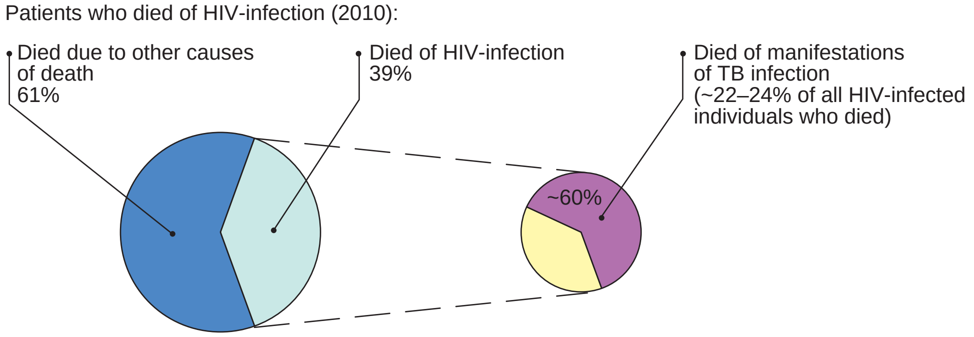

Fig. 9.5. Causes of death in patients with HIV infection in the Russian Federation, 2010. Figures in white (in the violet sector of the right circle) show the approximate proportion of patients who died of TB manifestations among all patients who died of HIV-infection (Source: Form No. 61, see the note in the text).

In Russia as a whole, this situation is the evidence of good coverage of new TB patients by HIV testing[122] and HIV-infected individuals by TB testing.

Form No. 33 also provides data on the coverage by HIV testing of all registered TB patients (78.7%, Table. 9.1). At present, the data from Form No. 33 can only be used regarding the coverage of TB patients by HIV testing and cannot be used as a reference for the notification rate of TB-HIV co-infection. This is due to the fact that when applying to TB facilities, HIV-infected people often conceal their registration at AIDS centers. Therefore, the detection of HIV in a TB patient cannot always be considered as a new case of co-infection. This is why the abovementioned system of individualized registration of TB-HIV cases has been implemented and the TB spe-

Table 9.1

The main data that characterize the problem of TB-HIV co-infection in the Russian Federation in 2007–2010

Years	2007	2008	2009	2010	
Indicators	Russian Federation				Range by the territories, 25% and 75% quartiles[1]
Form No. 61					
All cases of TB-HIV co-infection (active TB),	14,293	16,813	20,755	24,963	
including those among the resident population	11,431	13,213	16385	19,738	
Proportion of TB-HIV cases among all TB patients registered as of the end of the year, according to Form No. 33[2]	3.1%	3.8%	4.6%	6.0%	(1.1%; 5.7%)
Number of cases with TB-HIV co-infection detected in the reporting year	5,985	7,387	9,253	10,617	
– not including the FSIN	4,828	6,083	7,304	8,762	
Cases of TB-HIV co-infection detected in the reporting year, per 100,000 population	4.2	5.2	6.5	7.5	(1.6; 7.3)
Number of HIV-infected people screened for TB	146,105	185,858	235,753	279,716	
Percentage of people screened for TB (all methods of screening) among all registered HIV-infected people	54.6%	61.7%	70.8%	75.0%	(65.6%; 84.7%)
Form No. 33					
Patients evaluated for antibodies to HIV among new TB cases	87,448	90,461	88,452	84,669	
Of them, new TB cases with positive HIV antibodies results of immune blotting	2,401	2,845	3,440	3,633	
Percentage of patients evaluated for antibodies to HIV among the total number of all new TB cases	90.9%	92.4%	93.3%	95.8%	(94.1%; 99.1%)
Percentage of positive results of immune blotting among new TB cases	2.7%	3.1%	3.9%	4.3%	

[1] According to the statistical definitions of “25% quartile” and “75% quartile,” 25% and, correspondingly, 75% of the territories have the indicator values less than those indicated by the quartile values. Therefore, the data shown in parentheses (25% and 75% quartiles) indicate the ranges that include the indicators’ values for half of all RF entities. [2] Data for 2007–2009 differ from the previously published data due to the use of a more precise calculation method (see the note above).

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[122] In the WHO Global reports this kind of information is presented in section the “Collaborative TB-HIV activities” [77].

cialists have been appointed as responsible for the coordination of TB care of HIV patients and to work in close collaboration with the respective AIDS centers. So for the evaluation of TB-HIV prevalence and incidence it is more correct to use data from the reporting Form No. 61 ("data on all registered HIV infected patients," Table 2002) provided by the TB specialists responsible for the coordination of TB care delivery to HIV-infected people.

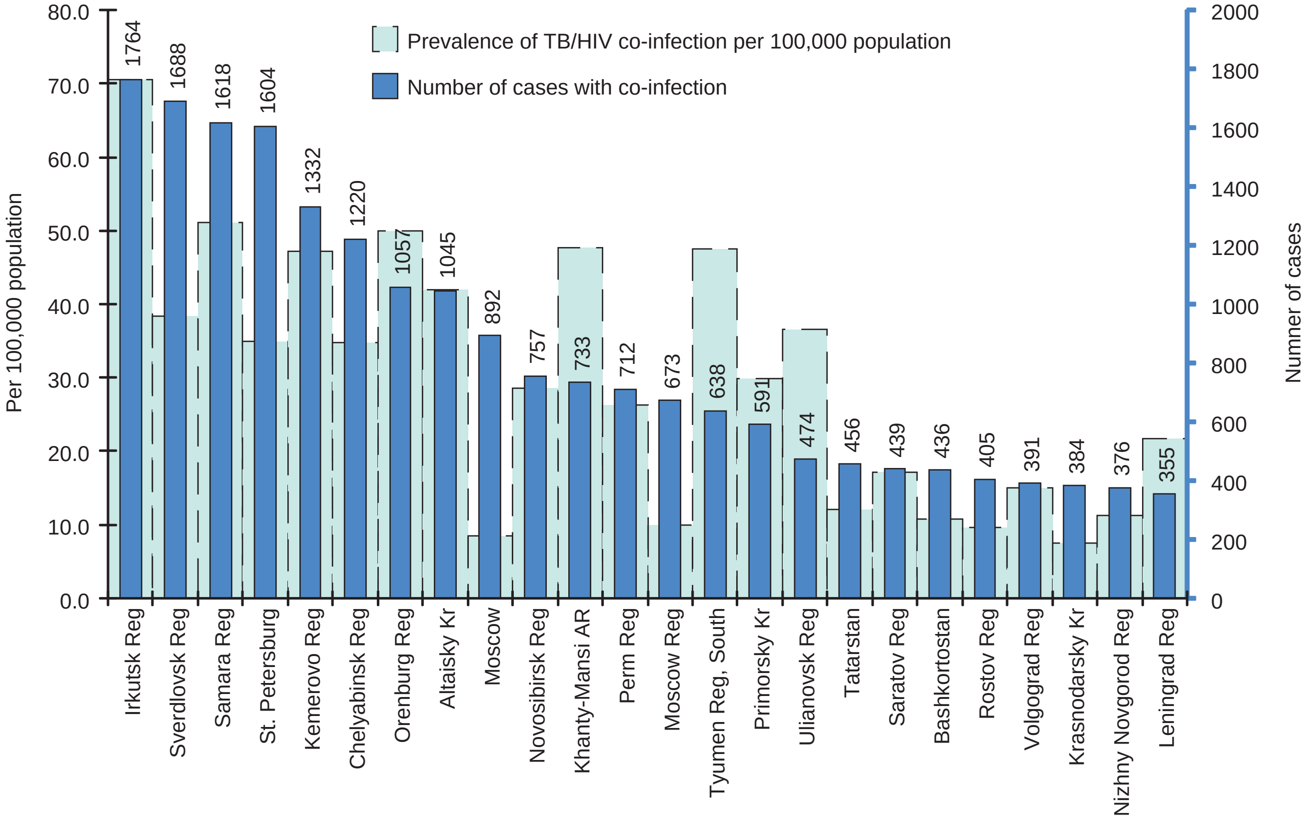
The main indicators related to TB-HIV co-infection, which can be obtained from the reporting forms of the state statistical surveillance No. 61 and No. 33, are presented in Table 9.1.

9.4. TB-HIV prevalence and mortality in the constituent entities of the Russian Federation

The TB-HIV prevalence rate in Russia overall reflects the situation typical for the country as a whole, while the data for the individual RF constituent entities may significantly vary from each other and from the overall national data. The range of the main indicators in the RF territories is presented in Table 9.1.

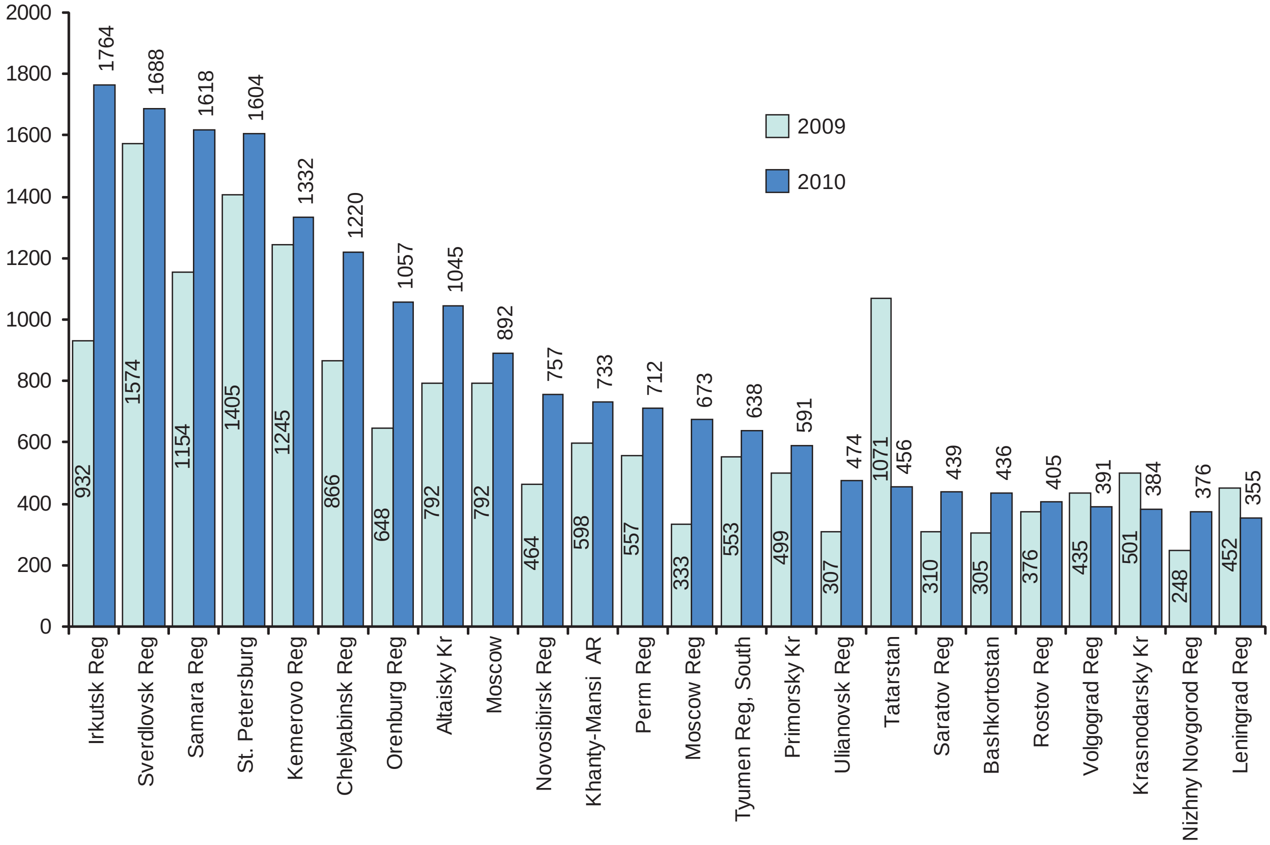
Fig. 9.6 presents the data from 24 territories with the highest numbers of TB-HIV co-infection reported in 2010. The total number of patients notified in those areas is about 80% of the total number of TB-HIV patients in the Russian Federation. In the majority of the abovementioned entities of the Russian Federation most of the patients with TB-HIV co-infection were registered among the resident population (Fig. 9.6c). It is advisable to consider the list of those constituent entities when planning the expenditures of the federal and regional TB-HIV control programs.

Fig. 9.6b demonstrated a considerable increase in the number of TB-HIV patients reported in the last two years in a number of territories and first of all in the UFD, SbFD and FEFD. Just like last year, the number of such patients almost doubled in the Irkutsk region (from 932 to 1,764). The same increase in the number of TB-HIV infected patients was observed in the Moscow region (from 333 to 673) and in the Republic of Mordovia (from 74 to 185). The number of patients increased half as much in the regions of Samara (from 1,154 to 1,618), Chelyabinsk (from 866 to 1,220), Novosibirsk (from 464 to 757), as well as in the regions of Uliyanovsk and Saratov and the Republic of Bashkortostan.

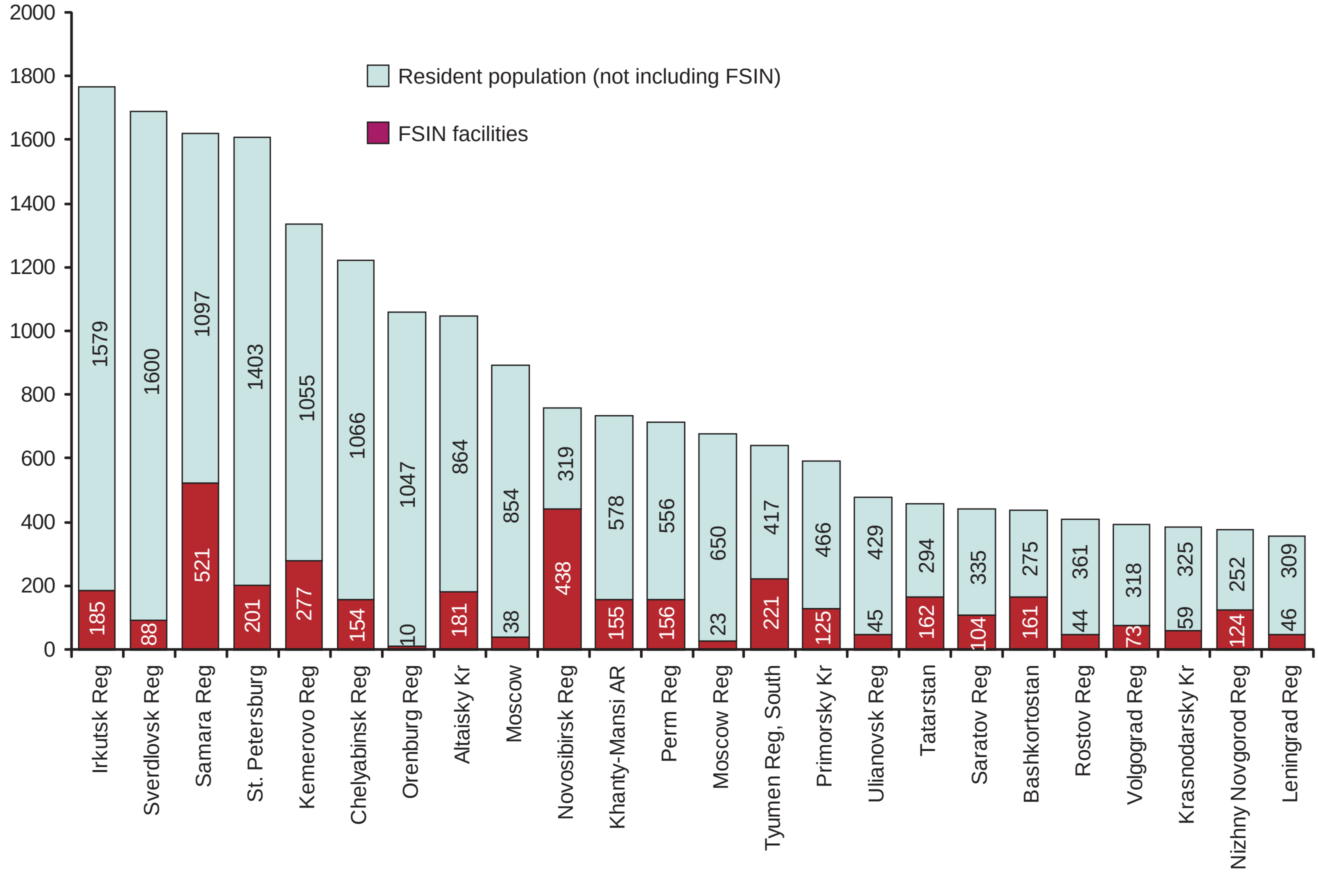


a) Number of TB-HIV patients and the prevalence of co-infection per 100,000 population, 2010

Fig. 9.6. The RF constituent entities with the highest numbers of patients with TB-HIV co-infection (over 350), ranged according to the data of 2010 (Source: Form No. 61)



b) Comparison of the number of TB-HIV patients in the register of 2009 and 2010



c) Number of TB-HIV patients among the resident population and in the FSIN facilities, 2010

Fig. 9.6. The RF constituent entities with the highest numbers of patients with TB-HIV co-infection (over 350), ranged according to the data of 2010 (Source: Form No. 61)

Fig. 9.7 presents the data from 28 RF entities with the highest proportion of cases with co-infection, which exceeds 5% among all TB patients registered at TB facilities in the Russian Federation (in 2009 there were 24 territories like this). Those areas experience a major impact of the co-infection on the spread of tuberculosis, which entails a need for regional TB services to pay special attention to this problem.

The analysis of the epidemiological situation in the federal districts shows that the highest proportion of cases with co-infection are reported in the NWFD (13.2% among TB patients), UFD (13.9%) and PFD (9.6%). Three out of four entities in the UFD (if we consider the Tyumen region together with the Khanty-Mansi autonomous area and Yamal-Nenets autonomous area), as well as the neighboring Bashkorostan and the regions of Orenburg and Perm in the PFD were part of 21 territories (Fig. 9.6) that contribute the most to the total number of TB-HIV patients in the country.

As a rule, the areas with the highest prevalence of the late stages of HIV-infection demonstrate the highest levels of HIV-infection among TB patients. Thus, among 28 constituent entities with the highest proportion of cases with co-infection, 20 territories are included in the list of the entities with the highest prevalence of the late stages of HIV-infection, which exceeds 25 cases per 100,000 population.

Therefore, the specialists of the TB facilities, which started seeing HIV-infected patients later than other places, should be aware that in the nearest future this will be a significant problem for them when they start working with patients at stages 4b, 4c and 5 of HIV-infection.

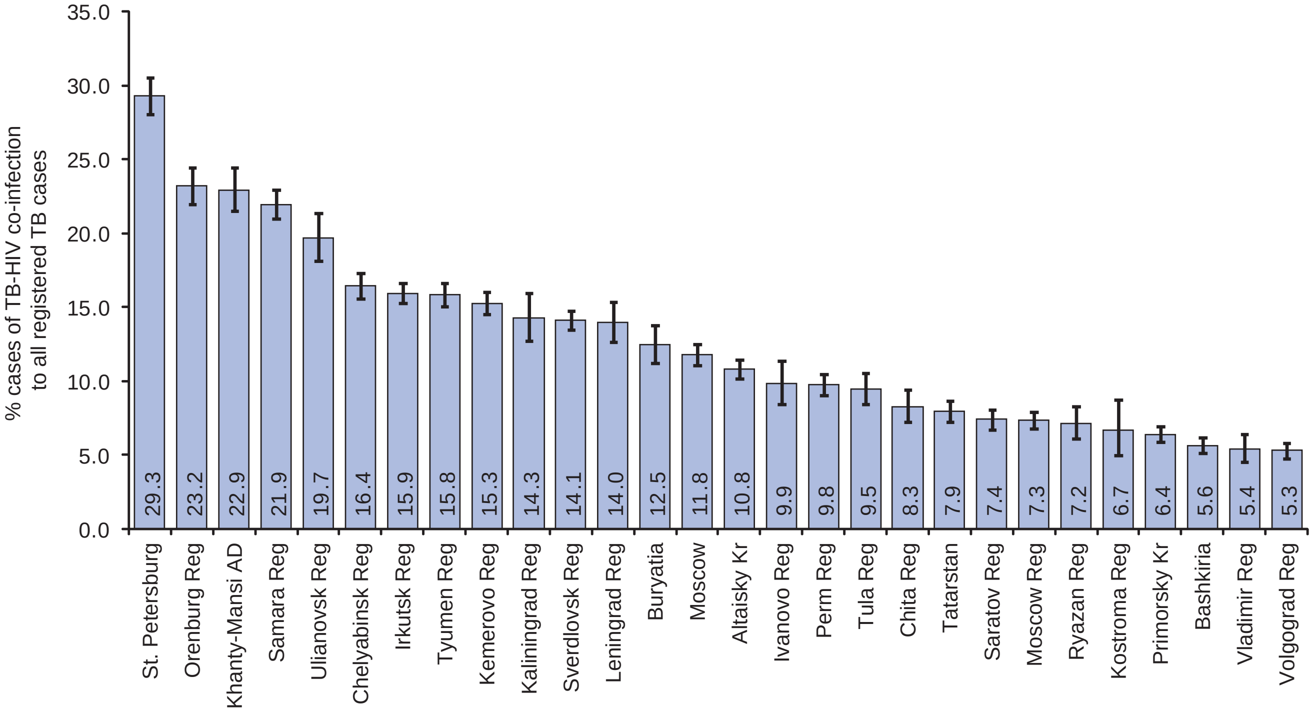


Fig. 9.7. Territories with the highest proportions of TB-HIV cases of co-infection (more than 5%) among all registered TB patients in the resident population (not including FSIN), 2010. The error bars indicate 95% CI (Source: Forms No. 61 and No. 33)

In 2008–2009 the increase in the number of cases with co-infection among the resident population was mainly uneven in the constituent entities of the country. Almost a 20% increase of the rate among the resident population (not including the FSIN, where the number of new TB-HIV cases basically did not change at that time, see Fig. 9.3) was determined by the change in the number of detected patients only in a limited number of RF entities. Thus, in the Moscow region a number of detected cases increased from 93 to 359, which basically determined the increase in the rate in the CFD. In the NWFD the increase in the number of new TB-HIV cases was due to an increase in the number of patients with co-infection reported in one year in St. Petersburg (from 441 to 490 cases). In the SFD, a decrease in the rate was mainly related to a decrease in a number of cases detected in the Krasnodarsky krai (from 179 to 106), which outweighs the increase in the number of patients detected in the Rostov region (from 109 to 157 cases). In the PFD, an increase of the rate was determined by the data from the regions of Nizhny Novgorod, Orenburg and Perm. In the SbFD an increase in the number of new TB-HIV cases was reported in six constituent entities: in the Republic of Buryatia, Altay and Krasnoyarsk krai, and in the regions of Irkutsk, Kemerovo and Novosibirsk. In the Far East, it is the Primorsky krai that determines the rate. And only in the UFD did all constituent entities report a significant increase of the rate.

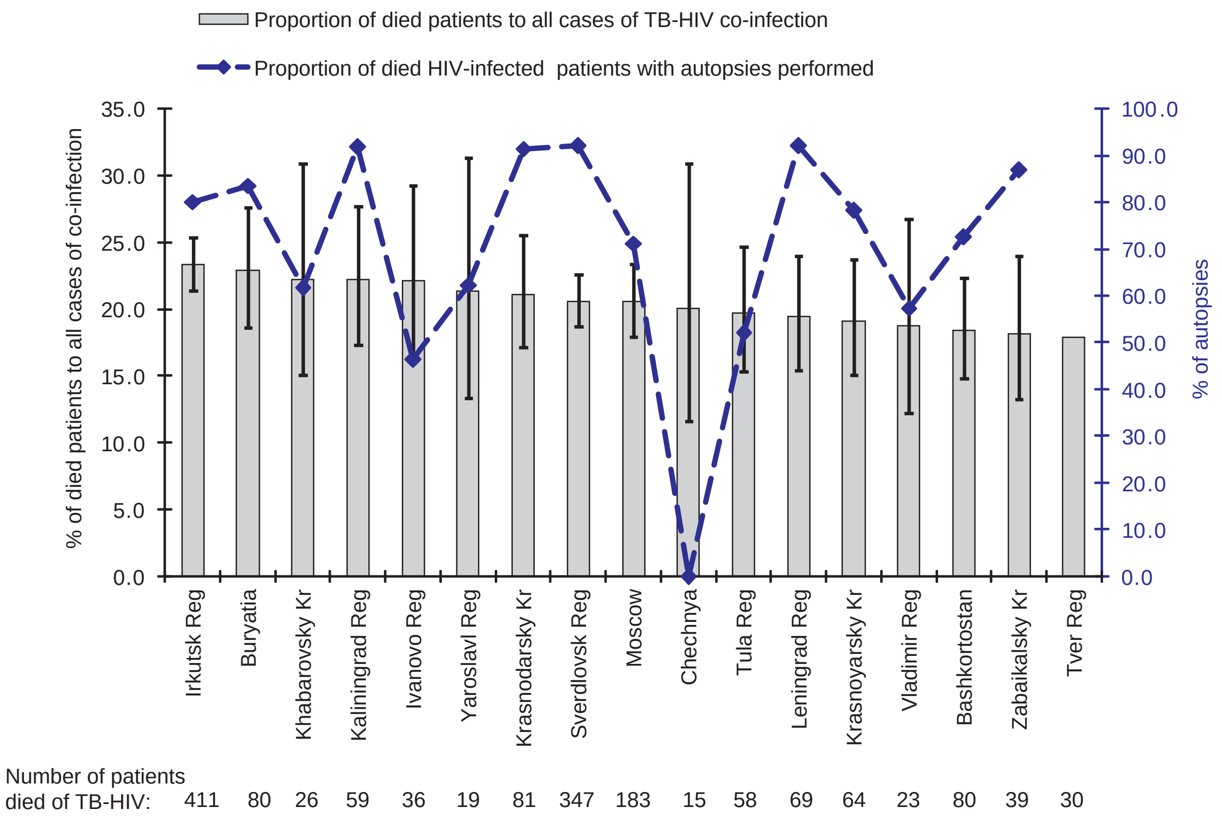


Fig. 9.8. The proportion of patients died of HIV-infection with the manifestations of mycobacterial infection (ICD-10 code B20.0) among cases of co-infection (for the RF territories with the proportion of people died of HIV-infection no less than 17% and at least 15 died patients) and the proportion of died HIV-infected people with the autopsy performed, 2010, The error bars indicate 95% CI (Source: Form No. 61)

Fig. 9.8 presents the territories where at least 17% of all patients with co-infection die of mycobacterial infection (B20.0 code of ICD-10). A high percentage of deaths can be the evidence of delayed TB detection in patients with immunodeficiency. It should be noted that in all abovementioned constituent entities, with the exception of the Vladimir and Ivanovo regions, the proportion of patients died of B20.0 in FSIN facilities is not high and amounts to no more than 15%. In general, the proportion of died HIV-infected patients with autopsies performed did not have an effect on the value of the rate.

Considering a significant range of the rate in RF entities, which characterizes the spread of TB-HIV co-infection, it is advisable to ensure a differentiated approach to management of the outpatient and inpatient care provided to those patients. It is important to consider the prevalence of HIV-infection in the area, the duration of HIV exposure in the territory and the TB infection rate in the population. These recommendations are provided in the guidelines for physicians, “Management of TB care for HIV-infected individuals,” developed by the MH&SD and WHO thematic working group in 2006 [25].

9.5. TB and HIV co-infection in the countries of the world

The interaction of TB and HIV control services is a necessary part of the process involving detection and adequate treatment of patients with co-infection, as well as prevention of TB transmission among people living with HIV [78]. These activities include development of collaboration between the TB and HIV control services, infection control measures, testing of TB patients for HIV-infection and provision of antiretroviral therapy (ART) to patients with co-infection, co-trimoxazole preventive treatment (CPT) and management of active screening and detection of TB among people living with HIV followed by isoniazid preventive treatment of those who does not have active TB.

In world practice, the estimated and notified values of the rates are used to study the spread of TB-HIV co-infection. The most commonly used are [77, 78, 80]

- the rates related to estimation and notification of the number and proportion of HIV-infected patients among new TB cases and relapses (i.e., HIV prevalence in incident TB cases);
- the reports on the number of TB patients with known HIV test results, the number of TB patients with positive HIV test results, and, starting with the Global TB Control WHO report 2009, the number of HIV-infected individuals evaluated for TB;
- the number of patients with co-infection receiving TB treatment, antiretroviral treatment and co-trimoxazole preventive treatment;
- treatment success among patients with co-infection (new and re-treatment cases).

These rates for some countries of the world, WHO regions and Russia are presented in Table 9.2 (the data of 2008).

Table 9.2

TB-HIV co-infection in the world, 2009 [78]

WHO Region / country	**Estimates of the number of incident TB cases with HIV co-infection**	Estimate of the HIV prevalence among new TB cases, %	TB patients tested for HIV-infection [a]		Number of TB patients with positive HIV test results	% notified TB-HIV cases in relation to the estimate	Proportion of positive results among TB patients tested for HIV-infection, %	Number and proportion of patients covered by ART among all TB-HIV patients, %	Number and proportion of patients covered by CPT among all TB-HIV patients, %	Number and proportion of patients covered by IPT among all TB-HIV patients, %
			Abs. number	%				%	%	Abs. num.
Globally	1,200,000	12	1,689,849	27	444,984	37.1	26	37	75	84,426
Africa	910,000	37	796,275	56	364,401	38.7	46	36	76	60,509
South Africa	290,000	60	197,448	51	114,523	40.0	58	42	71	23,583
USA	790	6.1	7,043	61	706	39.5	10	–	–	–
WHO European region	21,000	5.3	279,354	86	9,275	89.4	3.2	21	18	17,772
RF	12,000	8	204,624	131[b]	7,442[c]	44.2	4[c]	19[d]	NDA	10,451[c]

[a] In the Global Report, these data are considered as “the number of 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 to the recording of all TB patients used by the WHO and in the system of statistical recording used in the Russian Federation. According to the reporting form No. 33, in 2009 the coverage of new TB cases by HIV testing in Russia was 96% and the coverage of all registered TB patients was 79%.

[c] The data submitted by the Russian Federation to the WHO meet the number of new TB-HIV cases as presented in Form No. 61 and excluding the FSIN but not all TB-HIV co-infection cases. The number of new TB-HIV cases registered in the Russian Federation in 2009 as per Form No. 61 was 9,253, with the total number of registered TB-HIV cases amounting to 20,755 (16,385 excluding the FSIN). Therefore, adjustments will be needed in the information provided by the Russian Federation to the WHO, considering the specifics of the RF statistical reporting system.

[d] The data include only new HIV cases. In 2009, of all TB-HIV cases, ART was provided to 7,167 of 20,755 patients, that is, 35%.

NDA – no data available

Thus, according to the WHO estimate of 2009, in the world 12% of new TB cases and relapses (11–13%) have HIV co-infection. For the African countries this percentage amounts to 37%, and for the WHO European region it amounts to 5.3%.

In total in the world there are 1.6 mln. TB patients with known HIV test results (26% of all notified cases); of them 27% or 445,000 have positive test results. The highest proportion of patients tested for HIV infection was reported in the European, American and African WHO regions: 86%, 41% and 55%, respectively. The proportion of notified cases of co-infection in those regions is 3.2 %, 17% and 46%, respectively.

Unfortunately, based on the data provided to the WHO, the calculation of the rates for coverage by HIV tests is problematic for the Russian Federation (see note “b” in Table 9.2) due to some specifics of the statistical recording in the country.

Based on the data available in the Russian reporting forms, it is possible to obtain the number of detected patients, to calculate the proportion of HIV-infected people among tested new TB patients and the proportion of HIV-infected people among tested TB patients from the follow-up TB registers (new and retreatment cases).

In the world, the estimation of HIV prevalence among new notified TB cases is performed on the basis of (a) UNAIDS estimation[123] of the HIV prevalence in the country and (b) estimation of the parameter that shows how much the TB incidence among HIV-infected individuals exceeds the TB incidence in the population not affected by HIV infection. In other words, it is the calculation of the TB incidence ratio (IRR) in these two population groups. It is believed that for the countries with high prevalence of HIV-infection (over 1% of the population, according to the UNAIDS estimate) the TB incidence among HIV-infected individuals is 21 times higher than the TB incidence in the population not affected by HIV. For the countries with HIV prevalence in the range of 0.1%–1% (the Russian Federation is among them) this ratio equals to 27. Finally, in countries with low HIV-infection prevalence (less than 0.1%) the TB incidence among HIV-infected people is 37 times higher than that among people with the negative HIV status.

It should be noted that as a rule the number of cases with co-infection notified in the countries of the world reflects the information generated only by national TB control programs. It has a significant impact on the quality of surveillance and reduces its completeness and informational value. This has led to the establishment in Russia of the system that allows for the joining in one database the data on cases with TB-HIV co-infection that come from the TB specialists, infectious diseases specialists, pathomorphologists, and physicians from the FSIN.

Conclusion

TB-HIV co-infection is a problem of great importance for Russia. In the absence of adequate interventions, the increase in the prevalence of TB-HIV co-infection may cause serious harm to the health of the population in the country.

In order to improve the monitoring of TB-HIV co-infection, it is necessary to implement a uniform system of registration of those cases. The system should be based on the universal definition of an HIV infection case used for statistical purposes and take into account the updated information in the field of HIV-infection and tuberculosis.

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[123] Joint United Nations Programme on HIV/AIDS.

10. Multidrug-resistant tuberculosis

L.A. Mikhailova, E.I. Skachkova, S.A. Popov, I.M. Son, E.M. Belilovsky, I.D. Danilova

10.1. The indicators used in the Russian Federation for evaluation of the spread of multidrug-resistant tuberculosis

Recently the Russian Federation, like other countries of the world, has been putting major focus on studying the spread of multidrug-resistant tuberculosis (MDR-TB), the disease caused by TB mycobacteria that are resistant to at least two main TB drugs – isoniazid and rifampicin.

MDR-TB requires a much more expensive and long-term treatment with drugs that cause severe adverse reactions. MDR-TB patients need a long-run follow-up, and in most cases social support. Emergence of MDR-TB cases has a significant impact on TB occurrence by accumulation of infection sources in the population due to low treatment effectiveness.

RF regulatory documents traditionally distinguish between primary and acquired drug resistance [34]. Primary drug resistance (drug resistance among new TB patients) is nominally defined as resistance detected in mycobacteria that were obtained from a patient who never received TB drugs or received such medication for less than a month. It is therefore presumed that such a patient was infected with a drug-resistant strain of mycobacteria. The level of primary drug resistance characterizes a part of mycobacteria population that is circulating in an area and is an important indicator in assessing severity of the epidemiological situation. Secondary drug resistance is the resistance acquired by a patient in the course of treatment. It is viewed as an indirect sign of treatment failure. In Russia (and earlier globally) it is considered that the presence of resistant mycobacteria in a TB patient who received treatment with TB drugs for more than one month [63] is a reflection of secondary drug resistance.

In recent years the international guidelines on epidemiological surveillance management refer to primary and acquired drug resistance only for theoretical purposes [63, 73, 95] (see Section 10.6). These concepts are used in research and educational publications, as well as for conducting specific scientific studies that use, for instance, molecular genotyping methods.

As stated above, two indicators are used for epidemiological surveillance: MDR-TB diagnosed in patients with no history of previous treatment or those who were treated for less than 1 (one) month (this clarification means that patients receiving TB drugs for more than one month in theory can acquire drug resistance) and MDR-TB in previously treated or ”retreatment” cases who received medication for more than 1 month [83, 95].

This approach is used because it is difficult to prove the inherent resistance in the patient’s own MbT population, since patients on treatment for more than one month could have already been infected with MDR-TB strains at an earlier stage. In clinical practice acquired DR may be diagnosed if two conditions are met: (1) emergence of TB drug resistance during and after treatment as compared to the pre-treatment stage, and (2) suprainfection (reinfection with DR strains from other patients in a setting with inadequate infection control during treatment) has been excluded by molecular typing methods. The complicated methodology for confirmation of the secondary drug resistance was the reason why the WHO decided against using this concept in its guidelines and statistical reports, in particular, WHO/UNION Global reports on TB drug resistance [73, 83, 95] (see Section 10.6).

Nevertheless, any treatment and especially ineffective treatment increases drug resistance. Therefore, it is quite prudent from the epidemiological and management viewpoint that in Russia the secondary MDR-TB conditionally applies to MDR in previously treated patients and those on treatment for more than a month.

Since 1999, MDR-TB data for the resident population have been registered in the Russian Federal statistical reporting system. In 2005, FSIN reports also started to include MDR-TB data. Initially the overall quality of the reported data was unsatisfactory, and MDR-TB statistical data in the Russian Federation in 1999–2005 were just an approximate reflection of the actual rates, their annual changes and distribution by region. In 2005–2007 activities aimed at improving the quality of laboratory tests, MDR-TB registration and follow-up, as well as harmonization of the laboratory methods with the international standards, resulted in significant improvements of the content and quality of the reported data, as demonstrated by a number of facts in this chapter and in Chapter 12 (on results of the external quality assurance of laboratory testing). Therefore, it can be affirmed that in recent years the information in the reporting forms does not depend to the same extent as earlier on the quality and completeness of MDR-TB case registration and, with certain assumptions, can be successfully used to estimate the prevalence of this TB form in the population. Still, the registered MDR-TB rates in many areas – and therefore in the whole country – may still differ significantly from the actual level of MDR-TB spread in the population.

Along with other countries of the world, Russia traditionally uses “extensive” indicators for TB surveillance, that is, the proportion of notified MDR-TB cases among various TB patient populations (not among the general population). For practical purposes four extensive indicators are used in the Russian Federation:

- the proportion of MDR-TB among all new RTB cases with bacillary excretion, based on Form No. 33;
- the proportion of MDR-TB diagnosed prior to treatment initiation among new PTB patients tested for drug susceptibility (DST), based on Form No. 7-TB data;
- the proportion of MDR-TB diagnosed prior to treatment initiation among PTB relapses tested for drug susceptibility (DST), based on Form No. 7-TB;
- the proportion of MDR-TB among all RTB patients with bacillary excretion who were registered for dispensary follow-up as of the end of a reporting year (Form No. 33).

Analysis of the above extensive indicators is extremely relevant because it helps identify shortcomings in management of new cases and relapses; it can also be used to predict treatment effectiveness and to plan the appropriate management and treatment interventions.

Another important indicator (called the "intensive" indicator) that recently has been increasingly used in the RF [12] is the total number of MDR-TB patients registered by the end of the year,[124]computed per 100,000 population. This indicator is directly related to MDR-TB spread in the population[125] and can be determined only in those countries that, like the Russian Federation, have an efficient system of dispensary follow-up of TB patients, including MDR-TB cases. The value of this indicator and the absolute number of MDR-TB patients are required to estimate treatment costs for this category of patients in every individual entity of the Russian Federation.

Distinct from RF practice, the global estimates of DR-TB spread (e.g., in the WHO/UNION Global project on TB Drug resistance; see Section 10.6) do not use MDR-TB prevalence rates in the population, instead operating with the indicators that determine the proportion of MDR-TB in various TB treatment cohorts.

The current Russian reporting forms provide the data for calculating MDR-TB rates separately for new cases and for TB relapses. However, there is a lack of information for estimating the proportion of MDR-TB among retreatment cases after treatment failure or default, though knowing the specific pattern of DR TB for each separate retreatment patient group is extremely relevant for choosing adequate empiric regimens of treatment [73]. According to publications, MDR-TB rates differ significantly in cases after failed treatment, treatment default or relapse.

In addition to the above intensive indicator related to the reported MDR-TB prevalence, the number of MDR-TB cases among new TB cases (prior to treatment initiation) per 100,000 population has been used lately in Russia for data evaluation. This epidemiological indicator reflects the frequency of occurrence of new MDR-TB cases in the population by MDR-TB transmission, which is a potential result of treatment failure or inadequate infection control measures.

Applicability and relevance of various indicators can be illustrated with a chart (Fig. 10.1).

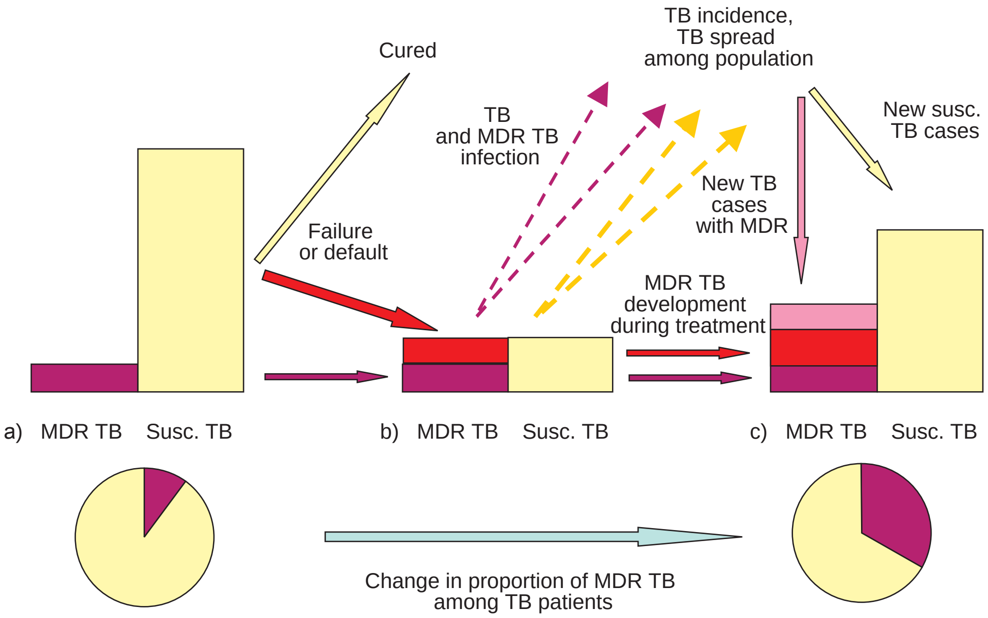

Fig. 10.1 Development of the epidemiological process of MDR-TB transmission in a situation of effective treatment with first-line drugs (a) prior to treatment initiation, (b) first-line drug treatment outcome for patients with drug-susceptible TB, and (c) MDR-TB spread in a population ("susc. TB" means drug-susceptible TB)

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[124] The indicator can be derived from reporting Form No. 33 for the resident population and from Form 4-tub for FSIN populations.

[125] The end-of-year number of registered MDR-TB patients is derived based on DST results derived only for culture-confirmed MbT+ patients. A more accurate indicator of the MDR-TB prevalence requires information on MDR-TB prevalence among TB patients who do not excrete bacilli, but obtaining it at present would be a complicated task. For this reason, and considering a not too high proportion of culture-confirmed TB diagnosis in the RF (42.5%; see Section 2.5), the given indicator only partially reflects the actual MDR-TB rate in the population, yet it shows the main trends to change.

The rate of MDR-TB spread depends on the adequacy of case management and effective infection control. However, the increase in the proportion of MDR-TB can occur not only due to inadequate and ineffective treatment, but also as a result of elimination ("washing out") of drug-susceptible MbT strains from the general TB population when treatment of drug-susceptible TB is successful (Fig. 10.1a and 10.1b). Fig. 10.1b shows that after "drug-susceptible" cases in a given region are cured with first-line drugs, some MDR-TB cases still remain (excluding those who died or were transferred out), and added to them are MDR-TB cases that developed as a result of treatment; the number of those patients depends on treatment adequacy and effectiveness.

Further in the process (Fig. 10.1c), in the absence of appropriate coverage of MDR-TB patients by adequate treatment, high success rate and adequate infection control, new drug-resistant TB cases emerge. This happens in parallel with an increasing number of new TB cases infected by MDR-TB through transmission. TB.

The chart above shows that the indicator "proportion of MDR-TB among TB patients" does not always reflect the true extent of the changing situation. It should be considered in combination with such indicators as the number of MDR-TB patients and the registered MDR-TB prevalence per 100,000 population; they indicate the size of the group that is a source of infection for the general population and can be used to predict further development of the situation.

10.2. Reporting forms used to collect MDR-TB data in the Russian Federation

Information on MDR-TB patients in the Russian Federation is presented in two reporting forms: Form No. 33 and Form No. 7-TB.

Form FSN No. 33 was the main source of MDR-TB data from 1999 until the implementation of cohort analysis was enforced by the Executive Order [35]. The structure of Form No. 33 remained relatively unchanged for many years, allowing for a long-term analysis of the trends in the registered MDR prevalence rate among new MbT+ patients with respiratory tuberculosis (RTB) and among all RTB MbT+ patients who were registered in TB facilities of the RF entities as of the end of the reporting year. The latter indicator, which, as mentioned above, indirectly reflects MDR-TB spread in the population, can be derived only from reporting Form No. 33 (see above in Section 10.1). However, using Form No. 33 for MDR-TB data analysis has a number of limitations.

Until 2009 this form served for estimation of the MDR-TB proportion among RTB cases with bacillary excretion (diagnosed by any laboratory method, without separation of culture-confirmed MbT+ cases). As such, the indicator did not provide for a very accurate characteristic of the MDR-TB spread, since not all MbT+ patients with RTB are culture-tested or have DST results. In 2009, Form No. 33 was supplemented with data on coverage of TB patients with drug susceptibility tests, allowing for calculation of MDR-TB share only for those RTB patients who had DST done. However, currently the quality of these locally collected data is not very high. The existent registration (recording) forms for dispensary follow-up (Form No. 30/4u, which is the main source of information for reporting Form No. 33) do not include information on drug resistance, while the procedure of documenting DST results in Form No. 33 is still under development. Besides, it should be noted that calculation of the MDR-TB proportion is done only for patients with RTB and not for pulmonary TB (PTB) cases, which is an internationally accepted practice.

Another limitation of Form No. 33 is that it contains test results, but the guidance note to the form does not specify at what treatment stage the test is to be performed. Therefore, this reporting form may contain the data not only for new cases with diagnosed primary MDR (i.e., for whom DST was performed prior to treatment initiation or within a month from the start of treatment[126]), but also for cases who were diagnosed with MDR-TB during the on-going course of treatment month after its initiation.

Thus, it is not prudent to use Form No. 33 for the calculation of such epidemiologically significant indicators as the proportion of MDR-TB among new MbT+ cases who never received TB treatment or who were treated with TB drugs for less than a month [34, 95].

Another factor undermining the completeness of MDR-TB data is the time of compiling the report, which is usually at the end of December of the reporting year. This means that MDR-TB patients who were registered as new cases in the last 1–3 months of the given year may be missing in the appropriate section of the report. DR data for these patients would be obtained only in the next year, after submitting the report, because in the RF DST is mostly performed on solid media and the results are reported within 2–3 months.

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[126] According to the WHO guidelines on DR surveillance [73] and the view held by some Russian experts, DST should be performed PRIOR to the current treatment course ("episode"). The condition that the patient did not take TB drugs earlier (prior to DST) or was taking them for less than a month should apply to possible administration of TB drugs that occurred BEFORE the given course ("episode") of treatment.

Since 2005 another sectoral reporting Form No. 7-TB has been used for estimating MDR spread among new TB cases and TB relapses; it was established by the MoH Executive Order [35] and is based on the cohort principle of patient registration. The data in this form allow for a more accurate calculation of these indicators. The form contains information about the number of new PTB cases and PTB relapses who had DST;[127] this number can be used as a denominator for calculating the proportion of these two MDR-TB groups. This ensures that calculation of the indicator is performed in accordance with the internationally accepted approach. Besides, Form No. 7-TB data provide information about the tests on clinical specimens that were collected at month "zero" of chemotherapy, that is, prior to the start of treatment. This is required by the existing guidance note and the structure of registration Form No. 1-TB, which is used as a source for compiling the report. Thus, the obtained data can serve as an accurate indicator of the primary MDR-TB in a given area. The annual reporting Form No. 7-TB containing MDR-TB data is submitted, according to the guidance note, in the second quarter of the year following the reporting year, and unlike Form No. 33, it must document all patients registered during a year and diagnosed with MDR-TB (with specimens collected upon registration).

Thus, the reporting Form No. 7-TB, as compared to Form No. 33, serves as a basis for more accurate and correct calculation of MDR-TB spread among new TB cases, and as such harmonizes the way the required indicators are derived with the internationally accepted standards. However, Form No. 7-TB data (unlike Form No. 33 data) can be used for evaluating the changes in the MDR-TB rates only for the last four years, since it was implemented throughout the RF in 2006–2007. Form No. 7-TB is completed both by the TB facilities under MoH&SD and by the FSIN (see Chapters 1 and 8). However, this chapter will only review the reported data of MoH&SD referring to the resident population. This is explained by a very recent introduction of the reporting Form No. 7-TB in FSIN facilities for collecting the DST results; therefore, more accurate MDR-TB data can be temporarily collected from the established FSIN customized internal forms (see Chapter 8).

In general, for obtaining credible drug resistance data it is essential to ensure reliable performance of the current TB reporting systems, both within the dispensary follow-up system (recording Form No. 30-4/u and reporting Form No. 33) and within the TB treatment control system based on the cohort principles (registration Forms No. 1-TB, No. 3-TB and reporting Form No. 7-TB).

10.3. MDR-TB among new TB cases

The data registered in the Russian Federation show an increasing proportion of MDR-TB among new RTB MbT+ cases since 1999 (from 6.7% in 1999 to 14.4% in 2010,[128] Form No. 33, Fig. 10.2). According to this reporting form, 5,666 MDR-TB cases were registered in 2010 among new RTB patients. The growth of this indicator may reflect not only the rising proportion of TB that is resistant to the main TB drugs, but also the improved performance of the TB dispensaries and laboratories in MDR-TB case registration, that is, improved MDR-TB case finding.

The primary MDR-TB rate calculated for the cohort of new pulmonary TB cases with DST result registered in 2010 (Form No. 7-TB) was 17.3%. For the resident population this rate was 17.1% (5,613 cases among 32,870 patients with DST results, according to the MoH&SD report), whereas for the penitentiary population[129] it was 20.2% (Fig. 10.2). Notably, compared to the nationwide high coverage of MbT+ cases with drug susceptibility testing (93.4%), the DST coverage was insufficient in the areas of FEFD (84.4%) and low in NCFD (76.0%), see Fig. 10.4. The DST was performed in less than 60% of patients excreting bacilli (culture-confirmed MbT+) in the Republics of Dagestan (28.3%) and Kalmykia (54.7%). In addition to the mentioned RF entities, 5 other areas showed DST coverage below 80% (the regions of Kaluga, Leningrad, Volgograd, the republics of North Ossetia and Kabardino-Balkaria). The DST coverage data are missing in the Amur region because in 2010 drug susceptibility testing was not performed there. In addition, the reporting form showed limited information on DST or missing DST results in the Republics of Kabardino-Balkaria and North Ossetia. On the other hand, 28 areas reported 100% coverage of patients with DST, which raises doubts about the provision of correct data for this indicator.

The rates of MDR-TB in new TB cases show significant variation in the areas (Figs. 10.2–10.6). Notably, in the Russian Federation the highest level of MDR-TB has been observed in the areas of Northwest, Privolzhsky

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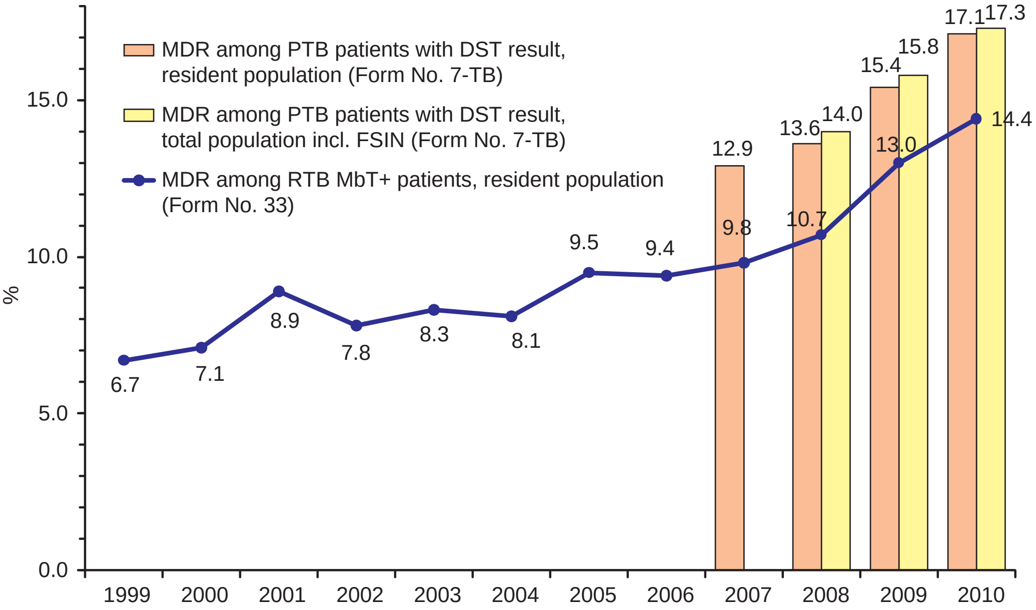
[127] For better accuracy in the calculation it is important that the data show not the number of patients who had DST, but the number of patients with the known DST results.

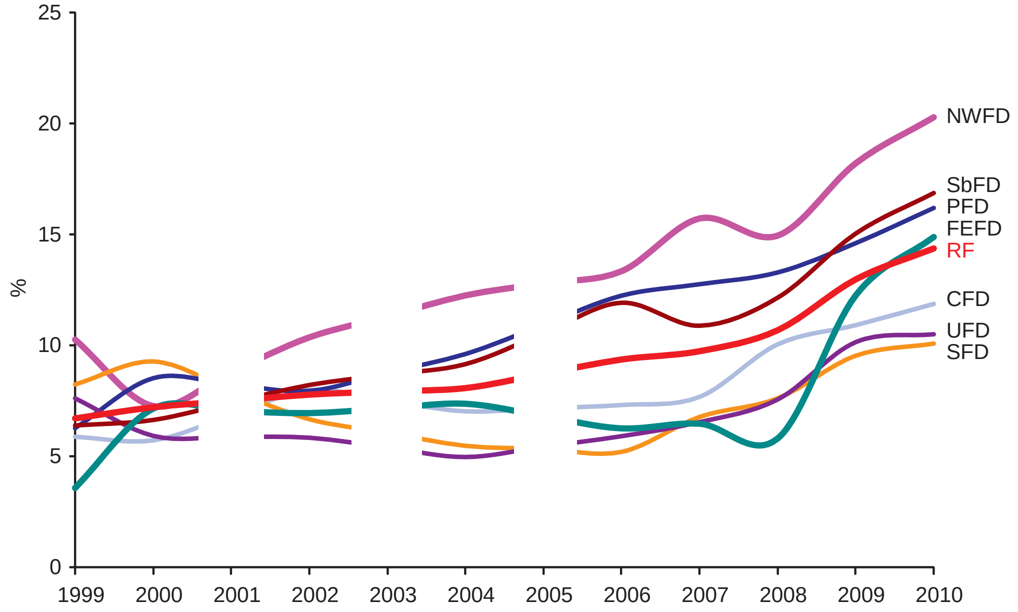
[128] Calculation of the proportion of MDR-TB among new cases with TB of respiratory organs who had DST (which was possible only since 2009, based on Form No. 33) yielded the rate of 18.5%. However, due to the limitations mentioned in the previous section, this rate cannot be used unconditionally for estimating the MDR-TB level among new TB cases. The data in Form No. 33 can be used primarily for assessing a long-term evolution of MDR-TB rates, and for the sake of comparison of 1999–2010 data the proportion of MDR-TB among all MbT+ TB cases is analyzed.

[129] The FSIN report based on the data from 78 entities of the Russian Federation.

and Siberian Federal Districts, where in the last 5–6 years the rates significantly exceeded the national average and fuelled the overall growth of this indicator in the country (Fig. 10.2b). In 2010 the proportion of MDR-TB among new pulmonary TB cases in NWFD, SbFD, FEFD and PFD was 22–25% (24.8%, 18.2%, 21.7% and 19.1%, respectively, Fig. 10.3). A high level of registered MDR-TB in new TB cases is observed in Siberia and the Far East (7.2 and 8.2 per 100,000), indicating a relatively high risk of infection with MDR-TB in these areas.



a) MDR-TB among new cases, the Russian Federation (Source: Forms No. 33 and No. 7-TB)



b) MDR-TB among new RTB cases, Federal Districts[130] (Form No. 33)

Fig. 10.2. The proportion of MDR-TB in new cases. The Russian Federation and the Federal Districts, 1999–2010 (Source: Forms No. 33 and No. 7-TB)

In 26 areas of the Russian Federation the proportion of MDR-TB among new cases with the DST results (according to Form No. 7-TB) is above 20%.[131] The highest rates of MDR-TB in 2010 were reported in the Republics

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[130] The data by the federal districts for 2001, 2003 and 2005 are not given due to considerable impact on the MDR-TB rates of over-reporting in Form No. 33 by the following entities: in 2001 by Krasnoyarsk Krai (fourfold growth in the usual rate during one year), in 2003 by the Volgograd and Chita Regions (excess of 2.5–4 times), and in 2005 by Primorsky Krai and Khabarovsk Krai (excess of 2 and 55 times). Correctness of the registration procedure for the above MDR-TB values in Form No. 33 needs to be checked.

[131] Hereinafter in the text only those areas are reviewed where in 2010 more than five MDR-TB cases were diagnosed among new patients, DST coverage was at least 50% and the share of culture-confirmed diagnosis was at least 35% (the WHO criteria for class B data, see Section 10.6).

of Tyva (46.0%), Sakha (Yakutia) (33.9%), Karelia (27.6%), Khakassia (27.0%), in the regions of Arkhangelsk (35.1), Ulyanovsk (30.2), Pskov (27.9%), Novgorod (26.9%), Leningrad (26.7%), Novosibirsk (25.5%), Samara (25.0%), Kaliningrad (23.9%), Sakhalin (23.6%), Nizhny Novgorod (23.3%), in Khabarovsk Krai (23.4%) and YaNAD (34.5%). The areas in the northwest of Russia are distinguished by a high level of MDR-TB among new cases. Out of the 27 RF entities that reported the highest MDR-TB rates in 2010, 8 are the areas in the NWFD (the district is composed of 10 entities and the Nenets AD).

Fig. 10.5 shows the RF entities that register 80% of the total MDR-TB cases among new MbT+ PTB patients. This information is relevant for planning and adequate funding of TB control programs in the regions, as treatment of new cases with MDR-TB requires considerable funding for procurement of second-line TB drugs and for case management. Six entities in the list stand out as contributors of one-quarter of all new cases with MDR-TB in the Russian Federation who were diagnosed at the time of registration: the regions of Kemerovo, Samara, Novosibirsk, Nizhny Novgorod, Primorsky Krai and the city of Moscow.

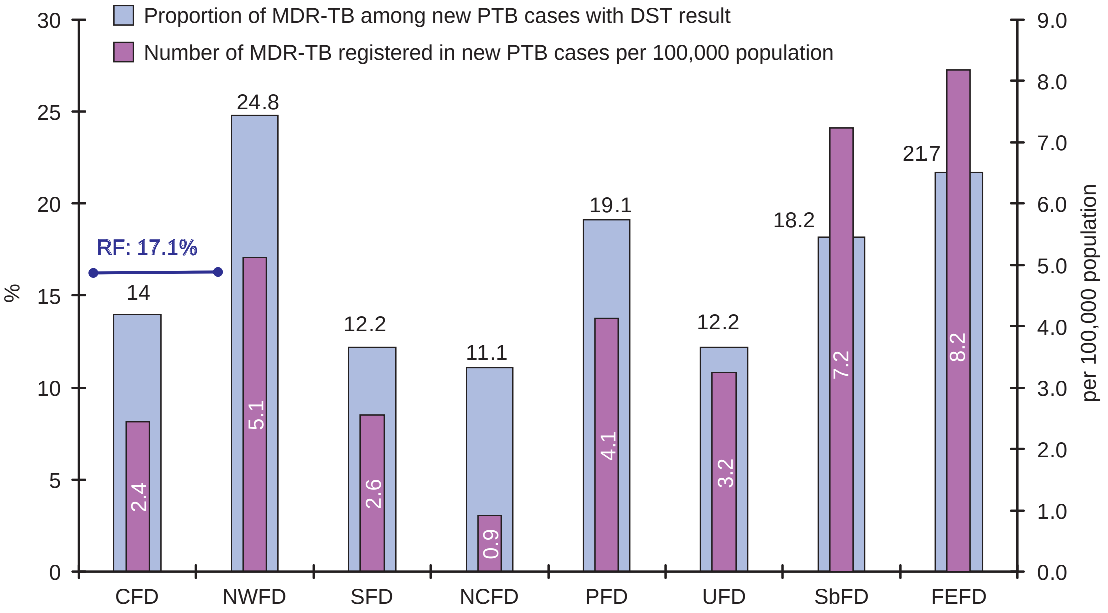

Fig. 10.3. Proportion of MDR-TB among new PTB cases with DST performed, and notified MDR among new PTB cases per 100,000 population, 2010, Federal Districts of the Russian Federation (Source: Form No. 7-TB, population data: Form No. 4)

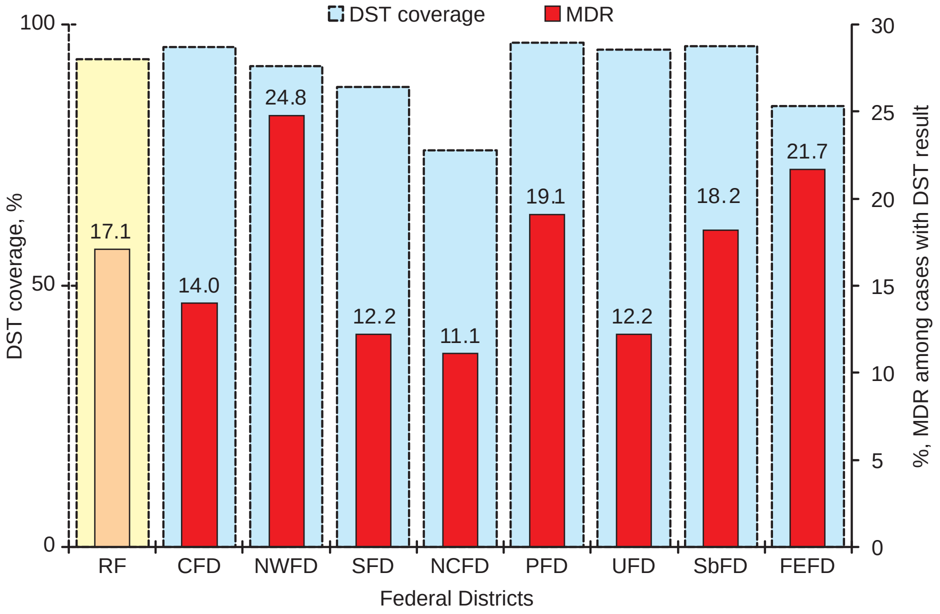

Fig. 10.4. Drug susceptibility testing (DST) coverage of MbT+ cases and MDR-TB prevalence among new pulmonary TB cases who had DST, 2010. Federal Districts and the Russian Federation (Source: Form No. 7-TB)

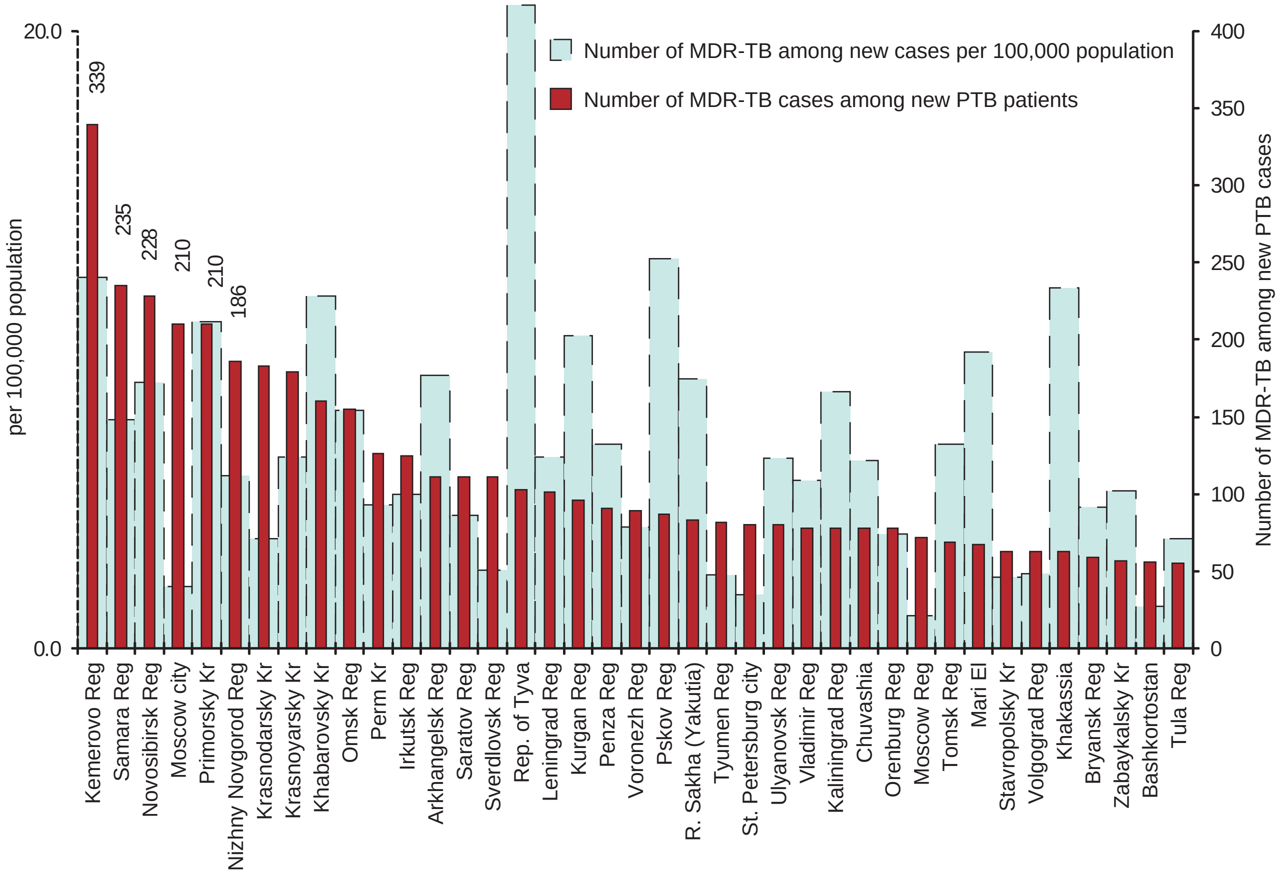

Fig. 10.5. The RF entities that registered the highest numbers of MDR-TB among new PTB cases prior to treatment, including those that account for 80% of all MDR-TB cases among new TB patients in the Russian Federation. The blue columns indicate the number of MDR-TB cases among new TB patients per 100,000 population in the given entities. The numbers above the left-hand columns indicate the number of new MDR-TB patients in the six RF entities that contribute a quarter of such cases in the country, 2010. (Source: Form No. 7-TB)

10.4. Registered MDR-TB prevalence among retreatment cases, including TB relapses

The reporting forms established in the Russian Federation are not only used to determine the level of MDR-TB among new cases; they also allow for the calculation of (a) the proportion of MDR-TB among TB relapses at the time of diagnosis and registration for treatment, (b) the proportion of MDR-TB in all TB cases as of end of the year, and, since 2010,[132] (c) the indicators of patient flows (changing patients' status, such as MDR-TB detection in different follow-up groups, transfers out, death, cured etc.) that can be used for getting an approximate insight into the routes of emerging MDR-TB cases and their removal from registers.

Against a high coverage (over 90%) of TB relapses with drug susceptibility testing, in 2010 the proportion of MDR-TB among them in TB facilities of the Russian Federation was 34.7% (1,921 cases, see Fig. 10.6). For the penitentiary facilities this indicator was 37.1% (512 cases).

A high MDR-TB rate in TB relapses, as compared to the indicator for new cases, may reflect, in particular, a high risk of reinfection with the MDR-TB strains during a previous hospitalization, due to inadequate infection control. However, errors made in classifying previous treatment outcomes cannot be excluded.

As stated above, the spread of MDR-TB among all TB cases in Russia is estimated by the extensive indicator – the proportion of all MDR-TB cases among all RTB patients registered by the end of a reporting year – and also by the intensive indicator, that is, the registered MDR-TB prevalence per 100,000 population.

According to Form No. 33, the number of all MDR-TB patients and their proportion among RTB cases is steadily growing: 31,359 MDR-TB cases were registered in 2010, with their share at 30.3% (Fig. 10.7 and 10.8). There is a considerable variation in the rates by the areas of the country – from 10.7% (the Republic of Adygea)

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[132] Owing to targeted efforts by FHCOIRI, since 2010 it is possible to use the table in reporting Form No. 33, which shows the MDR-TB patients flow. The table data show a more accurate balance between emerging MDR-TB cases and those MDR-TB patients who were removed from the register, both for the RF entities and nationwide.

to 55.8% (the Pskov region) of MDR-TB patients among RTB cases.[133] Half of RF constituent entities report the MDR-TB share from 24.1% to 41.6% (25% and 75% quartiles[134]). The highest MDR-TB rates among all RTB cases (over 45%) have been recorded in the regions of Pskov, Novgorod, Arkhangelsk, Belgorod, Ivanovo, Novosibirsk, Voronezh, Nizhny Novgorod, Kemerovo, Penza and in the Republic of Khakassia.

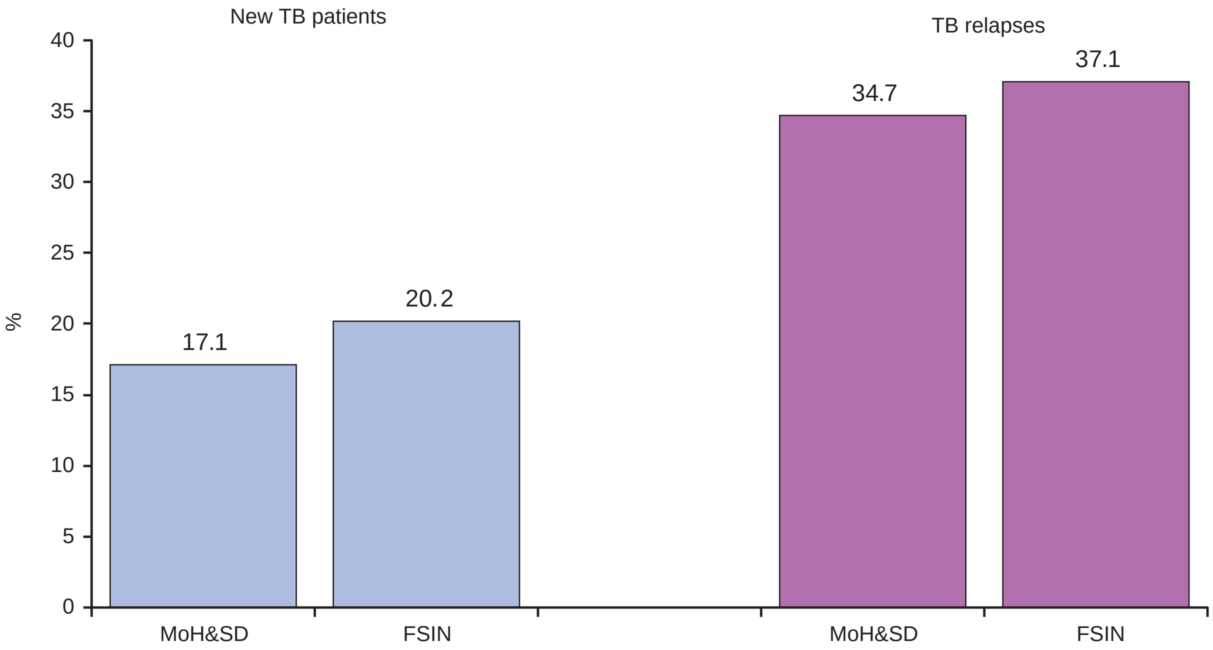

Fig. 10.6. The proportion of MDR-TB among new pulmonary TB cases and relapses who had DST, 2010 (Source: Forms No. 7-TB by two agencies – MoH&SD and FSIN)

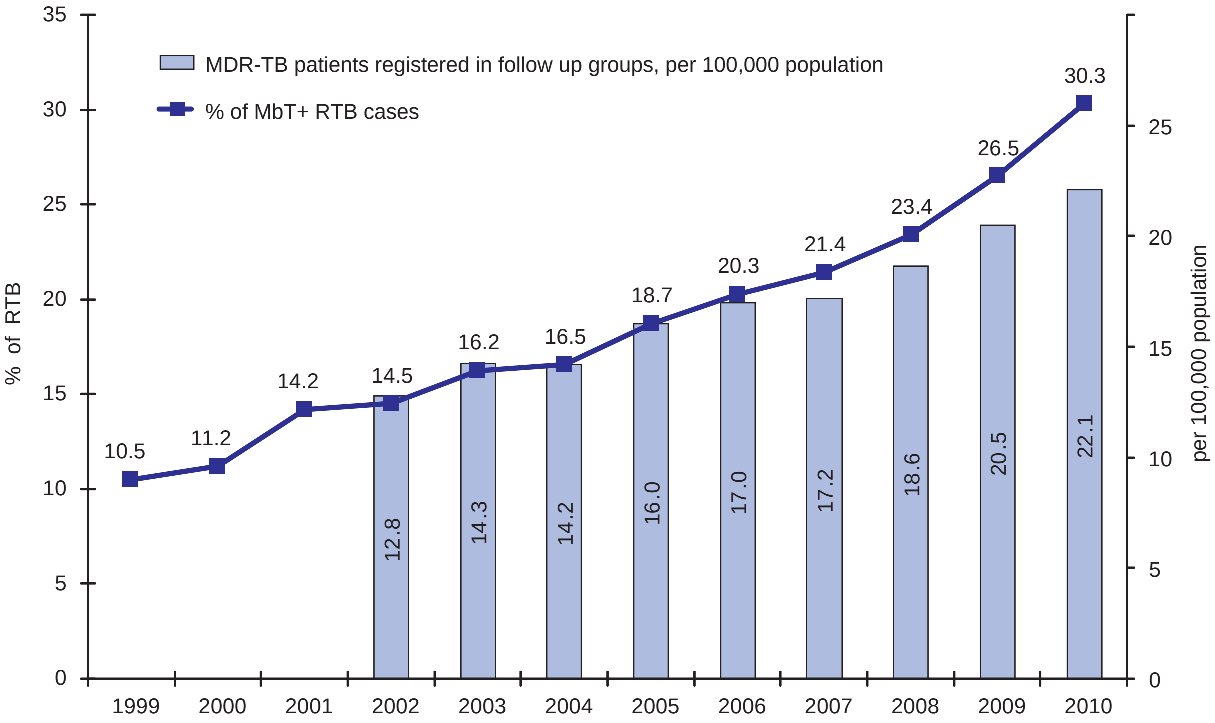

Fig. 10.7. Multidrug resistance in all groups of RTB MbT+ patients with respiratory tuberculosis: the share in RTB patients and the number of MDR-TB cases registered per 100,000 population (the indicator of registered MDR-TB prevalence in the population), the Russian Federation (Source: Form No. 33)

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[133] Excluding the Amur region, the Republics of Kabardino-Balkaria and Chechnya where virtually no DST has been performed in the recent years.

[134] 25% and 75% quartiles indicate the limiting ranges, with values under the limiting ranges registered in 25% and 75% of areas, respectively; that is, the indicator values falling within the 25% and 75% quartile ranges are reported in 50% of RF constituent entities.

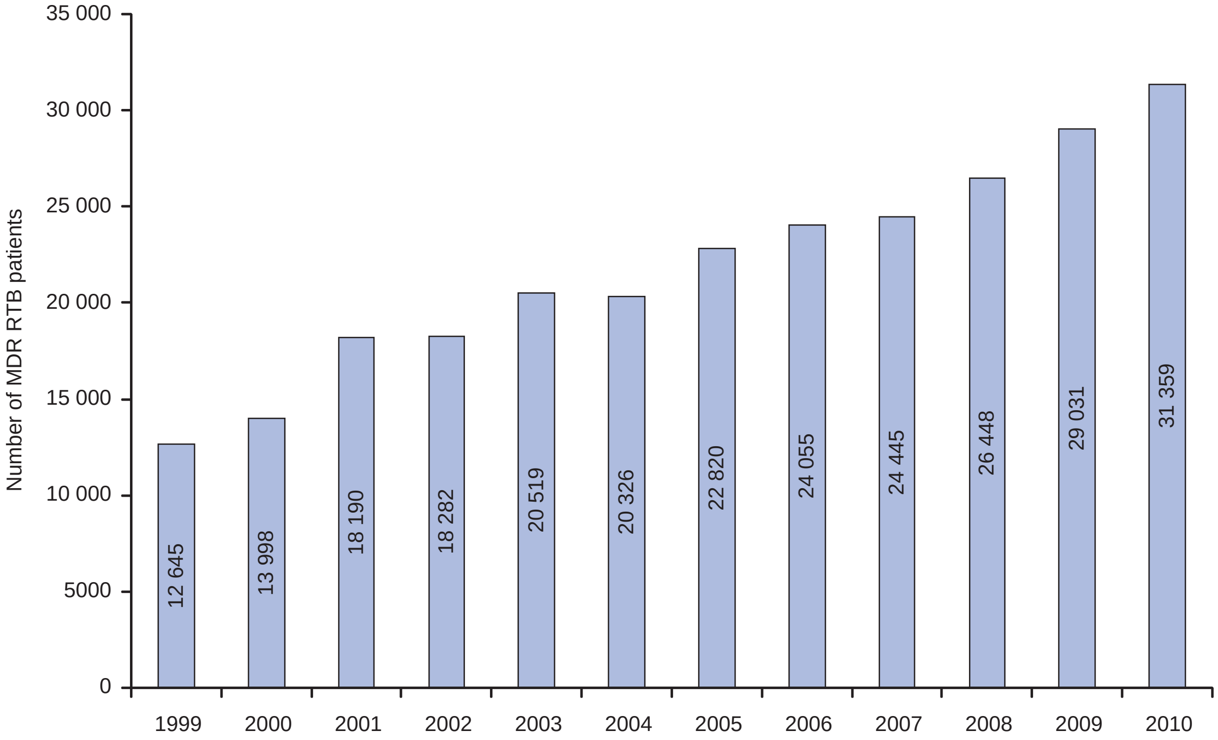


Fig. 10.8. The number of MDR-TB patients and registered MDR-TB prevalence in the Russian Federation in 1999–2010 (Source: Form No. 33)

It should be noted, though, that a large proportion of MDR cases among all groups of TB patients is not necessarily indicative of a widespread MDR-TB infection in the population of a given area. In comparing these indicators reported by different areas one should bear in mind that their value depends not only on the end-of-year registered number of MDR-TB cases (numerator of the indicator), but also on the total number of TB patients in the register, including chronic cases who constitute quite a significant number in certain areas (denominator of the indicator). A high indicator value (proportion of all MDR-TB cases among all registered RTB MbT+ patients) may also characterize effective performance of the laboratory service in detecting MDR-TB. Thus, improving the quality of laboratory diagnosis and enhancing the dispensary follow-up efficiency, including TB case management, simultaneously result in the increasing number of MDR-TB cases and a decline in the total number of MbT+ patients in the dispensary register (including patients with chronic TB forms). This may yield a mathematical growth in MDR-TB among TB patients registered at TB facilities, which under these circumstances is a positive trend. This situation can be observed in the regions of Ivanovo, Arkhangelsk, Tomsk, Orel and in the Republic of Khakassia. For example, over the last three years in the Arkhangelsk and Ivanovo regions the increasing proportion of MDR-TB among RTB MbT+ patients (from 44.6% to 50.0% and from 40.7% to 49.1%, respectively) was observed against a decline in the number of MDR-TB patients (from 262 to 233 and from 259 to 242 cases, respectively) and a dramatic fall in the number of registered RTB MbT+ patients (from 587 to 466 and from 636 to 493, respectively).

Thus, in comparing different areas it is more convenient to use an intensive indicator – the number of registered MDR-TB patients per 100,000 population, which reflects the registered MDR-TB prevalence. In the mentioned Arkhangelsk region with a high MDR-TB proportion (50%) among all patients, which is significantly higher than the RF average (30.3%), the number of MDR-TB per 100,000 population is lower than the nationwide indicator: 18.6 and 22.1 per 100,000, respectively (2010). Notably, against the long-term increase in the nationwide indicator, the region has been recording its steady annual decline over the last five years (from 36.9 in 2005).

A considerable increase in the proportion of MDR-TB among RTB patients in Russia in 2004–2010 (Fig. 10.7) may also be attributed to a significant decline in the total TB populations over these years, which is included in the denominator of the calculation formula for this indicator (see Chapter 4). However, the same figure also shows the increasing registered MDR-TB prevalence per 100,000 population. In contrast, this indicator does not depend on the total size of the TB population. A steady increase is also observed in the total end-of-year number of MDR-TB cases (Fig. 10.8).

The indicators related to the registered end-of-year MDR-TB number also show a significant variation by RF districts and constituent entities. In 2010 the highest proportion of MDR-TB among all RTB patients was observed in NWFD (37.7%), PFD (33.9%) and SbFD (33.6%), and the number of registered MDR-TB cases per 100,000 population (indicating registered MDR-TB prevalence in the population) in the SbFD and FEFD was 40.9 and 32.8 per 100,000 population, respectively (Fig. 10.9).

Fig. 10.10 shows the data from 40 entities of the Russian Federation that account for 80% of all MDR-TB patients registered in the country by the end of 2010. This information is relevant in allocating resources for procuring expensive second-line TB drugs and implementing appropriate case-management activities for these patients.

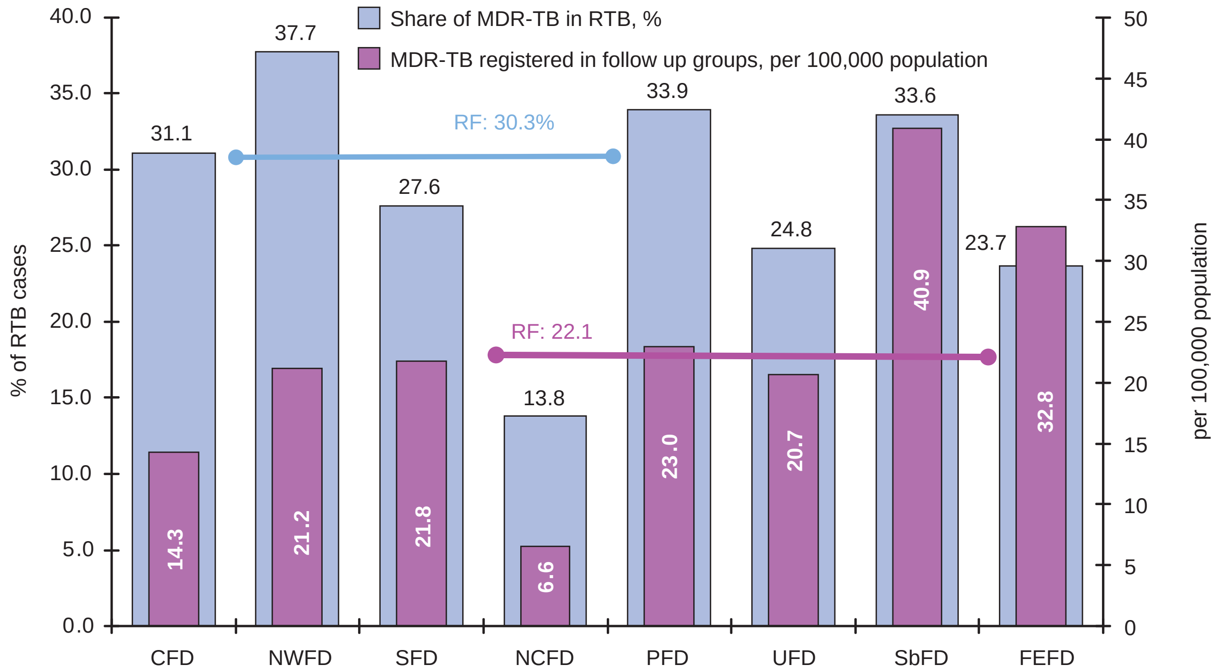


Fig. 10.9. The proportion of MDR-TB among all MbT+ cases of respiratory TB (among RTB groups with bacillary excretion) and the registered MDR-TB prevalence in the federal districts of the Russian Federation, 2010 (Source: Form No. 33, population data: Form No. 4)

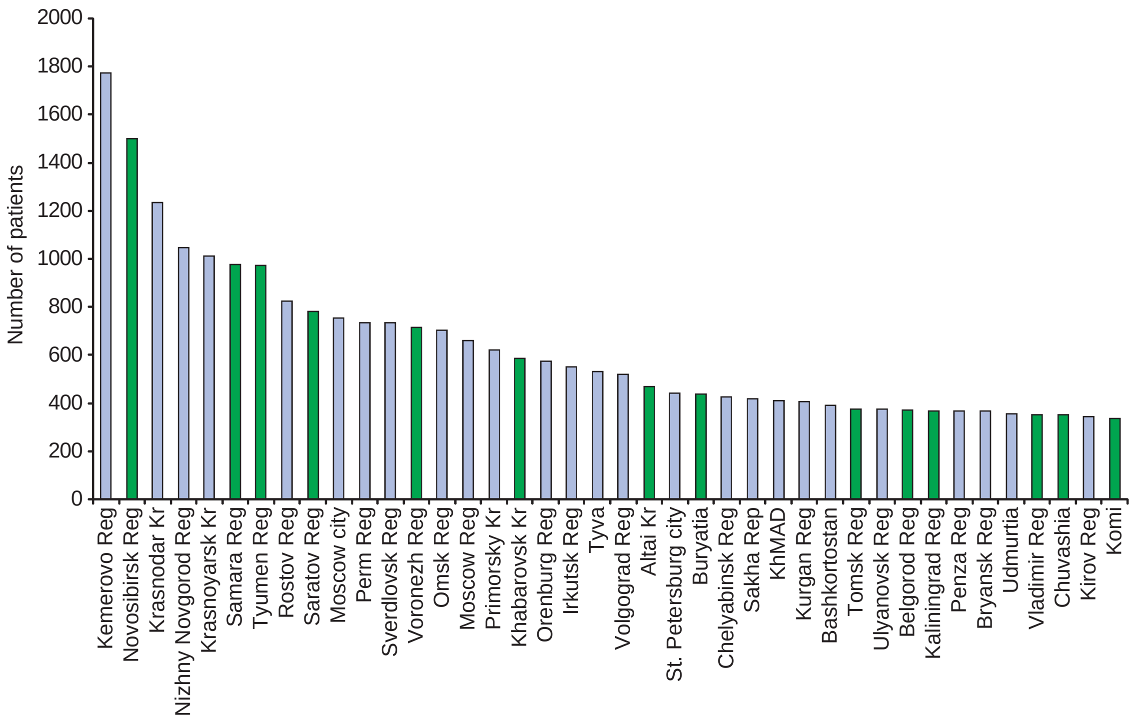
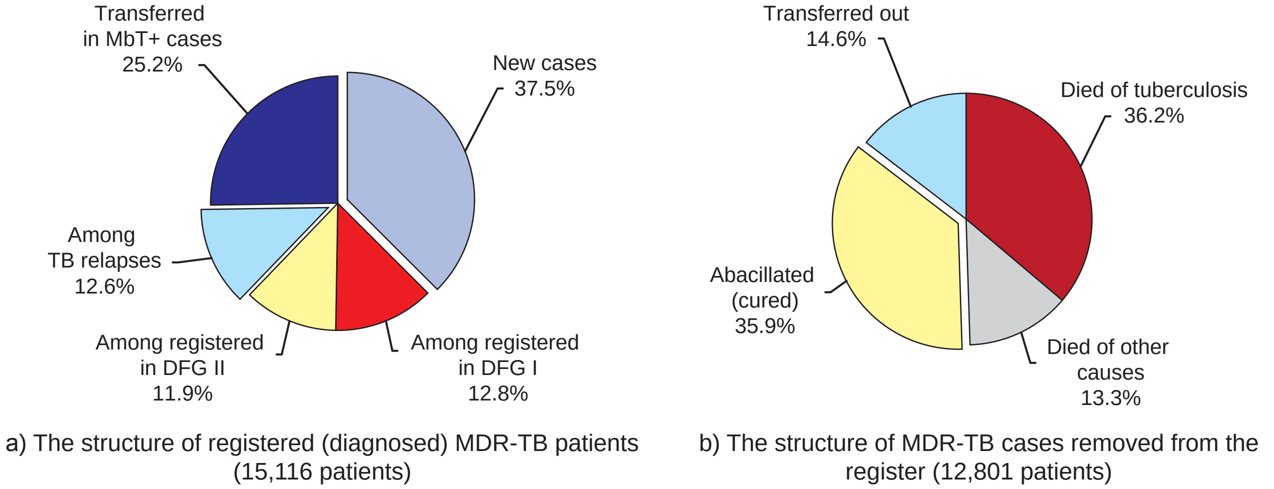


Fig. 10.10. The RF entities with the highest end-of-year numbers of MDR-TB patients in 2010 (80% of all MDR-TB patients in the Russian Federation). The green columns indicate the areas that had their proposals to GLC approved by the end of 2010. (Sources: Form No. 33 for MDR-TB numbers; the WHO Country Office in the RF for data on the GLC processing of proposals)

The green columns in the chart indicate 14 areas (with a total of 8,600 registered MDR-TB cases) whose proposals to procure quality-assured drugs through international facilities were approved by the Green Light Committee (GLC).[135] In addition to the areas shown in the chart, 13 more areas (with a total of 2,351 registered MDR-TB patients) received second-line drugs through the GLC.

Figure 10.11 shows the structure of emerging new MDR cases of respiratory TB and their removal from the register, based on the data of dispensary follow-up (Form No. 33). These data can be used for getting an insight (given the specifics of data entry into Form No. 33, as noted above[136]) of how the MbT+ MDR-TB population is being formed.

In the structure of new MDR-TB cases almost 40% (37.5% in 2010) are found among new RTB patients. About 13% of new MDR-TB cases are those developed in previously diagnosed re-treatment patients, 12% MDR-TB are found among chronic TB cases, and, finally, about a quarter of new multidrug-resistant cases are those detected in transferred-in patients – a phenomenon that requires a special review and research.



a) The structure of registered (diagnosed) MDR-TB patients (15,116 patients)

b) The structure of MDR-TB cases removed from the register (12,801 patients)

Fig. 10.11. Registration (a) and removal from the register (b) of MDR patients with RTB, 2010. The Russian Federation, DFG – dispensary follow-up group (Source: Form No. 33)

Another notable factor is the high fatality rate among RTB MDR cases, with the fatal outcome for 50% of the dispensary MRD-TB follow-up cases; moreover, 36.2% patients died of TB. During 2010 about 4,600 MDR-TB patients bacteriologically converted, which corresponds to 36% of all outcomes.

It should be noted that determination of the indicated outcomes through dispensary follow-up is not based on the cohort principles, and a considerable part of MDR-TB patients remain in the same dispensary registers for years. During 2010, 15,000 and 116 MDR-TB patients were registered and 12,801 patients were removed from the register, i.e., 50% and 40%, respectively, in relation to the number of MDR-TB patients registered by the beginning of 2010 (29,031 patients).

10.5. Review of the changes in the spread of MDR-TB in the Russian Federation, based on the data in federal reporting forms and sectoral statistical data in the periods before and after the introduction of MDR-TB data in the reporting system

As stated above, since 1999 the data characterizing the spread of MDR-TB have been recorded in the national reporting forms of the Russian Federation. According to these data, during the whole recording period a steady growth has been observed in the indicators that define the spread of MDR-TB, raising concerns both in this country and beyond its borders.

However, a high rate of DR-TB spread in Russia is determined by numerous factors, among which are traditional reasons associated with the existent shortcomings in case management in TB treatment, as well as consistently

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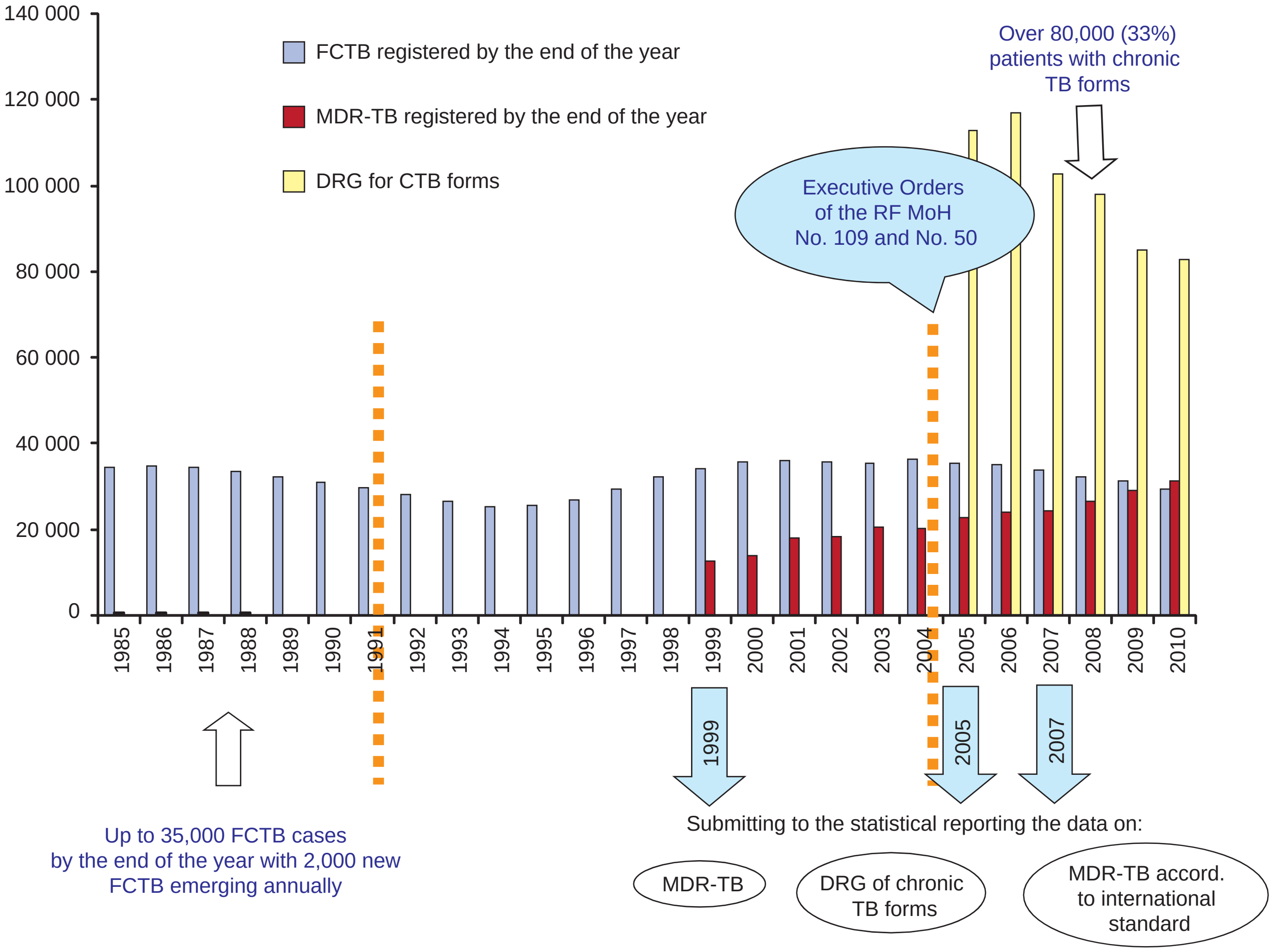
[135] The GLC is a group of independent international experts in the programmatic, scientific and clinical aspects of tuberculosis. One of its aims is to increase affordability of the expensive, quality-assured second-line drugs needed for treatment of MDR-TB cases. Price reduction for these drugs was achieved through close cooperation of the GLC with pharmaceutical companies.

[136] As discussed above, normally Form No. 33 used in RF entities does not include the data on MDR-TB cases that were registered during the last 2–3 months of the year. In addition, the chart shows the proportions of diagnosed MDR-TB cases in new patients and TB relapses, which may include not only MDR-TB cases found at pre-treatment stage, but also those who developed MDR-TB during the main course of treatment.

improving quality of MDR-TB case finding and notification; there are also historic reasons related to the earlier development of a considerable MbT+ population with chronic TB (CTB) forms, with a quite significant proportion of DR-TB and MDR-TB – up to 60–70% – among them [55, 23]. The development and ongoing growth of this massive source of MDR-TB infection is mostly due to inadequate case management and potentially may decrease in size due to both effective treatment and natural decline (deaths and rare cases of spontaneous cure).

The number and proportion of chronic TB forms can be estimated based on the national statistical data only since 2005. Prior to that time the size of the TB population with chronic forms could be provisionally estimated by the number of patients with fibrocavitary tuberculosis[137] (FCTB) registered by the end of the year, as they constitute a considerable part (approximately one-third) of follow-up group of chronic TB cases [57]. In new TB cases the proportion of FCTB in the regions does not exceed 2.5–5%. As FCTB cases were registered long before MDR-TB data were introduced in the statistical reports, this information can be useful for the indirect estimation of both the proportion of CTB forms among TB patients and the spread of MDR-TB, which is presumably associated with CTB forms.

Based on the available indicators and their trends, the changes in the MDR-TB spread in the Russian Federation can be conditionally divided into several stages (Fig. 10.12).



Over 80,000 (33%) patients with chronic TB forms

Executive Orders of the RF MoH No. 109 and No. 50

Up to 35,000 FCTB cases by the end of the year with 2,000 new FCTB emerging annually

Submitting to the statistical reporting the data on:

Fig. 10.12. Changes in the indicators associated with the spread of MDR-TB in the Russian Federation, 1985–2010

Initially, a considerable core of chronic TB patients developed in the late 1970s and early 1980s against the high TB incidence rates reported in the 1960s and 1970s (100 and more cases per 100,000 population [58]), when isoniazid resistance was building up and treatment with rifampicin was limited. By the mid-1980s the FCTB population was as high as 35,000 cases.

The executive orders and methodology guidelines issued by the MoH of the USSR in the 1970s and 1980s included not only the components of the standardized chemotherapy regimens and TB case management (based, among other things, on the DST results), but also emphasized the specifics of management and treatment of patients

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[137] These are the most severe pulmonary TB forms registered in Russian statistical reports. “Fibrocavitary” is defined as tuberculosis with the chronic course and extended lung cavitations and fibrosis – note by the translation editor.

with the CTB forms [33]. By 1994–1995 these measures resulted in the decline of FCTB disease to 25,000 cases, that is, by almost one-third compared to 1985. Meanwhile, there was no information about the spread of DR-TB in the country, as there was no system for DR-TB monitoring in place.

At the second stage – from early the 1990s up to 2004 – the ongoing socio-economic crisis caused significant problems with drug procurement and commitment to treatment by doctors and patients alike [56, 57]: "All performance indicators in the treatment of TB patients remain at a very low level… Deterioration in these indicators is caused by the declining treatment success due to general shortage and lack of full set of TB drugs … as well as inadequate controls over TB case management." The number of FCTB cases grew again during that time period, reaching by 2004 the former level of 35,000 patients.

At that stage since 1999, based on the modified version of reporting Form No. 33, the information on MDR-TB has been collected, including the data on MDR-TB among new TB cases and the end-of-year number of MDR-TB patients registered in follow-up registers. During those years the growing FCTB rate was accompanied by a constant increase in the registered MDR-TB. However, it should be noted that the MDR-TB data available in the reporting forms at that time had limited credibility. This was due not only to inadequate quality of the laboratory diagnosis *per se*, but also by the lack of clear definitions and explicit requirements specified for the MDR-TB data sources and the procedure of entering the DST results in the recording and reporting forms. Nevertheless, during those years relentless efforts were made to enhance the system of DR-TB monitoring and the relevant statistical reporting. Therefore, the increase in the MDR-TB indicators during the 1999–2004 period was due not just to the actually increasing spread of MDR-TB, but also to the significant quality improvement in the registration system for such patients, including registration of MDR-TB.

Individual surveys of MDR-TB prevalence that were conducted in that period showed that rather high DR rates (i.e., exceeding 20% for new cases) were already observed at that point of time in the Russian regions [32, 7].

Caused by significant shortcomings in case management that existed for at least a decade, by 2003–2004 a massive core of the chronic TB forms formed in the country again, underlying, among other things, a grave MDR-TB epidemiologic situation. Thus, the number of registered FCTB patients by the end of 2003 exceeded 36,000 [57].

Starting from 2003–2005, extensive interventions were undertaken in the Russian Federation to enhance the TB control strategies, including MDR-TB control. That stage is characterized by the following events:

- The Executive Orders of the RF MoH No. 109 and No. 50 (2003–2004 [34, 35]) were issued. Along with the dispensary follow-up, their implementation resulted in extensive measures aimed at improving case management, including the use of standardized treatment regimens, directly observed treatment and evaluation of treatment outcomes by the cohort method that requires monitoring of treatment effectiveness with regular laboratory tests and radiological examinations.
- Concerns over the dangers of MDR-TB spread in the country were raised by the Russian MoH&SD, and starting from 2008–2009 considerable funds were allocated for procurement of second-line TB drugs. Prior to that, 27 regional projects were initiated through the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) with the approval of the Green Light Committee (GLC); the projects covered almost one-third of the MDR-TB patients registered in those areas.
- With support from the RF MoH&SD, in 2005–2010 under the International Bank for Reconstruction and Development (IBRD or World Bank) and GFATM projects, laboratory equipment was upgraded in virtually all federal constituent entities.
- Numerous training courses for the regional laboratory personnel were held at the federal level.
- Significant progress was observed in the development of the surveillance system for drug-resistant TB (DR-TB), including in particular:
  - Implementation of the reporting system, which allows accurate estimation of the set of MDR-TB indicators in accordance with international requirements, as well as the proportion of MDR-TB patients receiving appropriate treatment regimens,
  - Launch of large-scale implementation of the federal system for external quality assurance of the laboratory testing ([A4], see Chapter 12),
  - Renewal of the system for external quality control of laboratory performance at the local level that was ensured with methodological assistance from specialized research institutes for laboratories in their region of supervision.

As a result, during that time period a decrease was observed in the size of the bacillary pool (of MbT+ patients) and in the number of patients with chronic TB forms – the potential sources of MDR-TB (see Chapter 4). The system of MDR-TB reporting also improved significantly (see Section 10.6).

Along with the declining numbers of CTB forms, the number of registered MDR-TB patients was still growing throughout the reviewed period (from 16 to 22.1 per 100,000 population in 2005–2010). This is associated with the epidemiological reservoir of MDR-TB infection that was building up for many years and still remains in quite large numbers: over 33,000 (including FSIN) MDR-TB patients registered as of the end of a year, as well as over 82,000 patients with CTB forms, with both registered and yet undetected MDR-TB among them. This large source of MDR-TB keeps MDR-TB in new TB cases at high levels (17.3% in 2010), and at the same time the number of CTB continues to be replenished due to a slowly decreasing proportion of TB cases with treatment failure (Chapter 7).

With this in mind, the implementation of interventions to achieve considerable reduction in the size of the bacillary pool is one of the most important areas in MDR-TB control in Russia. In addition to a natural decline due to deaths or quite rare cases of spontaneous cure, the size of this source primarily depends on two processes (Fig. 10.13):

- replenishment from **new MDR-TB cases** and **patients who failed treatment;**
- decline due to the extensive **coverage** of MDR-TB patients **with effective treatment**.

Thus, Fig. 10.13 shows that (according to Form No. 33 data) during 2010 in the Russian Federation the number of MDR-TB among RTB patients (29,031 patients at the beginning of the year) increased by 15,116 cases, including MDR-TB patients who were registered among new cases, TB relapses, previously treated patients on an ongoing course of treatment and transferred-in patients (see also Fig. 10.11). During 2010, due to cure (bacteriological conversion), transfer in or death, 12,801 MDR-TB patients were removed from the register. This means that the end-of-year registered number of MDR-TB patients is increasing, since the share of cured patients is insufficient in comparison to the new registered MDR-TB cases.

This is explained, in particular, by a still insufficient coverage of MDR-TB patients with adequate treatment by Category IV regimen. With 29,031 MR-TB patients registered at the beginning of 2010, category IV regimen was used for just 13,692 patients (47%). In a number of RF entities (e.g., in the Tomsk region), against considerable coverage (over 50%) of MDR-TB treatment, a high cure rate contributes to a decline in the registered number of MDR-TB cases.

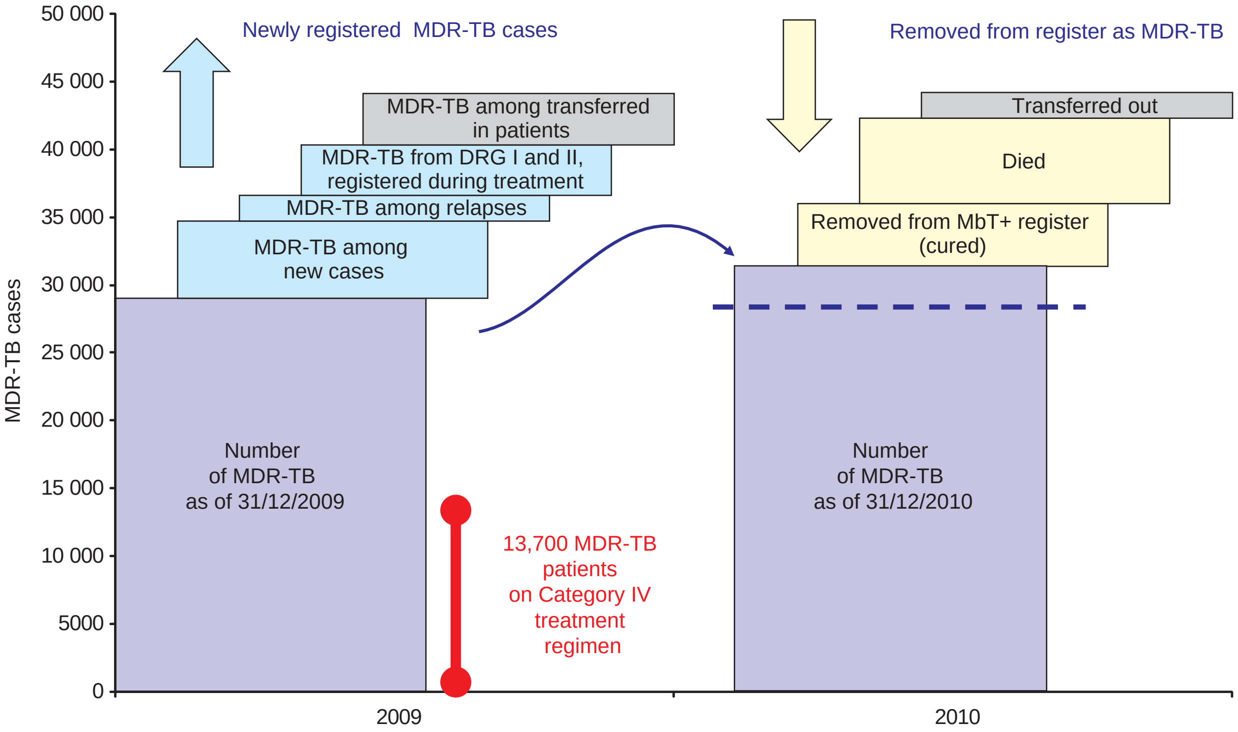

Fig. 10.13. The flow of MDR-TB among RTB patients, the Russian Federation, 2010 (Sources: Form No. 33, Form No. 2-TB for regimen IV treatment coverage data)

MDR-TB treatment coverage is an important indicator that can have the most pronounced impact on a decrease in the main MDR-TB source, and with that, an impact on the improvement of the general situation. At present, in the framework of the Priority National Program (PNP) “Health” and Federal Target Program (FTP) “Tuberculosis,” the MoH&SD of Russia allocated considerable funds for procurement of second-line TB drugs; with adequate drug management at the local level this should change the situation (see the introductory section of the review). It should be noted that the improved quality of the DR-TB recording and reporting system may still have a considerable impact on the current increase in the MDR-TB indicators. This is related to the development of regional DR surveillance systems, improvement of laboratory DR-TB diagnosis, and, finally, to streamlining of the dispensary registration system (review of the populations with CTB forms who are registered in DFG II). The latter has a direct effect on the indicators associated with the number of MDR-TB who are registered by the end of the year at the regional TBDs. However, despite the obvious success that the Russian Federation achieved in the development of DR-TB surveillance, a significant part of MDR-TB cases still remain undetected, which is proved by an insufficient laboratory confirmation of TB diagnosis (see Chapter 2).

Currently, large-scale interventions are carried out in the Russian Federation for the MDR-TB case management, and the national plan of the Russian Federation has been developed to control tuberculosis caused by multidrug-resistant strains (2011–2015); the plan provides for countrywide treatment coverage of 16,000 MDR-TB patients, that is, almost half of all registered MDR-TB patients. Concurrent countrywide actions are being implemented to enhance the DR-TB surveillance system and the system of infection control.

The undertaken efforts may result in two scenarios regarding the development of MDR-TB situation in the country.

Against improved MDR-TB case finding, extensive treatment coverage of MDR-TB patients in line with the MoH&DS plans, and the implementation of infection control measures, MDR-TB indicators may still continue to rise during the next 2–3 years. This will be due to the remaining impact of the accumulated reservoir of infection and to the improving system of recording and reporting for DR-TB. With more MDR-TB patients being started on adequate treatment, the number of registered MDR-TB cases will begin to decline, reflecting the depleting source of infection. Correspondingly, with a delay of 2–3 years the numbers and the proportion of MDR-TB among new cases will begin to decline. Starting from a certain timepoint, the changes in these indicators will mostly be determined by the quality of case management in MDR-TB treatment, rather than the size of the reservoir of infection – the remaining number of CTB forms.

In case of failure to ensure adequate treatment for most MDR-TB patients and address the challenges in the area of infection control, the factors determining the current high indicators will still remain, and the level of MDR-TB will be steadily growing (provided adequate DR-TB surveillance is ensured).

10.6. MDR-TB estimation and notification in the world

During monitoring and evaluation of the spread of drug-resistant tuberculosis, it is considerably more difficult to ensure the accuracy and completeness of the globally collected data than during monitoring of other core TB indicators. The underlying reason is that most countries in the world do not possess either financial or technical capacity for conducting quality-assured DST in sufficient amounts. Therefore, to calculate the indicators of DR-TB spread in the world, the WHO uses not only the information received from a limited number of efficient national DR surveillance systems, but also the findings from targeted DR-TB surveys and the mathematical estimation of MDR-TB prevalence based on specific equations and mathematical models [78, 80, 83].

Initiated by the WHO and IUATLD (“The UNION”), in 1994, the WHO/UNION Global Project on anti-tuberculosis drug resistance surveillance was launched. The goal of the Global Project was to estimate the DR-TB spread (the so-called DR-TB global burden) based on the uniform methodology, thus allowing for adequate comparison of the changes in resistance to TB drugs in various countries and regions. The results of project implementation serve as a basis for evaluating efficiency of the MDR-TB-targeted TB control activities and for studying other related aspects. In the past, the project reports were published approximately once every three years. This was deemed to be a required interval for the countries to organize and perform regular studies. By the present time, four reports were already published (1997, 2000, 2004 and 2008 [63, 95]), as well as the Global Report of 2010 on surveillance and response to MDR/XDR-TB [83], which updated Report No. 4, and the WHO Progress Report of 2011 “Towards universal access to diagnosis and treatment of M/XDR-TB by 2015” [94]. The last two publications not only provided the updates on the global M/XDR-TB epidemic (estimates and registered numbers), but also for the first time included information on progress the countries were making to diagnose and treat MDR-TB cases.

Since 1994, in the framework of the project a total of 119 countries (62% of countries of the world) reported MDR-TB data: 48 countries reported data from their continuous routine surveillance systems of DR-TB, and 71 countries reported data based on periodic surveys of representative samples of TB patients. The remaining 73 countries (38%) are still unable to present reliable and representative information on the spread of DR-TB.

The DR-TB data were included in the report if they were generated in accordance with at least three main principles:

- the reported data are representative of TB cases in the given country or its geographical areas under study;
- the provided information clearly distinguishes DR among new TB cases from DR among previously treated TB cases;
- the laboratory methods used for performing DST are selected from those that are recommended by the WHO, and all laboratories that are involved in data collection are the participants of the quality assurance system in cooperation with partner supranational reference laboratories.

The WHO/IUATLD reports No. 1 to No. 3 included data from 35, 58 and 77 countries of the world, respectively, and Report No. 4 included data from 81 countries and 2 special administrative regions of China. These countries reported 35% of total notified new ss+ (sputum smear-positive) TB cases [95]. The latest report of 2010 [83] updates Report No. 4 with the latest data from 38 countries of the world.

The Global project uses the following three indicators to estimate the spread of MDR-TB in the countries of the world:

- the proportion of MDR-TB cases registered prior to treatment initiation among cases never treated before or treated for less than 1 month;[138]
- the proportion of MDR-TB cases that were registered prior to retreatment initiation among patients who were previously treated for more than 1 month (relapses, retreatment cases after treatment failure or default, and other retreatment cases);
- the aggregate indicator that is calculated as the proportion of MDR-TB cases registered prior to treatment initiation both among new and retreatment cases.

In all cases the number of respective patients with known DST results[139] is used as the denominator.

Notably, according to WHO guidelines [73, 74], in calculating the first indicator (the proportion of MDR-TB among cases never treated before or treated for less than 1 month) the DST results are accepted only for patients with clinical specimens collected prior to treatment initiation. Since most countries lack a system of dispensary follow-up for TB patients, the calculation of MDR-TB spread among patients enrolled for a retreatment course is based on the test results received at the moment of patients' repeated enrolment for a course of treatment, which show the presence of MDR-TB (defined in the WHO reports as "incident MDR-TB case" or "notified MDR-TB case").

Therefore, the Global Project does not generate DR-TB prevalence-related indicators that reflect the total number of MDR-TB patients in the population at the reporting point of time, regardless of whether they were diagnosed with drug resistance within the reporting year or earlier, at the start of treatment or during the on-going course of treatment. Given the lack of data on the total number of MDR-TB patients at the specific (recording) time, it is only possible to provisionally estimate the required amounts of second-line TB drugs for coverage of MDR-TB patients with treatment.

As noted above, most countries of the world either lack countrywide data on the MDR-TB spread among TB patients and have only limited information from some regions of the country, or the quality of their data on laboratory testing is insufficient. This is why the WHO widely uses mathematical estimation to derive the MDR-TB prevalence among TB patients [83, 95, 98].

Estimation of the number and proportion of MDR-TB is made among new cases (never previously treated or treated for less than 1 month), retreatment cases (previously treated for at least 1 month) and among the aggregate number of TB cases. In this case, this is the estimation of the MDR-TB cases derived for the estimated number of TB cases, and not for the notified TB cases (new or retreatment cases).

Since 2009, the estimation of MDR-TB cases has been based not on all estimated TB cases, but on notified TB cases, both new and retreatment. This indicator is more practical to use for estimating the proportion of MDR-TB that the National TB programme was able to detect among the existing TB patients, as a ratio to their estimated number. In addition, since 2010 the estimate of the total annual incident MDR-TB cases per 100,000 population has been in use. (These are not "registered cases" as in the RF, but patients – both new and previously treated – who were enrolled for a new course of retreatment).

Estimation of indicators that characterize the spread of MDR-TB among TB patients was based on the latest DR data obtained in specific surveys or through routine surveillance systems from more than 100 countries. For countries where DR data are collected only at the subnational level, these data were assumed to be representative for the countrywide situation and used for calculations of the nationwide estimate by the special methodology [78, 83].

The WHO global estimate of incident MDR-TB "episodes" in 2008 was between 390,000 and 510,000 cases, with the so-called best estimate at 440,000. Among new TB cases and TB relapses, 360,000 MDR-TB cases were

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[138] In addition to new TB cases or newly diagnosed patients, this number also includes those cases who were registered in the earlier reporting period as TB patients but who never started treatment or were treated for less than 1 month before the clinical specimen was collected for DST.

[139] Initially, in accordance with the protocol [95], sputum smear-positive patients were included in the studies of DR-TB.

estimated (310,000–430,000), and the estimate for acquired MDR-TB that year was 94,000 [83].[140] The proportion of MDR-TB among new TB cases and relapses was estimated for that year at 3.6% (95% CI, 3.0–4.4).

In addition, according to 2009 estimates, there were 250,000 (230,000–270,000) MDR-TB cases among notified TB cases.

The estimated global numbers of MDR-TB (both primary and acquired resistance) in the WHO regions and in the individual countries are presented in Table 10.1 and Figs. 10.14 and 10.15. In addition to the regions, the table provides data for 27 MDR-TB high-burden countries. The WHO defines them as priority countries with regard to necessary improvements in MDR-TB diagnosis and case management. According to the estimates, 85% of the total global MDR-TB cases emerge in these countries.

China and India have the highest numbers of MDR-TB and, according to the WHO 2008 estimates, account for almost half (45%) of the total global MDR-TB cases, or almost 200,000 cases (Fig. 10.14). The Russian Federation ranks third among countries with considerable numbers of MDR-TB patients (8.6% of total global cases). This is obviously related to the high population numbers in these countries, and not just to the high MDR-TB level.

The WHO estimates the prevalence of MDR for the Russian Federation at 15.8% (12–20%) for new cases and at 42.4% (38–47%) for retreatment TB cases. The list of countries with the estimated highest proportions of MDR among new TB cases in the world includes Azerbaijan (22.3%) and the Republic of Moldova (19.4%), and the highest proportion of MDR among retreatment cases is estimated in Lebanon (62.5%), Tajikistan (61.6%), Kazakhstan (56.4%), Azerbaijan (55.8%), the Republic of Moldova (50.8%) and Greece (50%).

In terms of epidemiological danger for the country population, MDR-TB impact (the "local" MDR-TB burden) is better expressed by intensive indicators that are defined as the number of MDR-TB cases calculated per 100,000 population (Fig. 10.14). The MDR-TB prevalence rate derived from the WHO-estimated total number of MDR-TB patients shows high levels in such countries as Tajikistan (58.5 per 100,000 population), the Republic of Moldova (57.8), Kazakhstan (52.2) and Azerbaijan (45.8).

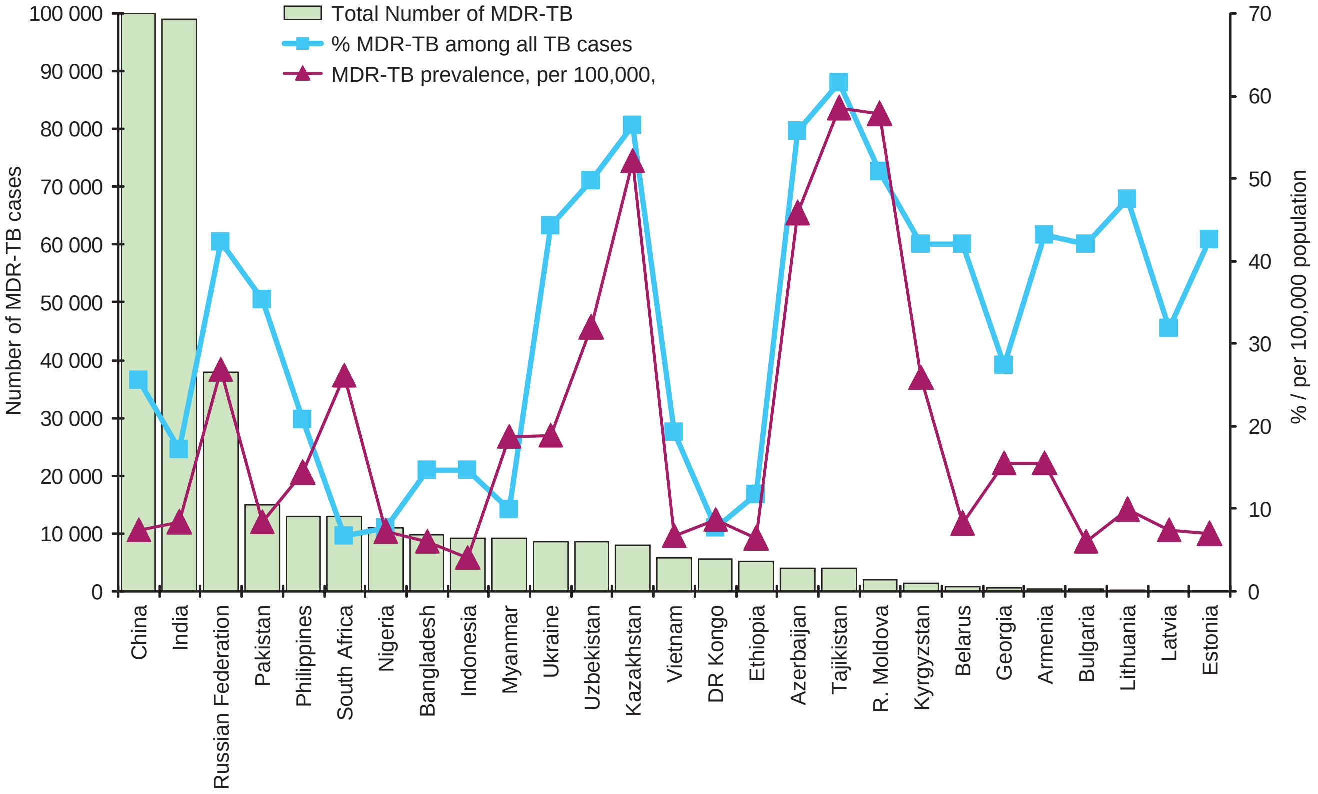

Fig. 10.14. Multidrug resistance among all (new and retreatment) TB cases in 27 MDR-TB high-burden countries, WHO estimates, 2008. The number and proportion of MDR-TB and the number of MDR-TB among all TB cases recalculated per 100,000 population. (Sources: [83], population: WHO data [80])

Overall, 30,535 MDR-TB cases were notified globally in 2009. These cases represent only 9% of the estimated MDR-TB global burden (440,000) of emerging cases. Among new TB cases only 3% of the estimated MDR-TB

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[140] The estimates take into account that previously treated TB cases either may have MDR acquired during the course of treatment or can be infected by an external MDR-TB strain. Therefore, "episodes" of primary MDR-TB among previously treated TB patients are calculated as "episodes" among new and relapse cases and are not counted again in the calculations for retreatment cases.

cases are notified globally, whereas in the Russian Federation the proportion stands at 25%. This reflects a generally insufficient usage of DST in many countries due to the limited capacity of laboratory services, because the private sector is involved in case finding and diagnosis in many countries (e.g., in India), or because public clinics are not supervised by the national TB program (e.g., in China), with resulting shortcomings in reporting. In 27 MDR-TB high-burden countries only 1% of new cases and 3% of previously treated TB cases are covered by DST. Among these countries only a few, including Russia, had a high DST coverage rate of MbT+ patients.

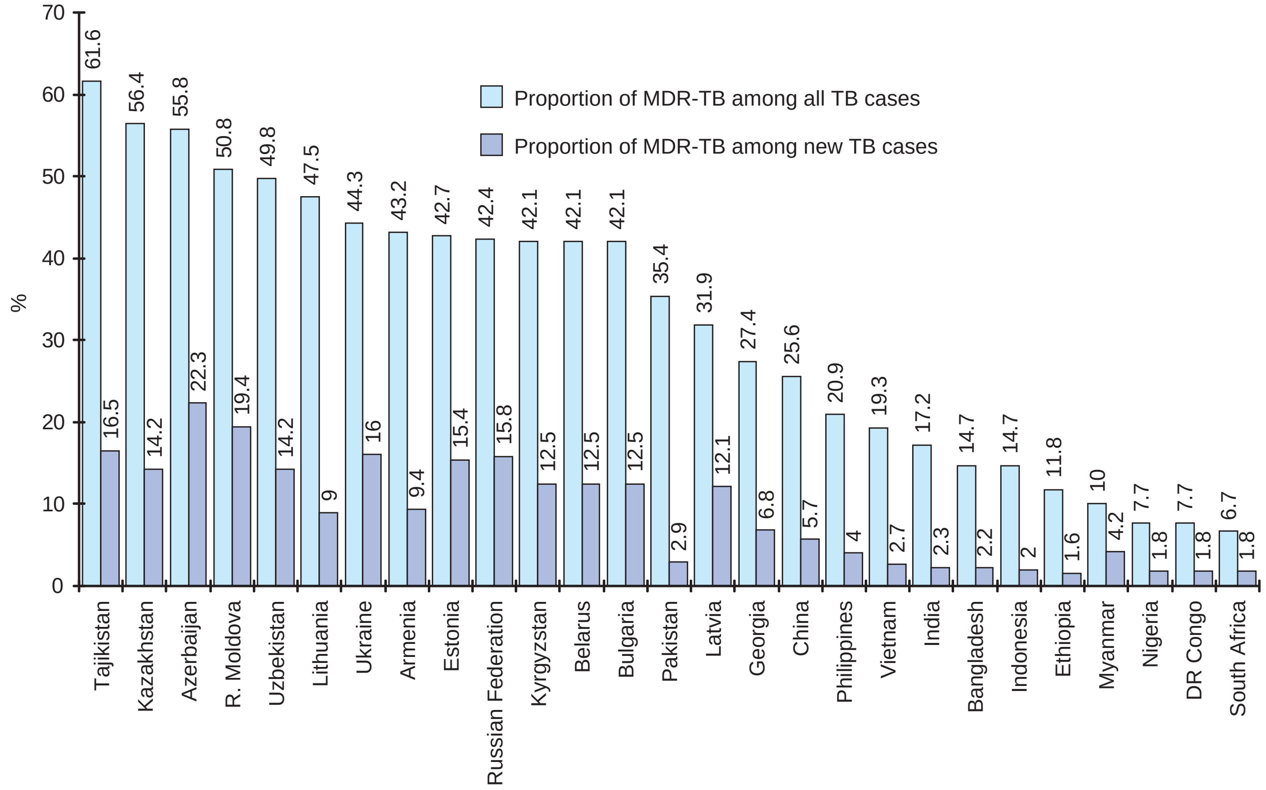

Fig. 10.15. The proportion of MDR cases among new and retreatment TB cases in countries of the world, WHO estimates, 2008 (Source: [83])

As noted above, current WHO Reports provide the estimated numbers of MDR-TB patients among **already notified TB cases**, as well as the share of actually detected MDR-TB patients as a ratio to those estimated numbers. In 2009 out of an estimated 250,000 MDR-TB patients among notified PTB cases only 30,535 (~12%) were detected, and 23,165 (~9%) were enrolled for treatment.

The data reported by the national DR surveillance systems and those obtained in specific surveys in a number of subnational areas demonstrate the following main findings regarding MDR-TB case notification.

Proportions of notified MDR-TB among new cases exceeding 12%[141] were documented in Azerbaijan (Baku city, 22.3%, 2007), Estonia (15.4%, 2008), Kazakhstan (14.2%, 2001), Latvia (12.1%, 2008), the Republic of Moldova (19.4%, 2006), Tajikistan (Dushanbe city and the Rudaki district, 16.5%, 2009), the Ukraine (the Donetsk region, 16.0%, 2006), Uzbekistan (Karakalpakstan, 13.2%, 2002 and Tashkent city, 14.8%, 2005), as well as in 11 regions of the Russian Federation (from 12.9% to 28.3%, 2008).

The proportion of MDR-TB among previously treated TB cases equal to or exceeding 50% was reported in Azerbaijan (Baku city, 55.8%, 2007), Kazakhstan (56.4%, 2001), the Republic of Moldova (50.8%, 2006), Tajikistan (Dushanbe city, the Rudaki district, 61.6%, 2009), Uzbekistan (Tashkent city, 60.0%, 2005) and in five regions of the Russian Federation (from 50% to 58.8%).

In India and China, with almost 100,000 MDR-TB patients in each country, no more than 100–300 patients are notified, and their data are submitted to the Global Report (e.g., in 2007 only 146 and 79 MDR-TB cases were notified, respectively). The Russian Federation has one of the relatively best performing systems for the MDR-TB registration, as compared to the estimated data. The country notifies 24% of the MDR-TB cases estimated among the notified cases. The total number (approximately 37,000) of MDR-TB patients who were registered by the end

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[141] Only the countries that report more than 10 MDR-TB patients annually are reviewed in this and in the following paragraph.

of 2009 both in TB facilities of the RF entities and in the FSIN is close to the WHO estimate of the total number of MDR-TB cases in Russia (38,000).[142]

According to the WHO definitions, the Russian Federation submits to the Global Report the information on notified MDR-TB cases among new patients and those enrolled for retreatment courses, that is, MDR-TB cases registered in the reporting year, excluding those who had been registered as MDR-TB in the preceding years. Until 2009, the RF provided the data for only new cases and TB relapses in the cohort of the reporting year and for those who were diagnosed with MDR-TB prior to treatment (Form No. 7-TB), corresponding in 2008 to 5,061 and 1,899 cases, respectively (6,960 in total) [83]. The data on other retreatment cases diagnosed with MDR-TB (enrolled for treatment after treatment failure, default and transferred in) were not submitted to the Global Report, as they were not documented in the RF reporting forms.

Since 2009, with the improved quality of data on dispensary follow-up of MDR-TB cases in the Reporting Form No. 33 (see above), the Russian Federation began to provide additional information about other retreatment cases diagnosed with MDR-TB (from DFG I and II, and transferred-in cases, Form No. 33). These data are published in the WHO Report as cases with undetermined history of previous treatment.[143] Thus, the Russian Federation submitted to the Global Report of 2010 the 2009 data for 14,686 MDR-TB cases registered during the year [78]; 5,816 MDR-TB registered cases among new cases (including the FSIN) and 2,314 MDR-TB cases that were registered among TB relapses (including the FSIN). The latter two numbers were derived from data on cases diagnosed with MDR-TB prior to treatment initiation in the respective cohorts (Form No. 7-TB).

The challenges arising in the implementation of effective DR control prompted the WHO Global Task Force on TB Impact Measurement to select the development of DR surveillance systems as a priority area in TB control. The latest Global Report on DR-TB (2010) [83] emphasizes the need to establish and develop effective national systems of continuous DR-TB surveillance. This goal was also included in the Resolution of the Sixty-second World Health Assembly (WHA 62.15) in 2009.

Consequently, the given report [83] focuses on the data related to the spread of drug-resistant TB that were documented in the countries of the world through the continuous systems of routine DR-TB surveillance. Notably, the review was performed only for the data of those surveillance systems that met the WHO established criteria for representativeness and quality. Compared to the previous issue, the present report includes the updated information from 30 countries and 3 territories with continuous surveillance systems and from 6 countries that conducted special DR surveys.

Overall, the Global Report [83] included information on the notified MDR-TB cases from almost 50 countries that submit reporting data of assured quality and level of representativeness generated by the national systems of routine DR surveillance (Fig. 10.14). Some countries were represented by selected subnational territories. All selected countries represented only high- and middle-income countries. These countries and territories were categorized into two classes based on WHO criteria.

Class A (high degree of accuracy and representativeness) included countries and territories that have a system of continuous DR-TB surveillance with routine DST for TB patients and that meet the following criteria:

- at least 50% of TB cases are notified, compared to the estimate (new case detection rate of at least 50%);
- at least 50% of the notified cases have positive cultures;
- at least 75% of all cases with positive culture (c+) have DST results available;
- concurrence of at least 95% of results for isoniazid and rifampicin in the most recent DST proficiency testing exercise performed with a supranational reference laboratory.

Countries and territories with Class B data (medium degree of representativeness) included those that have the system of continuous DR-TB surveillance with routine DST for TB patients. These countries/territories:

- do not meet the criteria for Class A, but positive culture (c+) is available for at least 35% of all notified cases;
- have DST results available in at least 50% of all notified cases with positive culture.

Class A data were provided by 30 countries of the world, 2 territories of China and 12 entities of the Russian Federation; and Class B data were provided by 17 countries of the world, including the nationwide data of the Russian Federation and the data from 8 of its entities.[144]

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[142] Such comparison is not entirely correct and can be used only as an approximation. 37,000 MDR-TB patients are registered in Russia by the end of the year, regardless of the year of their registration as MDR-TB cases and of whether they are on treatment. According to the WHO estimate, during 2008 there should have been documented 38,000 MDR-TB cases found in the process of registration for the primary or repeated course of TB treatment.

[143] It would have been correct to report only transferred-in patients (3,814 patients in 2010) as cases with undetermined treatment history.

[144] Initial criteria for selecting the data as Class B were stricter and included, among other things, restrictions related to the degree of accuracy in the results for isoniazid and rifampicin with the data of the national reference laboratory. Therefore, the number of RF territories with Class B data was limited to eight. There are many more entities of the Russian Federation that meet the criteria that were ultimately applied in the Global Report.

Table 10.1

WHO estimates and MDR-TB notification, 1995–2008 [94]

Country	MDR among new TB cases, 2008 (%)	MDR among previously treated TB cases, 2008 (%)	Number of MDR-TB cases, 2008	Per 100,000 population, 2008	Estimated number of MDR-TB among notified pulmonary TB cases in 2009 (A)	DST coverage of new patients (%)	DST coverage of retreatment cases (%)	Number of notified MDR-TB cases, 2009 (B)	Notified MDR-TB cases to the estimate, % (B/A)	Number of MDR-TB patients enrolled on treatment in 2009	Class
All countries	3,3	21	440000		250000			30535	12	23165	
Europe	12	41	81000		50000			13816	28	9568	
Americas	2,1	12	8200		5300			2865	54	3128	
Africa	1,5	6,8	69000		22000			8798	40	6194	
27 MDR-TB high-burden countries	3,9	23,0	380000		220000			25550	12	17234	
China	5,7	25,6	100000	7,5	66000	–	–	474	1	458	–
India	2,3	17,2	99000	8,4	73000	–	1%	1660	2	1136	–
Russian Federation	15,8	42,4	38000	26,9	31000	31%	21%	14686	48	8143	B (2009)
Pakistan	2,8	35,4	15000	8,5	9300	0%	1%	49	1	368	–
SAR	1,8	6,7	13000	26,2	9600	–	–	9070	94	4143	B (2008)
Philippines	4	20,9	13000	14,4	7600	1%	0%	1073	14	491	–
Nigeria	1,8	7,7	11000	7,3	2100	0%	0%	28	1	0	–
Bangladesh	2,2	14,7	9800	6,1	3600	–	–	–	–	352	A (2008)
Indonesia	2	14,7	9300	4,1	6400	–	–	–	–	20	–
Myanmar	4,2	10	9300	18,8	4800	–	10%	815	17	64	–
Ukraine	16	44,3	8700	18,9	7200	36%	>100%	3482	49	3186	B (2009)
Uzbekistan	14,2	49,8	8700	32	2900	3%	30%	654	22	464	–
Kazakhstan	14,2	56,4	8100	52,2	7300	25%	47%	3644	50	3209	B (2009)
Vietnam	2,7	19,3	5900	6,8	3500	–	–	217	6	307	–
DR Congo	1,8	7,7	5600	8,7	2200	–	1%	91	4	176	–
Ethiopia	1,6	11,8	5200	6,4	2000	0%	8%	233	12	88	–
Azerbaijan	22,3	55,8	4000	45,8	2400	–	–	–	–	–	–
Tajikistan	16,5	61,6	4000	58,5	1000	14%	>100%	319	31	52	–
Moldova	19,4	50,8	2100	57,8	1500	34%	68%	1069	72	334	B (2009)
Kyrgyzstan	12,5	42,1	1400	25,9	800	12%	35%	785	98	545	B (2009)
Belarus	12,5	42,1	800	8,3	900	45%	>100%	1342	>100	–	B (2009)
Georgia	6,8	27,4	670	15,6	370	40%	>100%	369	99	266	A (2009)
Armenia	9,4	43,2	480	15,6	180	33%	>100%	156	85	134	B (2009)
Bulgaria	12,5	42,1	460	6,1	420	28%	33%	43	10	43	B (2009)
Lithuania	9	47,5	330	9,9	330	64%	100%	322	98	322	A (2009)
Latvia	12,1	31,9	170	7,5	140	74%	91%	131	92	124	A (2009)
Estonia	15,4	42,7	93	6,9	82	74%	78%	86	>100	86	A (2009)
Other selected countries											
Peru	5,3	23,6	2600	9	2300	3%	19%	1578	70	1856	–
USA	1,1	3,8	190	0,1	91	70%	>100%	115	>100	115	A (2009)
Great Britain	1	6,4	98	0,2	34	56%	45%	58	>100	–	A (2009)
Germany	0,7	11	55	0,1	50	66%	47%	61	>100	–	A (2009)
CzechRepublic	2,1	2,7	20	0,2	11	65%	61%	8	72	–	A (2009)
Israel	3,6	33,3	16	0,2	11	76%	75%	7	62	7	A (2009)

Table 10.2

Countries and territories with national surveillance systems that collect DR data in accordance with WHO criteria for Class A and Class B, 2008–2009 [94]

Country/territory	New cases			Retreatment cases			All TB cases		
	Number of cases who had DST	MDR		Number of cases who had DST	MDR		Number of cases who had DST	MDR	
		number	%		number	%		number	%
CLASS A									
Australia	–	–	–	–	–	–	1056	31	2,9
Austria	265	5	1,9	23	8	34,8	439	22	5,0
Belgium	621	4	0,6	56	3	5,4	774	10	1,3
Bosnia & Herz.	854	0	0,0	66	2	3,0	920	2	0,2
Brunei	164	0	0,0	13	0	0,0	177	0	0,0
China, Hong Kong	2056	15	0,7	234	6	2,6	2290	21	0,9
China, Macao	201	3	1,5	27	0	0,0	228	3	1,3
Greece	413	5	1,2	39	3	7,7	452	8	1,8
Denmark	209	1	0,5	33	1	3,0	242	2	0,8
Estonia	245	54	22,0	62	32	51,6	307	86	28,0
Finland	295	6	2,0	7	0	0,0	302	6	2,0
Georgia	1777	183	10,3	594	185	31,1	2372	369	15,6
Germany	2261	36	1,6	151	15	10,6	2702	56	2,1
Hungary	486	16	3,3	55	4	7,3	542	20	3,7
Ireland	160	0	0,0	12	0	0,0	206	0	0,0
Island	259	5	1,9	6	2	33,3	265	7	2,6
Italy	1051	34	3,2	264	33	12,5	2511	82	3,3
Kuwait	427	9	2,1	1	0	0,0	428	9	2,1
Latvia	618	83	13,4	134	48	35,8	752	131	17,4
Lithuania	1074	114	10,6	404	208	51,5	1478	322	21,8
Netherlands	720	16	2,2	30	3	10,0	760	20	2,6
New Zealand	237	6	2,5	8	1	12,5	245	7	2,9
Norway	210	8	3,8	20	0	0,0	283	8	2,8
Oman	248	4	1,6	7	1	14,3	255	5	2,0
Portugal	1391	13	0,9	148	9	6,1	1539	22	1,4
Qatar	322	3	0,9	0	0	–	322	3	0,9
Serbia	923	6	0,7	130	10	7,7	1058	16	1,5
Singapore	915	3	0,3	85	0	0,0	1000	3	0,3
Slovakia	191	0	0,0	36	1	2,8	235	1	0,4
Slovenia	167	1	0,6	8	0	0,0	179	1	0,6
Sweden	424	8	1,9	35	4	11,4	515	13	2,5
Switzerland	258	3	1,2	34	1	2,9	415	5	1,2
Macedonia	191	0	0,0	28	1	3,6	219	1	0,5
United Kingdom	3957	37	0,9	364	12	3,3	4991	58	1,2
USA	8071	94	1,2	323	19	5,9	8495	114	1,3
CLASS B									
Albania	119	0	0,0	9	0	0,0	128	0	0,0
Armenia	480	80	16,7	200	76	38,0	680	156	22,9
Belarus	2071	280	13,5	1754	558	31,8	3985	867	21,8
Bulgaria	716	12	1,7	128	31	24,2	844	43	5,1
France	1304	13	1,0	106	14	13,2	1564	30	1,9
Greece	140	9	6,4	14	4	28,6	174	14	8,0
Kazakhstan	4140	981	23,7	4413	2329	52,8	9578	3644	38,0
Moldova	1284	289	22,5	1129	780	69,1	2413	1069	44,3
Russian Federation	36888	5816	15,8	6798	2314	34,0	58716	14686	25,0
SAR	–	–	–	–	–	–	84012	8026	9,6
Turkey	3714	99	2,7	599	123	20,5	4313	222	5,1
Ukraine	12007	1437	12,0	6348	2045	32,2	18355	3482	19,0

Table 10.3

Regions of the Russian Federations that meet the WHO criteria for Class A data, 2008

Country / territory	New cases			Previously treated cases			Total TB cases		
	Number of cases who had DST	MDR		Number of cases who had DST	MDR		Number of cases who had DST	MDR	
		number	%		number	%		number	%
Arkhangelsk Reg.	290	69	23.8	68	40	58.8	358	109	30.4
Belgorod Reg.	442	85	19.2	91	47	51.6	533	132	24.8
Bryansk Reg.	549	71	12.9	54	15	27.8	603	86	14.3
Ivanovo Reg.	275	55	20.0	52	30	57.7	327	85	26.0
Kaliningrad Reg.	436	84	19.3	51	22	43.1	487	106	21.8
Mari El	267	43	16.1	53	20	37.7	320	63	19.7
Murmansk Reg.	173	49	28.3	14	5	35.7	187	54	28.9
Orel Reg.	296	16	5.4	29	14	48.3	325	30	9.2
Pskov Reg.	370	101	27.3	44	22	50.0	414	123	29.7
Chuvashia	613	87	14.2	92	42	45.7	705	129	18.3
Tomsk Reg.	424	55	13.0	80	43	53.8	504	98	19.4
Vladimir Reg.	422	59	14.0	55	18	32.7	477	77	16.1

It should be noted that compared to the Fourth WHO Global Report [95], which included the data from only 4 Russian entities (the regions of Orel, Pskov and Tomsk, and the Republic of Mari El), the updated Global Report of 2010 [83] contains the data of as many as 20 RF entities (Class A: the regions of Belgorod, Bryansk, Vladimir, Ivanovo, Orel, Arkhangelsk, Kaliningrad, Murmansk, Pskov and Tomsk, the Republics of Mari El and Chuvashia; Class B: the regions of Ryazan, Vologda, Tyumen, Novosibirsk and Omsk, the Republics of Karelia and Altai, Yamalo-Nenets AD).

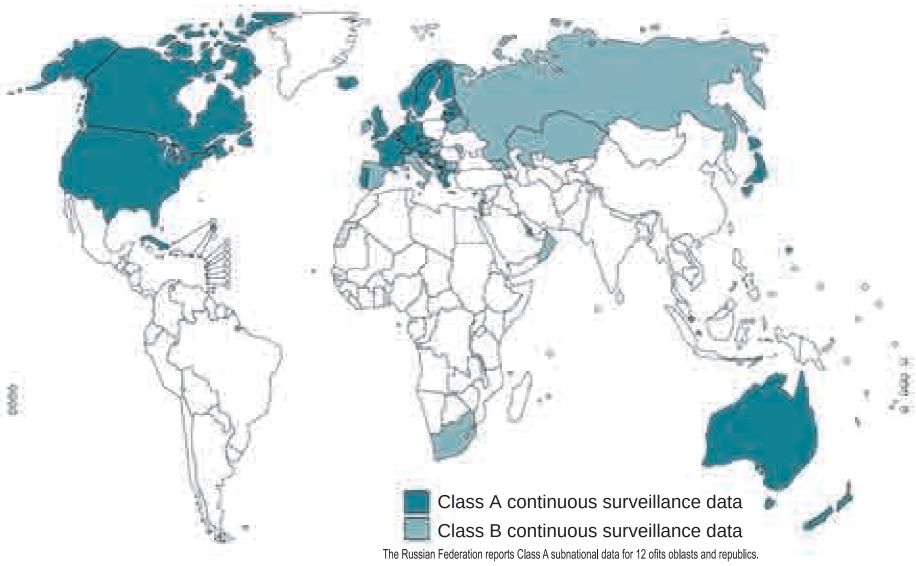
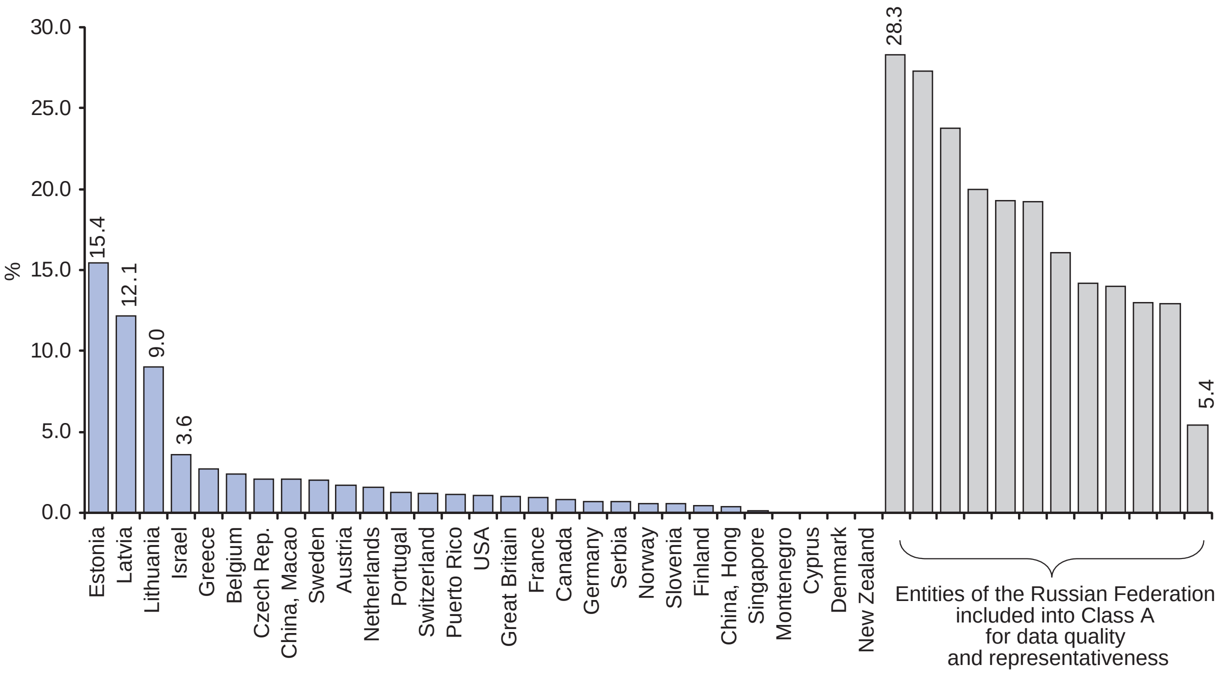


Fig. 10.16. Countries included in the 2010 Global report, WHO [83]. Distribution of the countries with Class A and Class B data, according to the performance of the national DR-TB surveillance systems [83]

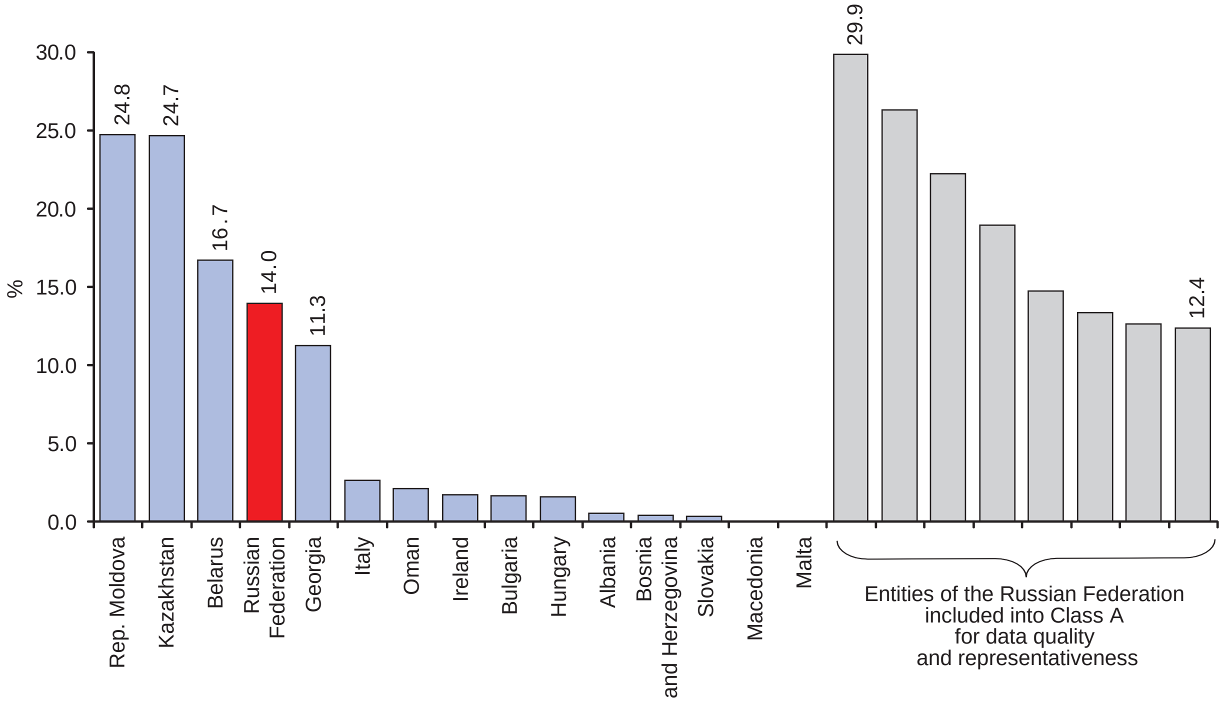
A significant increase in RF entities with the data quality meeting the WHO criteria was noted in the Global Report as considerable progress of the country in the development of the national system of DR surveillance.

Table 10.3 and Fig. 10.15 show the data generated by surveillance systems of selected Class A and Class B countries.

Recently, more attention is given to the emerging dangerous form of drug-resistant TB – extensively drug-resistant tuberculosis (XDR-TB). XDR-TB is caused by *M. tuberculosis*, which, in addition to the resistance pattern characteristic of MDR-TB, are also resistant to any fluoroquinolone and to at least one of the three second-line injectables (capreomycin, kanamycin or amikacin) [9]. Unfortunately, current data on the spread of XDR-TB are limited. By March 2011, 69 countries and territories had at least one notified XDR-TB case. The Russian Federation has not yet included XDR-TB in its reporting forms.



a) Quality and representativeness of Class A data



b) Class B for data representativeness

Fig. 10.17. MDR-TB notification among new cases by the DR surveillance systems in selected countries and territories, 2008 (Source: [83])

According to the WHO report of 2011, 13 out of 27 MDR-TB high-burden countries provided treatment outcomes of MDR patients notified in 2007. The treatment success data range from 25% to 82% (Bangladesh, 82% [352 patients], Georgia, 38% [266 patients], Kazakhstan, 77% [3,209 patients], Kyrgyzstan, 50% [545 patients] and SAR, 42% [4,143 patients]. The recording forms for treatment outcomes are not yet available in the Russian Federation; therefore, no evaluation of treatment outcomes for MDR-TB patients is performed.

Conclusion

The Russian Federation uses a number of indicators that characterize the spread of MDR-TB.

Information on drug-resistant TB from RF territories indicates the need for additional efforts to improve the performance of bacteriological laboratories and streamline and improve the performance of the statistical system for MDR-TB registration and data collection in the regions of the Russian Federation. The implementation of continuous monitoring of the testing quality, data collection quality and follow-up of TB populations in the country are equally important. The quality of information improved due to the implementation in 2006–2007 of a new statistical toolbox that is based, among other things, on the cohort analysis forms. Despite the differences for deriving the indicators, they all show an annual increase in the proportion and number of drug-resistant TB cases in the Russian Federation. The rates of MDR-TB in the RF regions is currently relatively high. The main underlying reasons for the high value of this rate are as follows:

- current shortcomings in case management, especially those cases that were observed in the previous years (see Chapter 7), such as a high rate of treatment default and non-compliance with the standardized treatment regimens;
- significant numbers of registered patients with chronic TB forms in Russian entities (see Chapter 4), resulting from ineffective treatment;
- inadequate infection control at health care facilities and while organizing and performing TB control interventions at the local level.

However, in recent years a number of RF entities have reported a decrease in MDR-TB cases, showing potential capacity for implementing an effective MDR-TB control program in the regions of the country.

11. Monitoring the implementation of measures aimed at improving health care provision to tuberculosis patients, pursuant to the Executive Order of the Russian MoH&SD of 05.02.2010

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In 2010, pursuant to the Executive Order of the MoH&SD No. 61 of 05.02.2010 [36], the Russian Federation introduced the monitoring system to implement the measures for improvement of health care delivery to TB patients. In accordance with the Executive Order, monitoring is carried out based on the data provided by health care authorities of the RF constituent entities that participate in the implementation of TB control activities.

The goals of monitoring are as follows:

- To obtain timely information regarding the implementation of the measures aimed at improving provision of health care to TB patients;
- To analyze and evaluate the results of the implemented measures;
- To detect problems related to the implementation of these measures and elaborate proposals to address them.

Reports on the implementation of measures are compiled by (a) municipal health care bodies that submit them to the health care authority of the respective RF entity, and (b) health care authorities of the RF entities that submit them to the RF MoH&SD. Monitoring is conducted on a monthly basis in accordance with the TB service target indicators, separately for adults and children.

The data are collected by the increment total method as monthly, quarterly, semi-annual and annual reports in accordance with the forms supplementing the Executive Order No. MT-MO "Information on supplies of medical equipment to health care facilities of RF entities and municipal bodies which participate in the implementation of measures aimed at improving provision of health care to TB patients" and No. MT–CP "Information about the main target indicators for activities of health care facilities of the RF entities and municipal bodies participating in the implementation of measures aimed at improving the provision of health care to TB patients."

The data submitted by the RF entities are transferred for validation and processing to the Federal Centre for TB Control Monitoring (FCTBM) at the Federal Research Institute for Health Care Organization and Information (FRIHCOI). The reviewed results are submitted to the Russian MoH&SD and – subsequently – to the chief phthisiatrist (an external consultant) of the Russian MoH&SD.

Upon approval of the Executive Order [36], the actual collection of information started at the end of the first quarter of 2010. This explains why the monthly collection of data started in April, and the data for the first three months were presented as the consolidated quarterly report.

In the first year of implementing the provisions of the Executive Order continuous efforts were made to improve the quality of the reports. In April and May reports were received from 65–70 RF entities, whereas by December all constituent entities of the Russian Federation submitted their reports.

The monthly monitoring generally serves both to provide the latest information that is instrumental for health care authorities in making decisions on TB detection and treatment, and also to evaluate the quality of the federal TB reports that are generated at the end of the year.

Fig. 11.1 and Fig. 11.2 demonstrate the increase in the number of new cases notified within a year in the Russian Federation as an increment total. The curve illustrates quite systematic and timely regional activities for case finding and the resulting generation of the reported data presented in Forms No. 33 and No. 8. Therefore, it may be concluded that the information submitted at the end of the year to federal forms (No. 8 and No. 33) is credible to a certain degree. A similar conclusion can be drawn based on the data changes for TB deaths, cases transferred in from the FSIN (Fig. 11.4 and Fig. 11.7) etc. A gradually increasing number of patients that is derived monthly by the cumulative sum, which concurs with the numbers generated in the national (federal) report after the end of the reporting year, can indicate the systematic epidemiological surveillance activities of regional TB facilities.

On the other hand, an insufficient level of case-detection is observed throughout the year in the entities of the NCFD (Fig. 12d), which warrants a focused review and analysis.

Fig. 11.3 demonstrates changes in the proportion of new TB cases among persons who had diagnostic fluorography examination for TB. The value of this indicator remained virtually unchanged throughout the year, except for December and October.

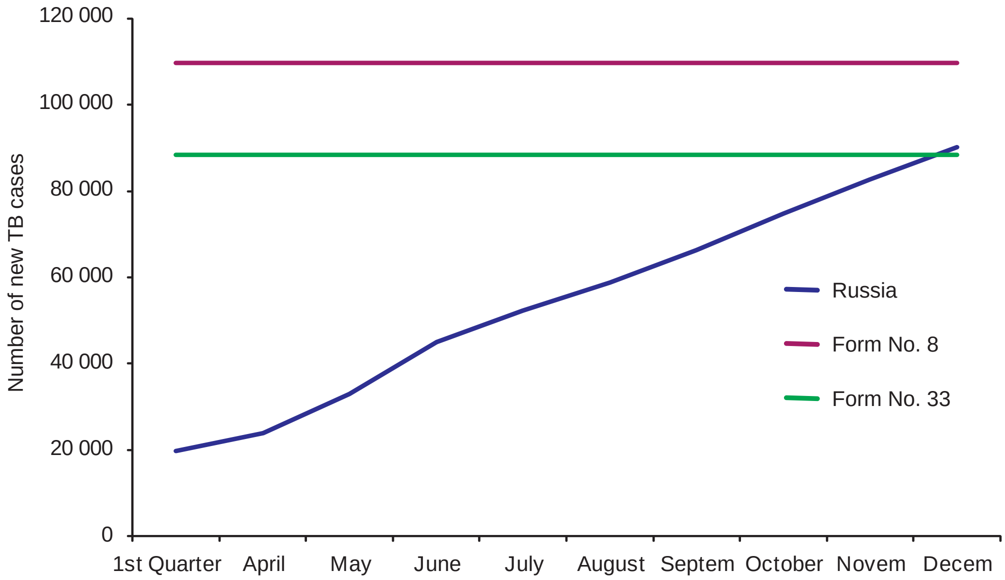
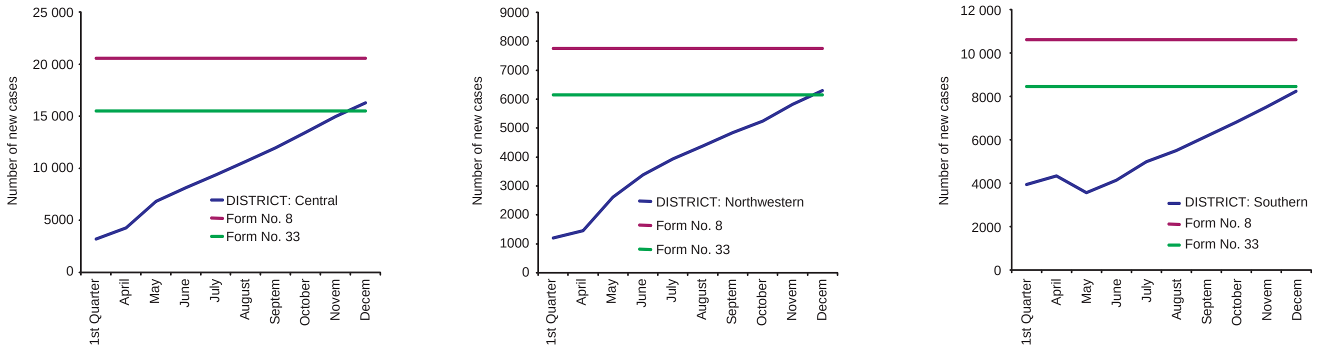


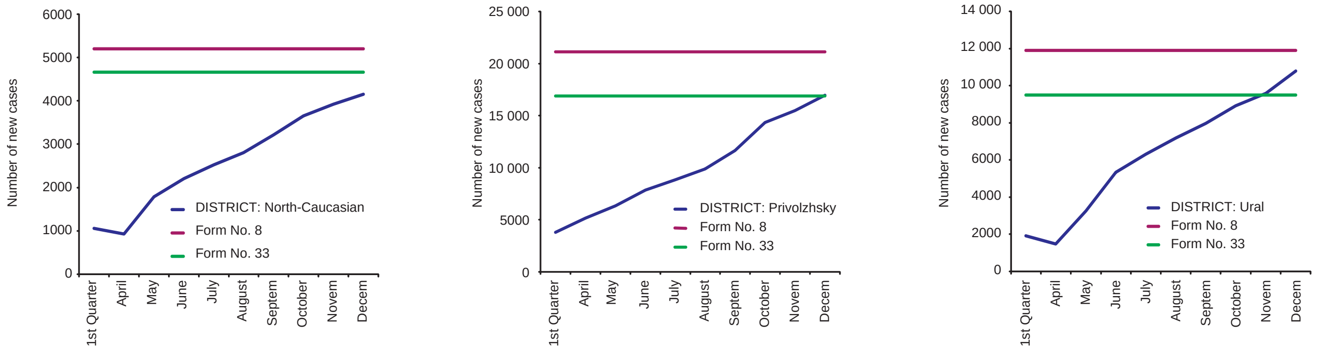
Fig. 11.1. The number of new TB cases notified according to the monthly reporting forms [36], the Russian Federation (Source: Forms No. MT-MO and No. MT-CP [36], FCTBM)



a) CFD (18 constituent entities)

b) NWFD (11 constituent entities)

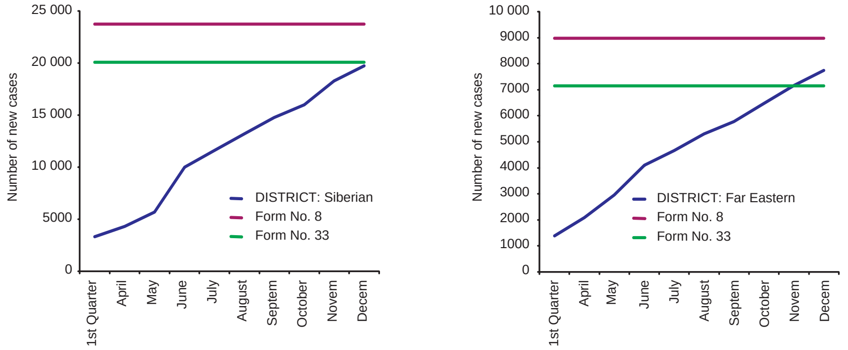
c) SFD (6 constituent entities)



d) NCFD (7 constituent entities)

e) PFD (14 constituent entities)

f) UFD (6 constituent entities)



g) SbFD (12 constituent entities)

h) FEFD (9 constituent entities)

Fig. 11.2. The number of new TB cases notified according to the monthly reporting forms [36], Federal Districts of the Russian Federation (Source: Forms No. MT-MO and No. MT-CP [36a], FCTBM)

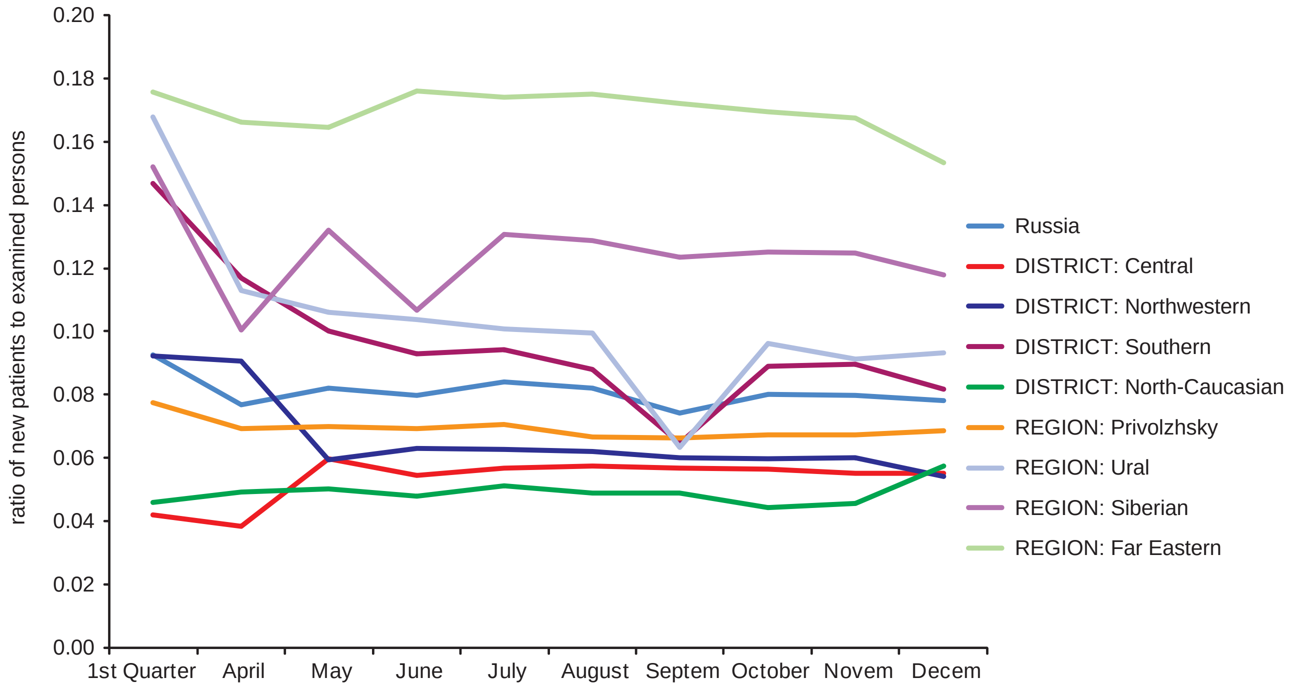


Fig. 11.3 The relationships between notified new TB cases and the number of persons who had TB diagnostic examination by fluorography (covered by X-ray screening), 2010, the Russian Federation
(Source: Forms No. MT-MO and No. MT-CP [36], FCTBM)

Apart from the monthly information, the end-of-year monitoring data are also used for evaluation of the data completeness in the annual federal reporting forms. Thus, for instance, clarification is needed regarding the monitoring findings on proportion of fibrocavitary TB (FCTB) among new TB patients in the CFD, UFD, SbFD and FEFD that are considerably higher than the data in Form No. 33 (Fig. 11.8).

The conducted monitoring allowed for the assessment of coverage with first- and second-line TB drugs. Fig. 11.5 and Fig. 11.6 demonstrate the proportion of RF entities and individual Federal districts that, according to the reported data, have coverage with TB drugs corresponding to the required amounts at the level of below 50%, 50–79%, 80–99% and 100% and more. Due to insufficient clarity in the guidance document on entering data in this section of the reporting forms,[145] the figures demonstrate approximate information, yet it reflects the general situation with the activities of RF entities in procuring first-line TB drugs and in distributing second-line TB drugs that they receive through the federal procurement system.

The charts show that 72% of federal entities have coverage of TB patients with first-line drugs at 80% and higher, yet for second-line drugs this level of coverage is achieved only in 62% of RF entities. Moreover, a particularly challenging situation is observed in SFD regarding first- and second-line TB drugs (with the respective 40% and 20% of district entities having less than 50% coverage with the required TB drugs); in NCFD with first-line drugs (14% of entities with less that 50% coverage with the required TB drugs); in PFD and FEFD with first- and second-line drugs and in SbFD with second-line drugs.

Therefore, the data obtained through monitoring are used for taking timely measures to streamline TB drug supplies at the level of the RF entities.

The first results of TB monitoring implementation pursuant to the Executive Order No. 61 of the RF MoH&DS allow drawing the following conclusions:

- In general, the monitoring findings reflect the actual situation of TB and in the future will provide the latest information regarding TB case finding and treatment and facilitate a timely response to emerging challenges.
- In a number of RF entities the monthly data collection from municipal heath care bodies is not operational.
- Efforts should continue to improve the reporting forms with their accompanying guidance documents used in the monitoring system.
- The monitoring data revealed certain shortcomings in the management of TB case finding, supplies of TB drugs funded from the budget of some RF entities, and production of the annual reports on TB.

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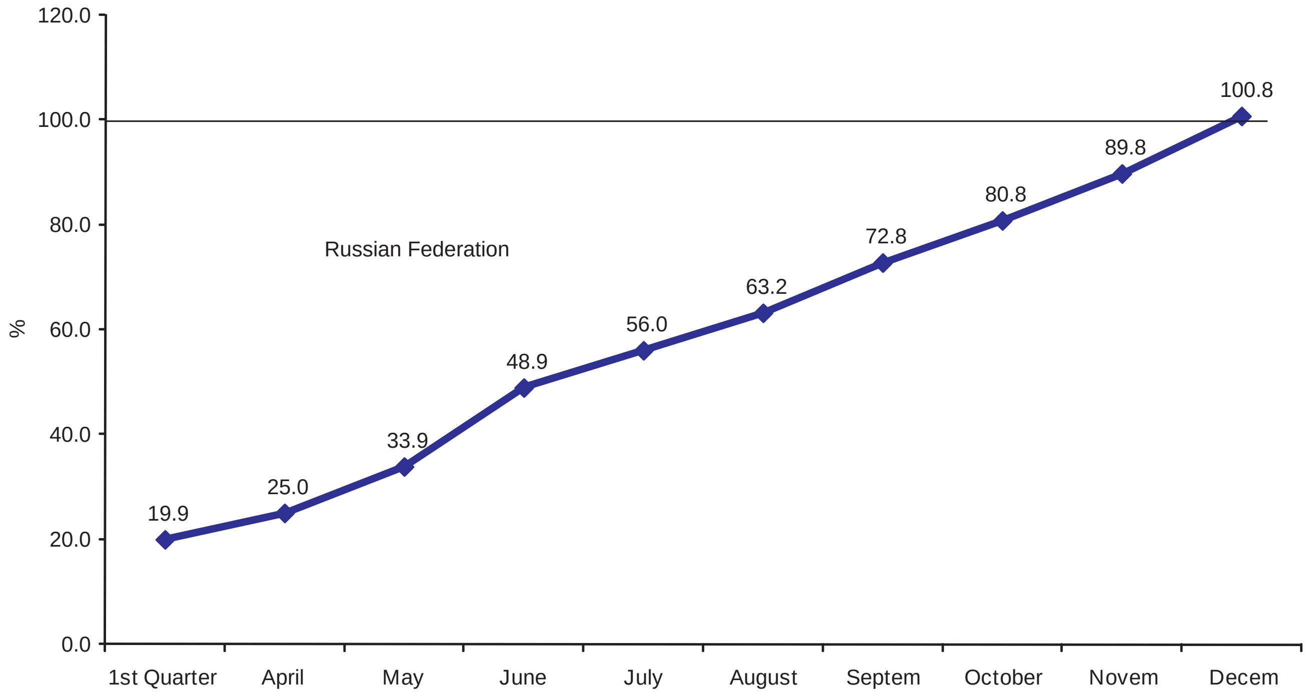
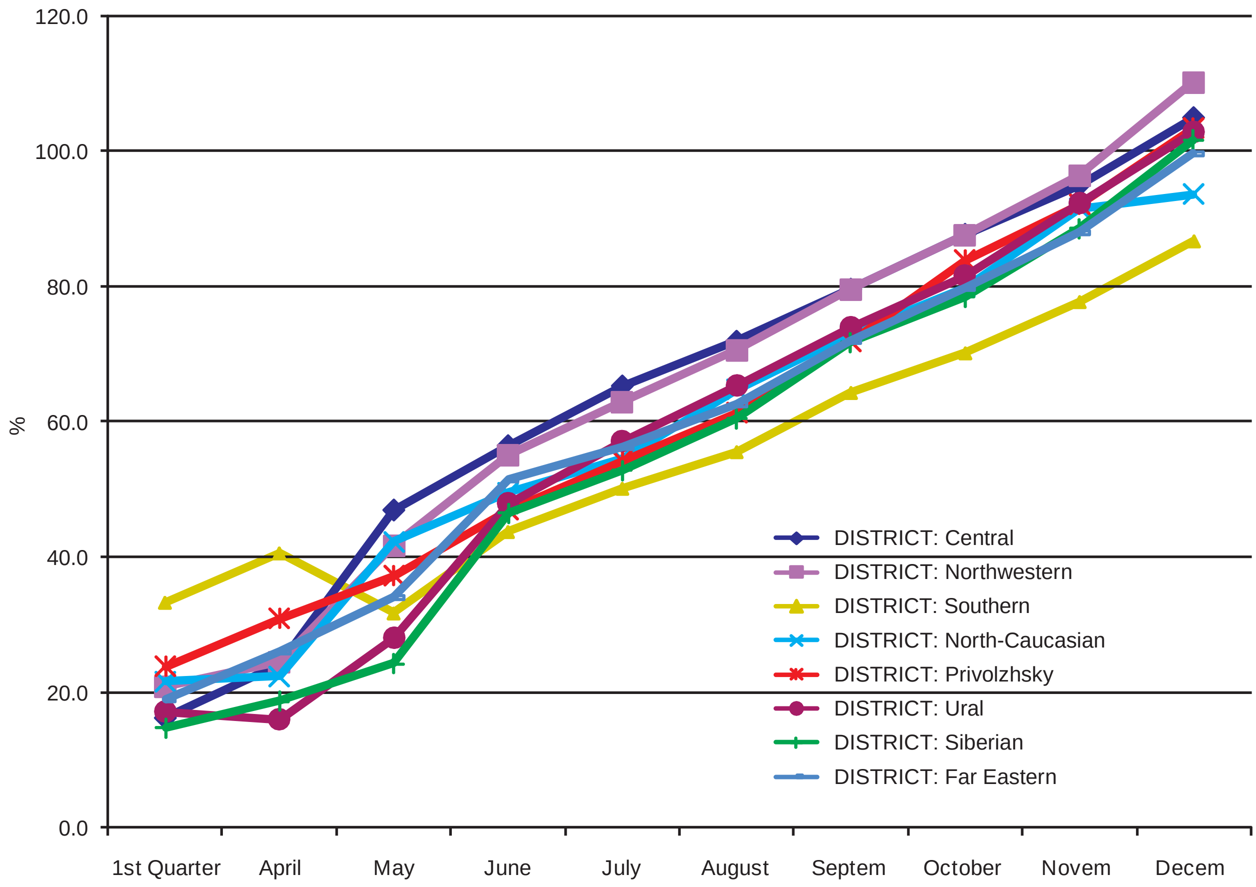
[145] The RF entities submit the data on the coverage with first- and second-line TB drugs in percentages, derived by the specific methodology; however, this methodology is meant for calculating requirements separately for each drug. Therefore, with varied coverage for different drugs, the data represent an estimate rather than an accurate calculation.



a) the Russian Federation



b) the Federal districts

Fig. 11.4. Changes in the number of notified TB deaths within a year, according to the monthly monitoring data; proportion (%) of the sum of TB deaths and TB deaths among persons not registered in regional TB facilities registered in reporting Form No. 33 by the end of the year, 2010, the Russian Federation
(Source: Forms No. MT-MO and No. MT-CP [36], Form No. 33, FCTBM data)

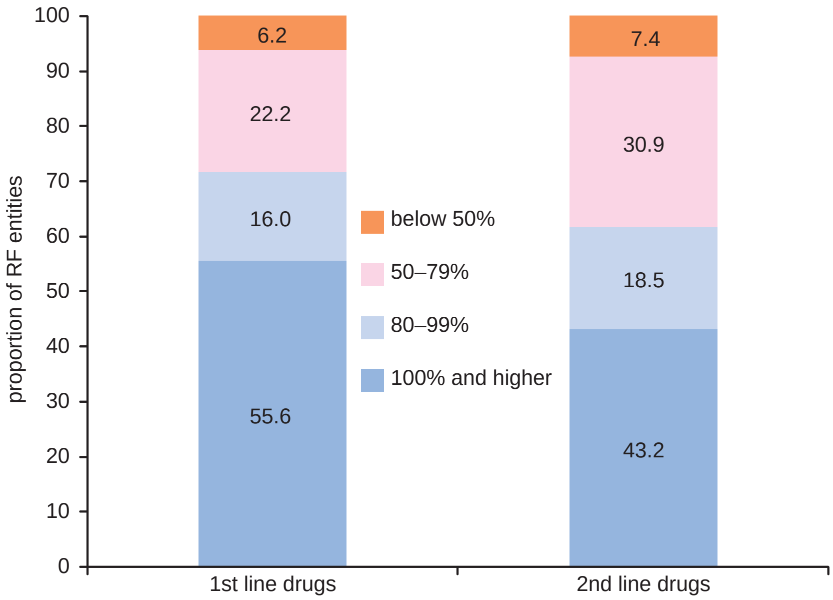
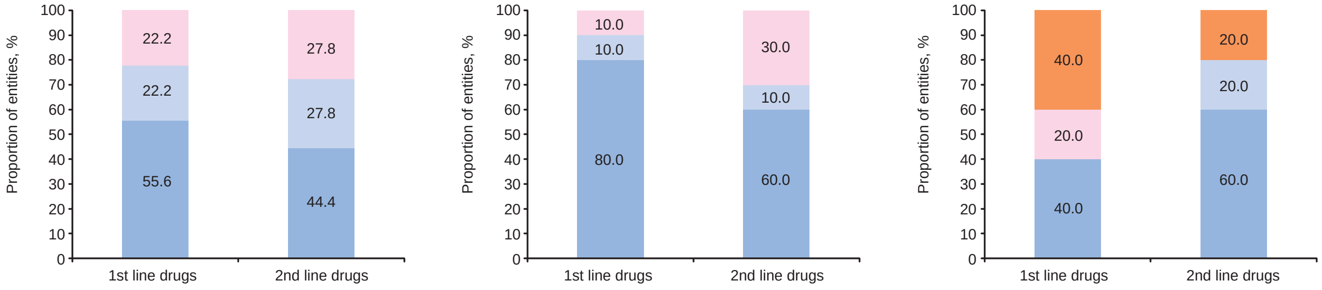


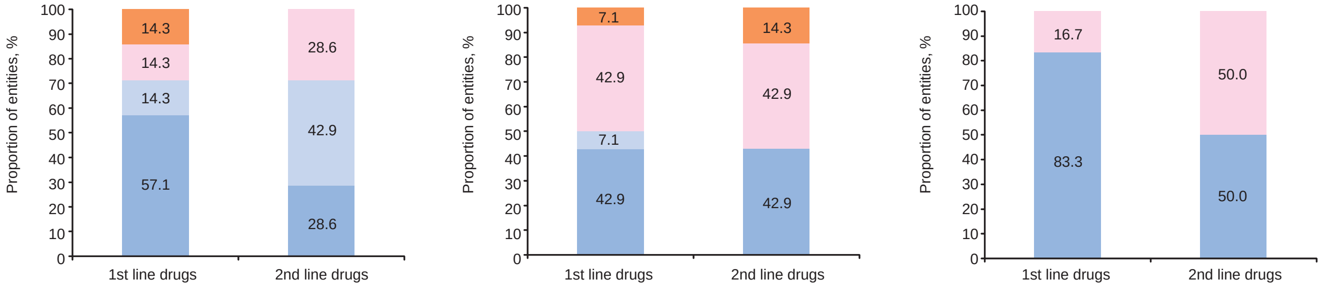
Fig. 11.5 The coverage of RF entities with first- and second-line TB drugs (as %, by the calculation methodology), 82 constituent entities, 2010 (Source: Forms No. MT-MO and No. MT-CP [36], FCTBM data)



a) CFD (18 constituent entities)

b) NWFD (11 constituent entities)

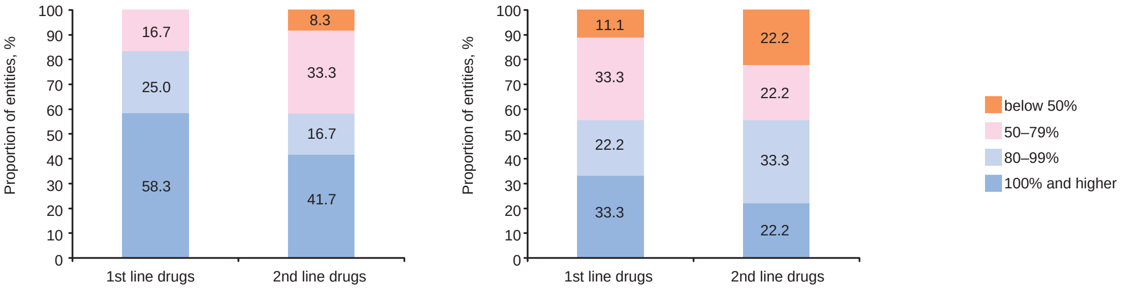
c) SFD (6 constituent entities)



d) NCFD (7 constituent entities)

e) PFD (14 constituent entities)

f) UFD (6 constituent entities)



g) SbFD (12 constituent entities)

h) FEFD (9 constituent entities)

Fig. 11.6. The coverage of the entities in federal districts of the Russian Federation with first- and second-line TB drugs (as %, by the calculation methodology), the Russian Federation, 2010 (Source: Forms No. MT-MO and No. MT-CP [36], FCTBM data)

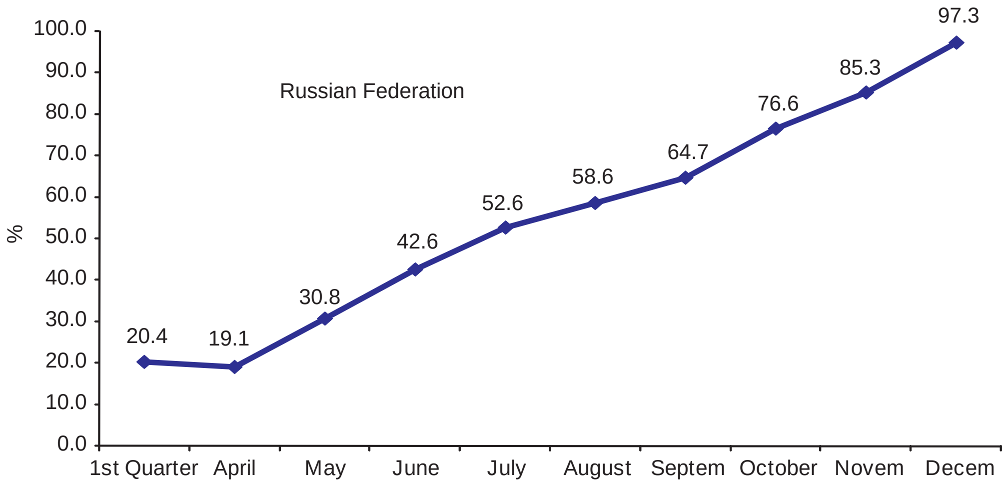
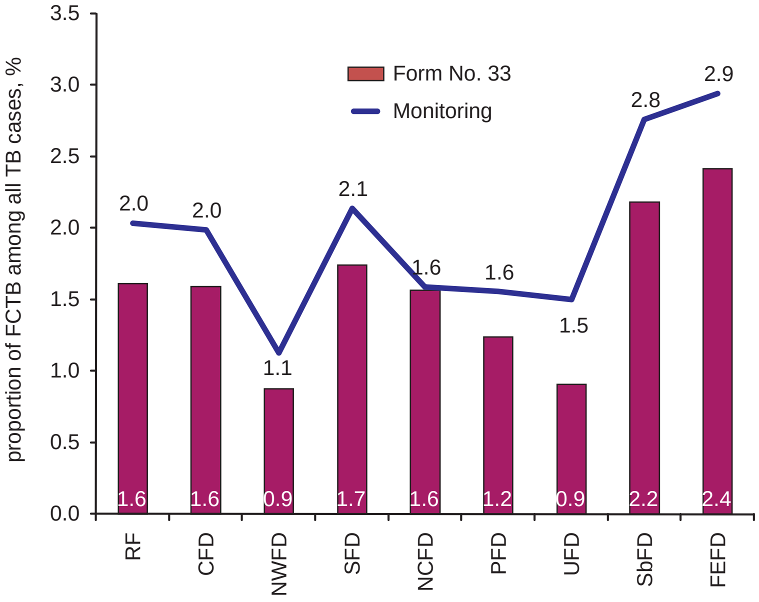


Fig. 11.7. The proportion of patients with active TB transferred from the FSIN as compared to the data in the annual Reporting Form No. 33, the Russian Federation, 2010 (Source: Forms No. MT-MO and No. MT-CP [36], FCTBM data, Form No. 33)

a) The number of new FCTB cases



b) The proportion of new FCTB patients among all TB cases

Fig. 11.8. The number of cases and the proportion of FCTB by the Federal districts. Comparison of the monitoring findings and Form No. 33 data, the Russian Federation, 2010 г. (Source: Forms No. MT-MO and No. MT-CP [36], FCTBM data, Form No. 33).

12. External quality assurance of *M. tuberculosis* detection and drug sensitivity testing in the Russian Federation

M.V. Shulgina, E.V. Zaikin, E.M. Belilovsky, V.N. Malakhov, A. Disu

The diagnostics of tuberculosis and clinical decision making is based on the laboratory tests for detecting the causative agent of tuberculosis and studying its characteristics, and the testing quality has a direct effect on the indicator values that are used for assessing the epidemiological situation of tuberculosis and planning the TB control programs. Therefore, this chapter of the analytical review presents the results of evaluation of TB laboratory diagnosis quality in the Russian Federation that were provided by the Federal Service for the External Quality Assurance of the Clinical Laboratory Tests (FSEQA).

12.1. Implementation of external quality assurance

The external quality assurance (EQA) for clinical laboratory testing has been implemented in Russia since 1995 in the framework of FSEQA [13, 88]. In 2010, 7 out of 113 FSEQA activity sections (both domestic and in collaboration with the international systems) focused on the quality of microbiological and molecular testing for TB diagnostics and treatment. In 2007–2010, the quality assurance of smear microscopy (by Ziehl-Neelsen [Z-N] method and fluorescent microscopy), as well as culture tests for detection of tuberculosis mycobacteria and drug susceptibility testing, was performed with support from the Russian Health Care Foundation and with Global Fund (GFATM) financing. This allowed for a considerable increase in the number of laboratories participating in the respective activity sections of FSEQA, as well as the ability to follow the trends in testing quality in different regions of the RF.

12.2. Quality of AFB smear microscopy

Despite the implementation of advanced rapid tools for laboratory diagnostics (such as molecular genetic techniques) into practices of TB public services, ensuring the quality of microscopy testing still remains one of the priorities of FSEQA activity sections that focus on laboratory techniques of TB diagnostics. This is a matter of particular relevance in the present analytical review, because the quality of detecting acid-fast bacilli (AFB) by Ziehl-Neelsen microscopy is “the litmus test” for the quality of performance and effectiveness of laboratory service management. It reflects the preparedness of general health care (GHC) facilities and specialized tuberculosis facilities (TBFs) to provide good quality laboratory testing while implementing advanced diagnostic tools.

The total number of laboratories that participated in the 2010 EQA program funded by the Russian Health Care Foundation reached 1,500 in the activity section “AFB detection by Z-N smear microscopy” and reached150 in the section “AFB detection by fluorescent microscopy.” The total number of applicants for participation in either of the activity sections reached 2,048 and 215, respectively. However, the number of participating laboratories was restricted due to limited EQA system capacity and available funding. Control smears were sent to the laboratories that had been the first to apply for participation, including the laboratories at health care facilities or independent laboratories, regardless of their affiliation or ownership.

In each of the two rounds of assessing the quality of AFB detection by Ziehl-Neelsen smear microscopy the participants received a set of eight control sputum specimens (smears), consisting of unstained negative smears, stained and unstained smears with low and high AFB volume prepared from the homogenized sputum of patients with non-specific lung diseases (for negative specimens) and from sputum-positive TB patients (for positive specimens) (see Table 12.1).

Only unstained smears were included in the sets for AFB detection by fluorescent microscopy: 2 AFB-negative samples and 6 samples with low AFB load (5–17 AFB in 100 fields examined at 1000x magnification). Expert testing of sample batches was performed by the FSEQA and showed that 2 batches contained a significant number of smears with the AFB load that was lower than 3 AFB in 300 fields (at 1000x magnification); therefore, those batches were excluded from assessment.

Based on the testing results received from the laboratories, the following characteristics were specified:

- testing sensitivity (as a percentage of identified positive smears) separately for samples with low and high AFB load;

- testing specificity (as percentage of AFB-free samples that were identified as negative);
- the quality of laboratory staining of smears (based on the difference in testing sensitivity for the AFB-containing smears that were stained in the FSEQA expert laboratory and those stained in the participating laboratory, within the activity section "AFB detection by Z-N smear microscopy").

Table 12.1

Control smears used within the section "AFB detection by Ziehl-Neelsen smear microscopy" in two rounds of 2010

Description of smears	Amount of AFB in 100 fields of vision	Number of specimens in two rounds
Negative	0	2
Unstained smears with low bacillary load	5–57	7
Stained smears with low bacillary load	5–48	3
Unstained smears with high bacillary load	65–273	2
Stained smears with high bacillary load	65–273	2

Since 2009, quality assurance of AFB smear microscopy by Ziehl-Neelsen stain has been accompanied by evaluation of results in the evaluation form; in addition, the participating laboratories were asked to complete a questionnaire regarding the specific methodology of the performed tests; the questionnaire was distributed together with the control smears. In case of non-compliance of the result report form or the testing method with the provisions of the Executive Order No. 109 of 21.03.2003 of the RF Ministry of Health (Annexes 10 and 11) and the Executive Order No. 690 of 02.10.2006 by the RF Ministry of Health and Social Development (Annex 5), an excerpt from the above Executive Orders and a letter specifying the identified errors were sent to the respective laboratory. Below is the summary of the analyzed errors that were detected in the applied methodology and recording of the test results; these errors may reflect the scope of training for the laboratory staff, as well as the quality of training.

Section "AFB detection by Z-N smear microscopy"

In this section 1,087 participants represented the GHC facilities, including the laboratories of non-TB specialized facilities, Russian Railways health care facilities and medical-sanitary units of the Federal Medico-biological Agency (FMBA): 49 laboratories represented the leading TB facilities in 41 constituent entities of the RF (hereinafter, the regional laboratories); 141 laboratories represented the district TB facilities that included the TB sanatoria along with the district, municipal and interdistrict TB dispensaries and TB hospitals; and 37 laboratories represented the Federal Penal Enforcement Service (FSIN). Out of 1,500 laboratories that received the sets of control smears in 2 assessment rounds, 1,455 (97%) provided the test results for at least 1 round, and 1,257 (84%) reported the results for both rounds. The results of control specimen testing in both rounds were provided by 969 (89%) GHC laboratories, 41 (84%) regional TB laboratories and 124 (88%) laboratories of the district TB facilities.

The GHC laboratories represented 78 entities of the Russian Federation. As in the previous edition of the analytical review [A4], in 2010 the participation in FSEQA of Ziehl-Neelsen microscopy in the Russian Federation was assessed by the number of participating laboratories per 100,000 population (Fig. 12.1). On average this indicator was 0.74; however, in 25 areas (including 5 constituent entities with no laboratories participating in the EQA) it was less than 0.5, that is, 1 participating laboratory per more than 200,000 population.

In the present review, three approaches are used for the EQA data analysis: (a) EQA analysis based on the aggregate total **test results**, (b) analysis based on **the laboratories** and (c) results by the **administrative areas** (constituent entities) of the Russian Federation. Results for each of the three types (concepts) of analysis are presented by the type of facilities at which the assessed laboratories operate, that is, GHC, district and regional TB facilities and FSIN facilities.

a) **Analysis of the aggregate EQA results.** Analysis of the **aggregate test results** received from the laboratories (see Fig. 12.2a) shows that the overall testing specificity in the laboratories of all facility types was sufficiently high – 96.4% – and has not changed significantly compared to the results of 2009 (96.9%, $p > 0.01$[146]).

The average sensitivity of AFB smear microscopy for low-load AFB specimens as an aggregate of all tests was 87.7% for the in-house stained smears in the assessed laboratories (89.2% in 2009); the sensitivity of AFB smear microscopy for high-load AFB specimens was 94.2% (91.9% in 2009).

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[146] In 2008, the specificity was at a statistically significant lower level: 94.6%, ($p < 0.01$) [A4].

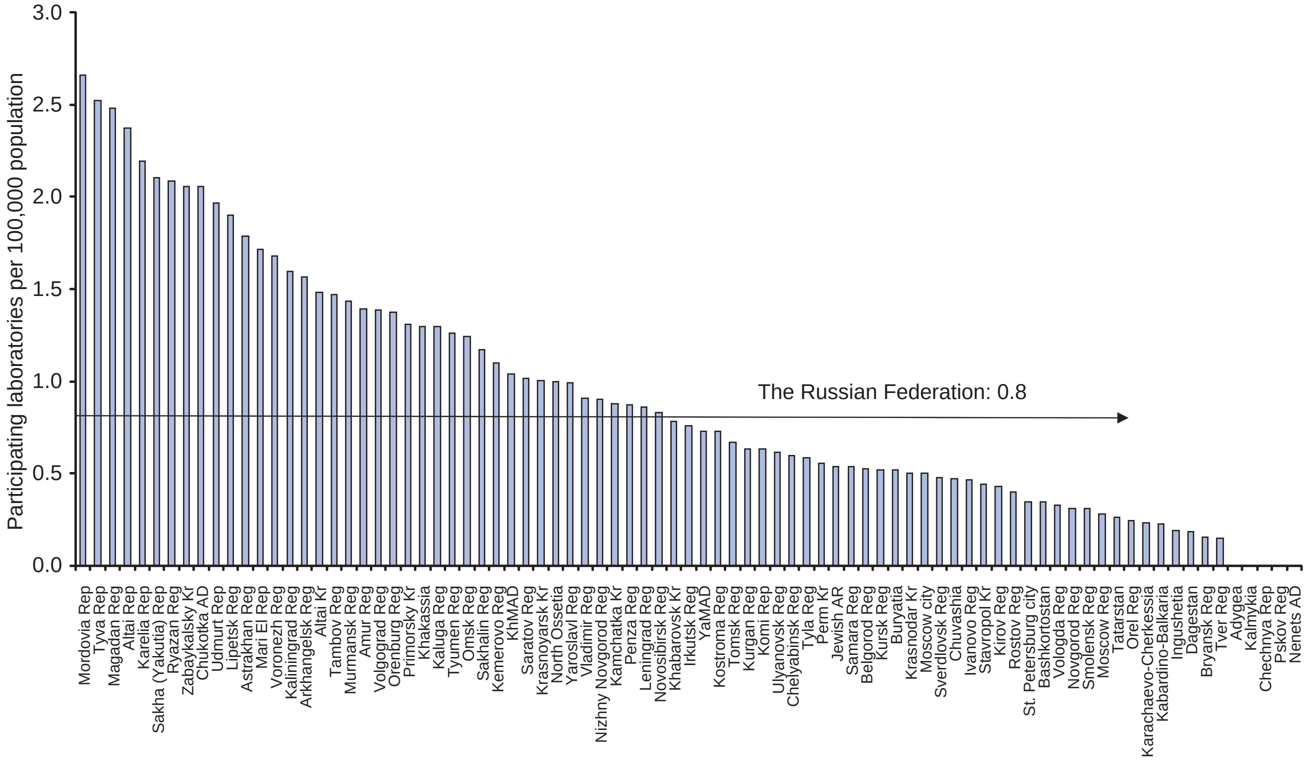
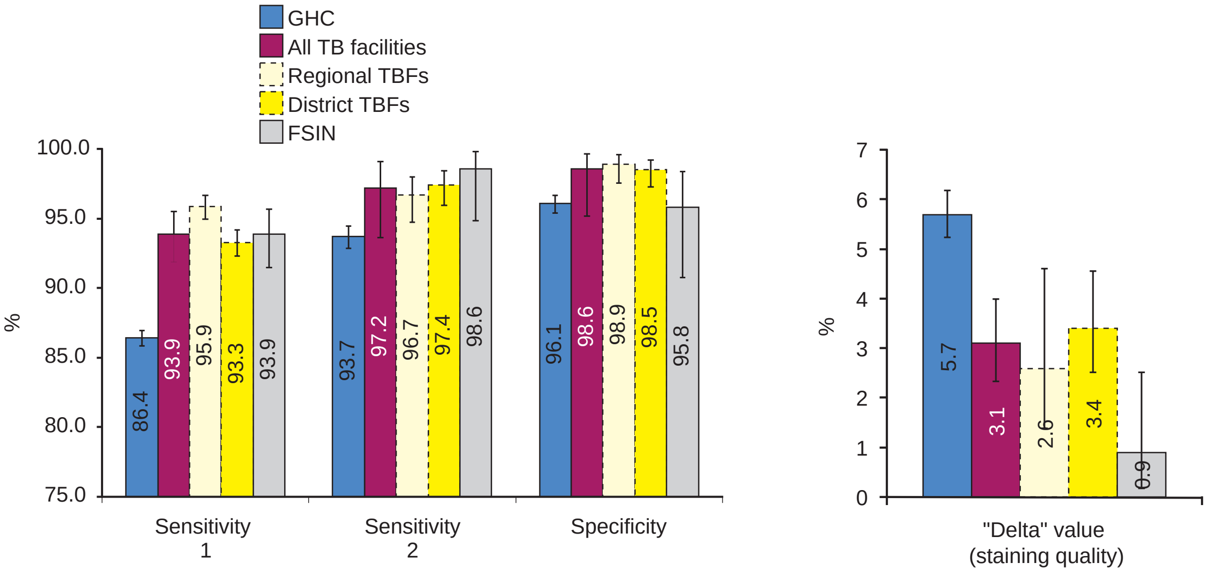
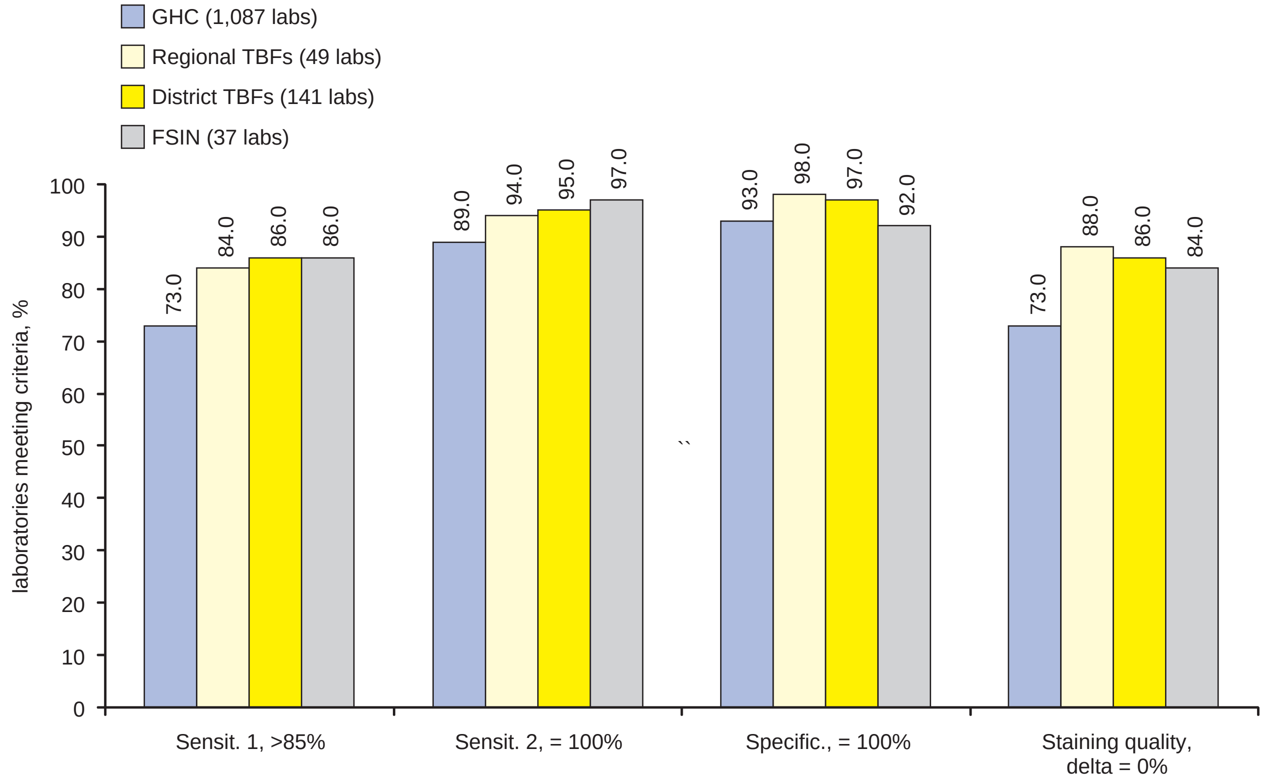


Fig. 12.1. Participation of the GHC laboratories in EQA
(the number of participating laboratories per 100,000 population, 2010)

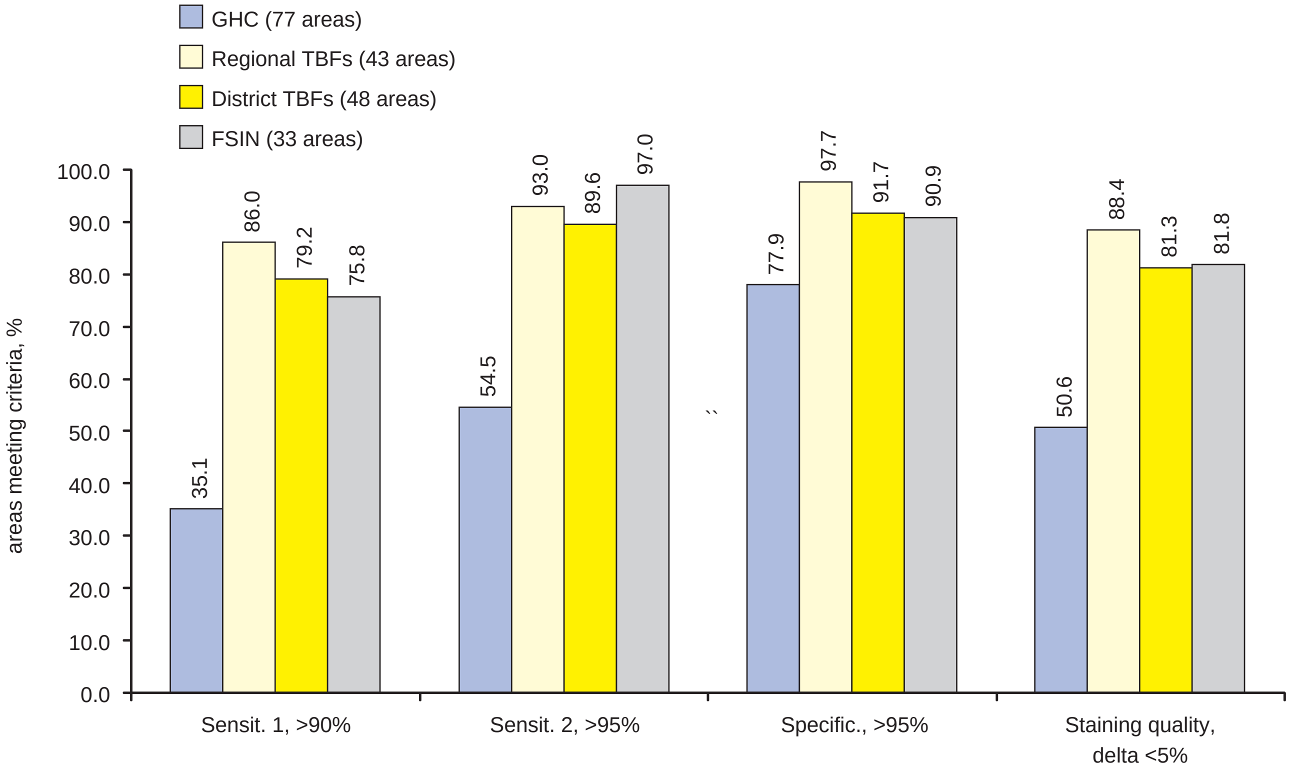


a) Aggregate data for all **results** demonstrated by the EQA participating laboratories
(upper and lower bounds indicate CI 95%)

Fig. 12.2. Evaluation results for Z-N smear microscopy in 2009; GHC, TB service and FSIN laboratories, the Russian Federation. Sensitivity 1 – sensitivity of smear microscopy with low AFB load. Sensitivity 2 – sensitivity of smear microscopy (in-house stained smears with high AFB load). Quality of staining – an indicator of staining quality defined as a difference in sensitivity of testing stained and unstained smears from the same sputum pools



b) Evaluation of testing results by the **laboratories.** Proportion of laboratories meeting the established criteria



c) Evaluation of testing results by the **administrative areas**. Proportion of areas where the average results of all EQA participating laboratories met the established criteria

Fig. 12.2. Evaluation results for Z-N smear microscopy in 2009; GHC, TB service and FSIN laboratories, the Russian Federation. Sensitivity 1 – sensitivity of smear microscopy with low AFB load. Sensitivity 2 – sensitivity of smear microscopy (in-house stained smears with high AFB load). Quality of staining – an indicator of staining quality defined as a difference in sensitivity of testing stained and unstained smears from the same sputum pools

Similar to 2009 [A4], the GHC laboratories (Fig. 12.2a) showed lower sensitivity of AFB smear microscopy for the in-house stained low-load AFB specimens compared to the laboratories at TB facilities (86.4% and 93.3%, respectively; $p < 0.01$). This indicator was higher in the laboratories of regional TB facilities than in TB facilities at the district level (95.3% and 93.3%; $p < 0.1$). In FSIN laboratories the average sensitivity of AFB smear microscopy in low-load AFB specimens was 93.9% for the in-house stained samples (96.8% in 2009). It should be noted that the sensitivity of AFB smear microscopy in low-load AFB specimens that were in-house stained by the laboratories belonging to the GHC, district TB facilities and FSIN has remained at a sufficiently high level after a statistically significant increase was recorded in 2008 [A3, A4]. In the laboratories at regional TB facilities this indicator has been consistently high throughout these years (including 2007).

The difference (%) in sensitivity of AFB microscopy between the smears that were stained in-house and in the FSEQA expert laboratory (hereinafter, “delta”) indicates the quality of smear staining: the lower the delta value, the higher the smear staining quality achieved. To assess the quality of the staining procedure, the FSEQA sets included five pairs of stained and unstained specimens (three low-volume pairs and two high-load pairs); for this purpose each pair was prepared from the same sputum pools.

In the rounds of 2010, the difference in sensitivity for the stained and unstained smear pairs in the laboratories had increased significantly (indicating deterioration) for the laboratories at all facility types, except in the FSIN sector [A4]. For GHC facilities the delta value was 5.7% (4.3% in 2009). The delta value for the group of district and regional TB laboratories was 3.4% and 2.6%, respectively (no statistical significance for the differences, $p > 0.05$), which was lower than in the GHC laboratories (5.7%, $p < 0.01$). In the FSIN laboratories this indicator was the lowest at 0.9%.

b) Analysis based on the laboratories. The nationwide effectiveness of AFB detection by Z-N smear microscopy depends on the proportion of **laboratories** with the satisfactory quality indicators for this test. According to the FSEQA **laboratory**-based data of 2010, 76% of all participating laboratories demonstrated sensitivity of at least 86% in AFB detection for low-load in-house stained smears (i.e., AFB not detected in one of seven smears), 90% of all participating laboratories demonstrated sensitivity of 100% for high-load AFB smears (78% in 2009), and 94% of laboratories had specificity of 100% (95% in 2009) (see Table 12.2 and Fig. 12.2b). There was no difference in evaluation of smears that were stained in-house and in the expert laboratory (delta value of 0%) in 75% of laboratories (78% of laboratories in 2009).

Table 12.2

Proportion of **laboratories** (%) with results meeting the quality criteria

Affiliation of laboratories participating in EQA (facility type)	Number of participating laboratories, number	Sensitivity of at least 86% for low AFB load smears, %	100% sensitivity for high AFB load smears, %	100% specificity, %	Difference in sensitivity for stained and unstained smears = 0%, %
Total	1455	76	90	94	75
GHC	1087	73	89	93	73
All TBFs	190	88	95	97	86
Regional TBFs	49	84	94	98	88
District TBFs	141	86	95	97	86
FSIN	37	86	97	92	84

Within the FSIN, 86% of participating laboratories showed sensitivity of over 86% for AFB low-load smears, 96% of participants correctly identified all specimens with high AFB load, and 92% correctly identified AFB-negative smears (100% specificity); 84% of participants demonstrated no difference in results when reading smears that were stained in-house and in the expert laboratory.

The proportion of laboratories at the TB facilities that met the above criteria was higher than their proportion among the GHC laboratories; that is, respectively, 88% and 73% of all participating laboratories ($p < 0.01$) demonstrated the sensitivity of at least 86% for AFB detection in low-load in-house stained smears; respectively, 95% and 89% of all participating laboratories ($p < 0.05$) showed the sensitivity of 100% for high-load AFB smears; the respective percentage for specificity of 100% was 97% and 93% ($p <0.05$). In 86% of laboratories at TB facilities and 73% of GHC laboratories ($p < 0.01$) no difference was found in the test results for the in-house stained smears compared to smears that were stained in the expert laboratory. No significant difference was found in groups of TB laboratories at the district and regional levels that met the above criteria.

c) Analysis by the administrative areas. The aggregate nationwide EQA results received from the laboratories mostly rely on the data provided by the administrative areas with the largest number of participating facilities. Therefore, the indicators do not allow for external quality assessment by administrative **areas**, for instance, to determine the number of **areas** that have a significant number of laboratories with unsatisfactory EQA results. Yet such information may be useful when evaluating the activities of the regional services and their managers that focus on improving laboratory diagnostic practices.

To compare performance of the GHC laboratories, the laboratories at regional and district TB facilities at a **territorial** and not at an institutional (laboratory) level, a proportion of the federal entities was calculated whose laboratories showed results at a specific level of quality; that is, the number of **areas** were identified in which the laboratories on average met the expert-defined criteria.

With regard to the sensitivity for AFB detection in low-load in-house stained smears ("sensitivity 1"), areas were identified in which the laboratories showed the overall result of over 90% (hereinafter the indicated level is the one set by the FSEQA experts as a benchmark of satisfactory results).

The group of federal areas with satisfactory sensitivity results for AFB detection in high-load in-house stained smears ("sensitivity 2") included those areas where the laboratories demonstrated the sensitivity level over 95%.

The group of administrative areas with the satisfactory quality of smear staining included those where the laboratories showed a less that 5% difference in sensitivity of smear microscopy performed on the in-house stained specimens *versus* samples stained by the expert laboratory.

Areas with the average specificity level in the laboratory testing of over 95% were classified into the group of areas with satisfactory specificity.

The FSEQA results (Fig. 12.2c) demonstrate that the proportion of areas in which the average quality levels shown by the GHC laboratories were higher than the defined benchmarks was relatively small. It was considerably smaller than the proportion of areas (entities of the RF) with similar results demonstrated by the TB laboratories. After a considerable improvement in 2009, the 2010 EQA results for the GHC laboratories [A4] remained stable or showed slight statistically insignificant changes in indicators. For instance, 77.9% of areas have GHC laboratories with a specificity level of at least 95% (51.9% in 2008, 78.5% in 2009), while the share of areas where the GHC laboratories showed the average sensitivity of at least 90% for AFB detection in unstained low-load AFB-positive smears was 35.1% (39.5% in 2008, 45.6% in 2009). The proportion of regions where the laboratories at TB facilities exceeded the expert level of 90% was statistically significantly higher than for GHC laboratories (79.0% versus 35.1%, $p < 0.01$), with a level of 79.2% for the assessed district TBD laboratories and 86.0% for the regional TBD laboratories.

The proportion of regions where the GHC laboratories demonstrated a satisfactory quality of staining was as low as 50.6% (40.7% in 2008, 53.2% in 2009). District TBF laboratories demonstrated the satisfactory quality of staining in a higher proportion (81.3%, $p < 0.01$) of areas (68.8% in 2008, 75.6% in 2009). Still higher was the share of areas with the satisfactory staining quality in regional TBF laboratories ($p > 0.05$), reaching 88.4% (91.1% in 2009, 84.0% in 2008).

The share of regions where laboratories demonstrated a satisfactory level of specificity was 91.7% for the assessed district TBF laboratories (81.3% in 2008, 92.7% in 2009), and for the regional TBF laboratories it was 97.7% (90.0% in 2008, 97.8% in 2009).

Constituent entities of the Russian Federation where the laboratories-participants in EQA met all defined criteria are presented in Table 12.3.

Obviously, the obtained results are simply an approximate reflection of the testing quality levels in the RF entities, specifically due to large variations in numbers of participating laboratories in each administrative area (from 1 to 53 for the GHC and from 1 to 12 for the district TBFs).

A significant part of the listed regions where the laboratories demonstrated satisfactory results of control smear testing had only 1–2 EQA participating laboratories. In that case, the average EQA results clearly do not reflect the testing quality in the region as a whole. On the other hand, a limited number of EQA participating laboratories in this territory may be an indication of some problems in the management of microscopy testing in the region.

If only those 48 Federal entities were reviewed where more than 0.8 GHC laboratories per 100,000 population were represented, the results would be consistent with those shown in Figure 12.2.

Table 12.3

Constituent entities of the Russian Federation where the laboratories-participants in EQA met all quality criteria established by the FSEQA experts for assessing the sensitivity for unstained smears with high and low bacillary load, specificity and the quality of staining

GHC		District TBFs		Regional TBFs		FSIN	
RF entities	Number of laboratories participating in FSEQA	RF entities	Number of laboratories	RF entities	Number of laboratories	RF entities	Number of laboratories
Arkhangelsk Region	18	Ingushetia	1	Buryatia	1	Buryatia	1
Tambov Region	15	Komi	2	Altai	1	Karelia	1
Vladimir Region	13	Tatarstan	1	Karelia	1	Mariy-El	1
Mari El	12	Khakassia	1	Komi	1	Mordovia	1
Tyva	8	R. Chuvashia	1	Sakha (Yakutia)	1	Rep. Khakassia	1
Chuvashia	6	Krasnodar Krai	12	Tatarstan	1	Rep. Chuvashia	1
Sakhalin Region	6	Primorsky Krai	3	Tyva	1	Altai Krai	2
Smolensk Region	3	Amur Region	1	Krasnodar Krai	2	Khabarovsk Krai	1
Chukotka AO	1	Astrakhan Region	3	Krasnoyarsk Krai	1	Arkhangelsk Region	1
Volgograd Region	31	Belgorod Region	1	Primorsky Krai	1	Voronezh Region	1
Altai Krai	37	Vladimir Region	1	Stavropol Krai	2	Kirov Region	1
Kaliningrad Region	13	Volgograd Region	4	Khabarovsk Krai	1	Kostroma Region	1
Rep. Khakassia	7	Ivanovo Region	1	Amur Region	1	Kurgan Region	1
Belgorod Region	7	Kaliningrad Region	3	Arkhangelsk Region	1	Novgorod Region	1
Tver Region	1	Lipetsk Region	1	Belgorod Region	1	Omsk Region	1
		Novgorod Region	1	Vladimir Region	1	Penza Region	1
		Novosibirsk Region	2	Ivanovo Region	1	Rostov Region	1
		Omsk Region	2	Irkutsk Region	1	Tula Region	1
		Penza Region	1	Kemerovo Region	1	Chelyabinsk Region	1
		Perm Krai	6	Kirov Region	1	Zabaykalsky Krai	1
		Samara Region	2	Kursk Region	1	Krasnoyarsk Krai	2
		Sverdlov Region	2	Lipetsk Region	1		
		Tambov Region	2	Nizhny Novgorod R.	1		
		Tomsk Region	1	Omsk Region	1		
		Chelyabinsk Region	2	Penza Region	1		
		Moscow city	4	Perm Krai	1		
		Yamalo-Nenets AO	1	Pskov Region	1		
		Tula Region	2	Smolensk Region	1		
		Saratov Region	4	Tomsk Region	1		
		Zabaykalsky Krai	1	Zabaykalsky Krai	1		
		Leningrad Region	3	Khanty-Mansi AO	1		
		Nizhny Novgorod R.	6	Orenburg Region	1		
				Tyumen Region	1		
				Saratov Region	1		

Evaluation of testing quality in terms of correct presentation of data and results of the survey of participating laboratories

In order to evaluate the quality and coverage of the laboratory staff training, the FSEQA analyzed the identified errors by regions and facility types. For this purpose the identified errors were grouped in the following way:

Group A – errors in performing the test:

- use of a decolourising agent other than acid (hydrochloric) alcohol or a solution of 25% sulphuric acid (potentially causing false-positive or false-negative results),

– use of oil other that immersion oil (e.g., liquid paraffin or castor oil, which has a significant impact on effectiveness of AFB detection in smear microscopy),
– use of a monocular microscope,[147]
– magnification too high or too low, too many or too few visual fields examined.

Group B – errors in reporting results:

– presentation of results only as “detected”/”not detected” or similarly, instead of using the semi-quantitative scale (1 to 9 AFB, 1+, 2+, 3+),
– reporting detection of KB, or MbT,
– reporting smear cytology results in the routine sputum test form.

Group C – inconsistencies in reporting the number of AFB, including incorrect evaluation of smears as negative or positive following detection of only several AFB.

Each of these error groups has a different degree of significance for effectiveness of the tests. For instance, Group A errors have a considerable impact on the specificity and sensitivity of testing, whereas Group B errors reflect the training quality (or scope of training for the laboratory personnel in the regions). Group B errors signify not only insufficient knowledge of the existing Executive Orders on testing report forms among the laboratory personnel, but also indicate that clinicians are not interested in receiving the test results in the established format. Group C errors are the results of calculation mistakes and a reflection of the laboratory staff negligence when completing the forms.

Table 12.4 summarizes the results of analyzed errors that were identified when assessing the report forms and responses to the first round questionnaires in 2010. The overall proportion of the laboratories that made at least one error was 44%, and their share among GHC laboratories was considerably higher than among TB service laboratories. The FSIN facilities demonstrated the lowest rate of laboratories with detected errors (only 6 laboratories, or 16.2%), which is an indication of good training in the system and a high level of performance.

A number of laboratories made several errors: two, three or four; most of them belong to the GHC system. No FSIN laboratory made more than one error.

Table 12.4

Results of the analysis of errors identified in the assessed reporting forms and questionnaires of round 1 in 2010

	All	GHC	TB laboratories			FSIN
			all	regional	district	
Evaluated forms, total	1308	1085	186	49	137	37
Proportion of laboratories that made:						
at least one error	44.0%	47,5%	29.8%	24.5%	32.1%	16.2%
two errors	9%	9%	4%	2%	4%	0%
more than two errors	1% (12 laboratories)	0.5% (6 laboratories)	0%	0%	0%	0%
Group A errors	25.3%	26.0%	21.4%	8.3%	25.0%	0.0%
Group B errors	49.6%	51.5%	35.7%	41.7%	34.1%	16.7%
Group C errors	43.3%	41.6%	55.4%	58.3%	54.5%	83.3%

The highest proportion of Group A errors was detected in the district TB service and GHC laboratories, where about a quarter of the laboratories committed errors.

Group B errors, which reflect disregard of the existing Executive Orders by both the laboratory staff and the clinicians, make the largest share in the total number of errors, with more than half of the GHC laboratories committing them. In the FSIN facilities only one laboratory made this type of error.

AFB detection by fluorescent microscopy

Control specimens within the FSEQA activity section “AFB Detection by Fluorescent Microscopy” were sent to 150 laboratories. The testing results of at least one set were received from 117 laboratories (78%), with 100 (85%) laboratories participating in both rounds.

Among the laboratories that participated in at least one round there were 23 GHC laboratories from 14 federal entities, 73 TBF laboratories from 44 entities (including 35 regional and 38 district TBF laboratories), and 18

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[147] Following a large-scale outfitting of the laboratories using a monocular microscope should no longer be viewed as an equipment supply problem, but rather as the lack of skills for using a binocular microscope by the staff.

FSIN laboratories. As in the previous year, some laboratories reported their inability to participate in this FSEQA activity because their fluorescent microscope was out of order.

Since assessment of the quality of fluorescent microscopy requires specimens with a lower AFB load (5–17 AFB in 100 f.) compared to specimens used to assess the quality of Ziehl-Neelsen microscopy (5–56 AFB in 100 f.), it is not correct to compare the mean data for AFB detection sensitivity in the respective FSEQA activities. The overall sensitivity of AFB detection by fluorescent microscopy (FM) in the control specimens was 88.8%. Moreover, there was an insignificant difference in the results produced by TB service and FSIN laboratories (89.0% and 90.0%), whereas for the GHC laboratories this level was considerably lower (82.9%).

The specificity of FM testing was statistically significantly lower than specificity of Z-N microscopy with 92.6% and 96.4%, respectively ($p < 0.01$). The specificity of testing control specimens in the regional TBF laboratories was 100%, which is statistically significantly ($p < 0.05$) higher than the data obtained in the district TBF and GHC laboratories (90.6% and 89.2%, respectively).

The FSIN laboratories demonstrated a specificity of 91.4% that was not statistically different from the results of the district TBF and GHC laboratories. Overall, the specificity of FM microscopy for the tested control specimens was considerably lower than in Z-N microscopy for all laboratory groups except the regional laboratories.

Out of 98 laboratories that participated in both rounds, 65 laboratories (66%) demonstrated the sensitivity of at least 90%, including 6 out of 14 GHC laboratories and 47 out of 66 TBF laboratories. Eighty-eight laboratories (90%) demonstrated a 100% specificity (no AFB detected in two out of two negative samples), including 12 GHC laboratories and 61 TBF laboratories.

12.3. Quality of culture testing to identify *M. tuberculosis*

Assessment of the laboratory tests in this FSEQA activity section targets errors in the process of culturing specimens that potentially contain *M. tuberculosis*. There are two sections in the FSEQA for evaluation of the culture testing quality to identify *M. tuberculosis*: “Detection of *M. tuberculosis* in culture*”* and “Detection of *M. tuberculosis* in culture and drug susceptibility testing (on liquid media).” The latter section evaluates the quality of detection of *M. tuberculosis* and the quality of drug susceptibility testing of the pathogens identified by culturing. All participants in this section use the sets of commercial reagents and the BACTEC MGIT 960 automated system. Participants in the section “Detection of *M. tuberculosis* in culture” mostly use solid media for culturing.

There were 10 specimens for each activity section. In 2010, the sets of control specimens for both sections served for assessing the quality of *M. tuberculosis* culturing starting from the decontamination stage, that is, the aggregate result of all procedures performed by a laboratory for testing the diagnostic material by culture method. The sets included culture samples of *M. tuberculosis* in two loads: with high and low count of *M. tuberculosis* (MbT); some MbT-containing specimens had been intentionally contaminated with microflora typically occurring in the respiratory airways.

The composition of control specimen sets allowed for assessing the correctness of an examination schedule for mycobacteria growth on inoculated test-tube slants (for solid media – weekly culture examination) and preliminary identification of MbT complex isolates. For this purpose the set included specimens containing fast-growing non-TB mycobacteria that were similar to *M. tuberculosis* in terms of acid-fast staining and the morphology of colonies. To check the correctness of the laboratory confirmation algorithm for identified AFB in cultures, specimens with *Corynebacteria* were included in the control panel. The result was deemed satisfactory if no specimens free of *M. tuberculosis* were identified as “MbT detected” (specificity of 100%).

MbT detection in cultures on solid (egg-based) media

The control set included the specimens that contained *M. tuberculosis* (MbT) culture in two concentrations: four specimens with low MbT count (10^5 CFU) and two specimens with high MbT count (5×10^6 CFU) that were contaminated with *Corynebacteria*. In addition to the MbT-containing specimens the set also included the specimens with *Corynebacteria* (2 specimens) and the specimens that contained fast-growing *M. smegmatis* (2 specimens), which allowed the evaluation of the ability of participants to differentiate them from MbT by the growth rate, colony morphology and Z-N smear microscopy of the grown culture.

In 2010, the sets of control specimens were sent to 171 laboratories and 158 (92%) of them provided the testing results. The laboratories at TB facilities, FSIN health care facilities, and research institutes of phthisiopulmonology and tuberculosis (Table 12.5) participated in this FSEQA activity section. In 2010, over 70% of the laboratories that function under the leading TB dispensaries in Russia took part in this activity section.

Table 12.5

Participants in FSEQA activity section "Detection of MBT in culture"

Facility type	Number of participants
Regional TBD	59
District TBD	48
FSIN	47
Research Institutes of phthisiopulmonology and TB	3
Military hospitals under the Ministry of Defence	1
Total	158

Out of all participating laboratories 28 correctly identified the composition of all 10 specimens, including 13 regional laboratories, 4 district laboratories and 11 FSIN laboratories.

The average sensitivity of *M. tuberculosis* detection in the low-load MbT specimens was 82% for the regional TB laboratories and 78% for the district TB laboratories ($p > 0.05$). This indicator was lower for the FSIN laboratories and was reported at the level of 62% ($p < 0.01$).

The proficiency of laboratories in detecting the fast-growing nontuberculous mycobacteria (*M. smegmatis*) was found to be much lower than in 2009, which is possibly a sign of the damaging effect of the decontamination process on nontuberculous mycobacteria. The effectiveness of their identification was only 42% for all laboratories. The specificity (MbT were not identified in MbT-negative specimens) for all laboratories was 89% (89% and 88.0% for the laboratories at the regional and district TB dispensaries, respectively, and 93% for the FSIN laboratories, $p > 0.05$).

For the purpose of the present review, the failure to identify MbT in ≥ 50% of the specimens with low MbT count (i.e., in 2, 3 or all 4 specimens) is considered as unsatisfactory sensitivity of MbT detection in culture.

In 2010, the proportion of the regional and district TB laboratories with the satisfactory results for MbT detection in specimens with low MbT count (10^5 CFU) was 89% for the laboratories at both levels, and 78% for the FSIN laboratories. Only 71% of the TBF laboratories at the regional level, 77% at the district level, and 79% of the FSIN laboratories did not detect MbT in any of the MbT-negative specimens, that is, demonstrated the specificity of 100%.

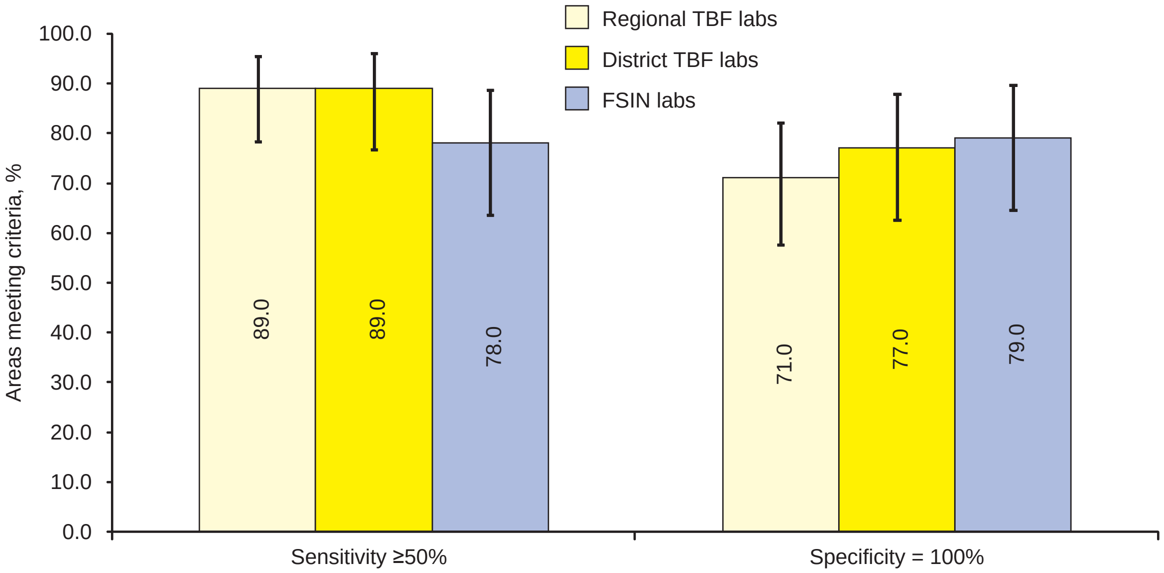


Fig. 12.3 The proportion of laboratories with satisfactory results for culture testing as determined by FSEQA.
The Russian Federation, 2010: 154 laboratories of the regional and district TB services and the FSIN laboratories.
The error bars indicate 95% confidence interval. A satisfactory result for the sensitivity is the ability
to identify MbT in at least two out of four specimens with low MbT load;
for the specificity – 100% of correct results for the MbT-negative specimens

Similar to 2009, in 2010 the FSEQA participants were sent questionnaires aimed at evaluating completeness of the internal laboratory quality control of culture examinations for TB diagnosis. The analysis of participants' responses to the questionnaire (152 laboratories) related to the internal quality control of the media revealed that only 48% of the surveyed laboratories (45% in 2009) practice quality control for both prepared medium sterility and its growth potential (50% of TBF laboratories at regional level, 32% at the district level, and 59% of the FSIN laboratories). No quality control of the media was reported by 27% of the laboratories (33% in 2009), with 19% of the TBF laboratories at the regional level, 25% at the district level, and 17% of the FSIN laboratories.

Responses to the survey question regarding the control of culture contamination level revealed that in 33 laboratories (24% of all respondents to the question *versus* 11% in 2009) the contamination level was below 2% (allowable contamination level for solid media is 2–5% [9, 82]), which indicates the excessive decontamination that may result in underdiagnosis of mycobacteria in the clinical specimens. Twenty-three laboratories or 15% (22% in 2009) did not reply to the question regarding control of the decontamination procedure, which suggests no such control is being performed.

MbT detection in liquid culture system

The control set contained the specimens with various cultures of *M. tuberculosis* (MbT) in two concentrations: 1 specimen with low MbT count (10^3 CFU); 8 specimens with high MbT count (5×10^4 CFU), one of which was contaminated with *Corynebacterium*, and 1 specimen containing a nontuberculous mycobacteria strain (*M. avium*). The amount of *M. tuberculosis* in the specimens was lower than in the specimens tested on solid media. The participants had to start testing the specimens with the decontamination procedure.

In 2010, the control sets were distributed among 35 laboratories. The results of the control specimen examination were obtained from 30 laboratories (86%). Among the participants in this FSEQA activity section there were 25 regional and 1 district TBF laboratories, 1 laboratory of the FSIN health care facility, and 3 laboratories of the research institutes of phthisiopulmonology and TB. All participants performed the testing in the automated BACTEC MGIT 960 systems with the commercial sets of reagents (media and reagents for sample preparation).

The average sensitivity of MbT detection for all the participants was 94%, which was higher than in testing on solid media (82% for the regional laboratories). Despite the lower load of MbT in the specimens for this activity section, 22 out of 30 laboratories detected TB mycobacteria in all MbT-positive specimens. Identification of nontuberculous mycobacteria was the biggest challenge: only 7 participants (23.3%) identified the culture grown from the specimen with *M. avium* as a non-TB mycobacterium, and one more participant reported it as contamination.

12.4. Drug susceptibility testing of TB mycobacteria

Since 2005, the FSEQA has been performing EQA for MbT drug susceptibility testing in collaboration with the WHO Network of supranational laboratories (SNL).

In 2010, EQA used the control panel provided by the WHO SNL (Sweden) to assess the drug susceptibility testing for first- and second-line drugs. The panel consisted of 20 MbT strains. However, the results of testing a number of panel strains in the FSEQA laboratories that were chosen as expert laboratories did not concur with the SNL results; therefore, those strains were excluded from the evaluation. The results of testing strain susceptibility to a critical concentration of isoniazid were assessed for 18 strains, and to the critical concentrations of rifampicin, streptomycin, ethambutol, kanamycin, ofloxacin and capreomycin – for 19 strains.

The test panel was sent to 165 participants in the FSEQA activity. The testing results were obtained from 146 laboratories (88%), including 67 regional TBF laboratories (81% of the regional TB dispensaries), 31 laboratories of the district TBF, 45 FSIN laboratories, and 4 laboratories of the research institutes of phthisiopulmonology and TB.

Three regional, one district and two FSIN laboratories performed drug susceptibility testing of all strains, disregarding the stability criteria established for the absolute concentration method. Their results were deemed invalid and were not evaluated.

In 2010, the quality of drug susceptibility testing was deemed satisfactory, and the results of the assessed laboratory and the data of the reference laboratories were concordant (both for susceptible and resistant strains): at 90% for the control strains to isoniazid and rifampicin and at 85% to streptomycin and ethambutol.

Satisfactory results in testing susceptibility to isoniazid were demonstrated by 48 laboratories of TB facilities at the regional level (75% of all whose results were evaluated), 16 laboratories of the district level (53%) and 33 FSIN laboratories (77%). Satisfactory results in testing susceptibility to rifampicin were demonstrated by 50 laboratories at the regional level (78%), 13 laboratories at the district level (43%) and 34 FSIN laboratories (79%). For streptomycin and ethambutol the satisfactory results were obtained, respectively, in 35 and 41 regional laboratories (55% and 64%), in 15 and 13 district laboratories (50% and 43%), and in 22 and 27 FSIN laboratories (53% and 61%), as shown in Table 12.6.

Table 12.6

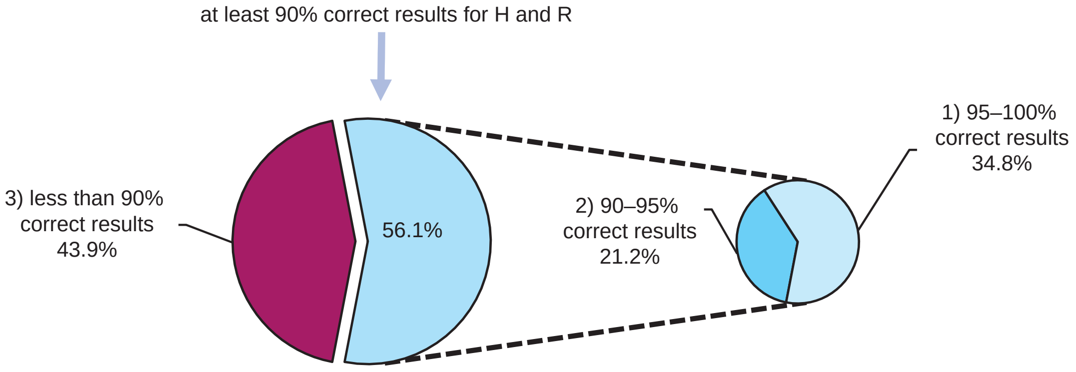
The number and proportion of bacteriological laboratories
with the satisfactory DST results to first-line TB drugs

TB drugs	Criterion	Bacteriological laboratories					
		Regional TBFs		District TBFs		FSIN	
		Number	%	Number	%	Number	%
Isoniazid	≥90%	48	75.0	16	53.3	33	76.7
Rifampicin	≥90%	50	78.1	13	43.3	34	79.1
Streptomycin	≥85%	35	54.6	15	50.0	23	53.5
Ethambutol	≥85%	41	64.0	13	43.3	27	62.8

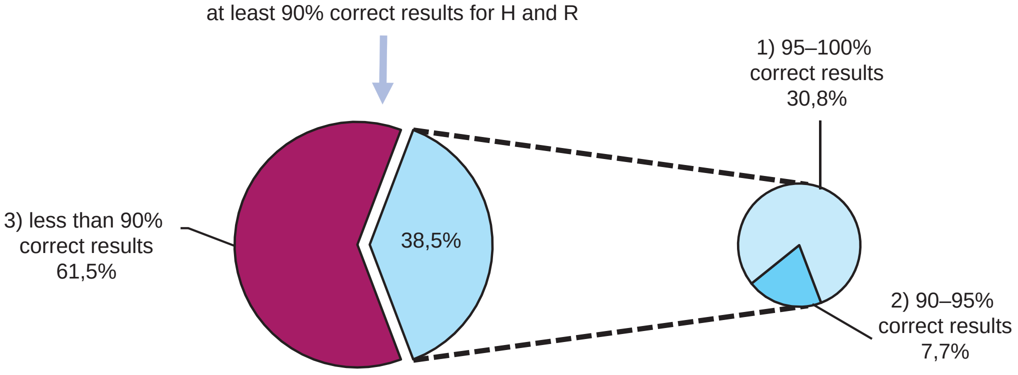
The proportion of laboratories with unsatisfactory DST result for isoniazid and rifampicin (less than 90% of correct results for any of these drugs) was respectively 25% and 22% (16 and 14 laboratories) among the regional TB laboratories, 47% and 57% (14 and 17 laboratories) among the district TB laboratories, and 23% and 21% (10 and 9 laboratories) among the FSIN laboratories.

In 2010, of all TBF laboratories participating in the FSEQA, 23 regional TB laboratories (35%) and 8 district TB laboratories (32%) demonstrated good results in determining susceptibility to at least isoniazid (H) and rifampicin (R): 95–100% concordance of their findings with the correct results (no more than one error in determining resistance to isoniazid and/or rifampicin, when testing 20 control strains (see Fig. 12.4). Among FSIN laboratories 20 laboratories (48%) demonstrated such results. Fourteen regional laboratories (21%), 2 district laboratories (7%) and 10 FSIN laboratories had a 90–94% concordance in their results. In 29 regional laboratories (44%), 16 district laboratories (59%) and 12 FSIN laboratories (28%) concordance with the reference DST results for at least isoniazid and rifampicin was below 90%.

The constituent entities where the laboratories demonstrated at least 90% concordance of the results for both isoniazid and rifampicin are listed in Table 12.7.

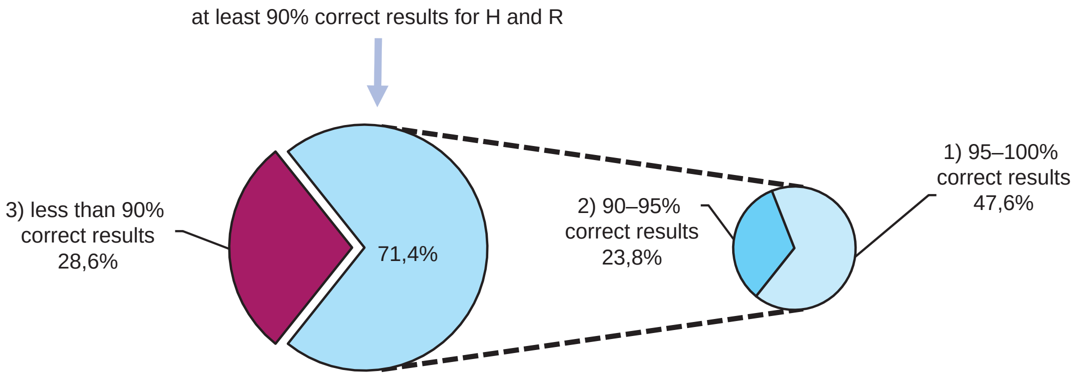


a) Regional TBFs



b) District TBFs

Fig. 12.4. The EQA results for drug susceptibility testing of *M. tuberculosis,* 66 laboratories of the regional TB facilities, 26 laboratories of the district TB facilities and 42 FSIN laboratories, Russian Federation, 2010 г. Legend: (1) – at least 95% of the correct results for H and R (no more than 1 error in testing 20 control strains for isoniazid and/or rifampicin); (2) – at least 90% of the correct results for susceptibility to H and/or R (excluding EQA results defined as category 1; (3) – less than 90% of the correct results for susceptibility to H or R



c) FSIN

Fig. 12.4. The EQA results for drug susceptibility testing of *M. tuberculosis,* 66 laboratories of the regional TB facilities, 26 laboratories of the district TB facilities and 42 FSIN laboratories, Russian Federation, 2010 г. Legend: (1) – at least 95% of the correct results for H and R (no more than 1 error in testing 20 control strains for isoniazid and/or rifampicin); (2) – at least 90% of the correct results for susceptibility to H and/or R (excluding EQA results defined as category 1; (3) – less than 90% of the correct results for susceptibility to H or R

Table 12.7

The list of the regional TBF laboratories with at least 90% concordance of the results in susceptibility testing of control strains

Entities of the Russian Federation and Research institutes	Bacteriological laboratories at					
	Regional TBF		District or municipal TBF		FSIN	
	isoniazid	rifampicin	isoniazid	rifampicin	isoniazid	rifampicin
Republic of Adygea	90	90				
Republic of Bashkortostan	100	93				
Republic of Buryatia	100	95			100	100
Republic of Karelia	100	100			90–100*	95*
Komi Republic	100	95			92	92
Republic of Mari El	100	90			100	95
Republic of Sakha-Yakutia			100	92		
Chuvash Republic	95	90			100	100
Altai Republic	100	95				
Krasnodar Krai	95	95				
Krasnoyarsk Krai	100	100			100*	95*
Primorsky Krai	100	100				
Khabarovsk Krai	90	90				
Amur Region	95	95				
Arkhangelsk Region	100	90			100	100
Astrakhan Region	90	90			95	90
Belgorod Region	100	90			95	90
Bryansk Region	90	90				
Vladimir Region	100	90			95–100*	95–100*
Volgograd Region	100	95				
Vologda Region	100	95				
Voronezh Region	95	100				
Ivanovo Region	100	90				
Irkutsk Region			90–100*	95–100*		
Kaliningrad Region	100	90			100	95
Kaluga Region					100	95
Kemerovo Region	100	95	100	95	100	100
Kirov Region					100	100
Kostroma Region	90	90			90	100
Kurgan Region	100	90				
Kursk Region	100	95				
Lipetsk Region					90	95
Moscow Region			100	95		

Table 12.7 (consummation)

Entities of the Russian Federation and Research institutes	Bacteriological laboratories at					
	Regional TBF		District or municipal TBF		FSIN	
	isoniazid	rifampicin	isoniazid	rifampicin	isoniazid	rifampicin
Murmansk Region	95	95				
Nizhny Novgorod Region	100	95			95	95
Novgorod Region	90	90				
Omsk Region	100	95				
Orenburg Region	94	94	95	100		
Orlov Region	100	100			95	90
Penza Region	100	95				
Perm Krai	100	100				
Pskov Region	90	90			95	100
Ryazan Region	100	95				
Samara Region					95	95
Saratov Region	90	95			100	95
Sverdlovsk Region	90	100				
Tambov Region	95	90			90	90
Tver Region					90	90
Tomsk Region	100	95				
Tula Region	100	90				
Tyumen Region			100	100		
Ulyanovsk Region	90	100			100	95
Chelyabinsk Region	95	95				
Zabaykalsky Krai	95	100				
Moscow city	100	90	100	95	95	90
St. Petersburg city	100	95				
Komi-Permyatsky AD	100	90				
FSI "St. Petersburg RI for phthisiopulmonology, Rosmedtekhnologies"	100	100				

* data of two laboratories.

Drug susceptibility testing to second-line drugs on solid (egg-based) media

Table 12.8 shows the number of laboratories that submitted the results of drug susceptibility testing of control strains to second-line drugs.

The proportion of regional TB laboratories with at least 90% concordant results with the reference laboratory data was 57% (34 laboratories) for kanamycin, 39% (18 laboratories) for capreomycin and 75% (41 laboratories) for ofloxacin. The respective indicators for the FSIN laboratories were 68% (25 laboratories), 58% (14 laboratories) and 72% (23 laboratories). Among the district TBs laboratories over 90% concordance for kanamycin was demonstrated by 8 out of 9 laboratories, for capreomycin it was demonstrated by 1 out of 3 laboratories, and for ofloxacin it was demonstrated by 6 out of 7 laboratories.

Table 12.8

Number of the laboratories that submitted the results of drug susceptibility testing to second-line drugs

Bacteriology laboratory	Kanamycin	Capreomycin	Ofloxacin
Regional TB facilities	60	46	54
District TB facilities	9	3	7
FSIN	37	24	32

Drug susceptibility testing on liquid media

Evaluating the quality of drug susceptibility testing in liquid culture media is the second part of the activity section "Detection of M. tuberculosis and drug susceptibility testing on liquid media" (see Section 12.3, part "**MbT detection on liquid culture**"). All participants performed the tests using the BACTEC MGIT 960 automated system. The participants tested drug susceptibility of isolated *M. tuberculosis* strains to isoniazid, rifampicin, streptomycin, ethambutol and pyrazinamide. Some participants failed to isolate MbT cultures in all nine MbT-positive specimens. In addition, two laboratories did not test strain susceptibility to pyrazinamide because they did not have the required reagent kit for such testing. As one specimen contained *M. avium*, the testing results for this specimen were not evaluated, even if the participants presented them as a drug susceptibility test of *M. tuberculosis.*

The effectiveness of determining drug susceptibility in the automated system (the proportion of concordant test results for strains that were found susceptible or resistant to TB drugs with the reference results) was much higher than in testing on solid media and reached approximately 96–99% (Table 12.9).

Table 12.9

Effectiveness of drug susceptibility testing of TB mycobacteria (the average score of 30 laboratories)

Antibacterial drug	Number of tests	Test effectiveness, %
Isoniazid	255	96.5
Rifampicin	255	98.4
Streptomycin	256	99.2
Ethambutol	256	95.7
Pyrazinamide	235	97.0

It should be noted that out of 30 laboratories 25 (83%) made no mistakes in determining the susceptibility of control MbT strains to isoniazid, the same number to ethambutol, 28 laboratories to rifampicin, the same number to streptomycin (93%), and 26 laboratories to pyrazinamide (86%).

12.5 Concepts globally used for the implementation of quality assurance system for smear microscopy, culture methods and DST

Laboratory service is a key component of any national tuberculosis (TB) control program (NTP) and at the same time it is the main component of DOTS – a strategy recommended by the WHO for tuberculosis control. As previously noted, the effectiveness of TB diagnosis and treatment monitoring directly depends on performance of the laboratory service, including the quality assurance for smear microscopy, culture and drug susceptibility tests (DST).

According to the principles used in the world, there should be a permanent system of quality assurance in place for managing bacteriological laboratory activities and achieving the recommended quality of laboratory diagnosis. In organizing the QA system in the national TB control programs consideration is given to a laboratory service network consisting of 3 levels: peripheral laboratories, intermediate laboratories (regional or provincial) and central laboratories. It somewhat corresponds to ranging of the bacteriological laboratories in the Russian Federation established by the Executive Order of the RF Ministry of Health [34], according to which there are level I (peripheral), II (intermediate) and III-IV (central, including the laboratories of the specialized TB research institutes, FSEQA) laboratories. The intermediate laboratories provide supervision, monitoring and quality assurance for the peripheral laboratories, including implementation of the smear rechecking system. On the other hand, the central laboratory, which may be part of a public health laboratory or a research laboratory, has an important function as the national reference laboratory in management and maintenance of the network (for instance, by developing guidelines for ensuring the standardized high-quality smear microscopy). In this regard such a laboratory should have the necessary resources to provide training and external quality assessment, including smear panel testing and rechecking of smears received from the intermediate and peripheral laboratories.

Support of the national reference laboratories by the supranational reference laboratories is an effective measure (Fig. 12.5), and it is essential to have an exchange of strain panels between them, in particular, for assessing the quality of their performance in the framework of the global drug resistance surveillance.

When implementing the laboratory testing by microscopy, culture and DST, the quality of the laboratory performance in the TB control system still remains a global challenge.

External quality assurance (EQA) under review in this chapter is just a component of the overall system of quality assurance (QA) for laboratory studies. This system consists of three components: internal quality control (QC), quality improvement activities (QIA) and, finally, external quality assurance.

QC, also called internal quality assurance, includes all means by which a laboratory controls its TB diagnostic operation.

Quality improvement activities (QIA) involve continuous monitoring and identifying drawbacks, followed by remedial action including retraining of staff when needed to prevent recurrence of identified problems. QIA often relies on the findings of the on-site evaluation visits to the laboratory.

MAP 1 Distribution of supranational reference laboratory network, 2009

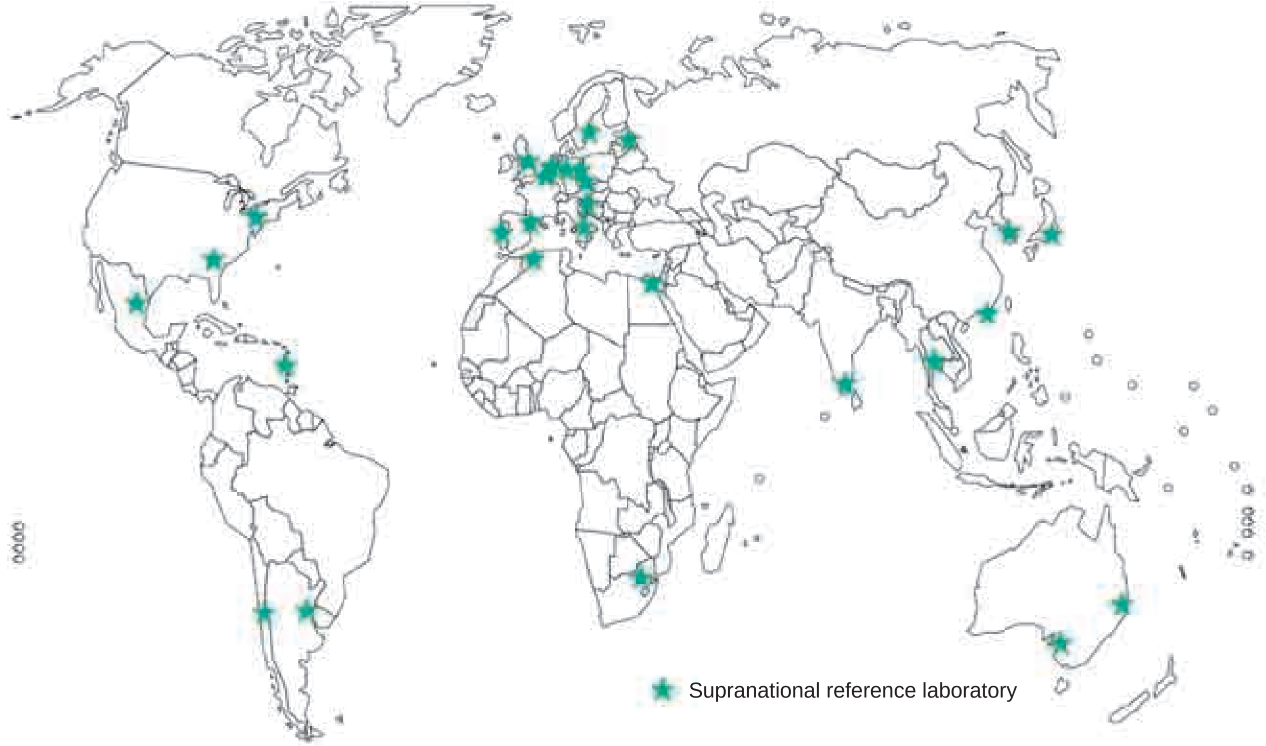


Fig. 12.5. Distribution of supranational reference laboratory network, 2009 [83]

EQA is conducted by higher-level laboratories through the panel testing, blind rechecking of samples and on-site evaluation of laboratory performance.

Regrettably, many countries in the world still do not practice external quality assurance (EQA) on a full scale in the laboratory microscopy centers. Table 12.10 illustrates EQA coverage in the countries of different WHO regions. It should be noted that the EQA systems in the countries include from one laboratory up to:

- for microscopy – 2,000 laboratories in the Philippines, 5,000 in Indonesia and 1,200 in India;
- for culture testing – 90 laboratories in Belarus and 163 in the Russian Federation; and
- for DST – up to 87 Laboratories in China and 141 in the Russian Federation (data of 2008).

Table 12.10

EQA in the WHO Regions

WHO regions	Total number of countries in the region	Number of laboratories participating in the EQA					
		By microscopy		By culture		By DST	
		#	%	#	%	#	%
The Americas	44	19	43.2	17	38.6	15	34.1
Africa	46	30	65.2	21	45.7	22	47.8
Europe	53	20	37.7	18	34.0	19	35.8
Eastern Mediterranean	22	18	81.1	13	59.1	10	45.5
South East Asia	11	10	90.9	6	54.5	6	54.5
Western Pacific	36	19	52.8	9	25.0	8	22.2
Globally	212	116	54.7	84	39.6	80	37.7

Quality assurance of culture testing techniques is quite complex to implement, and the existing WHO programs do not necessarily include it. Until recently not all national programs could afford culture testing; this is why so far no WHO guidelines for culture EQA have been adopted. Since the WHO recommends the introduction of culture and molecular genetic tools into laboratory diagnostic practices, the development of new EQA tools has become a matter of priority. Experience of the Russian Federation in this area may prove useful for developing such quality assessment programs.

The international **EQA** guidelines for microscopic examination of acid-fast bacilli consist of **3 components:** (1) general on-site evaluation of the quality of laboratory performance (by monitoring or supervisory visits), (2) “blind” rechecking of smears and (3) panel testing (PT). Each component has its advantages and disadvantages and also differs in terms of the required resources. Therefore, every national program can choose the most suitable EQA tool(s) based on its human resources, financial resources and other capabilities (including geographical specifics). The all-encompassing EQA includes an efficiently functioning panel-testing program and “blind” rechecking of specimens in addition to routine on-site quality evaluation (supervisory visits).

1. On-site evaluation of laboratory performance involves visits to the peripheral laboratories by the trained personnel from the reference or intermediate laboratories for evaluation, in particular, of the performance of the quality control (QC) measures and their improvement (QI). These visits are mandatory for improving the quality of laboratory performance and ensuring proper implementation of the existing standards for laboratory testing. DOTS requires quarterly visits to the district health care facilities by a district supervisor. The monitoring visit program for the peripheral laboratories by highly qualified experts from the reference and intermediate laboratories requires considerable funding and a large number of highly qualified laboratory specialists.

2. Blind rechecking. Blind rechecking of a sample of routine smears obtained from the peripheral and intermediate laboratories is the best method to evaluate the quality of direct Ziehl-Neelsen smear microscopy and to motivate the laboratory staff to improve performance [62]. The smear sample is to be selected by the supervisors from an upper-level laboratory. The countrywide system for routine blind rechecking of smears should be a long-term goal for the external quality assurance program. The method proposed in the recommendations developed jointly by the WHO, Union, CDC and other leading international bodies for tuberculosis control [62] defines the proper sample size based on the so-called Lot Quality Assurance Sampling system (LQAS). If properly applied, this method allows for statistically reliable evaluation of performance quality, in particular, the performance of the laboratory staff. Moreover, in high-volume settings (over 1,000 tests per year) and with the share of positive results among all test results exceeding 5%, the recommended sample size allows evaluation of the testing quality at a lower cost than in the previously recommended testing of all positive and 10% of negative smears. However in low-volume settings and a low proportion of positive results, the application of this method would mean rechecking virtually all smears.

In the previous guidelines by the WHO, CDC and other international documents on quality control it was recommended to recheck all MbT+ and 10% of MbT− smears. However, this is extremely inefficient in terms of the sample size and the scope of conducted activities, high workload of the laboratory staff and the required additional efforts, particularly in rereading MbT-positive slides. Moreover, the findings were frequently unreliable, because the sample was not random or blind, and the ultimate results (often used as “the gold standard”) depended on a single controller [86]. Therefore, since 2002, the LQAS method has been recommended for EQA of AFB smear microscopy, because its application relies on a small sample size. This is important for the implementation of rechecking method in high-volume laboratories and laboratories that have a high rate of MbT-positive results in routine testing. The method was successfully implemented in many countries [87].

A flowchart of the smear rechecking process is shown in Fig. 12.6.

3. **Panel testing.** A system for sending stained and/or unstained slides from the central laboratory to the peripheral laboratories for reading and interpretation of the results at regular intervals is recommended as a minimum requirement for assessment of the laboratory proficiency. A properly organized panel testing may reveal problems in performing laboratory tests; it also functions as a training exercise and is used for dissemination of uniform testing standards.

Notably, according to the WHO reporting form that the countries complete to submit the data to the WHO Global information system for tuberculosis data collection, it is required (in the EQA section) to report the number of laboratories meeting the following criteria for quality of laboratory testing.

Microscopy: Absence of “high false-positive” and “high false-negative” errors, that is, errors that are critical for making patient management decisions. The main idea of the external quality assurance program is to detect these types of errors. An error is considered “high false-positive” if samples reported by the assessed laboratory as 1+, 2+ or 3+ were found negative by microscopy examination in the control laboratory. An error is considered “high false-negative” if a sample with a negative microscopy result submitted for checking was found to be 1+, 2+ or 3+ in the control laboratory.

Culture tests: Over 90% of the specimens obtained from patients tested positive by smear microscopy at the start of treatment had positive culture result.

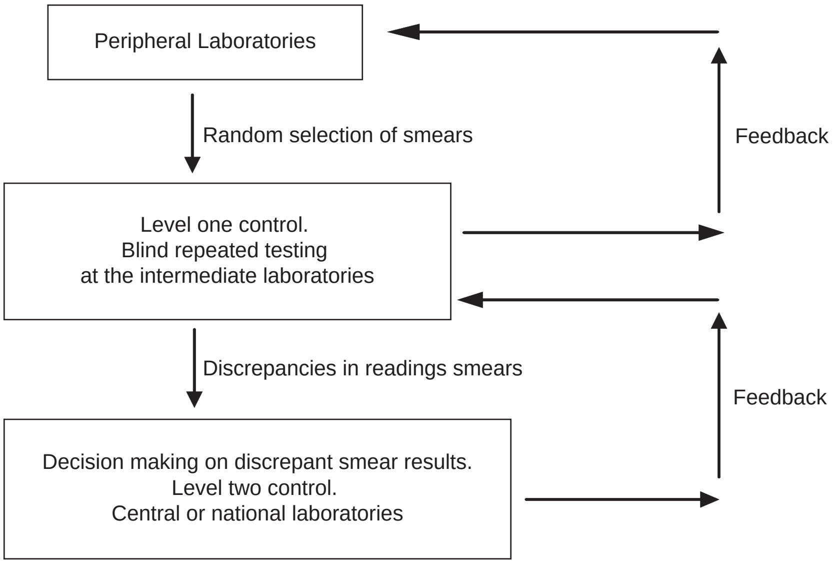


Fig. 12.6. Flowchart of the smear rechecking process

Drug susceptibility testing: Over 95% concordance rate for the DST results to both isoniazid and rifampicin that were obtained in the assessed laboratory and in the reference laboratory.

According to the expert advisory group at the WHO Regional Office for Europe, each country should have at least one officially certified national reference laboratory with the formally approved head of the laboratory [68].

Currently in the Russian Federation many EQA components have been implemented at the national level, and intensive efforts are made to develop and implement the missing component, to be included into the system of tuberculosis control activities. Supplementary to the WHO-recommended EQA components, the Russian Federation implements on the national level the quality assurance measures that so far have not appeared in the international guidelines. Therefore, the experience of the RF may be of use to other countries, particularly those with high TB incidence.

Conclusion

Implementation of the external quality assurance of the laboratory TB diagnostic tests in a considerable number of RF laboratories during the last four years allowed for reliable evaluation not only of the quality of laboratory diagnostics but also of the observed trends in its development.

External quality assurance of Ziehl-Neelsen microscopy revealed that a significant proportion of the laboratories including the GHC laboratories was capable of detecting acid-fast bacteria even in scanty control specimens. Testing specificity was also sufficiently high. After a considerable improvement in 2009, the EQA results for 2010 have remained stable or showed insignificant statistically invalid changes in the indicators.

Analysis of the testing result report form submitted by EQA participants and the data on testing techniques showed that 44% of all participants (47.5% of the GHC laboratories) made at least one error. Most errors were made in the result presentation format, which indicates disregard of the requirements stipulated in MoH Executive Orders No. 109 and 690. A significant proportion of the FSEQA participating laboratories (21% of all errors made and 22% of errors made by the GHC laboratories) make errors in the testing techniques that may result in failure to detect AFB.

13. TB service network. Resources

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The efficiency of countermeasures aimed at the spread of tuberculosis is directly related to the capacity of the health care facilities to perform TB control activities to the required extent.

13.1. TB facilities in the Russian Federation

The system of TB care management functions as a component of the health care system in which some major ideological and structural changes have taken place in the last 20 years.

After the adoption of Federal Law No. 131-FZ of 6.10.2003, "On the general managerial principles of the local government in the Russian Federation," the health care authorities turn over specialized medical facilities including the TB facilities to the level of RF constituent entities. The process of building the relationship between the municipal and regional levels of health care is still in a formative stage and requires a special interaction mechanism at the levels of health care management that allows for improvement of accessibility and quality of medical care.

At present, there is an ongoing process of shifting from a decentralized model to a centralized (local) model of TB service management, where the administrator and the only source of financing of TB facilities is the government of the RF constituent entity. When the TB dispensaries are turned over to the RF constituent entities (from the municipal jurisdiction), some of them lose their legal independence and become branches of the main TB dispensaries (Table 14.1). Due to the process of turning over the municipal TB facilities to the ownership of the RF constituent entities and reorganization of those facilities, the number of legal entities is decreasing and the facilities' capacity is improving. Meanwhile, the Federal Law No. 131-FZ is still not implemented in some RF constituent entities, such as the Moscow region and the Sakha Republic (Yakutia). In the latter it was justified by the need to delegate the functions of the specialized facilities due to a low density of the population and a lack of regular a transportation in some districts of the Republic.

The organizational structure of the TB service delivery at all levels is presented in the chart (Fig. 13.1), which shows the distribution of functions between the main medical facilities involved in TB care delivery.

The network of the TB facilities in the Russian Federation includes 2 research and practical (implementation) centers located in Moscow and in the Sakha Republic (Yakutia), 303 TB dispensaries (of them 262 have inpatient clinics), 73 TB hospitals, 41 TB sanatoria for adults, 104 sanatoria for children and 1,790 TB units in the primary health care. In Russia, there are 5 research institutes that are the centers of scientific, managerial, methodological, consultative, clinical and educational activities in the constituent entities of the Russian Federation: 2 research institutes in Moscow, 1 research institute in St. Petersburg, 1 in the Sverdlovsk region and 1 in the Novosibirsk region (See Section 13.5).

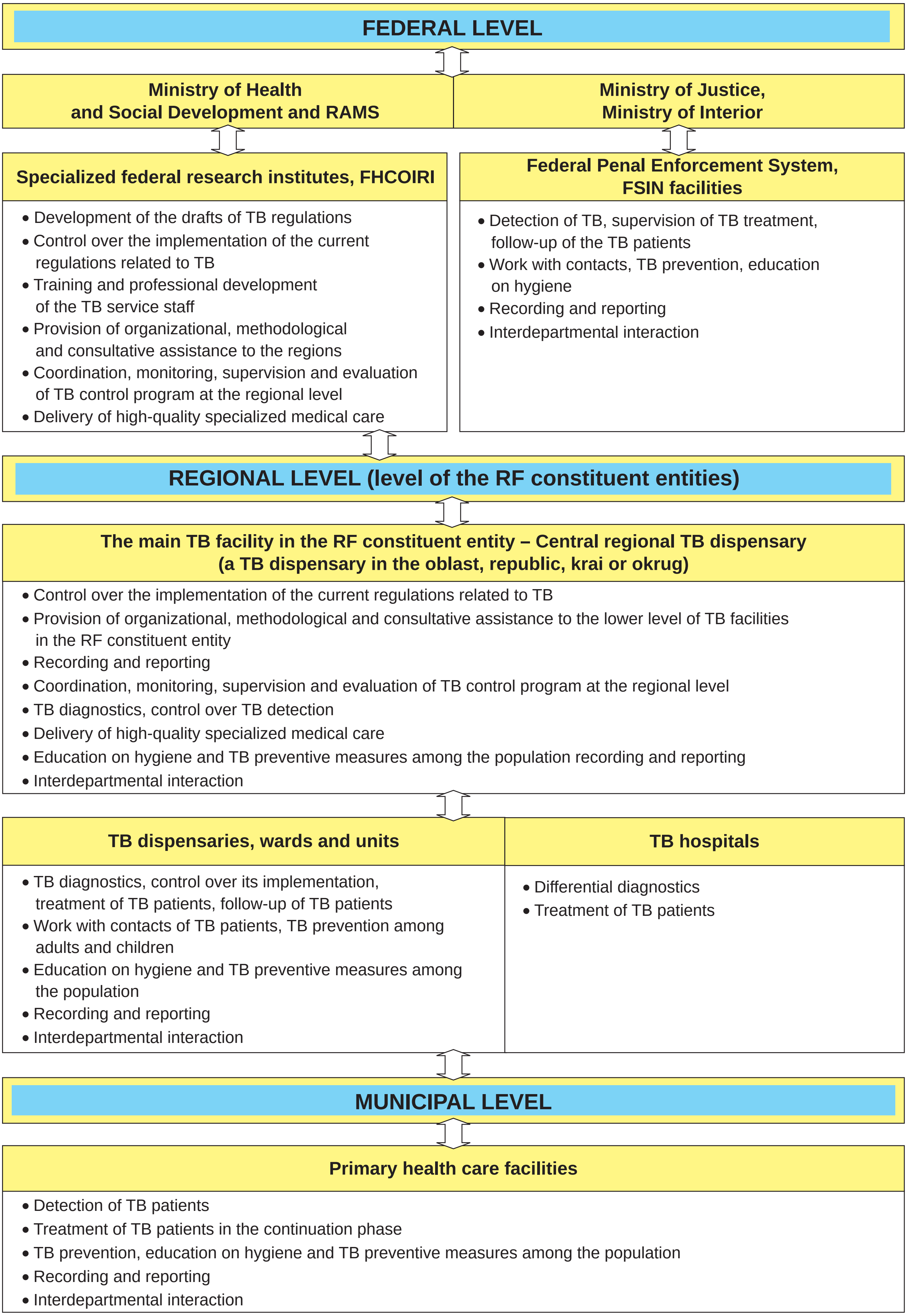
In the structure of the system for TB care delivery, the inpatient component significantly prevails over the outpatient one, which does not always meet the modern requirements for the treatment process.

As of the end of 2010, in the Russian Federation there were 74,368 inpatient TB beds, of them 6,816 beds for children of 0 to 17 years of age (Table 13.1). For the last 5 years the number of TB beds was reduced by more than 4,000 mainly due to the reduction in beds for adults. In 2010 the number of TB beds for adults was reduced by 1,049.

Per one inpatient TB bed in the country there are on average 3.4 patients with active TB (3.7 adult patients and 0.9 children) including 1.4 bacteriologically positive patients.

In 6 RF constituent entities, there are on average fewer than 2 TB patients per an inpatient TB bed: the regions of Belgorod, Voronezh, Ivanovo, Kostroma and Magadan and the city of Moscow. In 3 constituent entities of Russia, there are on average more than 6 TB patients: the Republics of Karelia and Chechnya, the Irkutsk region. In general, this rate varies over a wide range in the regions: from 1.0 (the Ivanovo region) to 11.4 (the Chechen Republic).

Along with the reduction in the number of inpatient beds, there should be an increase in the average bed occupancy within a year and in bed turnover, as well as the reduction of the average duration of a patient's stay in the inpatient clinic. However, it did not happen and for the last five years there has been no trend toward improvement. In 2010 in the Russian Federation as a whole, the occupancy of a TB bed for adult patients was 320.3 days [41]. In a number of regions the bed occupancy did not exceed 270 days (see Fig 13.2a): the Republic of North Ossetia-Alania (223.0), the Lipetsk region (243.4), the Kursk region (248.7), the city of Moscow (264.5)



FEDERAL LEVEL

Ministry of Health and Social Development and RAMS

Ministry of Justice, Ministry of Interior

Specialized federal research institutes, FHCOIRI

- Development of the drafts of TB regulations
- Control over the implementation of the current regulations related to TB
- Training and professional development of the TB service staff
- Provision of organizational, methodological and consultative assistance to the regions
- Coordination, monitoring, supervision and evaluation of TB control program at the regional level
- Delivery of high-quality specialized medical care

Federal Penal Enforcement System, FSIN facilities

- Detection of TB, supervision of TB treatment, follow-up of the TB patients
- Work with contacts, TB prevention, education on hygiene
- Recording and reporting
- Interdepartmental interaction

REGIONAL LEVEL (level of the RF constituent entities)

The main TB facility in the RF constituent entity – Central regional TB dispensary (a TB dispensary in the oblast, republic, krai or okrug)

- Control over the implementation of the current regulations related to TB
- Provision of organizational, methodological and consultative assistance to the lower level of TB facilities in the RF constituent entity
- Recording and reporting
- Coordination, monitoring, supervision and evaluation of TB control program at the regional level
- TB diagnostics, control over TB detection
- Delivery of high-quality specialized medical care
- Education on hygiene and TB preventive measures among the population recording and reporting
- Interdepartmental interaction

TB dispensaries, wards and units

- TB diagnostics, control over its implementation, treatment of TB patients, follow-up of TB patients
- Work with contacts of TB patients, TB prevention among adults and children
- Education on hygiene and TB preventive measures among the population
- Recording and reporting
- Interdepartmental interaction

TB hospitals

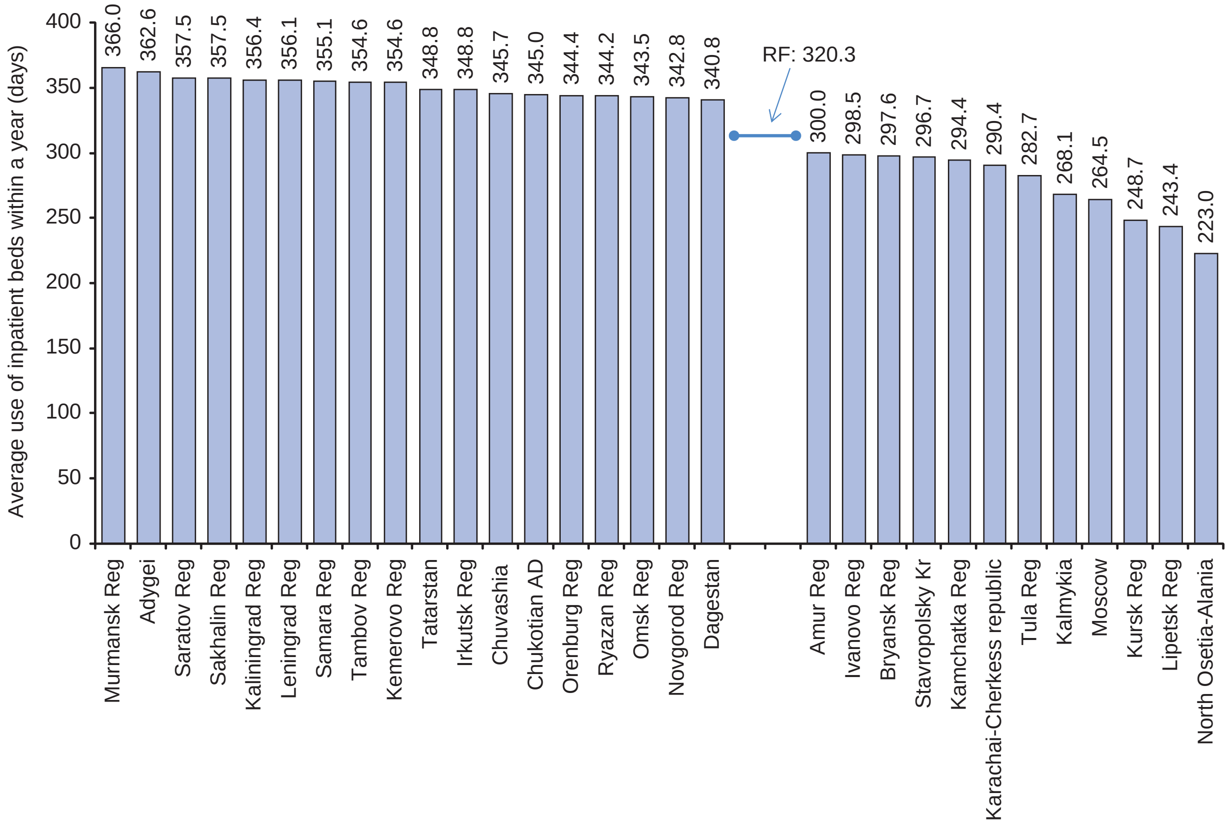
- Differential diagnostics
- Treatment of TB patients

MUNICIPAL LEVEL

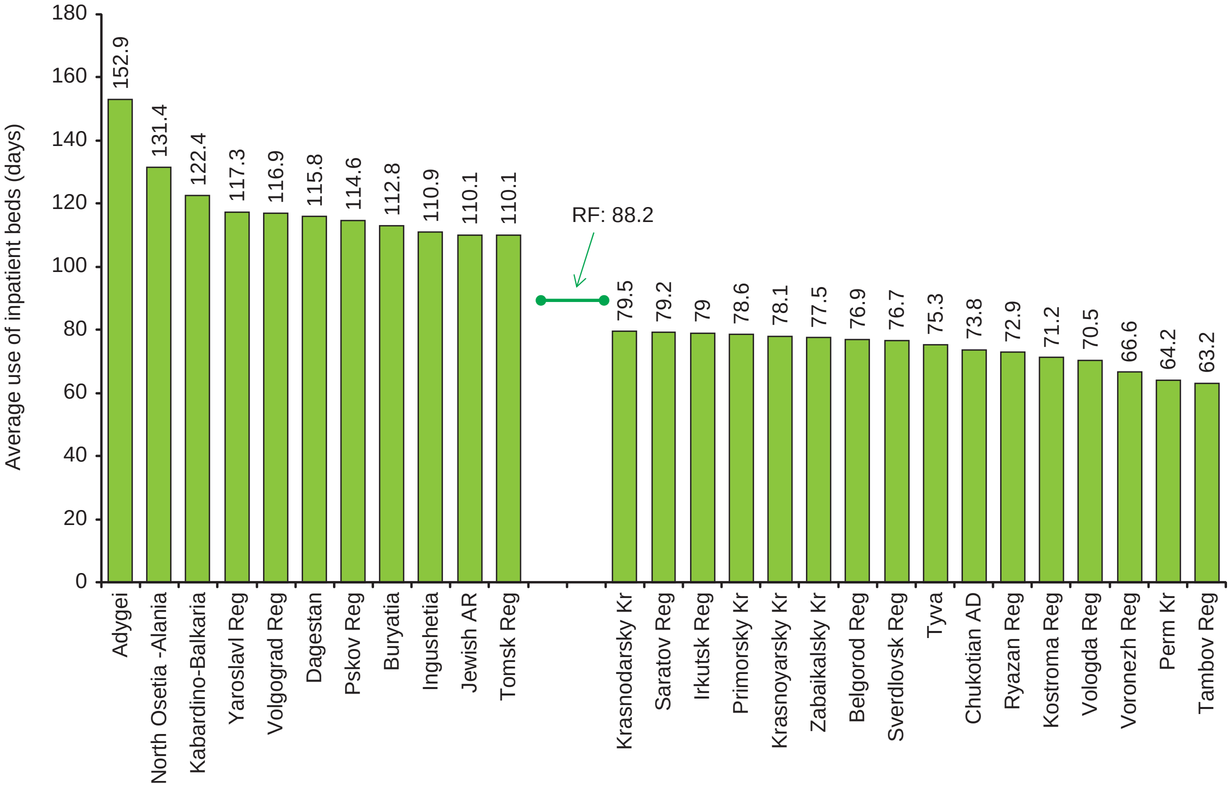
Primary health care facilities

- Detection of TB patients
- Treatment of TB patients in the continuation phase
- TB prevention, education on hygiene and TB preventive measures among the population
- Recording and reporting
- Interdepartmental interaction

Fig. 13.1 Organizational structure of medical care delivery to TB patients and Kalmykia (268.1). The occupancy of a pediatric TB bed was 313.8 days. At the same time, this rate did not exceed 175 days in the regions of Arkhangelsk (61.5), Murmansk (100.0), Vologda (120.0), and in the republics of Adygei (140.0), Karachai-Cherkess (164.0) and Kalmykia (175.0 days).



a)



b)

Fig. 13.2. Performance results of the TB inpatient clinics for adults: average bed occupancy within a year (a), an average duration of stay in the inpatient clinic (b). RF constituent entities (Source: [41], Form No. 47)

Table 13.1

Performance of the TB facilities in the Russian Federation, 2005–2010
(Source: FSS Forms No. 47, 14, 14-DS)

	2005	2006	2007	2008	2009	2010
Number of TB dispensaries	466	386	354	343	341	303
of them: with the inpatient beds	393	332	306	297	295	262
Number of TB hospitals	105	98	87	81	78	73
of them: with the outpatient clinics	27	28	28	24	24	20
Total number of inpatient TB beds	78,710	78,775	78,129	76,989	75,411	74,368
Number of inpatient TB beds for adults	72,286	71,994	71,358	70,334	68,601	67,552
per 1,000 adult population	0.51	0.51	0.50	0.50	0.48	0.47
Number of TB patients per bed	4.0	3.9	3.8	3.8	3.7	3.7
Average bed occupancy within a year	320.8	321.1	316.4	320.3	323.7	320.3
Average duration of a patient’s stay in the inpatient clinic (in days)	83.8	86.0	85.2	84.3	85.3	85.4
Number of inpatient beds for children aged 0–17	6,424	6,781	6,771	6,655	6,810	6,816
per 1,000 children 0–17 years of age	0.22	0.25	0.25	0.25	0.26	0.26
Number of TB patients per bed	1.2	1.1	1.1	1.0	0.9	0.9
Average bed occupancy per year	309.9	313.0	307.2	308.3	316.5	313.8
Average duration of a patient’s stay in the inpatient clinic (in days)	97.8	95.5	91.1	91.4	93.1	92.8
Number of sanatorium TB beds for adults	8,697	8,070	7,980	7,582	7,104	7,190
per 1,000 of adult population	0.06	0.06	0.06	0.05	0.05	0.05
Average number of days of bed occupancy per year	241.7	259.4	258.3	269.2	264.6	255.7
Number of sanatorium TB beds for children aged 0–17	16,306	16,130	15,555	14,901	14,633	13,370
per 1,000 children of 0–17 years old	0.57	0.59	0.58	0.57	0.56	0.51
Average number of days of bed occupancy per year	267.6	267.4	263.7	262.6	257.8	259.8
Number of TB beds in the day care clinic for adults		2,827	2,736	2,725	2,720	2,693
Average number of days of bed occupancy per year		301.5	298.0	294.2	311.2	306.8
Number of TB beds in the day care clinic for children aged 0–17		288	253	220	188	208
Average number of days of bed occupancy per year		260.0	255.4	255.0	257.1	253.7

The rate of bed turnover remained unchanged: for adults 3.8, and for children 3.4.

The average duration of inpatient bed use[148] was 85.4 days for adults and 92.8 days for children. In many entities of the Russian Federation the duration of the inpatient phase of treatment considerably exceeds the standards established for the intensive phase of treatment. For example, the duration of bed occupancy by adults, which exceeded 120 days, was reported in three Caucasian republics: Adygei (152.9), North Ossetia-Alania (131.4) and Kabardino-Balkaria (122.4) on conditions that the number of MDR-TB patients under long-term treatment with second-line drugs is very small in those territories.

The fact that there is no increase in the number of days of inpatient bed occupancy within a year, as well as no decrease in the average duration of patients’ stays in the inpatient clinic, cannot be explained by the reduction in the number of patients in need of inpatient care and by poor performance of activities aimed at bringing patients to treatment and proper case holding. For a number of constituent entities it is associated with the surplus of inpatient beds.

If on the average in the Russian Federation there are 0.3 TB beds per patient with active TB; in a number of regions this ratio is at least 0.5: 1.0 in the Ivanovo region, 0.8 in the Magadan region, 0.6 in the city of Moscow and 0.5 in the Sakha Republic, Chukotian autonomous district, and in the regions of Belgorod, Vologda, Voronezh, Kaluga, Kostroma and Chelyabinsk. At the same time, in Chechnya this ratio is critically low: 0.1. Considerable differences in the rate are also observed in the federal districts: in the Central Federal district there are 0.4 TB beds available per 1 TB patient, while in the North-Caucasian and Siberian Federal districts it is two times less: 0.2.

In 2010, of all new TB patients 85.4% were hospitalized, and 94.1% of MbT+ patients were hospitalized. According to the reports of the facilities, 191,814 patients were treated.

At present, the application of community-based approaches and treatment at TB sanatoria is not sufficient. Only 5.5% of new TB cases receive treatment in the day care clinics, and 3.9% of new TB cases receive treatment at the TB sanatoria. In general, the number of admissions to day care clinics does not exceed 6.6%, and admissions to the sanatoria do not exceed 9.2% from the total number of admissions (Form No. 33).

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[148] The average duration of an inpatient bed occupancy is the division of the average number of admitted, discharged and died patients and an average number of bed-days obtained from Form No. 30.

According to the reporting data, treatment of TB patients was not performed at the day care clinics in the regions of Vologda, Kursk, Leningrad, Magadan, Penza, Sakhalin, Tyumen and Ulianovsk; in the republics of Dagestan, Mordovia and Tyva, Kabardino-Balkaria, Karachai-Cherkessia and Udmurtia; in Yamal-Nenets and Chukotian autonomous districts, and in Kamchatka krai.

When transferring to the unified system of financing based on the number of treated patients and carrying out an independent expertise of the inpatient care provided to TB patients in line with the established standards, the TB service cannot function without considerable reduction of inpatient TB beds and scaling up of the use of more economical day care clinics at the TB outpatient departments.

In 2010 in the Russian Federation there were 41 TB sanatoria for adults, which functioned in 31 out of 83 constituent entities of the Russian Federation. The majority of the TB sanatoria are located in the Central (10) and Privolzhsky Federal Districts (14); the least number of sanatoria (1) are located in the North-Caucasian and Ural Federal Districts, while in the Far-Eastern Federal District the TB sanatoria are totally lacking.

According to the data from Form No. 47, of 104 TB sanatoria for children 26 are located in the Central Federal District and 22 are located in the Privolzhsky Federal District. The least number of sanatoria function in the NCFD, FEFD (5 in each) and in the UFD (6).

The occupancy of sanatorium TB beds is not sufficient: for adults it is 255.7 days, and for children it is 259.8 days.

By the request of the RF Ministry of Health and Social Development, the TB facilities submitted to FRIHCOI their summary annual reports for 2009 following No. 30, 14 and 62. These forms are not routinely submitted directly to the federal level, but they are summarized with the similar reports of non-TB facilities at the level of the medical statistics units in RF constituent entities. Therefore, at the federal level this information is not regularly available.

The main data obtained after processing the reporting forms for 2009, which were submitted by 378 TB facilities and 4 research institutes,[149] are presented in Tables 13.2 and 13.3 [48]. This information was used when developing suggestions on modernization of TB facilities in RF constituent entities.

According to the obtained data, the majority of TB facilities have a good potential (including outpatient service, surveillance activities and inpatient TB care) for TB control management in their territories.

Almost 90% of facilities have inpatient clinics (from 72% in the NWFD to almost 100% in the PFD, UFD, SbFD and FEFD). Surgical TB treatment is provided in 78 of 83 entities of the Russian Federation, 20% of the facilities have surgical inpatient wards and 17% have a department of thoracic surgery. The least proportion of facilities with the surgical wards or departments of thoracic surgery is reported in SFD and UFD: about 10%.

At the same time, according to the available data, more than 50% of buildings used by TB facilities require capital repairs, reconstruction or are in disrepair, and only 49% of buildings were suitable for use, while among the health care facilities overall there are more than 68% of such buildings (Fig. 13.3). Capital repairs were needed for 446 buildings, which is 38.9%, the reconstruction was needed for 92 buildings (8.0%), and 47 buildings (4.1%) are still in use but cannot be renovated and have to be demolished/replaced by new buildings. The issues of capital repairs and reconstruction of TB facilities will be addressed during the implementation of regional programs of health care modernization.

Fig. 13.3 Condition of the buildings that belong to TB and other types of health care facilities in the Russian Federation, 2009. (Source: Form No. 30)

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[149] Some TB facilities that submitted the reporting form in 2009–2010 changed their legal affiliation. Due to this, the numbers of the facilities in Tables 13.1 and 13.2 do not concur. Among the specialized research institutes, the data from the RIPP is lacking since this facility is not an independent unit but a part of the I. M. Sechenov Moscow Medical Academy.

Table 13.2

Material and technical resources: TB health care facilities (not including sanatoria), Russian Federation (Form FSSS No. 30 “Data on health care facilities,” 2009)

	Data from Form No. 30	Total for RF: Including research institutes		TB facilities		Including federal districts															
						CFD		NWFD		SFD		NCFD		PFD		UFD		SbFD		FEFD	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
1	Number of entities			82		18		10		6		7		14		6		12		9	
2	Number of facilities	382		378		99		39		50		20		59		42		45		24	
2.1	Incl. with inpatient clinics	341		337	89.2	80	80.8	28	71.8	43	86.0	19	95	59	100	41	97.6	43	95.5	24	100
2.2	Incl. with surgical wards	82		78	20,1	22	22,2	6	15,4	5	10,0	5	25	14	23.7	5	11.9	14	31.1	7	29.2
2.3	Incl. with thoracic surgery departments	69		65	17.2	19	19.2	5	12.8	5	10.0	5	25	12	20.3	4	9.5	10	22.2	5	20.8
2.4	Incl. with the artificial pneumothorax units	53		53	14.0	12	12.1	2	7.1	2	4.0	2	10	13	22.0	10	23.8	9	20	3	12.5
3	Number of buildings, incl.	1145		1131		267		81		179		60		164		149		186		45	
3.1	In disrepair	47	4.1	47	4.2	10	3.7	0	0.0	7	3.9	5	8.3	11	6.7	8	5.4	6	3.2	0	0
3.2	Require reconstruction	92	8.0	92	8.1	26	9.7	4	4.9	11	6.1	3	5.0	13	7.9	7	4.7	24	12.9	4	8.9
3.3	Require capital repairs	446	38.9	444	39.3	105	39.3	27	33.3	74	41.3	33	55.0	57	34.8	55	36.9	70	37.6	23	51.1
3.4	Do not require demolishing, reconstruction or capital repair	560	48.9	548	48.5	126	47.2	50	61.7	87	48.6	19	31.7	83	50.6	79	53.0	86	46.2	18	40.0

Table 13.3

Equipment of the TB facilities (not including sanatoria) in the Russian Federation (Form FSN No. 30, 2009)

	Available equipment	Total for RF: Including research institutes	TB facilities	In the federal districts							
				CFD	NWFD	SFD	NCFD	PFD	UFD	SbFD	FEFD
1	CT scanner	18	12	4	0	2	1	1	1	1	2
2	MR tomograph	3	3	1	0	1	0	0	0	1	0
3	X-ray units	772	765	187	73	75	29	152	90	103	48
3.1	of them for 1–2 work places	53.4%	53.3%	58.3%	60.3%	48%	58.6%	52.6%	50%	47.6%	58.3%
3.2	In use for more than 10 years, %	43.4%	43.7%	43.8%	50.7%	25.3%	55.2%	45.4%	51.1%	43.7%	35.4%
4	Digital units for chest examinations	330	327	91	34	29	12	61	35	48	17
4.1	of them in the equipped vehicles, %	45.5	45.9	48.4	29.4	58.6	33.3	50.8	51.4	39.6	41.2
4.2	In use for more than 10 years, %	1.8	1.8	1.1	0	0	8.3	1.6	2.9	4.2	0
5	Photofluorographic units	277	276	52	26	42	13	70	26	37	10
5.1	of them in the equipped vehicles, %	65.3	65.6	61.5	65.4	83.3	69.2	57.1	80.8	56.8	75.0
5.2	In use for more than 10 years, %	60.3	60.2	59.6	65.4	47.6	69.2	74.3	34.6	54.1	80.0
6	X-ray machines for use in patient rooms	160	147	44	11	9	7	15	13	29	19
6.1	In use for more than 10 years, %	39.4	40.8	43.2	54.5	11.1	85.7	73.3	15.4	27.6	36.8
7	Ultrasound examination units	248	231	66	25	18	6	39	34	23	20
8	Endoscopes	917	863	289	125	48	18	152	96	81	54
9	Bronchoscopes	651	605	196	87	37	18	92	75	62	38
10	ALV units	157	135	33	11	4	12	16	20	35	4
11	Electrocardiographs	848	825	208	88	94	29	147	105	103	51
12	Spirographs	109	93	32	40	9	79	65	59	23	93

CT – computed tomography. MR – magnetic-resonance tomography. ALV units – artificial lung ventilation units.

According to data on the equipment of the TB facilities at the regional level (Table 13.3), on the books at TB facilities there were 765 X-ray units Of them, more than 43% were in use for over 10 years. This equipment included 357 units for 3 work places and 408 units for 2 work places. In general, the X-ray equipment at the regional TB facilities was represented mainly by X-ray machines with 1–2 (24%) and 3 (21%) work places, as well as by the digital units for chest examinations (19%) and photofluorography units (17%). The proportion of other X-ray machines was low. In general, 26.9% of X-ray machines were in use for more than 10 years.

The TB facilities also have 12 computed tomography (CT) scanners, 63 bacteriology analyzers, 45 analyzers for enzyme-linked immunoassay, and 37 PCR (polymerase chain reaction) units (see Section 13.4). Equipment for the ultrasound examination was available in 90.1% (73) territories. In the framework of the regional modernization programs considerable renewal is planned of the medical equipment at medical facilities that provide TB care to the population.

13.2. Laboratory service in TB control

As stated in the Executive Order No. 109 [34] of the RF Ministry of Health and Social Development, “the microbiology examinations are the integral part of TB diagnostics, control of bacterial excretion status, choice of adequate treatment regimens and chemotherapy adjustment, assessment of treatment success and outcomes, projections for the course of the disease.” Therefore, the effective work of the laboratories is one of the most important components of TB care delivery to the population.

As of the end of 2010, in Russia there were 7,340 health care facilities with clinical diagnostic laboratories available, including 3,789 laboratories that perform microbiological examinations, of them 244 at the centralized laboratories. In the country there are 929 microbiology (bacteriology) laboratories; of them, 265 are centralized.

In order to improve the quality of the microbiology examinations for TB, in 2008–2009 in the framework of the World Bank (IBRR) project in the Russian Federation, more than 38,000 pieces of laboratory equipment was purchased and supplied, and 159 bacteriology laboratories and 2,371 clinical laboratories in the primary health care system and in the penitentiary sector were re-equipped (also see Chapter 8), just like 5 laboratories at the specialized TB research institutes and the main laboratory of the penitentiary sector in Moscow. In addition, in the framework of the Global Fund (GFATM) project 90 laboratories of the civilian health care sector and 65 laboratories of the penitentiary sector were additionally equipped with laboratory equipment and biological safety cabinets. At that time, financial and technical assistance to the implementation of the internal and external quality assurance of the bacteriological examinations was provided within the framework of the projects (Chapter 12). More than 1,000 laboratories took part in the program of the Federal System of the External Quality Assurance (FSEQA) of microscopy examinations, over 100 laboratories participated in the FSEQA program for culture examinations and more than 120 laboratories participated in drug susceptibility testing.

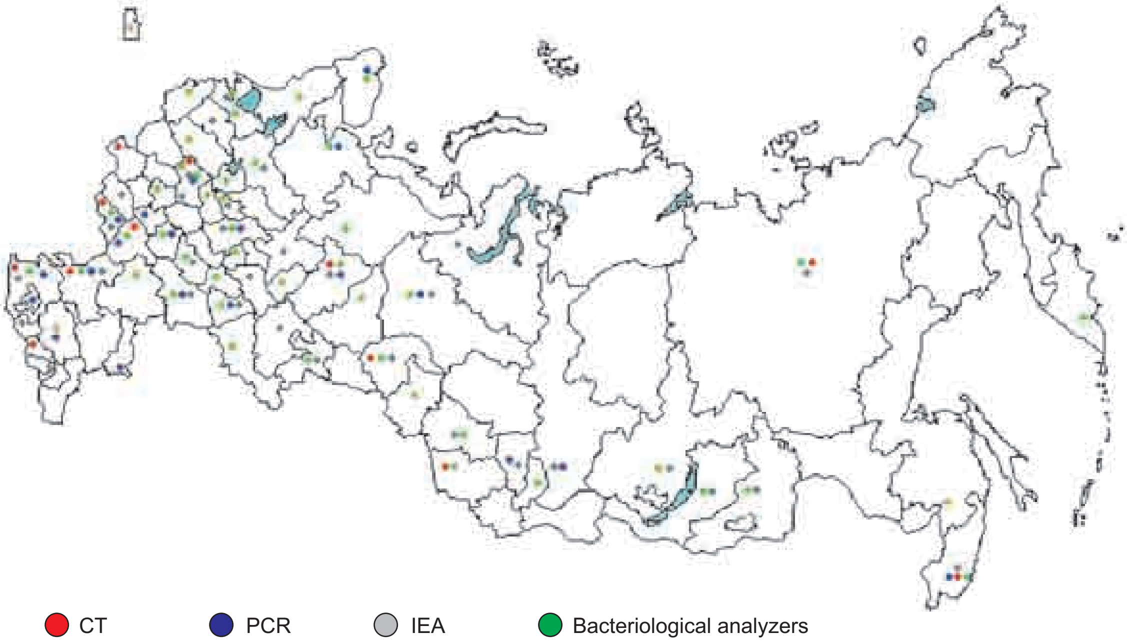

Fig. 13.4. Availability of equipment for diagnostics of TB, including laboratory diagnostics (Source: Data of FCTBM FRIHCOI, Form No. 30), CT – computed tomography, PCR – polymerase chain reaction, IEA – Immune-Enzyme Analysis

At present, there are 122 bacteriology laboratories at the regional TB facilities; of them, 50 are equipped with BACTEC (41%). In total there were 63 BACTECs available at the bacteriology laboratories of the regional TB facilities.

PCR technology was applied in the laboratories of 32 constituent entities of the Russian Federation. In total, on the books at regional TB facilities there were 37 PCR units.

According to the requested data submitted to the Federal Centre for TB Control Monitoring (FCTBM) at the Federal Research Institute for Health Care Organization and Information (FRIHCOI) by 81 RF entities (without the Nenets and Chukotian AD), the clinical diagnostic laboratories (CDL) of the TB facilities are not sufficiently equipped. Hemoglobinometers were available in 50% of the CDL; hematology analyzers were available in 30.7%. The laboratories of 36.9% of facilities had neither hematology analyzers nor hemoglobinometers. It is also necessary to improve equipment of the biochemical laboratories at regional TB facilities. Blood enzyme tests were performed at the TB facilities in 70 (92.6%) entities of the Russian Federation. The laboratories are able to identify the values of water-salt metabolism in 60 (74.1%) RF entities and are able to perform hormone blood tests in 19 (23.5%) RF entities. The biochemical analyzers were available at TB facilities in 18 (22.0%) entities of the Russian Federation.

Immunology examinations were performed in 27 (33.3%) entities of the Russian Federation, and enzyme-linked immunoassays were performed in 38 entities. In total, on the books at the TB facilities there were 45 analyzers for enzyme-linked immunoassays.

The data on the number of laboratories performing direct microscopy examinations, culture tests and DSTs are still lacking the reporting FSSS forms. In the reporting FSSS form No. 30 there is information only on the number of abovementioned tests performed.

In 2010 in Russia 8,815,000 MbT microscopies and 11,042,000 MbT culture examinations were performed. If the number of culture tests per TB patient in the follow-up register would be used as a conditional indicator, we could get a considerable range of values – from 300–400 tests per patient in the Republic of Karelia and in the regions of Orel and Murmansk, to 6–8 culture tests in the regions of Kurgan, Astrakhan, Novosibirsk and in the Republic of Ingushetia. Possible reasons for such differences require a separate analysis.

13.3. Staff of the facilities (units) that provide TB care to the population

According to the Reporting Form No. 17, as of the end of 2010, staffing with TB specialists was 5.7 per 100,000 population (6.3 in 2005). Of them, 94.6% are certified TB specialists, and 63.6% of the staff belong to a certain proficiency level, including 35.5% with the highest proficiency level (Table 13.4).

Table 13.4

Profiles of human resources available at the TB facilities and TB specialists in general, Russian Federation, 2005–2010 (Source: FSSS Forms No. 30 and No. 17)

Years	2006	2008	2010
Form No. 30: people working at TB facilities			
Physicians of various specializations			
Established positions	17,569	17,709	17,658
Occupied positions	16,581	16,614	16,382
Actual number of people	9,969	9,804	9,703
Combined jobs ratio	1.7	1.7	1.7
Medical nurses, technicians, paramedics:			
Established positions	41,146	40,656	40,090
Occupied positions	39,474	38,980	38,271
Form No. 17:			
Number of TB specialists	8,813	8,517	8,171
per 100,000 population	6.2	6.0	5.7
% of TB specialists who belong to a certain grade	62.9	64.5	63.6
including %:			
Highest Grade of TB specialists	30.8	33,3	35.5
Grade I	37.4	37.5	35.1
Grade II	13.6	10.8	9.2

Based on the FCTBM data obtained by the request for the standard reporting forms on staffing for 2009, which are submitted to the regional Health Department, the average age of a TB specialist is about 50. Only about 4% of the physicians are under 30 years of age, and 15% are over 70 years old. The majority of medical workers in the TB service are women (78.5%).

According to the data from the FSSS form No. 30, as of 31.12.2010 TB facilities in the Russian Federation had 17,658 available positions for doctors of all specializations; 12,612 positions for TB doctors, including 7,935 positions in outpatient clinics; and 40,090 positions for medical technicians, nurses and paramedics. Almost two-thirds (62%) of available positions of TB doctors were at outpatient clinics. TB specialists occupied 92.5% of the positions available; in the outpatient clinics they occupied 91.5% of positions, and in the inpatient clinics they occupied 94%.

Nine thousand seven hundred and three physicians work in the facilities, of them 4,603 work in the outpatient clinics. The ratio of two or more jobs that are held by physicians of various specializations is 1.7; among TB specialists the ratio is 1.6 (in the outpatient clinic, 1.6; in the inpatient clinic, 1.8).

The number of physician at TB facilities is declining every year. In 2007–2010 the number of physicians fell from 9,814 to 9,703, and the number of TB specialists fell from 7,406 to 7,073.

13.4. Financing

At present, the financing of the main TB control activities is determined by the priority national project (PNP) “Health” and the Federal target program (FTP) “Prevention and control of socially significant diseases for 2007–2012,” in which the “Tuberculosis” program is the main component (37.7% of financing).

According to the report presented by the RF Ministry of Health and Social Development to the WHO Global system of data collection on monitoring and evaluation of TB control programs implementation (See Chapter 1), in 2010 over 36 billion rubles ($1258 mln.) were allocated for TB control activities, of them 56 mln. rubles ($2 mln.) were allocated in the framework of the GF project and 41 mln. rubles ($1.4 mln.) were allocated by other international agencies.

Of all allocated financial resources, 44.9% was used to maintain the activities of TB facilities, 35.9%, was used for salaries of the medical staff at the TB facilities, 3.7%, was used for purchasing first-line drugs, 10.5% was used for purchasing second-line drugs and 4.5% was used for the laboratory component.

The bulk of financing is needed for maintaining the material and technical resources of TB facilities (maintenance of the buildings, equipment etc.).

In the framework of the PNP “Heath” 2.8 billion rubles will be allocated from the federal budget; of that amount about 1.15 billion rubles will be allocated for purchasing antibacterial drugs for treatment of MDR-TB patients.

In the framework of the FTP component “Tuberculosis” 7.9 billion rubles will be allocated in 2011. Of that amount about 1.7 billion rubles will be allocated for capital construction, 2 billion rubles will be allocated for the introduction of modern tools of diagnostic, treatment and rehabilitation of TB patients, and 4.0 billion rubles will be spent on TB drugs.

By the request of the RF Ministry of Health and Social Development, the FCTBM performed collection and analysis of data from the FSSS Form No. 62 for 2009 “Data on provision and financing of medical care,” data from the analytical report of the progress of activities implementation in the framework of the FTP “Prevention and control of socially significant diseases for 2007–2012” as well as reports of the “Russian Health Care” Foundation. According to the obtained data, 30.7 billion rubles were allocated for TB control activities from different sources of financing including 23.5 and 3.6 billion rubles, respectively, (88.4%) from the budgets of the constituent entities of the Russian Federation and municipalities, 3.3 billion rubles (10.8%) from the federal budget, and 0.8% of all resources from the international agencies for TB control activities in 2008. As a result of this financial support, about 82 thousand rubles from all sources of financing were spent on one patient with active TB in 2008.

According to data of the FSSS Form No. 62,[150] in 2009 the budgets of the RF constituent entities allocated 21 billion rubles total for TB service (the data from 76 territories). The distribution of the financial resources throughout the federal districts was approximately the following: PFD – 4.2 billion rubles, SbFD – 3.7 billion rubles, CFD – 3.6 billion rubles, UFD – 2.5 billion rubles, SFD – 2.4 billion rubles, FEFD – 2.1 billion rubles, NWFD – 1.6 billion rubles and NCFD – 1 billion rubles.

Among RF constituent entities the largest amount of financing was available for TB control activities in the regions of Rostov (1,150 mln. rubles), Moscow (1,051 mln. rubles), Krasnodar krai (971 mln. rubles), Sverdlovsk

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[150] Reporting forms were submitted by 76 constituent entities of the Russian Federation.

(797 mln. rubles), Irkutsk (706 mln. rubles), Chelyabinsk (688 mln. rubles), Khanty-Mansiysky AR (688 mln. rubles) and in the Republic of Bashkortostan (657 mln. rubles). The least amount of finances was allocated for TB control activities in the Jewish AR (49 mln. rubles), Republics of Karachai-Cherkess (37 mln. rubles), Altai (41 mln. rubles), Kalmykia (51 mln. rubles), Adygei (52 mln. rubles), Mari El (59 mln. rubles), Karelia (67 mln. rubles) and Nenets AR (107 mln. rubles). In the TB service of the Russian Federation the financing per patient with active TB[151] amounts to 80,628.26 rubles. This amount varies significantly in the federal districts and constituent entities of the Russian Federation.

Thus, if the FEFD, UFD and NWFD spend 90,000–100,000 rubles per patient (108,000 rubles and 92,000 rubles each of the last two, respectively), the PFD, CFD and SFD spend about 80,000 rubles (85,000, 84,000 and 80,000 rubles, respectively), while the SbFD and NCFD spend less than 70,000 (66,000 and 50,000 rubles, respectively).

In the RF constituent entities the largest amount of financial resources per TB patient was spent in the Magadan region (534,000 rubles), Kamchatka krai (272,000 rubles), Khanty-Mansiysky AD (256,000 rubles), Ivanovo region (232,000 rubles), Belgorod region (202,000 rubles), Kostroma region (198,000 rubles), Komi Republic (185,000 rubles) and Voronezh region (172,000 rubles). The lowest amount of financial resources as calculated per TB patient was allocated for the TB control activities in the Nenets AD (2,000 rubles), Republic of Chechnya (19,000 rubles), Kaliningrad region (23,000 rubles), Altai krai (34,000 rubles), Irkutsk region (38,000 rubles), Karachai-Cherkess Republic (41,000 rubles), Republic of Dagestan (47,000 rubles) and Smolensk region (50,000 rubles).

In 2009, the expenditure divisions of the TB service in the Russian Federation looked as follows: 63.6% (about 13.5 billion rubles) was used for salaries of the medical and other types of staff of the TB facilities, 21.0% (4.5 billion rubles) was the allocation for nonfinancial assets, 13.8% (2.9 billion rubles) was used for purchasing services, 1.3% (0.3 billion rubles) was the share of other types of expenditures, and finally 0.04% (8.8 billion rubles) was spent on the social support of TB patients.

The biggest share of expenditures of the salaries paid to the medical and non-medical staff working in the TB service in the overall division of expenditures in 2009 was reported in the Republic of Kalmykia (80.6%) and in the regions of Sverdlovsk (83.2%) and Astrakhan (75.6%). The smallest percentage of expenditure of the salaries paid to the medical and non-medical staff of the TB service was reported in the regions of Samara (48.1%), Pskov (50.16%) and Sakhalin (51.1%). The highest proportion of expenditures related to purchasing services in the overall division of expenditures in 2009 was in the Moscow region (29.3%), Kamchatka krai (28.6%) and Amur region (25.9%); and the lowest proportion was reported in the Sverdlovsk region (5.7%) and in the Republics of Chechnya (6.6%) and Tyva (6.7%).

Only 21 constituent entities of the Russian Federation allocated the financial resources for the social support of TB patients (the regions of Vladimir, Voronezh, Ivanovo, Kaluga, Kostroma, Arkhangelsk, Penza, Ulianovsk, Kemerovo, Tomsk, Magadan, Sakhalin and the Republics of Karelia, Kalmykia, Tatrstan, Buryatia, as well as the Nenets AD, Jewish AR, Kamchatsky krai and Khabarovsky krai), but in these constituent entities this budget line does not exceed 1% of the total amount of expenditures. In 2009 in the Russian Federation 1.7 billion rubles were spent on nutrition of TB patients, which was 8% of the total amount of expenditures of the TB service.

The analysis of expenses on patients' meals in the Russian Federation in 2009 showed that the biggest share of those expenses was reported in the Tomsk region (37.6%), and in the Republics of Chechnya (14.8%), Dagestan (13.5%) and North Ossetia-Alania (13.4%). The smallest percentage of expenses on meals was reported in the Sakha Republic (Yakutia) (0.6%), Sakhalin region (3.7%), Kamchatka krai (4.2%), and in the regions of Sverdlovsk (4.4%) and Moscow (4.4%). The cost of nutrition per one patient of the TB service was 6,400 rubles or 18 rubles a day. The largest amount of money is spent per one patient on meals in the regions of Magadan (51,000 rubles), Tomsk (42,000 rubles), Kostroma (18,000 rubles), Lipetsk (16,600 rubles), Belgorod (16,200 rubls), Ivanovo (15,500 rubles.), Novgorod (14,900 rubles) and in the Khanty-Mansiysk AR (14,300 rubles).

According to the WHO Global report [78], in 103 countries of the world where 96% of all TB cases are registered, $4.7 billion will be allocated for TB control in 2011 (in 2006, $3.9 billion). The governments will provide 86% of financing, including loans, 11% of financing will be allocated in the framework of GF projects, and 2% will be provided by other donors.

According to the data submitted to the Global Report in 2009 [80], it is supposed that the main share of financing of TB control activities in 2010 comes from the European region – $1.9 billion. Most of that amount comes from the Russian Federation, which is the evidence of a true commitment of the RF government to TB control Then follow the African countries, with a share of $0.5 billion.

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[151] The data on patients with active TB registered at the TB facilities as of the end of 2009 (according to Form No. 33) were used for the calculations.

13.5. Research institutes involved in the delivery and improvement of TB care

The TB control activities in the Russian Federation are currently organized and performed by five specialized federal institutes, the Federal Research Institute for Health Care Organization and Information (FRIHCOI), and two research and practical centers (RPC) in Moscow (MSPCTC – Municipal Scientific and Practical Center for TB control in Moscow under the Health Department of Moscow) and in Yakutsk (RPC “Phthisiology” under the Health Ministry of the Republic of Sakha-Yakutia).

The abovementioned institutions deal not only with the organization and conduct of fundamental and applied tuberculosis studies but are also responsible for TB surveillance, including collection and verification of statistical data, monitoring and evaluation, consulting and technical assistance to TB facilities in the Russian Federation. In accordance with the Executive Order of 4.5.2005, issued by the RF Federal Agency for Health and Social Development, the five specialized TB research institutes conduct organizational and methodological guidance within their fields of responsibility.

Table 13.5[152] contains the basic information on existing research institutions. The table also carries information on the main work areas of the specialized institutions outside of their daily organizational, methodological and educational activities.

Table 13.5

Research institutes and centers involved in TB control in the Russian Federation (as of 2010)

Institution	**Central TB Research Institute, Moscow**
Affiliation	Russian Academy of Medical Science
Year of foundation	1921
Main areas of activity	– fundamental research in the field of bacteriology of tuberculosis, immunology, immune genetics, biochemistry and pathologic morphology of pulmonary tuberculosis and other granulomatous diseases; – research and applied studies directed at the development of new diagnostic and therapeutic technologies; – the study of pathogenesis of acute progressive forms of tuberculosis and tuberculosis in HIV-infected patients; – in its capacity as a WHO collaboration center, the institute cooperates with the Russian and international organizations in joint research and pooling of experience in the field of tuberculosis
Research staff	174 research staff members including 1 associate member of the Academy, 44 with D.Sc. degrees, and 78 with Ph. D. degrees
Number and names of the supervision areas	15 constituent entities and Baikonur (Kazakhstan): the regions of Astrakhan, Vladimir, Ivanovo, Orel, Nizhniy Novgorod, Saratov, Penza, Ulianovsk and the Republics of Mari El, Ingushetia, Kalmykia, Mordovia, Tatrstan, Chechnya and Dagestan
Departments and other educational activities	– Department of phthisiopulmonology of Moscow Medical University of Stomatology; – Department of Phthisiopulmonology of the Russian Public Medical University; – Department of thoracic surgery at the Russian Academy of Post-diploma Education; – The Training Center for doctors and nurses from the regions of Russia, the CIS countries and the developing countries of Africa. The Center runs three branches operating at the regional dispensaries where doctors and nurses receive advanced post-graduation training
Institution	**Research Institute of Phthisiopulmonology, Moscow**
Affiliation	The First Medical University in Moscow named after I.M. Sechenov, under the RF Ministry of Health and Social Development
Year of foundation	1918
Main areas of activity	– epidemiology of tuberculosis and reliable methods of epidemiological surveillance; – pharmacokinetics, pharmacodynamics and interaction of anti-tuberculosis drugs; – fundamentals of TB prevention and treatment in children and adolescents; – TB monitoring; – under its auspices the Research Institute of Phthisiopulmonology has the following centers focused on the following studies: pre-clinical studies of new drugs, post BCG vaccination complications, treatment of sarcoidosis
Research staff	46 researchers including 21 with D.Sc. degrees and 14 with Ph.D. degrees
Number and names of the supervision areas	25 constituent entities of the Russian Federation: the regions of Bryansk, Kaluga, Moscow, Ryazan, Smolensk, Tula, Yaroslavl, Belgorod, Voronezh, Kursk, Lipetsk, Tambov, Volgograd, Samara, Kostroma, Rostov and Tver, Krasnodarsky and Stavropolskiy krais, Moscow, the Republics of Chuvashiya, Adigei, Kabardino-Balkaria, North Ossetia (Alaniya), Karachai-Cherkess

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[152] The table is based on annual reports of 2010, submitted by specialized TB research institutes to the inter-departmental committee of the Russian Ministry of Health and Social Development and Russian Academy of medical science “Tuberculosis and granulomatous lung diseases.”

Table 13.5 (consummation)

Departments and other educational activities	– Department of phthisiopulmonology at the First Medical University in Moscow named after I.M. Sechenov; – department of post-diploma training of the physicians, sub-department of TB
Institution	**St. Petersburg Research Institute of Phthisiopulmonology**
Affiliation	RF Ministry of Health and Social Development
Year of foundation	1923
Main areas of activity	– institutional activities aimed at improving effectiveness of prevention, early detection, follow-up and treatment of pulmonary and extrapulmonary TB; – improvement of diagnostics, therapeutic and surgical treatment of tuberculosis; – challenges of surgical treatment of children with tuberculosis of bones, joints and the spinal column; – challenges of TB management under the conditions of the extreme north
Research staff	89 researchers including 27with D.Sc. degrees and 43 with Ph.D. degrees; of them 42 researchers specialize in extra-pulmonary TB research, including 15 staff members with D.Sc. degrees and 23 staff members with Ph.D. degrees
Number and names of the supervision areas	11 constituent entities of the Russian Federation: the regions of Arkhangelsk, Vologda, Murmansk, Leningrad, Novgorod, Kaliningrad, and Pskov, the city of St. Petersburg, the Karelskaya and Komi Republics and the Nenets Autonomous District
Departments and other educational activities	Department of phthisiology
Institution	**The Urals Research Institute of Phthisiopulmonology**
Affiliation	RF Ministry of Health and Social Development
Year of foundation	1922
Main areas of activity	– development and improvement of medical technologies applied in prevention diagnostics, and treatment of tuberculosis in population residing under conditions of ecological pressing; development and trial of new drugs; – development and introduction of rapid methods of diagnostics and early detection of tuberculosis; – development of reliable methods of controlling TB epidemiology
Research staff	45 researchers including 11 with D.Sc. degrees and 19 with Ph.D. degrees
Number and names of the supervision areas	11 constituent entities of the Russian Federation: the regions of Kurgan, Orenburg, Sverdlovsk, Chelyabinsk, Tyumen and Kirov, the republics of Bashkortostan and Udmurtiya, Permskiy krai, the Khanti-Mansi and Yamalo-Nenets autonomous districts
Departments and other educational activities	– department of phthisiology and pulmonology; – department of radiation diagnostics; – department of clinical laboratory diagnostics; – department of surgery
Institution	**The Novosibirsk TB Research Institute**
Affiliation	RF Ministry of Health and Social Development
Year of foundation	1943
Main areas of activity	– development of new management mechanisms for TB control activities; – development of molecular and genetic methods of TB diagnostics; – study of etiology and pathogenesis of drug resistant tuberculosis; – improvement in the system of target delivery of medications to TB-affected organs in patients with concomitant pathology; – improvement in phthisio-surgical methods of treating asocial patients with chronic forms of pulmonary TB; – epidemiological monitoring of tuberculosis as an antropozoonosis factor; – WHO collaboration center
Research staff	29 researchers including 8 with D.Sc. degrees and 16 with Ph.D. degrees
Number and names of the supervision areas	21 constituent entities of the Russian Federation: the regions of Kemerovo, Novosibirsk, Omsk, Tomsk, Irkutsk, Amur, Magadan and Sakhalin regions, and the republics of Khakasia, Buryatia, Sakha (Yakutia), Tyva, Altay, Krasnoyarsky, Altaiskiy, Zabaikalskiy, Kamchatskiy, Khabarovskiy, and Primorskiy krais, the Chukotian and Jewish autonomous districts
Departments and other educational activities	Department of tuberculosis at the advanced training department of the medical academy

For the country as a whole, it is the Federal Research Institute for Health Care Organization and Information (FRIHCOI) under the Ministry of Health and Social Development (founded in 1999) that performs TB surveillance and collects, verifies and analyzes statistical data. The institute conducts research and educational activities covering all aspects of informatization in the health services. In 2007, (in line with the RF MH&SD Executive Order No. 143 of 2.3.2007) the institute set up a Federal Centre for TB Control Monitoring (FCTBM) in the Russian Federation. The main purpose of this center is to establish a common information area on TB-related issues in the Russian Federation.

This center functions as a federal management and methodology unit. Within the framework of its competence the center coordinates its activities with the federal legislative and executive bodies, regional executive bodies, local governmental agencies, various public institutions, medical and other organizations irrespective of their types of ownership and affiliation, government non-budgetary bodies, and international foundations.

13.6. Resources of the general health care network on TB care delivery

Primary health care institutions play a crucial role in TB detection and outpatient treatment of TB patients.

The main method in TB detection in Russia is fluorography screening. Since 2005, there has been an active introduction of modern digital equipment for chest examination. The Priority National Project "Health" played an important role in re-equipping medical centers with modern X-ray diagnostic tools. At present, the health services are equipped with 5,960 X-ray and digital units for chest examination (Fig. 13.5), of which over 90% are installed at primary health care institutions.

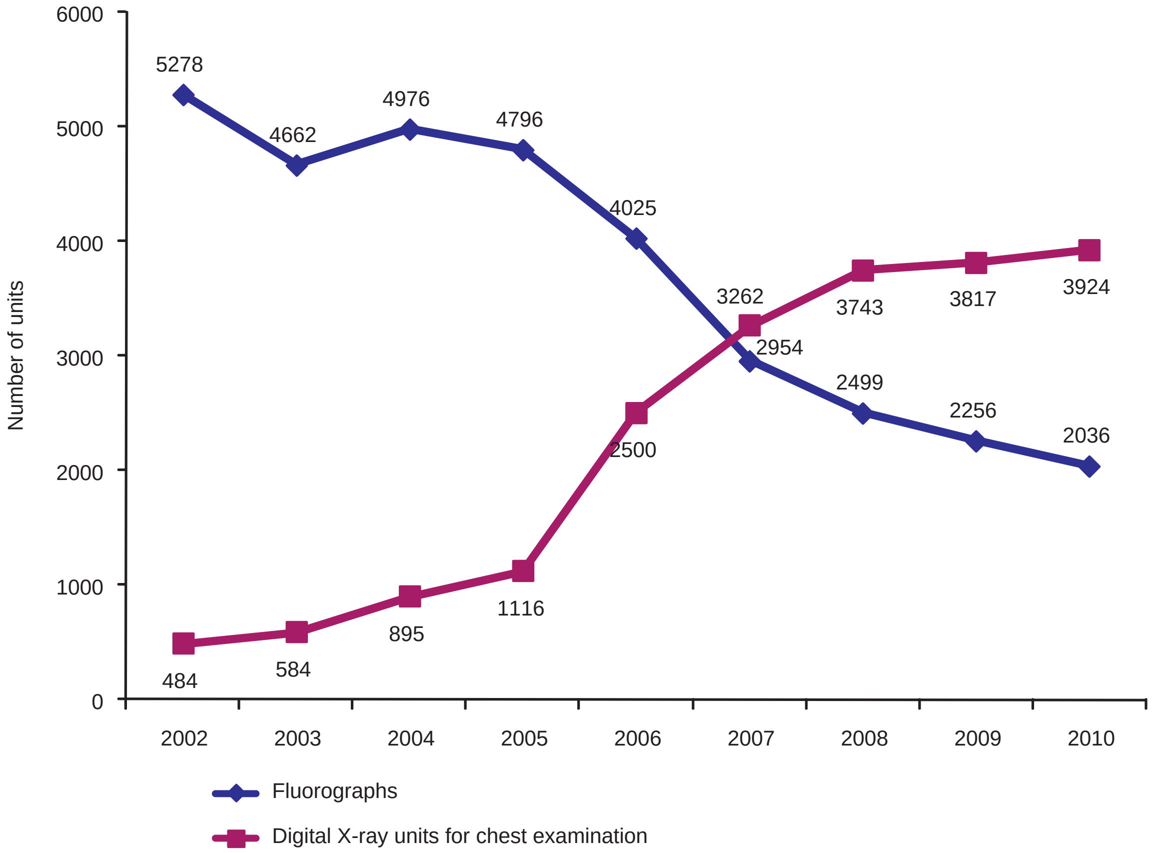

Fig 13.5. The trends in equipping health care facilities for mass TB screening (fluorography, and digital units for chest examination), Russian Federation (Source: Form No. 30)

The proportion of outdated digital devices for chest examination with a service period exceeding 10 years amounted to 2.9%, and for film fluorography units it amounted to 74%.

As of the end of 2010, there were 3.6% of malfunctioning digital devices and 12.6% of non-operational film X-fluorography units.

Mobile X-ray units were set up to ensure medical examination of the rural and other population groups not affiliated with any educational or professional institutions. Most of these units were provided within the framework of the priority national project "Health." Out of the 861 mobile fluorography units, 59.9% were digital and only 1% of these had been in operation for over 10 years. There was a total of 4.2% of non-operational units. Out of the total number of mobile fluorography units (41% of all mobile units), 55.7% had been in use for over 10 years and 15.7% did not function.

Staffing by radiologists and radiation therapists during the period from 2004 to 2010 practically did not change: 1.1 per 10,000 of the population. In 2010, all medical facilities had a total of 13,500 radiologists and 29,000 X-ray laboratory assistants.

In terms of TB detection management, it is highly important to maintain the necessary staff of district internal disease specialists and general practitioners. Their maximum number – 3.5 per 10,000 of the population – was reported in 2008. In 2009–2010, their number dropped to 3.3 per 10,000, that is, to the level of 1997. In 2010, the medical facilities in the country had a total staff of 73,538 doctors (59,001 district internal disease specialists, 26,722 district pediatricians and 8,983 general practitioners).

The doctors responsible for the laboratory diagnostics of tuberculosis are involved in identification of contagious patients who are the most dangerous from the point of view of epidemiology. In 2010, the medical and preventive centers (including TB facilities) had a total staff of 14,286 doctors specializing in clinical laboratory diagnostics, 2,801 bacteriologists and 2,725 biologists working in the clinical diagnostic laboratories. The laboratories also have a staff of 23,521 laboratory technicians and 49,744 feldshers-technicians.

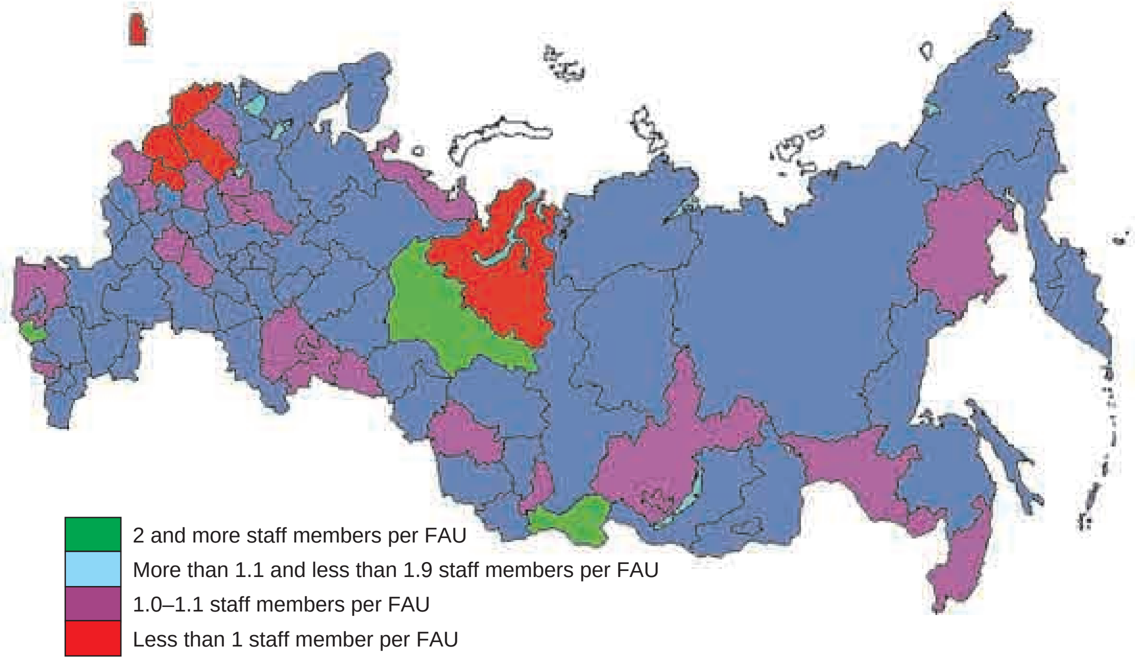

Fig. 13.6. Staffing of the feldsher-obstetrics units (FOU): number of staff members per FOU, 2009, Russian Federation (Source: Form No. 47)

Directly observed treatment in the remote areas far from the TB units is provided by the staff members of the feldsher-obstetrics units (FOU). The FOU staffing with the feldshers and nurses did not change compared with 2009, and it was 1.2 staff members (a feldsher and/or a nurse) per 1 FOU. Insufficient staffing of the feldsher's units (less than 1 worker per FOU) was reported in the regions of Magadan, Kaliningrad, Tver and in the Primorsky krai (Fig. 13.6), where some problems related to ensuring DOT to the rural population may occur.

Therefore, when planning TB control activities it is essential to consider the available resources and capacity of the primary health care.

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Annex 1

Definitions used in the Russian Federation for dispensary follow-up 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” [20]

1. Groups of dispensary follow-up and TB registration for adult patients at the 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+)[153]**–** follow-up of new MbT+ TB cases

I-A (MbT–) – follow-up of new MbT– TB cases

I-B (MbT+) – follow-up of MbT+ TB relapses

I-B (MbT–) – follow-up of MbT– TB relapses

I-C – follow-up of patients with treatment default and patients avoiding evaluation. Patient transfer to group I-B occurs 1 month after he or she was lost for follow-up.

II-A – follow-up of patients with chronic TB in need of intensive treatment which may result in cure.

II-B – 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 after clinical cure.

2. Groups of dispensary follow-up and registration of children and adolescents at the 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 the manifestations a chronic disease.

Group III – children and adolescents at risk of TB relapse at any site. It includes two 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 the sources of TB infection. It has two subgroups: **IV-A –** persons in contact with MbT+ family members, relatives and household contacts, as well as those in contact with MbT+ individuals at the facilities for children and adolescents; children and adolescents living in the areas of TB facilities; **IV-B –** persons in contact with active MbT– TB patients; children and adolescents from the families of livestock farmers working at farms with unfavorable TB situation, as well as those from the families with livestock having TB.

Group V – children and adolescents with complications after TB vaccinations. It includes three 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 three subgroups: **VI-A –** children and adolescents at an early stage of primary TB infection (conversion of tuberculin tests); **VI-B –** previously infected children and adolescents with hyperergic reaction to tuberculin; **VI-C –** children and adolescents with increased tuberculin sensitivity.

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[153] MbT – mycobacteria of tuberculosis, see the list of abbreviations.

3. General definitions

Chemotherapy regimen – The combination of TB drugs, duration of their administration, time and scope of the follow-up evaluations, as well as the organizational forms of treatment, based on patients' groups.

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.

Chronic course of active TB – long-term (over 2 years), 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 excreted into the external environment. Among extra-respiratory TB cases, patients with bacterial excretion are those who have MbT detected in fistula discharge, 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. It 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 organs and tissues is the X-ray examination (radiological – survey 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” [21]

1. Groups of patients by history of their registration for treatment:

TB cases registered for the first time (new TB cases) – patients who have never been previously treated for TB or have taken TB drugs for less than one month.[154]

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 above definitions, but for whom a decision has been made about a provision for a chemotherapy course.

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 at 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 at 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 required 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 remains or becomes smear positive at month 5 or later on during treatment.

Failed course of chemotherapy confirmed by culture – a treatment outcome when a patient had positive sputum culture results at the beginning of treatment and the sputum culture 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 sputum 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 from TB – a treatment outcome registered in the event of patient’s death from TB during the course of treatment.

Other causes of death – a treatment outcome registered in the event of patient’s death during the course of treatment from 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.

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[154] According to Executive Order No. 109 [20], the central consultative committee of physicians makes decisions concerning the 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.

Transferred out – patients who left the administrative territory or were transferred from one department to another (e.g., released from a penitentiary facility where their 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 that includes intensive and continuation phases for the achievement of clinical cure of active TB.

Annex 2

Major epidemiological and TB care effectiveness indicators in the Russian Federation

Table 1

TB notification rate in the Russian Federation, 2006–2010 (notification rate by territory, Form No. 8)

№	Federal districts, constituent entities of the Russian Federation	New TB cases																					
		All forms of tuberculosis										Of them with respiratory TB						Of them with pulmonary TB					
		number of cases					per 100,000 population					number of cases			per 100,000 population			number of cases			per 100,000 population		
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
RUSSIAN FEDERATION		**117646**	**118367**	**120835**	**117227**	**109904**	**82.6**	**83.3**	**85.1**	**82.6**	**77.4**	**117066**	**113531**	**106391**	**82.5**	**80.0**	**75.0**	**109724**	**106282**	**99310**	**77.3**	**74.9**	**70.0**
DISTRICT: Central		22012	23332	23727	22456	20576	59.0	62.7	63.9	60.5	55.4	22859	21611	19795	61.6	58.2	53.3	21230	20036	18318	57.2	54.0	49.4
1	**Regions:** Belgorod	942	879	960	784	712	62.3	58.0	63.1	51.3	46.5	911	742	673	59.9	48.6	44.0	872	712	651	57.3	46.6	42.5
2	Bryansk	1168	1259	1287	1277	1138	88.2	95.9	98.7	98.5	88.1	1235	1227	1087	94.7	94.7	84.1	1135	1137	1007	87.0	87.7	77.9
3	Vladimir	1189	1161	1167	1156	939	81.1	79.8	80.8	80.6	65.7	1138	1121	919	78.8	78.1	64.3	1067	1037	849	73.9	72.3	59.4
4	Voronezh	1509	1597	1576	1438	1278	65.5	69.8	69.3	63.5	56.5	1507	1347	1207	66.2	59.4	53.4	1438	1283	1157	63.2	56.6	51.2
5	Ivanovo	672	578	610	631	533	61.4	53.3	56.7	59.0	50.0	583	605	512	54.2	56.6	48.0	553	568	473	51.4	53.1	44.3
6	Kaluga	741	721	735	688	651	73.2	71.6	73.2	68.6	65.0	707	670	621	70.4	66.9	62.0	664	634	563	66.1	63.3	56.2
7	Kostroma	327	304	297	365	291	46.3	43.5	42.8	52.9	42.3	296	357	286	42.6	51.7	41.5	262	311	254	37.7	45.1	36.9
8	Kursk	932	892	958	911	720	79.2	76.5	82.7	79.1	62.7	938	892	696	80.9	77.4	60.6	889	840	661	76.7	72.9	57.5
9	Lipetsk	877	943	902	724	680	74.5	80.5	77.4	62.4	58.7	876	700	654	75.1	60.3	56.5	861	678	633	73.8	58.4	54.7
10	Moscow	3483	3921	3770	3640	3412	52.5	58.9	56.3	54.1	50.5	3656	3546	3328	54.6	52.7	49.3	3426	3272	3048	51.2	48.6	45.1
11	Orel	496	481	472	458	391	59.7	58.4	57.6	56.2	48.1	455	439	379	55.5	53.9	46.6	417	411	364	50.9	50.4	44.8
12	Ryazan	927	971	963	903	803	78.7	83.1	82.9	78.2	69.7	929	872	781	80.0	75.5	67.8	876	813	731	75.4	70.4	63.5
13	Smolensk	1009	899	970	923	859	100.9	91.0	99.1	95.1	88.9	941	897	846	96.1	92.5	87.6	878	837	814	89.7	86.3	84.3
14	Tambov	738	750	727	759	738	65.7	67.5	66.0	69.5	67.8	692	732	697	62.8	67.0	64.0	658	701	672	59.7	64.2	61.7
15	Tver	1138	1104	1093	1019	927	81.4	79.7	79.5	74.7	68.1	1075	1001	905	78.2	73.3	66.5	988	914	839	71.9	67.0	61.7
16	Tula	1261	1228	1295	1399	1077	79.3	78.0	83.0	90.4	69.9	1245	1352	1041	79.8	87.4	67.6	1161	1272	990	74.4	82.2	64.3
17	Yaroslavl	806	819	693	618	620	60.9	62.2	52.8	47.2	47.5	645	586	580	49.1	44.8	44.4	585	532	502	44.6	40.7	38.4
18	**City:** Moscow	3797	4825	5252	4763	4807	36.4	46.1	50.1	45.2	45.5	5030	4525	4583	48.0	42.9	43.4	4500	4084	4110	42.9	38.8	38.9
DISTRICT: Northwestern		8684	8426	8624	8500	7750	63.9	62.3	64.0	63.2	57.7	8378	8236	7530	62.1	61.2	56.0	7565	7479	6885	56.1	55.6	51.2
19	**Republics:** Kareliya	477	491	437	429	438	68.6	71.0	63.4	62.5	64.0	424	411	425	61.5	59.9	62.1	395	390	401	57.3	56.9	58.6
20	Komi	796	926	882	820	709	81.2	95.3	91.6	85.9	74.5	835	785	673	86.7	82.2	70.8	783	739	633	81.3	77.4	66.6
21	**Regions:** Arkhangelsk	942	756	740	697	668	73.3	59.2	58.4	55.4	53.3	724	683	658	57.1	54.3	52.5	680	635	619	53.7	50.5	49.3
22	Vologda	564	575	608	540	549	45.8	46.9	49.8	44.4	45.2	582	522	530	47.7	42.9	43.7	545	483	508	44.7	39.7	41.9
23	Kaliningrad	1265	1256	1105	941	878	134.8	134.0	117.9	100.4	93.6	1083	917	854	115.5	97.8	91.1	949	796	771	101.2	84.9	82.2
24	Leningrad	1207	1134	1302	1430	1182	73.6	69.3	79.7	87.7	72.5	1278	1392	1168	78.3	85.4	71.7	1198	1296	1115	73.4	79.5	68.4
25	Murmansk	500	497	428	455	393	58.1	58.2	50.5	54.2	47.0	418	441	381	49.4	52.5	45.5	327	419	351	38.6	49.9	42.0
26	Novgorod	451	444	438	432	390	68.2	67.8	67.5	67.2	60.9	423	424	382	65.2	65.9	59.6	400	404	363	61.6	62.8	56.7
27	Pskov	623	642	669	604	567	86.6	90.5	95.5	87.2	82.3	663	588	556	94.6	84.9	80.7	642	564	533	91.6	81.4	77.4
28	**City:** St. Petersburg	1859	1705	2015	2152	1976	40.6	37.3	44.0	46.9	43.0	1948	2073	1903	42.6	45.2	41.4	1646	1753	1591	36.0	38.2	34.6
DISTRICT: Southern		16298	17521	17040	10771	10607	73.4	76.8	74.5	78.5	77.3	16472	10524	10403	72.0	76.7	75.9	15620	10002	9673	68.3	72.9	70.5
29	**Republics:** Adygeya	346	411	375	359	318	78.3	93.2	84.8	81.0	71.8	366	348	312	82.8	78.6	70.4	336	319	296	76.0	72.0	66.8
30	Kalmykiya	369	365	349	315	288	128.2	127.5	122.6	111.1	101.7	343	299	280	120.4	105.4	98.9	315	276	251	110.6	97.3	88.6
31	**Krai:** Krasnodarsky	3105	3676	3653	3443	3623	60.9	71.9	71.2	66.8	70.2	3578	3361	3571	69.7	65.2	69.2	3466	3256	3465	67.5	63.2	67.1

№	Federal districts, constituent entities of the Russian Federation	New TB cases																					
		All forms of tuberculosis										Of them with respiratory TB						Of them with pulmonary TB					
		number of cases					per 100,000 population					number of cases			per 100,000 population			number of cases			per 100,000 population		
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
32	**Regions:** Astrakhan	875	872	947	913	901	88.0	87.4	94.4	90.7	89.5	933	900	882	93.0	89.4	87.6	876	830	815	87.3	82.5	80.9
33	Volgograd	2807	3099	2843	2697	2457	106.8	118.5	109.2	104.0	94.9	2778	2623	2407	106.7	101.1	92.9	2680	2544	2099	102.9	98.1	81.0
34	Rostov	3121	3248	3175	3044	3020	72.8	76.2	74.7	71.9	71.4	3122	2993	2951	73.5	70.7	69.8	2986	2777	2747	70.3	65.6	64.9
	DISTRICT: North-Caucasian				5659	5198				61.4	56.2		5300	4883		57.5	52.8		4916	4556		53.3	49.2
35	**Republics:** Dagestan	1644	1582	1596	1485	1394	62.0	59.2	59.1	54.5	50.9	1513	1392	1318	56.0	51.1	48.1	1411	1308	1241	52.3	48.0	45.3
36	Ingushetia	183	214	157	202	234	37.4	43.1	31.2	39.4	45.3	151	193	217	30.0	37.7	42.0	130	167	194	25.8	32.6	37.5
37	Kabardino-Balkaria	488	491	431	428	358	54.7	55.1	48.3	47.9	40.1	419	417	353	47.0	46.7	39.5	378	391	324	42.4	43.8	36.2
38	Karachai-Cherkes	212	219	233	205	203	49.3	51.2	54.5	48.0	47.5	216	189	195	50.5	44.3	45.7	208	171	195	48.7	40.0	45.7
39	North Ossetia – Alania	439	512	451	459	405	62.5	72.9	64.2	65.4	57.8	419	415	363	59.7	59.2	51.8	364	358	325	51.8	51.0	46.4
40	Chechnya	912	1004	925	958	906	77.7	83.9	75.6	76.4	71.4	875	906	854	71.5	72.3	67.3	801	830	764	65.5	66.2	60.3
41	**Krai:** Stavropolskiy	1797	1828	1905	1922	1698	66.4	67.6	70.4	70.9	62.6	1759	1788	1583	65.0	66.0	58.4	1669	1691	1513	61.7	62.4	55.8
	DISTRICT: Privolzhskiy	23815	22681	23166	22946	21146	78.3	74.9	76.7	76.1	70.2	22348	22216	20378	74.0	73.7	67.7	21068	20955	19191	69.8	69.5	63.7
42	**Republics:** Bashkortostan	2231	2114	1972	1940	1910	55.0	52.2	48.6	47.8	47.0	1856	1830	1815	45.8	45.1	44.6	1754	1712	1717	43.3	42.2	42.2
43	Mari El	469	582	577	635	581	66.1	82.6	82.2	90.8	83.2	558	621	569	79.5	88.8	81.5	521	579	532	74.3	82.8	76.2
44	Mordovia	588	583	614	668	539	69.0	69.1	73.4	80.5	65.2	605	660	531	72.3	79.5	64.2	566	635	509	67.6	76.5	61.6
45	Tatarstan	2298	2207	2221	2203	2020	61.1	58.7	59.0	58.4	53.5	2119	2109	1910	56.3	55.9	50.5	1999	1987	1787	53.1	52.7	47.3
46	Udmurtia	1269	1254	1251	1097	990	82.3	81.7	81.7	71.8	64.9	1221	1074	958	79.8	70.3	62.8	1160	1013	907	75.8	66.3	59.4
47	Chuvash	1052	994	1087	1032	939	81.6	77.4	84.9	80.7	73.5	1068	1014	918	83.4	79.3	71.8	1038	989	892	81.0	77.3	69.8
48	**Krai:** Permskiy	3200	2827	2953	2757	2754	116.8	103.8	108.8	101.9	102.0	2870	2671	2670	105.8	98.8	98.8	2687	2483	2457	99.0	91.8	91.0
49	**Regions:** Kirov	1014	911	1003	945	867	70.7	64.2	71.3	67.7	62.3	945	903	821	67.2	64.7	59.0	894	852	769	63.5	61.0	55.3
50	Nizhny Novgorod	2844	2512	2503	2613	2345	83.7	74.5	74.7	78.4	70.6	2453	2547	2294	73.2	76.4	69.0	2300	2368	2196	68.7	71.1	66.1
51	Orenburg	2371	2312	2405	2237	2030	111.2	108.9	113.7	105.9	96.1	2344	2182	1950	110.8	103.3	92.3	2128	2011	1766	100.6	95.2	83.6
52	Penza	1026	985	1070	1053	918	73.2	70.8	77.3	76.5	66.8	1039	1025	884	75.1	74.5	64.4	985	998	840	71.2	72.5	61.2
53	Samara	2535	2518	2647	2754	2490	79.6	79.3	83.4	86.9	78.5	2512	2676	2396	79.2	84.4	75.6	2418	2579	2297	76.2	81.3	72.5
54	Saratov	1902	1771	1758	1926	1768	73.1	68.4	68.2	75.0	68.9	1701	1871	1703	66.0	72.8	66.4	1625	1776	1616	63.0	69.1	63.0
55	Ulyanovsk	1016	1111	1105	1086	995	76.5	84.4	84.4	83.4	76.6	1057	1033	959	80.8	79.4	73.8	993	973	906	75.9	74.7	69.8
	DISTRICT: Ural	12574	12717	12840	12068	11894	102.8	103.9	104.8	98.4	96.9	12431	11702	11553	101.5	95.4	94.1	11480	10747	10757	93.7	87.6	87.6
56	**Regions:** Kurgan	1347	1320	1436	1279	1305	138.2	136.8	150.1	134.6	137.7	1381	1238	1243	144.4	130.3	131.2	1201	1069	1168	125.6	112.5	123.3
57	Sverdlovsk	4620	4913	5270	4682	4663	104.9	111.7	119.9	106.5	106.1	5117	4558	4562	116.4	103.7	103.8	4823	4207	4224	109.7	95.7	96.1
58	Tyumen	3949	3404	3184	3167	3038	118.4	101.3	94.0	92.7	88.6	3102	3083	2965	91.6	90.3	86.4	2858	2821	2736	84.4	82.6	79.8
	Khanty-Mansiyskiy AD	1423	1299	1302	1238	1186	95.9	86.8	86.1	81.0	77.1	1281	1217	1160	84.7	79.6	75.4	1190	1133	1082	78.7	74.1	70.3
	Yamal-Nenetskiy AD	439	400	389	435	418	82.1	74.0	71.6	79.8	76.5	377	423	407	69.4	77.6	74.5	351	383	376	64.6	70.3	68.8
	Tyumen region (not including ADs)	2087	1705	1493	1494	1434	158.5	129.0	112.2	111.5	106.6	1444	1443	1398	108.5	107.7	103.9	1317	1305	1278	99.0	97.4	95.0
59	Chelyabinsk	2658	3080	2950	2940	2888	75.4	87.7	84.0	83.8	82.3	2831	2823	2783	80.7	80.5	79.3	2598	2650	2629	74.0	75.5	74.9

№	Federal districts, constituent entities of the Russian Federation	New TB cases																				
		All forms of tuberculosis										Of them with respiratory TB						Of them with pulmonary TB					
		number of cases					per 100,000 population					number of cases			per 100,000 population			number of cases			per 100,000 population		
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
DISTRICT: Siberian		25888	25067	25988	25247	23738	131.9	128.1	132.9	129.1	121.4	25301	24535	23038	129.4	125.5	117.8	23925	23185	21580	122.4	118.6	110.3
60	**Republics:** Altai	260	237	250	253	221	126.9	114.9	120.1	120.5	104.9	241	241	219	115.8	114.8	103.9	208	224	185	99.9	106.7	87.8
61	Buryatia	1672	1397	1527	1617	1395	173.9	145.5	159.0	168.1	144.8	1497	1577	1352	155.9	163.9	140.3	1405	1465	1281	146.3	152.3	133.0
62	Tyva	759	731	751	720	740	245.7	235.4	240.1	228.2	233.4	701	663	685	224.1	210.1	216.1	676	639	650	216.1	202.5	205.0
63	Khakassia	637	548	605	634	528	118.5	102.1	112.5	117.7	97.9	591	630	514	109.9	117.0	95.3	563	604	489	104.7	112.1	90.7
64	**Krai:** Altaiskiy	3605	3317	3352	3248	2886	142.3	131.8	133.9	130.2	115.9	3265	3168	2821	130.5	127.0	113.3	3091	2994	2663	123.5	120.1	106.9
65	Trans-Baikal (Chita region)	1198	1206	1380	1170	1166	106.5	107.6	123.4	104.7	104.4	1352	1145	1138	120.9	102.5	101.9	1299	1095	1092	116.2	98.0	97.8
66	Krasnoyarskiy	3021	3009	3092	3008	2822	104.2	104.0	107.0	104.0	97.5	3005	2904	2708	104.0	100.4	93.6	2867	2767	2572	99.2	95.7	88.9
67	**Regions:** Irkutsk	3159	3439	3576	3351	3688	125.3	137.0	142.7	133.8	147.4	3465	3218	3540	138.2	128.5	141.4	3283	3001	3176	131.0	119.8	126.9
68	Kemerovo	4349	4041	4164	4151	3667	153.5	143.0	147.5	147.1	130.0	4079	4040	3598	144.5	143.2	127.6	3741	3730	3296	132.5	132.2	116.9
69	Novosibirsk	3647	3501	3599	3508	3467	137.9	132.7	136.4	132.6	130.8	3511	3449	3397	133.1	130.4	128.2	3396	3368	3287	128.7	127.3	124.0
70	Omsk	2466	2582	2642	2638	2319	121.5	127.7	131.0	131.0	115.3	2573	2577	2246	127.6	128.0	111.6	2441	2444	2129	121.1	121.4	105.8
71	Tomsk	1115	1059	1050	949	839	107.9	102.4	101.3	91.2	80.4	1021	923	820	98.5	88.7	78.6	955	854	760	92.1	82.0	72.8
DISTRICT: Far-Eastern		8366	8614	9434	9568	8979	128.2	132.6	145.7	148.3	139.4	9262	9395	8797	143.1	145.7	136.6	8822	8951	8337	136.3	138.8	129.4
72	**Republic:** Sakha (Yakutia)	782	736	859	780	760	82.3	77.4	90.4	82.1	80.1	822	750	731	86.5	79.0	77.0	782	702	668	82.3	73.9	70.4
73	**Krai:** Kamchatka	288	281	321	337	243	82.7	81.1	93.2	98.3	71.0	316	336	242	91.7	98.0	70.7	286	295	208	83.0	86.0	60.8
74	Primorskiy	3325	3586	3819	4142	3974	165.2	179.2	191.7	208.7	200.5	3766	4085	3906	189.1	205.8	197.1	3573	3901	3693	179.4	196.5	186.3
75	Khabarovskiy	1721	1806	1947	2012	1771	122.2	128.6	138.8	143.6	126.5	1927	1997	1759	137.4	142.5	125.6	1857	1921	1686	132.4	137.1	120.4
76	**Regions:** Amur	1251	1233	1363	1245	1244	142.5	141.4	157.2	144.3	144.5	1335	1202	1215	154.0	139.4	141.2	1286	1151	1171	148.3	133.4	136.1
77	Magadan	138	130	142	141	114	81.2	77.8	86.4	87.0	70.7	140	136	101	85.2	83.9	62.6	127	119	89	77.3	73.4	55.2
78	Sakhalin	584	503	589	553	498	111.5	96.8	114.0	107.9	97.5	567	538	470	109.8	104.9	92.0	531	527	462	102.8	102.8	90.4
79	**A.R.:** Jewish	245	310	352	314	321	131.7	167.0	189.8	169.5	173.5	348	312	319	187.6	168.4	172.4	339	299	311	182.8	161.4	168.1
80	**A.D.:** Chukotskiy	32	29	42	44	54	63.4	57.6	84.2	89.7	111.1	41	39	54	82.2	79.5	111.1	41	36	49	82.2	73.4	100.8

Table 2

Notification rate of extrarespiratory TB in the Russian Federation, 2006–2010 (notification rate by territory, Form No. 8)

№	Federal districts, constituent entities of the Russian Federation	New extrarespiratory TB cases																				RTB, extrapulmonary sites			
		All forms of extrarespiratory TB								Of them meninges and CNS				Of them bones and joints				Of them genitourinary TB							
		number of cases				per 100,000 population				number of cases		per 100,000 population		number of cases		per 100,000 population		number of cases		per 100,000 population		number of cases		per 100,000 population	
		2007	2008	2009	2010	2007	2008	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
RUSSIAN FEDERATION		**3971**	**3769**	**3696**	**3513**	**2.8**	**2.7**	**2.6**	**2.5**	**200**	**190**	**0.1**	**0.1**	**1242**	**1162**	**0.9**	**0.8**	**1138**	**1140**	**0.8**	**0.8**	**7249**	**7081**	**5.1**	**5.0**
DISTRICT: Central		850	868	845	781	2.3	2.3	2.3	2.1	47	37	0.1	0.1	331	289	0.9	0.8	228	231	0.6	0.6	1575	1477	4.2	4.0
1	**Regions:** Belgorod	47	49	42	39	3.1	3.2	2.7	2.5	0	1	0.0	0.1	21	24	1.4	1.6	7	8	0.5	0.5	30	22	2.0	1.4
2	Bryansk	55	52	50	51	4.2	4.0	3.9	3.9	0	0	0.0	0.0	16	13	1.2	1.0	30	35	2.3	2.7	90	80	6.9	6.2
3	Vladimir	28	29	35	20	1.9	2.0	2.4	1.4	1	0	0.1	0.0	21	14	1.5	1.0	8	3	0.6	0.2	84	70	5.9	4.9
4	Voronezh	85	69	91	71	3.7	3.0	4.0	3.1	1	2	0.0	0.1	23	23	1.0	1.0	48	32	2.1	1.4	64	50	2.8	2.2
5	Ivanovo	17	27	26	21	1.6	2.5	2.4	2.0	0	0	0.0	0.0	6	3	0.6	0.3	7	6	0.7	0.6	37	39	3.5	3.7
6	Kaluga	40	28	18	30	4.0	2.8	1.8	3.0	0	0	0.0	0.0	7	4	0.7	0.4	1	12	0.1	1.2	36	58	3.6	5.8
7	Kostroma	6	1	8	5	0.9	0.1	1.2	0.7	1	0	0.1	0.0	4	1	0.6	0.1	2	2	0.3	0.3	46	32	6.7	4.6
8	Kursk	26	20	19	24	2.2	1.7	1.6	2.1	2	1	0.2	0.1	5	10	0.4	0.9	3	4	0.3	0.3	52	35	4.5	3.0
9	Lipetsk	39	26	24	26	3.3	2.2	2.1	2.2	0	0	0.0	0.0	12	9	1.0	0.8	5	2	0.4	0.2	22	21	1.9	1.8
10	Moscow	107	114	94	84	1.6	1.7	1.4	1.2	12	5	0.2	0.1	45	31	0.7	0.5	6	23	0.1	0.3	274	280	4.1	4.1
11	Orel	20	17	19	12	2.4	2.1	2.3	1.5	1	0	0.1	0.0	9	6	1.1	0.7	4	3	0.5	0.4	28	15	3.4	1.8
12	Ryazan	27	34	31	22	2.3	2.9	2.7	1.9	6	0	0.5	0.0	15	15	1.3	1.3	6	1	0.5	0.1	59	50	5.1	4.3
13	Smolensk	23	29	26	13	2.3	3.0	2.7	1.3	2	1	0.2	0.1	8	5	0.8	0.5	2	4	0.2	0.4	60	32	6.2	3.3
14	Tambov	41	35	27	41	3.7	3.2	2.5	3.8	0	2	0.0	0.2	2	3	0.2	0.3	24	31	2.2	2.8	31	25	2.8	2.3
15	Tver	15	18	18	22	1.1	1.3	1.3	1.6	3	1	0.2	0.1	11	7	0.8	0.5	2	7	0.1	0.5	87	66	6.4	4.9
16	Tula	62	50	47	36	3.9	3.2	3.0	2.3	1	0	0.1	0.0	12	12	0.8	0.8	28	18	1.8	1.2	80	51	5.2	3.3
17	Yaroslavl	31	48	32	40	2.3	3.7	2.4	3.1	5	4	0.4	0.3	5	14	0.4	1.1	6	5	0.5	0.4	54	78	4.1	6.0
18	**City:** Moscow	181	222	238	224	1.7	2.1	2.3	2.1	12	20	0.1	0.2	109	95	1.0	0.9	39	35	0.4	0.3	441	473	4.2	4.5
DISTRICT: Northwestern		291	246	264	220	2.1	1.8	2.0	1.6	17	8	0.1	0.1	88	73	0.7	0.5	68	62	0.5	0.5	757	645	5.6	4.8
19	**Republics:** Kareliya	23	13	18	13	3.3	1.9	2.6	1.9	0	2	0.0	0.3	9	5	1.3	0.7	1	1	0.1	0.1	21	24	3.1	3.5
20	Komi	47	47	35	36	4.8	4.9	3.7	3.8	0	0	0.0	0.0	10	11	1.0	1.2	14	13	1.5	1.4	46	40	4.8	4.2
21	**Regions:** Arkhangelsk	16	16	14	10	1.2	1.3	1.1	0.8	0	0	0.0	0.0	6	5	0.5	0.4	5	2	0.4	0.2	48	39	3.8	3.1
22	Vologda	23	26	18	19	1.9	2.1	1.5	1.6	1	0	0.1	0.0	6	1	0.5	0.1	3	7	0.2	0.6	39	22	3.2	1.8
23	Kaliningrad	29	22	24	24	3.1	2.3	2.6	2.6	1	0	0.1	0.0	10	12	1.1	1.3	5	9	0.5	1.0	121	83	12.9	8.8
24	Leningrad	30	24	38	14	1.8	1.5	2.3	0.9	6	0	0.4	0.0	12	3	0.7	0.2	8	2	0.5	0.1	96	53	5.9	3.3
25	Murmansk	7	10	14	12	0.8	1.2	1.7	1.4	1	0	0.1	0.0	3	5	0.4	0.6	4	4	0.5	0.5	22	30	2.6	3.6
26	Novgorod	22	15	8	8	3.3	2.3	1.2	1.2	4	1	0.6	0.2	1	4	0.2	0.6	2	1	0.3	0.2	20	19	3.1	3.0
27	Pskov	11	6	16	11	1.5	0.9	2.3	1.6	0	0	0.0	0.0	10	4	1.4	0.6	1	3	0.1	0.4	24	23	3.5	3.3
28	**City:** St. Petersburg	83	67	79	73	1.8	1.5	1.7	1.6	4	5	0.1	0.1	21	23	0.5	0.5	25	20	0.5	0.4	320	312	7.0	6.8
DISTRICT: Southern		666	568	247	204	2.9	2.5	1.8	1.5	9	12	0.1	0.1	107	98	0.8	0.7	63	51	0.5	0.4	522	730	3.8	5.3
29	**Republics:** Adygeya	10	9	11	6	2.3	2.0	2.5	1.4	0	0	0.0	0.0	3	1	0.7	0.2	3	5	0.7	1.1	29	16	6.5	3.6
30	Kalmykiya	17	6	16	8	5.9	2.1	5.6	2.8	1	1	0.4	0.4	5	6	1.8	2.1	7	1	2.5	0.4	23	29	8.1	10.2

№	Federal districts, constituent entities of the Russian Federation	New extrarespiratory TB cases																				RTB, extrapulmonary sites			
		All forms of extrarespiratory TB								Of them meninges and CNS				Of them bones and joints				Of them genitourinary TB							
		number of cases				per 100,000 population				number of cases		per 100,000 population		number of cases		per 100,000 population		number of cases		per 100,000 population		number of cases		per 100,000 population	
		2007	2008	2009	2010	2007	2008	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
31	**Krai:** Krasnodarsky	72	75	82	52	1.4	1.5	1.6	1.0	6	4	0.1	0.1	20	19	0.4	0.4	21	9	0.4	0.2	105	106	2.0	2.1
32	**Regions:** Astrakhan	16	14	13	19	1.6	1.4	1.3	1.9	2	1	0.2	0.1	6	5	0.6	0.5	2	5	0.2	0.5	70	67	7.0	6.7
33	Volgograd	114	65	74	50	4.4	2.5	2.9	1.9	0	2	0.0	0.1	50	36	1.9	1.4	15	9	0.6	0.3	79	308	3.0	11.9
34	Rostov	74	53	51	69	1.7	1.2	1.2	1.6	0	4	0.0	0.1	23	31	0.5	0.7	15	22	0.4	0.5	216	204	5.1	4.8
DISTRICT: North-Caucasian				359	315			3.9	3.4	6	7	0.1	0.1	126	104	1.4	1.1	87	76	0.9	0.8	384	327	4.2	3.5
35	**Republics:** Dagestan	97	83	93	76	3.6	3.1	3.4	2.8	3	5	0.1	0.2	42	41	1.5	1.5	12	7	0.4	0.3	84	77	3.1	2.8
36	Ingushetia	5	6	9	17	1.0	1.2	1.8	3.3	0	0	0.0	0.0	6	9	1.2	1.7	1	1	0.2	0.2	26	23	5.1	4.5
37	Kabardino-Balkaria	18	12	11	5	2.0	1.3	1.2	0.6	0	0	0.0	0.0	4	2	0.4	0.2	0	0	0.0	0.0	26	29	2.9	3.2
38	Karachai-Cherkes	12	17	16	8	2.8	4.0	3.7	1.9	0	0	0.0	0.0	8	3	1.9	0.7	0	1	0.0	0.2	18	0	4.2	0.0
39	North Ossetia – Alania	33	32	44	42	4.7	4.6	6.3	6.0	1	1	0.1	0.1	15	10	2.1	1.4	9	14	1.3	2.0	57	38	8.1	5.4
40	Chechnya	52	50	52	52	4.4	4.1	4.1	4.1	1	1	0.1	0.1	26	23	2.1	1.8	3	4	0.2	0.3	76	90	6.1	7.1
41	**Krai:** Stavropolskiy	146	146	134	115	5.4	5.4	4.9	4.2	1	0	0.0	0.0	25	16	0.9	0.6	62	49	2.3	1.8	97	70	3.6	2.6
DISTRICT: Privolzhskiy		907	818	730	768	3.0	2.7	2.4	2.6	22	26	0.1	0.1	228	243	0.8	0.8	301	320	1.0	1.1	1261	1187	4.2	3.9
	Republics:																								
42	Bashkortostan	110	116	110	95	2.7	2.9	2.7	2.3	1	2	0.0	0.0	38	28	0.9	0.7	36	35	0.9	0.9	118	98	2.9	2.4
43	Mari El	17	19	14	12	2.4	2.7	2.0	1.7	0	0	0.0	0.0	5	2	0.7	0.3	3	4	0.4	0.6	42	37	6.0	5.3
44	Mordovia	19	9	8	8	2.2	1.1	1.0	1.0	0	0	0.0	0.0	4	3	0.5	0.4	2	3	0.2	0.4	25	22	3.0	2.7
45	Tatarstan	119	102	94	110	3.2	2.7	2.5	2.9	1	5	0.0	0.1	52	54	1.4	1.4	29	30	0.8	0.8	122	123	3.2	3.3
46	Udmurtia	32	30	23	32	2.1	2.0	1.5	2.1	1	1	0.1	0.1	8	8	0.5	0.5	5	8	0.3	0.5	61	51	4.0	3.3
47	Chuvash	29	19	18	21	2.3	1.5	1.4	1.6	1	0	0.1	0.0	4	7	0.3	0.5	7	10	0.5	0.8	25	26	2.0	2.0
48	**Krai:** Permskiy	104	83	86	84	3.8	3.1	3.2	3.1	1	3	0.0	0.1	12	14	0.4	0.5	56	49	2.1	1.8	188	213	7.0	7.9
49	**Regions:** Kirov	47	58	42	46	3.3	4.1	3.0	3.3	0	2	0.0	0.1	9	9	0.6	0.6	18	22	1.3	1.6	51	52	3.7	3.7
50	Nizhny Novgorod	66	50	66	51	2.0	1.5	2.0	1.5	2	1	0.1	0.0	8	18	0.2	0.5	37	29	1.1	0.9	179	98	5.4	2.9
51	Orenburg	79	61	55	80	3.7	2.9	2.6	3.8	6	6	0.3	0.3	15	25	0.7	1.2	14	19	0.7	0.9	171	184	8.1	8.7
52	Penza	47	31	28	34	3.4	2.2	2.0	2.5	0	0	0.0	0.0	14	8	1.0	0.6	11	18	0.8	1.3	27	44	2.0	3.2
53	Samara	123	135	78	94	3.9	4.3	2.5	3.0	4	2	0.1	0.1	21	26	0.7	0.8	42	53	1.3	1.7	97	99	3.1	3.1
54	Saratov	55	57	55	65	2.1	2.2	2.1	2.5	0	1	0.0	0.0	20	26	0.8	1.0	26	33	1.0	1.3	95	87	3.7	3.4
55	Ulyanovsk	60	48	53	36	4.5	3.7	4.1	2.8	5	3	0.4	0.2	18	15	1.4	1.2	15	7	1.2	0.5	60	53	4.6	4.1
DISTRICT: Ural		420	409	366	341	3.4	3.3	3.0	2.8	24	22	0.2	0.2	89	72	0.7	0.6	91	104	0.7	0.8	955	796	7.8	6.5
56	**Regions:** Kurgan	47	55	41	62	4.8	5.7	4.3	6.5	0	0	0.0	0.0	8	16	0.8	1.7	21	36	2.2	3.8	169	75	17.8	7.9
57	Sverdlovsk	124	153	124	101	2.8	3.5	2.8	2.3	6	4	0.1	0.1	26	16	0.6	0.4	42	43	1.0	1.0	351	338	8.0	7.7
58	Tyumen	114	82	84	73	3.4	2.4	2.5	2.1	17	13	0.5	0.4	18	15	0.5	0.4	13	5	0.4	0.1	262	229	7.7	6.7
	Khanty-Mansiyskiy AD	32	21	21	26	2.2	1.4	1.4	1.7	1	1	0.1	0.1	6	9	0.4	0.6	3	1	0.2	0.1	84	78	5.5	5.1
	Yamal-Nenetskiy AD	10	12	12	11	1.9	2.2	2.2	2.0	2	3	0.4	0.5	1	3	0.2	0.5	3	0	0.6	0.0	40	31	7.3	5.7
	Tyumen region (not including ADs)	72	49	51	36	5.4	3.7	3.8	2.7	14	9	1.0	0.7	11	3	0.8	0.2	7	4	0.5	0.3	138	120	10.3	8.9
59	Chelyabinsk	135	119	117	105	3.8	3.4	3.3	3.0	1	5	0.0	0.1	37	25	1.1	0.7	15	20	0.4	0.6	173	154	4.9	4.4

№	Federal districts, constituent entities of the Russian Federation	New extrarespiratory TB cases																						RTB, extrapulmonary sites			
		All forms of extrarespiratory TB								Of them meninges and CNS				Of them bones and joints				Of them genitourinary TB							
		number of cases				per 100,000 population				number of cases		per 100,000 population		number of cases		per 100,000 population		number of cases		per 100,000 population		number of cases		per 100,000 population	
		2007	2008	2009	2010	2007	2008	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
DISTRICT: Siberian		638	687	712	700	3.3	3.5	3.6	3.6	70	72	0.4	0.4	205	215	1.0	1.1	237	234	1.2	1.2	1350	1458	6.9	7.5
60	**Republics:** Altai	13	9	12	2	6.3	4.3	5.7	0.9	1	0	0.5	0.0	2	0	1.0	0.0	6	0	2.9	0.0	17	34	8.1	16.1
61	Buryatia	35	30	40	43	3.6	3.1	4.2	4.5	0	1	0.0	0.1	9	14	0.9	1.5	14	19	1.5	2.0	112	71	11.6	7.4
62	Tyva	41	50	57	55	13.2	16.0	18.1	17.3	6	6	1.9	1.9	27	26	8.6	8.2	4	2	1.3	0.6	24	35	7.6	11.0
63	Khakassia	4	14	4	14	0.7	2.6	0.7	2.6	0	0	0.0	0.0	1	8	0.2	1.5	1	6	0.2	1.1	26	25	4.8	4.6
64	**Krai:** Altaiskiy	88	87	80	65	3.5	3.5	3.2	2.6	0	2	0.0	0.1	43	34	1.7	1.4	24	19	1.0	0.8	174	158	7.0	6.3
65	Trans-Baikal	27	28	25	28	2.4	2.5	2.2	2.5	0	0	0.0	0.0	5	4	0.4	0.4	14	17	1.3	1.5	50	46	4.5	4.1
66	Krasnoyarskiy	84	87	104	114	2.9	3.0	3.6	3.9	2	1	0.1	0.0	33	45	1.1	1.6	42	43	1.5	1.5	137	136	4.7	4.7
67	**Regions:** Irkutsk	103	111	133	148	4.1	4.4	5.3	5.9	41	38	1.6	1.5	32	28	1.3	1.1	33	47	1.3	1.9	217	364	8.7	14.5
68	Kemerovo	93	85	111	69	3.3	3.0	3.9	2.4	5	7	0.2	0.2	25	13	0.9	0.5	40	24	1.4	0.9	310	302	11.0	10.7
69	Novosibirsk	62	88	59	70	2.3	3.3	2.2	2.6	6	9	0.2	0.3	13	27	0.5	1.0	16	11	0.6	0.4	81	110	3.1	4.2
70	Omsk	62	69	61	73	3.1	3.4	3.0	3.6	9	7	0.4	0.3	6	12	0.3	0.6	34	39	1.7	1.9	133	117	6.6	5.8
71	Tomsk	26	29	26	19	2.5	2.8	2.5	1.8	0	1	0.0	0.1	9	4	0.9	0.4	9	7	0.9	0.7	69	60	6.6	5.7
DISTRICT: Far-Eastern		198	172	173	182	3.0	2.7	2.7	2.8	5	6	0.1	0.1	68	68	1.1	1.1	63	62	1.0	1.0	444	460	6.9	7.1
72	**Republic:** Sakha (Yakutia)	39	37	30	29	4.1	3.9	3.2	3.1	0	0	0.0	0.0	13	12	1.4	1.3	7	2	0.7	0.2	48	63	5.1	6.6
73	**Krai:** Kamchatka	2	5	1	1	0.6	1.5	0.3	0.3	1	0	0.3	0.0	0	0	0.0	0.0	0	0	0.0	0.0	41	34	12.0	9.9
74	Primorskiy	52	53	57	68	2.6	2.7	2.9	3.4	1	2	0.1	0.1	39	36	2.0	1.8	15	26	0.8	1.3	184	213	9.3	10.7
75	Khabarovskiy	14	20	15	12	1.0	1.4	1.1	0.9	1	0	0.1	0.0	5	3	0.4	0.2	1	0	0.1	0.0	76	73	5.4	5.2
76	**Regions:** Amur	25	28	43	29	2.9	3.2	5.0	3.4	2	3	0.2	0.3	7	9	0.8	1.0	23	13	2.7	1.5	51	44	5.9	5.1
77	Magadan	6	2	5	13	3.6	1.2	3.1	8.1	0	1	0.0	0.6	0	0	0.0	0.0	4	9	2.5	5.6	17	12	10.5	7.4
78	Sakhalin	55	22	15	28	10.6	4.3	2.9	5.5	0	0	0.0	0.0	2	7	0.4	1.4	12	12	2.3	2.3	11	8	2.1	1.6
79	**A.R.:** Jewish	4	4	2	2	2.2	2.2	1.1	1.1	0	0	0.0	0.0	0	1	0.0	0.5	0	0	0.0	0.0	13	8	7.0	4.3
80	**A.D.:** Chukotskiy	1	1	5	0	2.0	2.0	10.2	0.0	0	0	0.0	0.0	2	0	4.1	0.0	1	0	2.0	0.0	3	5	6.1	10.3

Table 3

TB notification and prevalence rates among children in the Russian Federation, 2006–2010 (notification rate by territory, Form No. 8; prevalence – Form No. 33)

№	Federal districts, constituent entities of the Russian Federation	New TB cases in children (0–14 years of age)										Registered TB cases in children (0–14 years of age) as of the end of the year									
		number of cases					per 100,000 population					number of cases					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
RUSSIAN FEDERATION		**3423**	**3422**	**3203**	**3111**	**3263**	**16.4**	**16.4**	**15.3**	**14.6**	**15.2**	**4653**	**4457**	**4164**	**4106**	**4269**	**22.3**	**21.3**	**20.0**	**19.5**	**19.9**
DISTRICT: Central		559	544	536	514	577	11.9	11.6	11.4	10.7	11.9	670	677	646	635	662	14.2	14.5	13.8	13.4	13.7
1	**Regions:** Belgorod	16	17	11	11	16	7.7	8.2	5.3	5.2	7.6	20	17	15	15	20	9.5	8.2	7.3	7.2	9.5
2	Bryansk	56	33	53	45	31	29.5	17.9	29.0	24.7	17.0	76	52	53	49	49	39.4	27.9	29.0	26.9	26.8
3	Vladimir	45	38	31	37	31	23.5	20.0	16.3	19.2	15.9	64	61	44	51	50	33.2	32.1	23.2	26.6	25.7
4	Voronezh	12	18	15	20	12	4.0	6.2	5.2	6.9	4.1	20	17	18	18	13	6.7	5.8	6.2	6.2	4.5
5	Ivanovo	20	11	9	22	14	14.4	8.0	6.6	15.9	10.0	26	20	15	27	20	18.5	14.5	11.0	19.6	14.3
6	Kaluga	17	32	27	16	37	12.7	24.3	20.4	11.9	27.5	24	32	39	22	31	17.8	24.2	29.6	16.5	23.0
7	Kostroma	6	16	19	14	15	6.1	16.6	19.6	14.3	15.2	4	14	20	16	13	4.0	14.5	20.7	16.4	13.1
8	Kursk	3	11	9	10	12	1.8	6.9	5.7	6.3	7.5	9	14	11	12	12	5.5	8.7	6.9	7.6	7.5
9	Lipetsk	16	7	10	10	6	10.0	4.4	6.3	6.3	3.8	23	13	14	15	9	14.2	8.2	8.9	9.4	5.6
10	Moscow	98	68	81	67	96	11.7	8.1	9.5	7.6	10.7	126	103	108	100	103	15.0	12.3	12.8	11.5	11.5
11	Orel	12	11	15	11	9	10.6	9.9	13.6	9.9	8.1	15	14	10	8	9	13.1	12.5	9.0	7.2	8.1
12	Ryazan	18	23	8	17	16	12.1	15.7	5.5	11.5	10.8	16	26	15	26	31	10.6	17.6	10.2	17.7	20.9
13	Smolensk	38	33	33	36	14	29.5	26.2	26.3	28.5	11.0	39	46	45	51	21	29.9	36.3	35.9	40.5	16.5
14	Tambov	6	7	9	5	10	4.0	4.8	6.3	3.5	7.0	9	7	10	7	10	5.9	4.8	6.9	4.9	7.0
15	Tver	26	19	17	14	15	14.0	10.4	9.2	7.5	8.0	27	28	29	26	28	14.4	15.2	15.8	14.1	15.0
16	Tula	32	39	37	37	31	16.5	20.5	19.5	19.5	16.3	50	58	63	65	67	25.5	30.3	33.3	34.3	35.2
17	Yaroslavl	26	31	25	28	49	15.3	18.3	14.6	16.1	28.0	29	33	22	22	48	16.9	19.5	13.0	12.8	27.4
18	**City:** Moscow	112	130	127	114	163	9.4	10.8	10.3	8.9	12.6	93	122	115	105	128	7.8	10.2	9.5	8.4	9.9
DISTRICT: Northwestern		343	315	281	288	244	19.1	17.7	15.7	15.8	13.3	367	330	282	292	258	20.3	18.6	15.9	16.2	14.1
19	**Republics:** Kareliya	15	13	8	6	9	15.0	13.2	8.1	6.0	8.9	30	22	17	13	13	29.8	22.3	17.3	13.1	12.9
20	Komi	34	27	23	23	22	21.5	17.3	14.8	14.8	14.1	38	34	33	30	31	23.7	21.7	21.3	19.4	19.9
21	**Regions:** Arkhangelsk	27	24	18	23	14	13.9	12.5	9.4	11.8	7.2	31	31	22	26	15	15.8	16.1	11.5	13.5	7.7
22	Vologda	21	23	12	17	7	11.6	12.9	6.7	9.3	3.8	28	22	9	16	9	15.4	12.3	5.0	8.8	4.9
23	Kaliningrad	105	91	83	56	59	81.2	71.2	64.5	42.9	44.9	68	61	49	36	29	52.0	47.7	38.4	27.8	22.1
24	Leningrad	32	39	26	25	17	15.8	19.6	13.1	12.5	8.4	30	38	28	32	24	14.6	19.0	14.2	16.0	11.9
25	Murmansk	4	11	4	8	10	3.2	8.9	3.3	6.5	8.1	6	12	10	9	11	4.7	9.7	8.2	7.3	8.9
26	Novgorod	6	10	8	7	7	6.7	11.4	9.1	7.8	7.8	12	14	13	14	12	13.3	15.9	14.8	15.8	13.4
27	Pskov	7	4	5	10	6	7.5	4.3	5.5	10.9	6.5	14	8	7	11	9	14.7	8.6	7.7	12.0	9.7
28	**City:** St. Petersburg	92	73	94	113	93	17.7	14.0	17.7	20.6	16.7	110	88	94	105	105	21.1	17.0	17.9	19.5	18.8
DISTRICT: Southern		510	579	505	223	270	13.4	14.7	12.8	21.9	13.3	891	882	791	259	292	24.4	22.4	20.2	0.0	14.4
29	**Republics:** Adygeya	2	5	5	4	5	2.8	7.2	7.2	5.7	7.1	0	3	4	4	8	0.0	4.3	5.8	5.7	11.4
30	Kalmykiya	31	32	14	8	14	54.3	57.4	25.4	14.6	25.5	42	39	18	14	17	72.5	69.4	32.6	25.5	31.0
31	**Krai:** Krasnodarsky	37	56	45	45	52	4.8	7.4	5.9	5.8	6.6	37	59	47	41	46	4.8	7.8	6.2	5.3	5.9
32	**Regions:** Astrakhan	49	48	46	51	58	30.0	29.5	27.9	30.3	34.2	57	59	49	51	65	34.7	36.4	30.0	30.6	38.3

№	Federal districts, constituent entities of the Russian Federation	New TB cases in children (0–14 years of age)										Registered TB cases in children (0–14 years of age) as of the end of the year									
		number of cases					per 100,000 population					number of cases					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
33	Volgograd	37	39	47	38	34	9.9	10.6	12.8	10.3	9.2	55	45	47	47	38	14.6	12.2	12.9	12.8	10.3
34	Rostov	86	79	61	77	107	14.5	13.6	10.5	13.2	18.2	108	101	80	102	118	18.0	17.2	13.8	17.5	20.1
DISTRICT: North-Caucasian					254	225				26.0	11.5				513	508				0.0	26.0
35	**Republics:** Dagestan	105	99	81	78	63	15.7	15.1	12.5	12.0	9.7	173	155	125	125	110	25.7	23.5	19.2	19.2	16.9
36	Ingushetia	13	22	17	19	19	9.1	15.8	12.4	14.1	14.2	40	42	44	49	48	27.7	29.7	32.0	36.0	35.8
37	Kabardino-Balkaria	11	10	10	12	9	6.6	6.2	6.3	7.6	5.7	30	14	15	19	18	17.7	8.6	9.5	12.1	11.5
38	Karachai-Cherkes	12	10	9	8	3	15.1	12.9	11.7	10.3	3.9	25	29	22	18	13	30.9	37.1	28.6	23.3	16.8
39	North Ossetia – Alania	45	69	55	40	34	36.5	56.9	45.4	32.8	27.8	74	80	80	51	45	59.4	65.6	66.3	42.0	36.9
40	Chechnya	38	64	72	57	56	10.4	17.3	19.0	14.6	14.1	183	182	185	185	210	50.4	49.7	49.7	48.1	52.8
41	**Krai:** Stavropolskiy	44	46	43	40	41	10.5	11.2	10.5	9.6	9.8	67	74	75	66	64	15.9	17.9	18.3	16.0	15.4
DISTRICT: Privolzhskiy		542	473	497	485	471	12.0	10.6	11.2	10.8	10.5	729	643	651	657	622	16.0	14.4	14.7	14.7	13.8
42	**Republics:** Bashkortostan	48	47	44	40	34	7.1	7.0	6.6	5.9	5.0	85	82	76	78	66	12.3	12.2	11.4	11.6	9.7
43	Mari El	20	20	21	19	18	18.5	18.9	19.8	17.8	16.8	28	21	21	19	19	25.6	19.7	19.9	17.9	17.7
44	Mordovia	11	16	16	18	12	9.5	14.2	14.5	16.4	10.9	21	26	28	26	25	17.8	22.8	25.2	23.6	22.8
45	Tatarstan	62	51	59	45	59	10.5	8.8	10.2	7.8	10.1	58	42	46	39	48	9.7	7.2	8.0	6.7	8.2
46	Udmurtia	29	34	16	30	22	11.7	13.9	6.5	12.0	8.7	39	43	25	42	23	15.6	17.5	10.2	17.0	9.1
47	Chuvash	16	13	13	17	12	8.0	6.6	6.7	8.6	6.1	27	20	26	20	13	13.3	10.2	13.3	10.2	6.6
48	**Krai:** Permskiy	52	23	36	41	46	12.1	5.4	8.4	9.4	10.5	63	34	47	55	60	14.5	8.0	11.0	12.7	13.6
49	**Regions:** Kirov	19	14	23	19	15	9.7	7.3	12.0	9.8	7.7	30	28	33	31	31	15.1	14.5	17.2	16.0	15.9
50	Nizhny Novgorod	63	65	70	74	68	14.1	14.7	15.8	16.5	15.1	115	107	120	125	114	25.5	24.1	27.2	28.0	25.3
51	Orenburg	45	42	42	35	46	13.2	12.6	12.6	10.5	13.7	63	60	56	51	55	18.3	17.9	16.9	15.3	16.4
52	Penza	26	17	17	19	19	14.2	9.5	9.5	10.6	10.6	24	14	13	19	22	12.9	7.8	7.3	10.6	12.2
53	Samara	77	73	73	68	67	17.7	16.9	16.8	15.5	15.1	101	90	87	77	76	23.0	20.8	20.1	17.6	17.2
54	Saratov	48	36	55	35	34	13.4	10.2	15.7	9.9	9.6	49	51	59	49	44	13.5	14.4	16.8	13.9	12.5
55	Ulyanovsk	26	22	12	25	19	14.4	12.5	6.9	14.4	11.0	26	25	14	26	26	14.1	14.1	8.0	15.0	15.0
DISTRICT: Ural		261	258	257	209	212	13.8	13.7	13.5	10.8	10.8	458	435	396	388	363	24.1	23.2	21.0	20.2	18.5
56	**Regions:** Kurgan	43	28	34	21	24	29.2	19.4	23.6	14.5	16.5	76	52	37	39	40	50.9	35.9	25.8	27.0	27.4
57	Sverdlovsk	93	118	114	89	77	14.8	18.7	17.9	13.7	11.7	177	210	194	195	166	28.0	33.5	30.7	30.3	25.2
58	Tyumen	90	78	76	69	72	15.3	13.3	12.7	11.3	11.6	129	110	99	92	88	21.8	18.8	16.8	15.2	14.2
	Khanty-Mansiyskiy AD	15	18	12	5	15	5.5	6.6	4.3	1.8	5.2	22	26	17	7	17	8.0	9.5	6.2	2.5	5.9
	Yamal-Nenetskiy AD	31	19	25	27	25	29.2	18.0	23.6	25.3	23.3	42	26	24	31	25	39.3	24.6	22.7	29.2	23.3
	Tyumen region (not including ADs)	44	41	39	37	32	21.1	19.6	18.3	16.8	14.3	65	58	58	54	46	31.0	27.9	27.6	24.9	20.5
59	Chelyabinsk	35	34	33	30	39	6.7	6.5	6.3	5.6	7.2	76	63	66	62	69	14.4	12.1	12.7	11.7	12.8
DISTRICT: Siberian		924	941	835	846	921	29.5	30.3	26.7	26.5	28.6	1136	1137	1050	1021	1166	35.9	36.6	33.8	32.3	36.2
60	**Republics:** Altai	12	14	20	18	27	26.7	30.9	43.1	37.6	55.7	17	14	25	21	28	37.7	31.1	54.8	44.5	57.7
61	Buryatia	94	79	61	81	58	52.1	43.8	33.3	43.0	30.4	83	65	58	75	62	45.7	36.2	32.0	40.4	32.5
62	Tyva	30	33	25	27	31	36.2	40.0	29.8	31.4	35.6	50	52	39	36	34	59.9	63.3	46.9	42.5	39.1
63	Khakassia	21	20	17	26	17	23.6	22.6	19.0	28.6	18.5	19	27	18	22	20	21.1	30.6	20.3	24.4	21.8

№	Federal districts, constituent entities of the Russian Federation	New TB cases in children (0–14 years of age)										Registered TB cases in children (0–14 years of age) as of the end of the year									
		number of cases					per 100,000 population					number of cases					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
64	**Krai:** Altaiskiy	98	80	84	76	93	26.3	21.7	22.7	20.2	24.5	96	76	74	74	102	25.5	20.6	20.1	19.9	26.9
65	Trans-Baikal	39	35	34	31	28	18.2	16.5	16.0	14.3	12.9	32	32	38	30	32	14.8	15.1	18.0	14.0	14.7
66	Krasnoyarskiy	126	113	99	82	87	27.5	25.0	21.9	17.9	18.9	165	148	138	102	111	35.6	32.7	30.7	22.5	24.1
67	**Regions:** Irkutsk	126	130	102	114	179	29.1	30.3	23.6	25.9	40.3	185	221	199	221	301	42.2	51.5	46.4	50.7	67.8
68	Kemerovo	214	271	229	210	202	50.3	63.9	53.3	47.8	45.5	238	263	229	199	195	55.6	62.1	53.9	45.8	43.9
69	Novosibirsk	70	49	57	55	77	18.7	13.2	15.2	14.3	19.7	82	61	58	69	93	21.8	16.5	15.6	18.1	23.8
70	Omsk	67	79	76	83	82	21.8	26.2	25.2	27.2	26.7	120	123	114	115	130	38.7	40.6	37.9	37.9	42.4
71	Tomsk	27	38	31	43	40	17.8	25.1	20.2	27.4	25.1	49	55	60	57	58	32.1	36.4	39.5	36.7	36.4
DISTRICT: Far-Eastern		283	311	292	292	343	26.8	29.8	28.0	27.8	32.5	401	352	348	341	398	37.5	33.6	33.4	32.6	37.7
72	**Republic:** Sakha (Yakutia)	96	65	62	47	45	45.8	31.4	30.1	22.8	21.8	96	72	54	51	63	45.4	34.7	26.2	24.8	30.6
73	**Krai:** Kamchatka	34	36	30	40	33	62.9	67.5	56.3	74.6	61.2	53	39	39	49	37	97.2	72.8	73.4	91.8	68.7
74	Primorskiy	62	83	108	109	162	21.2	28.9	37.6	37.7	55.8	67	78	115	117	173	22.7	27.0	40.1	40.6	59.6
75	Khabarovskiy	30	39	32	37	45	14.4	18.9	15.5	17.6	21.3	39	39	24	27	45	18.6	18.9	11.7	12.9	21.3
76	**Regions:** Amur	12	31	29	31	23	8.2	21.5	20.2	21.4	15.8	49	37	40	38	26	33.2	25.6	27.9	26.4	17.9
77	Magadan	12	16	10	17	17	44.8	61.4	38.9	66.1	65.7	21	14	12	20	22	77.2	53.2	46.5	78.2	85.0
78	Sakhalin	29	37	15	7	15	36.3	46.8	18.9	8.7	18.6	68	69	57	35	28	84.4	87.1	72.1	43.7	34.7
79	**A.R.:** Jewish	7	4	4	2	3	22.3	12.9	12.9	6.4	9.5	7	3	5	2	2	22.1	9.7	16.2	6.4	6.4
80	**A.D.:** Chukotskiy	1	0	2	2	0	9.9	0.0	19.7	19.7	0.0	1	1	2	2	2	9.9	9.9	19.7	19.6	19.8

Table 4

Notification rate of MbT+ TB cases in the Russian Federation, 2006–2010 (notification rate by territory, Form No. 8)

№	Federal districts, constituent entities of the Russian Federation	New MbT+ TB patients										Proportion of MbT+ cases to all new TB cases					New pulmonary MbT+ cases confirmed by microscopy method											
		number of cases					per 100,000 population					%					number of cases				per 100,000 population				to pulmonary TB, %			
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
RUSSIAN FEDERATION		**48938**	**48567**	**50168**	**50096**	**45883**	**34.3**	**34.2**	**35.3**	**35.3**	**32.3**	**41.6**	**41.0**	**41.5**	**42.7**	**41.7**	**33103**	**33949**	**33351**	**31416**	**23.3**	**23.9**	**23.5**	**22.1**	**31.0**	**30.9**	**31.4**	**31.6**
DISTRICT: Central		9916	9770	10306	9928	9066	26.5	26.3	27.8	26.7	24.4	45.0	41.9	43.4	44.2	44.1	6611	6709	6684	6161	17.8	18.1	18.0	16.6	31.5	31.6	33.4	33.6
	Regions:																											
1	Belgorod	472	460	522	425	380	31.2	30.3	34.3	27.8	24.8	50.1	52.3	54.4	54.2	53.4	293	308	269	235	19.3	20.2	17.6	15.4	36.6	35.3	37.8	36.1
2	Bryansk	625	623	740	718	617	46.9	47.4	56.7	55.4	47.8	53.5	49.5	57.5	56.2	54.2	410	434	401	405	31.2	33.3	30.9	31.3	36.3	38.2	35.3	40.2
3	Vladimir	578	473	567	569	496	39.2	32.5	39.2	39.7	34.7	48.6	40.7	48.6	49.2	52.8	383	422	426	365	26.3	29.2	29.7	25.5	36.9	39.6	41.1	43.0
4	Voronezh	803	817	768	697	594	34.7	35.7	33.8	30.8	26.3	53.2	51.2	48.7	48.5	46.5	456	417	355	353	19.9	18.3	15.7	15.6	31.6	29.0	27.7	30.5
5	Ivanovo	424	352	374	377	372	38.5	32.5	34.7	35.2	34.9	63.1	60.9	61.3	59.7	69.8	223	229	204	190	20.6	21.3	19.1	17.8	42.5	41.4	35.9	40.2
6	Kaluga	393	370	323	345	261	38.7	36.7	32.2	34.4	26.1	53.0	51.3	43.9	50.1	40.1	280	254	264	206	27.8	25.3	26.3	20.6	44.2	38.3	41.6	36.6
7	Kostroma	180	157	138	160	134	25.4	22.4	19.9	23.2	19.5	55.0	51.6	46.5	43.8	46.0	105	92	115	90	15.0	13.2	16.7	13.1	38.3	35.1	37.0	35.4
8	Kursk	462	418	481	431	370	39.0	35.8	41.5	37.4	32.2	49.6	46.9	50.2	47.3	51.4	298	310	341	267	25.5	26.7	29.6	23.2	37.5	34.9	40.6	40.4
9	Lipetsk	367	364	335	295	253	31.1	31.1	28.7	25.4	21.9	41.8	38.6	37.1	40.7	37.2	197	116	107	151	16.8	9.9	9.2	13.0	22.1	13.5	15.8	23.9
10	Moscow	1121	1209	1187	1291	1164	16.9	18.2	17.7	19.2	17.2	32.2	30.8	31.5	35.5	34.1	976	988	1108	944	14.7	14.8	16.5	14.0	27.2	28.8	33.9	31.0
11	Orel	361	335	339	288	262	43.3	40.6	41.4	35.4	32.2	72.8	69.6	71.8	62.9	67.0	215	213	182	174	26.1	26.0	22.3	21.4	49.4	51.1	44.3	47.8
12	Ryazan	295	403	431	366	318	25.0	34.5	37.1	31.7	27.6	31.8	41.5	44.8	40.5	39.6	305	309	246	225	26.1	26.6	21.3	19.5	34.9	35.3	30.3	30.8
13	Smolensk	385	304	338	350	316	38.3	30.8	34.5	36.1	32.7	38.2	33.8	34.8	37.9	36.8	150	168	179	173	15.2	17.2	18.5	17.9	18.7	19.1	21.4	21.3
14	Tambov	370	432	392	418	440	32.7	38.9	35.6	38.3	40.4	50.1	57.6	53.9	55.1	59.6	276	253	322	262	24.8	23.0	29.5	24.1	41.2	38.4	45.9	39.0
15	Tver	431	378	445	435	418	30.6	27.3	32.4	31.9	30.7	37.9	34.2	40.7	42.7	45.1	338	410	325	279	24.4	29.8	23.8	20.5	34.0	41.5	35.6	33.3
16	Tula	619	603	633	571	537	38.7	38.3	40.6	36.9	34.9	49.1	49.1	48.9	40.8	49.9	386	413	374	380	24.5	26.5	24.2	24.7	36.1	35.6	29.4	38.4
17	Yaroslavl	272	295	243	224	222	20.5	22.4	18.5	17.1	17.0	33.7	36.0	35.1	36.2	35.8	212	148	138	142	16.1	11.3	10.5	10.9	30.3	25.3	25.9	28.3
18	**City:** Moscow	1758	1777	2050	1968	1912	16.9	17.0	19.5	18.7	18.1	46.3	36.8	39.0	41.3	39.8	1108	1225	1328	1320	10.6	11.7	12.6	12.5	25.6	27.2	32.5	32.1
DISTRICT: Northwestern		4000	3945	4085	3932	3726	29.4	29.2	30.3	29.2	27.7	46.1	46.8	47.4	46.3	48.1	2646	2742	2404	2393	19.6	20.3	17.9	17.8	36.5	36.2	32.1	34.8
19	**Republics:** Kareliya	235	241	198	216	219	33.7	34.8	28.7	31.5	32.0	49.3	49.1	45.3	50.3	50.0	174	163	133	157	25.1	23.7	19.4	22.9	40.0	41.3	34.1	39.2
20	Komi	370	490	458	394	361	37.6	50.4	47.5	41.3	38.0	46.5	52.9	51.9	48.0	50.9	392	352	270	261	40.4	36.5	28.3	27.4	47.4	45.0	36.5	41.2
	Regions:																											
21	Arkhangelsk	493	411	397	406	403	38.2	32.2	31.3	32.3	32.1	52.3	54.4	53.6	58.2	60.3	300	288	285	307	23.5	22.7	22.7	24.5	43.6	42.4	44.9	49.6
22	Vologda	284	263	276	241	265	23.0	21.5	22.6	19.8	21.8	50.4	45.7	45.4	44.6	48.3	174	187	161	165	14.2	15.3	13.2	13.6	34.1	34.3	33.3	32.5
23	Kaliningrad	595	529	558	480	409	63.3	56.4	59.5	51.2	43.6	47.0	42.1	50.5	51.0	46.6	355	384	332	294	37.9	41.0	35.4	31.3	32.6	40.5	41.7	38.1
24	Leningrad	525	459	604	589	553	31.9	28.1	37.0	36.1	33.9	43.5	40.5	46.4	41.2	46.8	247	356	324	314	15.1	21.8	19.9	19.3	24.1	29.7	25.0	28.2
25	Murmansk	232	248	197	206	213	26.8	29.0	23.3	24.5	25.5	46.4	49.9	46.0	45.3	54.2	170	96	132	131	19.9	11.3	15.7	15.7	36.9	29.4	31.5	37.3
26	Novgorod	229	234	228	199	189	34.4	35.7	35.1	30.9	29.5	50.8	52.7	52.1	46.1	48.5	193	172	199	115	29.5	26.5	30.9	18.0	48.9	43.0	49.3	31.7
27	Pskov	353	376	427	349	350	48.7	53.0	60.9	50.4	50.8	56.7	58.6	63.8	57.8	61.7	226	269	225	217	31.9	38.4	32.5	31.5	37.5	41.9	39.9	40.7
28	**City:** St. Petersburg	684	694	742	852	764	14.9	15.2	16.2	18.6	16.6	36.8	40.7	36.8	39.6	38.7	415	475	343	432	9.1	10.4	7.5	9.4	33.9	28.9	19.6	27.2
DISTRICT: Southern		6182	6813	6356	4238	4034	27.1	29.9	27.8	30.9	29.4	37.9	38.9	37.3	39.3	38.0	5282	5089	2650	2859	23.2	22.3	19.3	20.8	33.4	32.6	26.5	29.6
29	**Republics:** Adygeya	146	162	151	152	156	33.0	36.7	34.2	34.3	35.2	42.2	39.4	40.3	42.3	49.1	160	149	130	125	36.3	33.7	29.3	28.2	41.9	44.3	40.8	42.2

№	Federal districts, constituent entities of the Russian Federation	New MbT+ TB patients										Proportion of MbT+ cases to all new TB cases					New pulmonary MbT+ cases confirmed by microscopy method											
		number of cases					per 100,000 population					%					number of cases				per 100,000 population				to pulmonary TB, %			
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
30	Kalmykiya	90	118	133	130	95	31.2	41.2	46.7	45.8	33.5	24.4	32.3	38.1	41.3	33.0	79	81	84	56	27.6	28.4	29.6	19.8	25.7	25.7	30.4	22.3
31	**Krai:** Krasnodarsky	1130	1395	1349	1410	1454	22.2	27.3	26.3	27.4	28.2	36.4	37.9	36.9	41.0	40.1	975	907	994	1060	19.1	17.7	19.3	20.5	28.0	26.2	30.5	30.6
32	**Regions:** Astrakhan	320	321	276	292	382	32.2	32.2	27.5	29.0	37.9	36.6	36.8	29.1	32.0	42.4	312	267	276	352	31.3	26.6	27.4	35.0	39.3	30.5	33.3	43.2
33	Volgograd	1264	1453	1102	1172	965	48.0	55.6	42.3	45.2	37.3	45.0	46.9	38.8	43.5	39.3	906	835	846	627	34.7	32.1	32.6	24.2	31.5	31.2	33.3	29.9
34	Rostov	1176	1091	1181	1082	982	27.3	25.6	27.8	25.5	23.2	37.7	33.6	37.2	35.5	32.5	830	910	320	639	19.5	21.4	7.6	15.1	27.5	30.5	11.5	23.3
DISTRICT: North-Caucasian					2070	1826				22.4	19.7				36.6	35.1			1855	1658			20.1	17.9			37.7	36.4
35	**Republics:** Dagestan	606	634	732	645	553	22.9	23.7	27.1	23.7	20.2	36.9	40.1	45.9	43.4	39.7	627	681	600	539	23.5	25.2	22.0	19.7	45.7	48.3	45.9	43.4
36	Ingushetia	91	115	71	66	85	18.7	23.2	14.1	12.9	16.5	49.7	53.7	45.2	32.7	36.3	102	67	60	75	20.6	13.3	11.7	14.5	53.1	51.5	35.9	38.7
37	Kabardino-Balkaria	187	188	149	127	101	20.9	21.1	16.7	14.2	11.3	38.3	38.3	34.6	29.7	28.2	172	145	127	101	19.3	16.3	14.2	11.3	39.4	38.4	32.5	31.2
38	Karachai-Cherkes	63	89	81	62	67	14.6	20.8	19.0	14.5	15.7	29.7	40.6	34.8	30.2	33.0	28	28	21	44	6.5	6.6	4.9	10.3	14.9	13.5	12.3	22.6
39	North Ossetia – Alania	193	171	144	140	129	27.5	24.4	20.5	20.0	18.4	44.0	33.4	31.9	30.5	31.9	150	135	128	122	21.4	19.2	18.3	17.4	45.0	37.1	35.8	37.5
40	Chechnya	341	353	350	336	318	29.3	29.5	28.6	26.8	25.1	37.4	35.2	37.8	35.1	35.1	353	350	336	318	29.5	28.6	26.8	25.1	40.6	43.7	40.5	41.6
41	**Krai:** Stavropolskiy	575	723	637	694	573	21.2	26.7	23.5	25.6	21.1	32.0	39.6	33.4	36.1	33.7	588	534	583	459	21.8	19.7	21.5	16.9	37.4	32.0	34.5	30.3
DISTRICT: Privolzhskiy		10127	9856	10148	10208	9010	33.2	32.5	33.6	33.9	29.9	42.5	43.5	43.8	44.5	42.6	6001	6127	6324	5905	19.8	20.3	21.0	19.6	29.3	29.1	30.2	30.8
42	**Republics:** Bashkortostan	779	661	634	567	535	19.2	16.3	15.6	14.0	13.2	34.9	31.3	32.2	29.2	28.0	452	460	447	402	11.2	11.3	11.0	9.9	24.0	26.2	26.1	23.4
43	Mari El	316	377	320	409	357	44.4	53.5	45.6	58.5	51.1	67.4	64.8	55.5	64.4	61.4	225	218	243	199	31.9	31.1	34.8	28.5	43.1	41.8	42.0	37.4
44	Mordovia	250	208	217	204	166	29.2	24.6	25.9	24.6	20.1	42.5	35.7	35.3	30.5	30.8	129	87	119	105	15.3	10.4	14.3	12.7	24.2	15.4	18.7	20.6
45	Tatarstan	916	876	847	946	807	24.4	23.3	22.5	25.1	21.4	39.9	39.7	38.1	42.9	40.0	538	480	549	507	14.3	12.7	14.5	13.4	27.5	24.0	27.6	28.4
46	Udmurtia	576	609	564	457	422	37.3	39.7	36.8	29.9	27.6	45.4	48.6	45.1	41.7	42.6	369	339	332	318	24.0	22.1	21.7	20.8	32.0	29.2	32.8	35.1
47	Chuvash	660	674	748	706	627	51.1	52.5	58.4	55.2	49.0	62.7	67.8	68.8	68.4	66.8	492	516	460	435	38.3	40.3	36.0	34.0	52.8	49.7	46.5	48.8
48	**Krai:** Permskiy	1396	1290	1268	1254	1171	50.8	47.3	46.7	46.4	43.4	43.6	45.6	42.9	45.5	42.5	725	584	704	760	26.6	21.5	26.0	28.1	28.6	21.7	28.4	30.9
49	**Regions:** Kirov	538	507	523	484	471	37.3	35.7	37.2	34.7	33.9	53.1	55.7	52.1	51.2	54.3	306	321	274	256	21.5	22.8	19.6	18.4	38.0	35.9	32.2	33.3
50	Nizhny Novgorod	1130	1147	1217	1150	1094	33.1	34.0	36.3	34.5	32.9	39.7	45.7	48.6	44.0	46.7	696	821	724	764	20.6	24.5	21.7	23.0	29.9	35.7	30.6	34.8
51	Orenburg	861	801	842	819	675	40.3	37.7	39.8	38.8	31.9	36.3	34.6	35.0	36.6	33.3	374	482	458	404	17.6	22.8	21.7	19.1	18.4	22.7	22.8	22.9
52	Penza	474	483	554	597	469	33.7	34.7	40.0	43.4	34.2	46.2	49.0	51.8	56.7	51.1	330	342	310	316	23.7	24.7	22.5	23.0	37.2	34.7	31.1	37.6
53	Samara	1166	1111	1238	1371	1191	36.6	35.0	39.0	43.2	37.6	46.0	44.1	46.8	49.8	47.8	630	664	853	744	19.8	20.9	26.9	23.5	27.5	27.5	33.1	32.4
54	Saratov	702	681	736	767	643	26.9	26.3	28.5	29.9	25.1	36.9	38.5	41.9	39.8	36.4	430	474	515	404	16.6	18.4	20.0	15.8	26.1	29.2	29.0	25.0
55	Ulyanovsk	363	431	440	477	382	27.2	32.7	33.6	36.6	29.4	35.7	38.8	39.8	43.9	38.4	305	339	336	291	23.2	25.9	25.8	22.4	30.6	34.1	34.5	32.1
DISTRICT: Ural		4593	4472	4893	4700	4353	37.5	36.5	40.0	38.3	35.4	36.5	35.2	38.1	38.9	36.6	2787	2892	2854	2540	22.8	23.6	23.3	20.7	24.7	25.2	26.6	23.6
56	**Regions:** Kurgan	486	421	647	533	545	49.6	43.6	67.6	56.1	57.5	36.1	31.9	45.1	41.7	41.8	214	309	343	275	22.2	32.3	36.1	29.0	21.0	25.7	32.1	23.5
57	Sverdlovsk	1909	1902	1959	1821	1683	43.3	43.3	44.6	41.4	38.3	41.3	38.7	37.2	38.9	36.1	1029	1058	969	964	23.4	24.1	22.1	21.9	23.1	21.9	23.0	22.8

№	Federal districts, constituent entities of the Russian Federation	New MbT+ TB patients										Proportion of MbT+ cases to all new TB cases					New pulmonary MbT+ cases confirmed by microscopy method											
		number of cases					per 100,000 population					%					number of cases				per 100,000 population				to pulmonary TB, %			
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
58	Tyumen	1098	1011	1078	1172	1058	33.0	30.1	31.8	34.3	30.8	27.8	29.7	33.9	37.0	34.8	679	727	753	664	20.2	21.5	22.1	19.4	22.2	25.4	26.7	24.3
	Khanty-Mansiyskiy AD	502	453	484	453	416	34.0	30.3	32.0	29.6	27.0	35.3	34.9	37.2	36.6	35.1	274	302	280	239	18.3	20.0	18.3	15.5	23.6	25.4	24.7	22.1
	Yamal-Nenetskiy AD	145	123	144	195	147	27.3	22.8	26.5	35.8	26.9	33.0	30.8	37.0	44.8	35.2	78	98	138	97	14.4	18.0	25.3	17.7	21.7	27.9	36.0	25.8
	Tyumen region (not including ADs)	451	435	450	524	495	34.3	32.9	33.8	39.1	36.8	21.6	25.5	30.1	35.1	34.5	327	327	335	328	24.7	24.6	25.0	24.4	21.2	24.8	25.7	25.7
59	Chelyabinsk	1100	1138	1209	1174	1067	31.2	32.4	34.4	33.5	30.4	41.4	36.9	41.0	39.9	36.9	865	798	789	637	24.6	22.7	22.5	18.2	31.4	30.7	29.8	24.2
DISTRICT: Siberian		10591	10293	10658	10878	10008	53.8	52.6	54.5	55.6	51.2	40.9	41.1	41.0	43.1	42.2	7258	7617	7497	7119	37.1	39.0	38.3	36.4	31.8	31.8	32.3	33.0
60	**Republics:** Altai	68	82	98	92	82	33.3	39.8	47.1	43.8	38.9	26.2	34.6	39.2	36.4	37.1	35	51	34	46	17.0	24.5	16.2	21.8	17.2	24.5	15.2	24.9
61	Buryatia	572	579	590	638	642	59.4	60.3	61.4	66.3	66.6	34.2	41.4	38.6	39.5	46.0	487	437	441	438	50.7	45.5	45.8	45.5	38.4	31.1	30.1	34.2
62	Tyva	373	366	345	345	369	120.9	117.9	110.3	109.4	116.4	49.1	50.1	45.9	47.9	49.9	230	190	210	258	74.1	60.7	66.6	81.4	35.2	28.1	32.9	39.7
63	Khakassia	334	303	309	293	243	62.1	56.4	57.5	54.4	45.1	52.4	55.3	51.1	46.2	46.0	199	195	175	136	37.1	36.3	32.5	25.2	38.8	34.6	29.0	27.8
64	**Krai:** Altaiskiy	920	766	912	1049	971	36.2	30.4	36.4	42.1	39.0	25.5	23.1	27.2	32.3	33.6	663	718	838	752	26.4	28.7	33.6	30.2	21.6	23.2	28.0	28.2
65	Trans-Baikal	469	435	517	563	492	41.6	38.8	46.2	50.4	44.0	39.1	36.1	37.5	48.1	42.2	342	401	434	374	30.5	35.9	38.9	33.5	35.1	30.9	39.6	34.2
66	Krasnoyarskiy	1359	1375	1320	1327	1216	46.8	47.5	45.7	45.9	42.0	45.0	45.7	42.7	44.1	43.1	899	902	785	783	31.1	31.2	27.1	27.1	32.2	31.5	28.4	30.4
67	**Regions:** Irkutsk	1229	1342	1422	1425	1384	48.6	53.5	56.7	56.9	55.3	38.9	39.0	39.8	42.5	37.5	933	1018	979	967	37.2	40.6	39.1	38.6	29.9	31.0	32.6	30.4
68	Kemerovo	2204	2006	2028	2067	1881	77.6	71.0	71.8	73.3	66.7	50.7	49.6	48.7	49.8	51.3	1351	1356	1341	1292	47.8	48.0	47.5	45.8	37.7	36.2	36.0	39.2
69	Novosibirsk	1416	1495	1501	1418	1314	53.4	56.7	56.9	53.6	49.6	38.8	42.7	41.7	40.4	37.9	987	1108	1014	1039	37.4	42.0	38.3	39.2	30.0	32.6	30.1	31.6
70	Omsk	963	963	1082	1152	954	47.3	47.6	53.7	57.2	47.4	39.1	37.3	41.0	43.7	41.1	684	850	904	711	33.8	42.2	44.9	35.3	28.7	34.8	37.0	33.4
71	Tomsk	684	581	534	509	460	66.1	56.2	51.5	48.9	44.1	61.3	54.9	50.9	53.6	54.8	448	391	342	323	43.3	37.7	32.8	30.9	45.8	40.9	40.0	42.5
DISTRICT: Far-Eastern		3529	3416	3720	4139	3858	53.9	52.6	57.5	64.2	59.9	42.2	39.7	39.4	43.3	43.0	2518	2773	3080	2780	38.8	42.8	47.8	43.2	31.6	31.4	34.4	33.3
72	**Republic:** Sakha (Yakutia)	388	330	435	390	402	40.8	34.7	45.8	41.1	42.3	49.6	44.8	50.6	50.0	52.9	217	272	293	282	22.8	28.6	30.9	29.7	34.3	34.8	41.7	42.2
73	**Krai:** Kamchatka	102	75	107	122	101	29.2	21.7	31.1	35.6	29.5	35.4	26.7	33.3	36.2	41.6	71	106	89	83	20.5	30.8	26.0	24.3	29.6	37.1	30.2	39.9
74	Primorskiy	1469	1546	1506	1893	1729	72.7	77.3	75.6	95.4	87.2	44.2	43.1	39.4	45.7	43.5	1084	1173	1476	1313	54.2	58.9	74.4	66.2	32.3	32.8	37.8	35.6
75	Khabarovskiy	676	612	782	901	859	47.9	43.6	55.7	64.3	61.3	39.3	33.9	40.2	44.8	48.5	555	612	623	571	39.5	43.6	44.5	40.8	32.5	33.0	32.4	33.9
76	**Regions:** Amur	361	346	333	289	245	41.0	39.7	38.4	33.5	28.5	28.9	28.1	24.4	23.2	19.7	263	284	263	230	30.2	32.8	30.5	26.7	22.5	22.1	22.8	19.6
77	Magadan	65	52	63	66	55	37.9	31.1	38.3	40.7	34.1	47.1	40.0	44.4	46.8	48.2	35	36	33	27	20.9	21.9	20.4	16.7	32.4	28.3	27.7	30.3
78	Sakhalin	325	288	291	291	282	61.8	55.4	56.3	56.8	55.2	55.7	57.3	49.4	52.6	56.6	198	194	203	167	38.1	37.6	39.6	32.7	46.4	36.5	38.5	36.1
79	**A.R.:** Jewish	122	149	180	158	155	65.4	80.3	97.0	85.3	83.8	49.8	48.1	51.1	50.3	48.3	93	88	91	93	50.1	47.4	49.1	50.3	30.9	26.0	30.4	29.9
80	**A.D.:** Chukotskiy	21	18	23	29	30	41.6	35.7	46.1	59.1	61.7	65.6	62.1	54.8	65.9	55.6	2	8	9	14	4.0	16.0	18.3	28.8	7.1	19.5	25.0	28.6

Table 5

New TB cases registered at the TB facilities in the constituent entities of the Russian Federation, 2006–2010 (resident population, Form No. 33)

№	Federal districts, constituent entities of the Russian Federation	New TB cases																						
		All forms of tuberculosis										inc. cases with postmortem diagnosis	Of them with respiratory TB								Of them with TB of other organs			
													Total				Of them pulmonary TB							
		number of cases					per 100,000 population						number of cases		% to all forms		number of cases		% to all forms		number of cases		% to all forms	
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
RUSSIAN FEDERATION		**96867**	**96251**	**97886**	**94755**	**88391**	**68.0**	**67.7**	**69.0**	**66.8**	**62.3**	**63.3**	**91266**	**85058**	**96.3**	**96.2**	**85118**	**79241**	**89.8**	**89.6**	**3489**	**3333**	**3.7**	**3.8**
DISTRICT: Central		17642	17429	17830	17083	15530	47.3	46.9	48.0	46.0	41.8	42.8	16304	14811	95.4	95.4	15073	13686	88.2	88.1	779	719	4.6	4.6
1	**Regions:** Belgorod	819	778	865	687	630	54.1	51.3	56.8	45.0	41.2	41.8	645	592	93.9	94.0	617	572	89.8	90.8	42	38	6.1	6.0
2	Bryansk	1044	1110	1164	1130	952	78.8	84.5	89.3	87.2	73.7	75.4	1081	901	95.7	94.6	988	825	87.4	86.7	49	51	4.3	5.4
3	Vladimir	898	877	877	876	735	61.3	60.3	60.7	61.0	51.4	52.3	842	715	96.1	97.3	767	653	87.6	88.8	34	20	3.9	2.7
4	Voronezh	1166	1251	1227	1155	1020	50.6	54.7	53.9	51.0	45.1	45.5	1070	952	92.6	93.3	1013	920	87.7	90.2	85	68	7.4	6.7
5	Ivanovo	536	455	492	480	389	49.0	42.0	45.7	44.9	36.5	36.7	457	369	95.2	94.9	427	338	89.0	86.9	23	20	4.8	5.1
6	Kaluga	558	534	533	507	480	55.2	53.0	53.1	50.6	47.9	49.2	489	455	96.4	94.8	448	413	88.4	86.0	18	25	3.6	5.2
7	Kostroma	269	242	243	280	231	38.1	34.6	35.0	40.6	33.6	34.3	272	226	97.1	97.8	236	203	84.3	87.9	8	5	2.9	2.2
8	Kursk	779	763	820	811	616	66.2	65.4	70.8	70.4	53.6	54.6	793	594	97.8	96.4	743	559	91.6	90.7	18	22	2.2	3.6
9	Lipetsk	679	738	710	612	539	57.7	63.0	60.9	52.7	46.6	46.6	589	513	96.2	95.2	572	494	93.5	91.7	23	26	3.8	4.8
10	Moscow	2922	3107	2989	2899	2809	44.0	46.7	44.7	43.1	41.6	43.2	2816	2732	97.1	97.3	2593	2503	89.4	89.1	83	77	2.9	2.7
11	Orel	433	400	379	386	326	52.2	48.5	46.3	47.4	40.1	41.0	367	315	95.1	96.6	341	301	88.3	92.3	19	11	4.9	3.4
12	Ryazan	793	737	690	664	582	67.4	63.1	59.4	57.5	50.5	51.8	633	563	95.3	96.7	586	516	88.3	88.7	31	19	4.7	3.3
13	Smolensk	762	686	751	735	711	76.2	69.4	76.7	75.8	73.6	76.2	709	698	96.5	98.2	651	666	88.6	93.7	26	13	3.5	1.8
14	Tambov	626	633	624	636	608	55.7	56.9	56.7	58.2	55.9	56.0	610	568	95.9	93.4	594	555	93.4	91.3	26	40	4.1	6.6
15	Tver	870	859	868	804	743	62.2	62.0	63.2	58.9	54.6	56.1	789	721	98.1	97.0	707	659	87.9	88.7	15	22	1.9	3.0
16	Tula	978	906	1005	976	807	61.5	57.6	64.4	63.1	52.4	54.9	932	771	95.5	95.5	862	729	88.3	90.3	44	36	4.5	4.5
17	Yaroslavl	594	598	521	468	502	44.9	45.4	39.7	35.8	38.4	39.4	437	464	93.4	92.4	391	391	83.5	77.9	31	38	6.6	7.6
18	**City:** Moscow	2916	2755	3072	2977	2850	27.9	26.3	29.3	28.3	27.0	27.6	2773	2662	93.1	93.4	2537	2389	85.2	83.8	204	188	6.9	6.6
DISTRICT: Northwestern		6885	6698	6727	6538	6146	50.7	49.5	49.9	48.6	45.7	46.9	6308	5947	96.5	96.8	5680	5401	86.9	87.9	230	199	3.5	3.2
19	**Republics:** Kareliya	396	422	338	352	339	57.0	61.0	49.1	51.3	49.5	50.3	334	328	94.9	96.8	314	307	89.2	90.6	18	11	5.1	3.2
20	Komi	592	670	653	611	515	60.4	69.0	67.8	64.0	54.1	57.4	579	483	94.8	93.8	543	451	88.9	87.6	32	32	5.2	6.2
21	**Regions:** Arkhangelsk	630	562	555	549	544	49.0	44.0	43.8	43.6	43.4	45.8	536	535	97.6	98.3	496	507	90.3	93.2	13	9	2.4	1.7
22	Vologda	467	450	478	441	479	37.9	36.7	39.2	36.3	39.5	39.6	424	461	96.1	96.2	392	440	88.9	91.9	17	18	3.9	3.8
23	Kaliningrad	1014	999	884	734	687	108.0	106.6	94.3	78.3	73.2	75.9	712	663	97.0	96.5	611	587	83.2	85.4	22	24	3.0	3.5
24	Leningrad	1011	877	1045	1012	1003	61.6	53.6	64.0	62.1	61.5	63.1	984	989	97.2	98.6	915	948	90.4	94.5	28	14	2.8	1.4
25	Murmansk	376	400	328	357	313	43.7	46.8	38.7	42.5	37.4	39.1	348	302	97.5	96.5	328	276	91.9	88.2	9	11	2.5	3.5
26	Novgorod	360	355	350	343	313	54.4	54.2	53.9	53.3	48.9	49.0	336	305	98.0	97.4	316	284	92.1	90.7	7	8	2.0	2.6
27	Pskov	465	493	488	463	463	64.7	69.5	69.6	66.9	67.2	68.4	449	452	97.0	97.6	425	433	91.8	93.5	14	11	3.0	2.4
28	**City:** St. Petersburg	1574	1470	1608	1676	1490	34.4	32.2	35.1	36.5	32.4	32.8	1606	1429	95.8	95.9	1340	1168	80.0	78.4	70	61	4.2	4.1
DISTRICT: Southern		14005	15040	14451	8877	8441	63.1	65.9	63.2	64.7	61.6	61.8	8631	8239	97.2	97.6	8206	7784	92.4	92.2	246	202	2.8	2.4
29	**Republics:** Adygeya	283	331	314	317	292	64.0	75.0	71.0	71.6	65.9	66.8	306	286	96.5	97.9	277	270	87.4	92.5	11	6	3.5	2.1

№	Federal districts, constituent entities of the Russian Federation	New TB cases																				
		All forms of tuberculosis										inc. cases with postmortem diagnosis	Of them with respiratory TB								Of them with TB of other organs			
													Total				Of them pulmonary TB							
		number of cases					per 100,000 population						number of cases		% to all forms		number of cases		% to all forms		number of cases		% to all forms	
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
30	Kalmykiya	342	336	295	249	246	118.8	117.3	103.6	87.8	86.9	87.6	234	238	94.0	96.7	212	212	85.1	86.2	15	8	6.0	3.3
31	**Krai:** Krasnodarsky	2626	3169	2991	2778	2820	51.5	62.0	58.3	53.9	54.6	54.9	2696	2769	97.0	98.2	2606	2664	93.8	94.5	82	51	3.0	1.8
32	**Regions:** Astrakhan	755	755	744	734	720	75.9	75.7	74.2	72.9	71.5	71.5	721	701	98.2	97.4	655	627	89.2	87.1	13	19	1.8	2.6
33	Volgograd	2084	2302	2146	2124	1923	79.3	88.1	82.4	81.9	74.3	74.6	2050	1874	96.5	97.5	1980	1814	93.2	94.3	74	49	3.5	2.5
34	Rostov	2827	2894	2833	2675	2440	65.9	67.9	66.7	63.2	57.7	57.8	2624	2371	98.1	97.2	2476	2197	92.6	90.0	51	69	1.9	2.8
DISTRICT: North-Caucasian					5058	4658				54.9	50.3	50.4	4705	4347	93.0	93.3	4345	4028	85.9	86.5	353	311	7.0	6.7
35	**Republics:** Dagestan	1535	1497	1499	1433	1331	57.9	56.0	55.5	52.6	48.6	48.6	1340	1255	93.5	94.3	1257	1188	87.7	89.3	93	76	6.5	5.7
36	Ingushetia	182	212	157	175	197	37.2	42.7	31.2	34.2	38.1	38.1	167	182	95.4	92.4	141	161	80.6	81.7	8	15	4.6	7.6
37	Kabardino-Balkaria	437	429	374	367	324	49.0	48.1	41.9	41.1	36.2	36.2	356	319	97.0	98.5	327	293	89.1	90.4	11	5	3.0	1.5
38	Karachai-Cherkes	196	212	227	193	194	45.6	49.5	53.1	45.2	45.4	45.4	178	186	92.2	95.9	160	178	82.9	91.8	15	8	7.8	4.1
39	North Ossetia – Alania	902	1001	921	429	380	76.9	83.7	58.7	61.2	54.2	54.2	386	338	90.0	88.9	342	300	79.7	78.9	43	42	10.0	11.1
40	Chechnya	403	437	412	958	901	57.4	62.3	75.3	76.4	71.1	71.1	906	849	94.6	94.2	830	759	86.6	84.2	52	52	5.4	5.8
41	**Krai:** Stavropolskiy	1433	1465	1538	1503	1331	53.0	54.2	56.8	55.5	49.1	49.4	1372	1218	91.3	91.5	1288	1149	85.7	86.3	131	113	8.7	8.5
DISTRICT: Privolzhskiy		19399	18294	18754	18534	16891	63.8	60.4	62.1	61.5	56.1	56.9	17838	16162	96.2	95.7	16753	15157	90.4	89.7	696	729	3.8	4.3
42	**Republics:** Bashkortostan	1868	1752	1673	1628	1607	46.0	43.2	41.3	40.1	39.5	39.6	1520	1512	93.4	94.1	1402	1416	86.1	88.1	108	95	6.6	5.9
43	Mari El	449	541	536	569	514	63.3	76.7	76.4	81.4	73.6	74.9	555	502	97.5	97.7	514	468	90.3	91.1	14	12	2.5	2.3
44	Mordovia	561	543	531	501	382	65.8	64.3	63.5	60.4	46.2	46.5	493	374	98.4	97.9	468	354	93.4	92.7	8	8	1.6	2.1
45	Tatarstan	2055	1887	1884	1866	1689	54.6	50.2	50.0	49.4	44.7	45.8	1776	1586	95.2	93.9	1670	1483	89.5	87.8	90	103	4.8	6.1
46	Udmurtia	1075	1090	1101	983	878	69.8	71.0	71.9	64.4	57.5	59.1	960	848	97.7	96.6	899	799	91.5	91.0	23	30	2.3	3.4
47	Chuvash	888	865	941	908	831	68.9	67.3	73.5	71.0	65.0	66.1	893	810	98.3	97.5	868	785	95.6	94.5	15	21	1.7	2.5
48	**Krai:** Permskiy	2473	2167	2312	2159	2086	90.3	79.5	85.2	79.8	77.2	78.7	2077	2012	96.2	96.5	1935	1848	89.6	88.6	82	74	3.8	3.5
49	**Regions:** Kirov	828	718	796	724	638	57.7	50.6	56.6	51.9	45.9	47.4	684	596	94.5	93.4	635	553	87.7	86.7	40	42	5.5	6.6
50	Nizhny Novgorod	2066	1868	1880	2030	1806	60.8	55.4	56.1	60.9	54.3	55.8	1967	1760	96.9	97.5	1850	1671	91.1	92.5	63	46	3.1	2.5
51	Orenburg	1847	1772	1817	1755	1593	86.6	83.5	85.9	83.1	75.4	75.4	1701	1516	96.9	95.2	1542	1366	87.9	85.8	54	77	3.1	4.8
52	Penza	923	853	849	907	731	65.8	61.3	61.3	65.9	53.2	53.5	880	699	97.0	95.6	853	669	94.0	91.5	27	32	3.0	4.4
53	Samara	1898	1847	1996	2035	1868	59.6	58.2	62.9	64.2	58.9	59.5	1963	1777	96.5	95.1	1875	1685	92.1	90.2	72	91	3.5	4.9
54	Saratov	1653	1541	1548	1571	1475	63.5	59.5	60.0	61.2	57.5	57.9	1519	1412	96.7	95.7	1442	1348	91.8	91.4	52	63	3.3	4.3
55	Ulyanovsk	815	850	890	898	793	61.3	64.5	68.0	69.0	61.1	61.7	850	758	94.7	95.6	800	712	89.1	89.8	48	35	5.3	4.4
DISTRICT: Ural		10444	10353	10435	9704	9480	85.3	84.6	85.2	79.1	77.2	78.5	9364	9150	96.5	96.5	8604	8475	88.7	89.4	340	330	3.5	3.5
56	**Regions:** Kurgan	1147	1126	1127	1004	1013	117.7	116.7	117.8	105.7	106.9	111.7	965	954	96.1	94.2	925	924	92.1	91.2	39	59	3.9	5.8
57	Sverdlovsk	3781	3935	4115	3662	3635	85.8	89.5	93.6	83.3	82.7	84.2	3549	3535	96.9	97.2	3225	3232	88.1	88.9	113	100	3.1	2.8
58	Tyumen	3344	2910	2794	2679	2523	100.3	86.6	82.5	78.5	73.6	74.1	2598	2451	97.0	97.1	2352	2237	87.8	88.7	81	72	3.0	2.9
	Khanty-Mansiyskiy AD	1268	1146	1147	1013	967	85.5	76.6	75.8	66.2	62.8	63.6	993	941	98.0	97.3	921	873	90.9	90.3	20	26	2.0	2.7
	Yamal-Nenetskiy AD	369	343	343	366	331	69.0	63.4	63.1	67.1	60.6	61.1	354	321	96.7	97.0	314	291	85.8	87.9	12	10	3.3	3.0
	Tyumen region (not including ADs)	1707	1421	1304	1300	1225	129.7	107.5	98.0	97.0	91.1	91.5	1251	1189	96.2	97.1	1117	1073	85.9	87.6	49	36	3.8	2.9

№	Federal districts, constituent entities of the Russian Federation	New TB cases																						
		All forms of tuberculosis										inc. cases with postmortem diagnosis	Of them with respiratory TB								Of them with TB of other organs			
													Total				Of them pulmonary TB							
		number of cases					per 100,000 population						number of cases		% to all forms		number of cases		% to all forms		number of cases		% to all forms	
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
59	Chelyabinsk	2172	2382	2399	2359	2309	61.6	67.8	68.4	67.2	65.8	66.6	2252	2210	95.5	95.7	2102	2082	89.1	90.2	107	99	4.5	4.3
DISTRICT: Siberian		21546	21371	22008	21407	20073	109.7	109.2	112.6	109.5	102.6	105.1	20726	19406	96.8	96.7	19474	18128	91.0	90.3	681	667	3.2	3.3
60	**Republics:** Altai	257	236	249	224	217	125.4	114.4	119.6	106.7	103.0	103.9	212	215	94.6	99.1	195	181	87.1	83.4	12	2	5.4	0.9
61	Buryatia	1385	1365	1358	1310	1134	144.0	142.2	141.4	136.2	117.7	119.6	1270	1092	96.9	96.3	1187	1039	90.6	91.6	40	42	3.1	3.7
62	Tyva	637	567	578	568	592	206.2	182.6	184.8	180.0	186.7	194.9	512	539	90.1	91.0	488	504	85.9	85.1	56	53	9.9	9.0
63	Khakassia	535	507	560	570	473	99.6	94.4	104.2	105.8	87.7	88.7	566	459	99.3	97.0	541	434	94.9	91.8	4	14	0.7	3.0
64	**Krai:** Altaiskiy	3102	2891	2963	2868	2481	122.4	114.9	118.4	115.0	99.6	102.4	2789	2417	97.2	97.4	2621	2283	91.4	92.0	79	64	2.8	2.6
65	Trans-Baikal	961	1012	1145	1023	961	85.4	90.3	102.4	91.6	86.0	86.8	999	933	97.7	97.1	949	899	92.8	93.5	24	28	2.3	2.9
66	Krasnoyarskiy	2491	2446	2559	2420	2337	85.9	84.6	88.5	83.7	80.8	83.0	2329	2234	96.2	95.6	2212	2122	91.4	90.8	91	103	3.8	4.4
67	**Regions:** Irkutsk	2735	3006	3150	2949	3221	108.5	119.7	125.7	117.8	128.7	133.8	2827	3082	95.9	95.7	2622	2812	88.9	87.3	122	139	4.1	4.3
68	Kemerovo	3651	3524	3519	3602	3219	128.9	124.7	124.7	127.7	114.1	116.6	3492	3154	96.9	98.0	3190	2859	88.6	88.8	110	65	3.1	2.0
69	Novosibirsk	2913	2869	2959	2865	2813	110.1	108.8	112.2	108.3	106.2	108.0	2807	2746	98.0	97.6	2726	2636	95.1	93.7	58	67	2.0	2.4
70	Omsk	2003	2097	2099	2160	1880	98.7	103.7	104.1	107.3	93.4	94.9	2101	1809	97.3	96.2	1989	1693	92.1	90.1	59	71	2.7	3.8
71	Tomsk	876	851	869	848	745	84.8	82.3	83.8	81.4	71.4	72.2	822	726	96.9	97.4	754	666	88.9	89.4	26	19	3.1	2.6
DISTRICT: Far-Eastern		6937	7057	7665	7542	7156	106.3	108.6	118.4	116.9	111.1	112.1	7378	6982	97.8	97.6	6972	6569	92.4	91.8	164	174	2.2	2.4
72	**Republic:** Sakha (Yakutia)	692	620	657	634	648	72.8	65.2	69.1	66.8	68.3	68.4	604	619	95.3	95.5	559	564	88.2	87.0	30	29	4.7	4.5
73	**Krai:** Kamchatka	253	239	278	296	200	72.7	69.0	80.7	86.3	58.4	61.1	296	199	100.0	99.5	255	166	86.1	83.0	0	1	0.0	0.5
74	Primorskiy	2727	2915	3129	3199	3088	135.5	145.7	157.1	161.2	155.8	156.4	3149	3025	98.4	98.0	2991	2847	93.5	92.2	50	63	1.6	2.0
75	Khabarovskiy	1405	1470	1559	1540	1389	99.7	104.7	111.1	109.9	99.2	99.8	1526	1378	99.1	99.2	1457	1310	94.6	94.3	14	11	0.9	0.8
76	**Regions:** Amur	1046	991	1111	1037	968	119.2	113.6	128.1	120.2	112.5	113.7	994	940	95.9	97.1	943	896	90.9	92.6	43	28	4.1	2.9
77	Magadan	110	109	99	104	98	64.7	65.2	60.2	64.2	60.8	61.4	99	86	95.2	87.8	82	73	78.8	74.5	5	12	4.8	12.2
78	Sakhalin	447	399	469	407	413	85.4	76.7	90.8	79.4	80.8	84.0	392	385	96.3	93.2	383	378	94.1	91.5	15	28	3.7	6.8
79	**A.R.:** Jewish	225	286	322	281	300	120.9	154.1	173.6	151.7	162.1	164.8	279	298	99.3	99.3	267	288	95.0	96.0	2	2	0.7	0.7
80	**A.D.:** Chukotskiy	32	28	41	44	52	63.4	55.6	82.2	89.7	107.0	107.0	39	52	88.6	100.0	35	47	79.5	90.4	5	0	11.4	0.0

Table 6

Laboratory TB diagnostics in the Russian Federation, 2008–2010
(TB facilities in the constituent entities of the Russian Federation, MH&SD data: Form No. 7-TB)

№	Federal districts, constituent entities of the Russian Federation	Cohorts of new pulmonary TB cases																								
		Total			Of them MbT+ cases confirmed by microscopy (M+)						% of coverage by culture tests	Of them MbT+ cases confirmed by culture (Cu+)						% of coverage by drug susceptibility testing			Of them MDR-TB					
		number of cases			number of cases			%				number of cases			%[1]						number of cases			% to cases covered by DST		
		2008	2009	2010	2008	2009	2010	2008	2009	2010	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
RUSSIAN FEDERATION		**91805**	**89147**	**82898**	**30328**	**29935**	**27977**	**33.0**	**33.6**	**33.7**	**92.6**	**37573**	**37317**	**35232**	**40.9**	**43.7**	**42.5**	**91.1**	**91.6**	**93.4**	**4656**	**5353**	**5613**	**13.6**	**15.7**	**17.1**
DISTRICT: Central		17605	16943	15412	5969	5891	5430	33.9	34.8	35.2	90.2	7710	7401	6797	43.8	50.3	44.1	94.7	94.7	95.7	952	980	908	13.0	14.0	14.0
1	**Regions:** Belgorod	798	636	591	279	242	217	35.0	38.1	36.7	100.0	442	358	341	55.4	56.3	57.7	100.0	100.0	100.0	85	71	52	19.2	19.8	15.2
2	Bryansk	1056	1050	828	371	355	329	35.1	33.8	39.7	100.0	550	560	447	52.1	53.3	54.0	99.8	100.0	100.0	71	73	59	12.9	13.0	13.2
3	Vladimir	831	805	680	389	381	329	46.8	47.3	48.4	95.9	426	471	404	51.3	58.5	59.4	99.1	89.6	98.8	59	88	78	14.0	20.9	19.5
4	Voronezh	1130	1034	942	334	274	289	29.6	26.5	30.7	97.1	605	566	481	53.5	54.7	51.1	98.7	94.5	95.9	87	78	89	14.6	14.6	19.3
5	Ivanovo	446	450	368	212	190	179	47.5	42.2	48.6	96.5	314	321	287	70.4	71.3	78.0	87.6	86.0	82.9	55	56	54	20.0	20.3	22.7
6	Kaluga	547	600	506	224	249	198	41.0	41.5	39.1	99.0	277	288	202	50.6	48.0	39.9	86.3	82.3	79.7	24	15	31	10.0	6.3	19.3
7	Kostroma	216	243	212	71	91	69	32.9	37.4	32.5	100.0	119	116	112	55.1	47.7	52.8	100.0	100.0	100.0	8	7	17	6.7	6.0	15.2
8	Kursk	816	750	580	253	288	221	31.0	38.4	38.1	100.0	365	289	276	44.7	38.5	47.5	100.0	100.0	100.0	32	18	33	8.8	6.2	12.0
9	Lipetsk	682	587	506	105	93	127	15.4	15.8	25.1	100.0	305	248	208	44.7	42.2	41.1	100.0	100.0	100.0	39	27	22	12.8	10.9	10.6
10	Moscow	2812	2735	2619	832	960	803	29.6	35.1	30.7	59.7	675	522	547	24.0	19.1	20.9	84.3	84.7	88.7	49	51	72	8.6	11.5	14.8
11	Orel	368	361	327	196	174	167	53.3	48.2	51.1	99.4	297	260	243	80.7	72.0	74.3	99.7	98.5	99.6	16	16	21	5.4	6.3	8.7
12	Ryazan	658	612	536	258	202	190	39.2	33.0	35.4	100.0	300	250	194	45.6	40.8	36.2	99.7	98.8	100.0	37	28	19	12.4	11.3	9.8
13	Smolensk	701	674	676	145	143	145	20.7	21.2	21.4	84.8	256	253	218	36.5	37.5	32.3	68.8	76.3	81.7	16	18	6	9.1	9.3	3.4
14	Tambov	560	585	545	229	258	204	40.9	44.1	37.4	99.4	315	345	343	56.3	59.0	63.0	97.5	99.1	91.0	26	60	53	8.5	17.5	17.0
15	Tver	834	767	722	381	305	266	45.7	39.8	36.8	77.3	192	350	302	23.0	45.6	41.8	47.4	83.1	100.0	1	16	10	1.1	5.5	3.3
16	Tula	989	953	832	335	320	306	33.9	33.6	36.8	91.1	511	461	433	51.7	48.4	52.1	95.7	98.7	96.3	58	64	55	11.9	14.1	13.2
17	Yaroslavl	479	462	448	130	127	124	27.1	27.5	27.7	94.9	223	195	210	46.6	42.2	46.8	100.0	100.0	95.2	14	16	27	6.3	8.2	13.5
18	**City:** Moscow	3682	3639	3494	1225	1239	1267	33.3	34.0	36.3	99.8	1538	1548	1537	41.8	42.5	44.0	100.0	100.0	99.0	275	278	210	17.9	18.0	13.8
DISTRICT: Northwestern		6256	6095	5687	2355	2213	2168	37.6	36.3	38.1	95.0	3168	3059	3014	50.6	37.5	53.0	97.3	83.4	92.1	607	551	689	19.7	21.3	24.8
19	**Republics:** Kareliya	325	340	331	142	126	144	43.7	37.1	43.5	99.1	144	195	190	44.3	57.4	57.4	100.0	100.0	97.4	43	48	51	29.9	24.6	27.6
20	Komi	574	543	451	298	224	217	51.9	41.3	48.1	96.5	305	326	278	53.1	60.0	61.7	100.0	97.5	99.6	79	61	54	25.9	19.2	19.5
21	**Regions:** Arkhangelsk	502	499	513	218	233	252	43.4	46.7	49.1	96.9	302	303	322	60.2	60.7	62.8	96.0	96.4	98.1	69	75	111	23.8	25.7	35.1
22	Vologda	471	426	454	154	141	148	32.7	33.1	32.6	100.0	232	215	240	49.3	50.5	52.9	100.0	100.0	100.0	31	21	49	13.4	9.8	20.4
23	Kaliningrad	856	695	677	379	334	297	44.3	48.1	43.9	96.3	436	354	326	50.9	50.9	48.2	100.0	100.0	100.0	84	79	78	19.3	22.3	23.9
24	Leningrad	1000	1085	1031	290	275	310	29.0	25.3	30.1	80.0	440	425	497	44.0	39.2	48.2	100.0	46.0	76.1	43	53	101	9.8	23.9	26.7
25	Murmansk	325	354	291	94	125	120	28.9	35.3	41.2	95.2	179	192	180	55.1	54.2	61.9	96.6	99.0	96.1	49	55	36	28.3	28.9	20.8
26	Novgorod	366	322	281	141	94	96	38.5	29.2	34.2	100.0	221	164	157	60.4	50.9	55.9	68.8	84.8	99.4	30	29	42	19.7	20.9	26.9
27	Pskov	531	480	471	234	204	202	44.1	42.5	42.9	98.9	370	304	315	69.7	63.3	66.9	100.0	100.0	99.0	101	75	87	27.3	24.8	27.9
28	**City:** St. Petersburg	1289	1351	1187	404	457	382	31.3	33.8	32.2	100.0	533	581	510	41.3	43.4	43.0	100.0	63.3	81.2	77	55	80	14.4	15.6	19.3

№	Federal districts, constituent entities of the Russian Federation	Cohorts of new pulmonary TB cases																								
		Total			Of them MbT+ cases confirmed by microscopy (M+)						% of coverage by culture tests	Of them MbT+ cases confirmed by culture (Cu+)						% of coverage by drug susceptibility testing			Of them MDR-TB					
		number of cases			number of cases			%				number of cases			%[1]						number of cases			% to cases covered by DST		
		2008	2009	2010	2008	2009	2010	2008	2009	2010	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
DISTRICT: Southern		13401	8398	7988	4451	2555	2536	33.2	30.4	31.7	99.8	4241	3150	3275	31.6	24.9	41.0	85.9	90.4	88.1	355	310	350	9.7	10.9	12.2
29	**Republics:** Adygeya	316	295	291	119	94	80	37.7	31.9	27.5	100.0	151	105	155	47.8	35.6	53.2	100.0	84.8	100.0	13	4	6	8.6	4.5	3.9
30	Kalmykiya	261	213	213	75	73	48	28.7	34.3	22.5	98.6	121	107	75	46.4	50.2	35.2	72.7	84.1	54.7	22	9	3	25.0	10.0	7.3
31	**Krai:** Krasnodarsky	2819	2705	2804	828	892	976	29.4	33.0	34.8	97.2	1173	1186	1262	41.6	43.8	45.0	90.2	96.7	92.1	158	154	183	14.9	13.4	15.7
32	**Regions:** Astrakhan	663	655	632	210	219	277	31.7	33.4	43.8	88.8	132	186	266	19.9	28.4	42.1	100.0	100.0	99.2	8	25	46	6.1	13.4	17.4
33	Volgograd	2036	1995	1836	647	671	660	31.8	33.6	35.9	98.3	706	728	819	34.7	36.5	44.6	95.2	68.5	68.9	44	69	63	6.5	13.8	11.2
34	Rostov	2669	2535	2212	655	606	495	24.5	23.9	22.4	100.0	866	838	695	32.4	33.1	31.4	100.0	100.0	100.0	65	49	49	7.5	5.8	7.1
DISTRICT: North-Caucasian			4323	4041		1752	1566		40.5	38.8	77.3		1102	1006		46.3	24.9		67.6	76.0		50	85		7.1	11.1
35	**Republics:** Dagestan	1325	1257	1188	687	619	534	51.8	49.2	44.9	99.4	341	391	283	25.7	31.1	23.8	24.6	33.0	28.3	9	6	3	10.7	4.7	3.8
36	Ingushetia	130	167	194	67	60	75	51.5	35.9	38.7	92.3	69	58	83	53.1	34.7	42.8	97.1	93.1	84.3	7	2	8	10.4	3.7	11.4
37	Kabardino-Balkaria	493	351	253	187	115	78	37.9	32.8	30.8	100.0	107	25	18	21.7	7.1	7.1	9.3	39.1	72.2	0	0	0	0.0	0.0	0.0
38	Karachai-Cherkes	200	80	187	27	18	50	13.5	22.5	26.7	88.2	74	56	55	37.0	33.9	29.4	100.0	50.0	90.9	0	0	2	0.0	0.0	4.0
39	North Ossetia – Alania	368	358	311	134	129	116	36.4	36.0	37.3	36.7	80	65	32	21.7	17.4	10.3	57.5	28.9	62.5	3	3	0	6.5	27.3	16.4
40	Chechnya	797	830	759	350	335	317	43.9	40.4	41.8	11.5	0	0	55	0.0	0.0	7.2	0.0	0.0	100.0	0	0	9	0.0	0.0	16.4
41	**Krai:** Stavropolskiy	1324	1280	1149	465	476	396	35.1	37.2	34.5	99.5	421	507	481	31.8	39.6	41.9	94.3	96.4	99.2	26	39	63	6.5	8.0	13.2
DISTRICT: Privolzhskiy		17117	17030	15433	5438	5504	4843	31.8	32.3	31.4	97.3	7928	7882	6744	46.3	37.8	43.7	92.4	94.7	96.5	1172	1319	1242	16.0	18	19.1
42	**Republics:** Bashkortostan	1509	1434	1449	448	352	304	29.7	24.5	21.0	100.0	508	444	432	33.7	31.0	29.8	100.0	100.0	100.0	25	24	56	4.9	5.4	13.0
43	Mari El	483	521	479	202	214	178	41.8	41.1	37.2	100.0	267	374	330	55.3	71.8	68.9	100.0	97.9	100.0	43	57	67	16.1	15.6	20.3
44	Mordovia	489	485	358	95	114	96	19.4	23.5	26.8	99.2	190	177	139	38.9	36.5	38.8	100.0	100.0	100.0	18	6	11	9.5	3.4	7.9
45	Tatarstan	1667	1746	1532	467	541	473	28.0	31.0	30.9	99.6	653	771	673	39.2	44.2	43.9	100.0	100.0	100.0	43	62	37	6.6	8.0	5.5
46	Udmurtia	1011	913	812	322	306	273	31.8	33.5	33.6	96.3	515	368	351	50.9	40.3	43.2	65.2	87.5	91.2	35	47	46	10.4	14.6	14.4
47	Chuvash	897	868	785	474	434	392	52.8	50.0	49.9	99.5	628	605	538	70.0	69.7	68.5	97.6	95.7	93.7	87	88	78	14.2	15.2	15.5
48	**Krai:** Permskiy	2149	1932	1839	593	581	564	27.6	30.1	30.7	97.9	925	789	506	43.0	40.9	27.5	99.5	89.4	94.3	203	226	126	22.1	32.1	26.4
49	**Regions:** Kirov	697	681	587	285	227	200	40.9	33.3	34.1	98.8	357	324	239	51.2	47.6	40.7	79.8	99.1	96.7	62	56	40	21.8	17.4	17.3
50	Nizhny Novgorod	1829	1907	1768	637	658	628	34.8	34.5	35.5	92.4	865	881	884	47.3	46.2	50.0	91.0	86.5	90.5	136	175	186	17.3	23.0	23.3
51	Orenburg	1606	1546	1362	396	340	309	24.7	22.0	22.7	96.1	611	614	474	38.0	39.7	34.8	100.0	99.3	100.0	96	109	78	15.7	17.9	16.5
52	Penza	782	862	703	307	277	233	39.3	32.1	33.1	100.0	457	532	425	58.4	61.7	60.5	100.0	100.0	100.0	33	66	91	7.2	12.4	21.4
53	Samara	1748	1870	1668	515	719	595	29.5	38.4	35.7	100.0	966	1067	939	55.3	57.1	56.3	98.9	96.5	100.0	260	229	235	27.2	22.2	25.0
54	Saratov	1440	1462	1355	403	464	358	28.0	31.7	26.4	99.8	599	597	524	41.6	40.8	38.7	85.6	92.5	96.9	86	102	111	16.8	18.5	21.9
55	Ulyanovsk	810	803	736	294	277	240	36.3	34.5	32.6	82.1	387	339	300	47.8	42.2	40.7	59.7	87.3	88.3	45	72	80	19.5	24.3	30.2
DISTRICT: Ural		9863	9291	9053	2802	2645	2607	28.4	28.5	28.8	97.3	3816	3509	3422	38.7	41.9	37.8	90.1	91.7	95.2	316	318	398	9.2	11.5	12.2
56	**Regions:** Kurgan	982	925	924	271	304	428	27.6	32.9	46.3	98.7	394	217	447	40.1	23.5	48.4	100.0	100.0	100.0	40	56	96	10.2	25.8	21.4

№	Federal districts, constituent entities of the Russian Federation	Cohorts of new pulmonary TB cases																					
		Total			Of them MbT+ cases confirmed by microscopy (M+)						% of coverage by culture tests	Of them MbT+ cases confirmed by culture (Cu+)						% of coverage by drug susceptibility testing			Of them MDR-TB					
		number of cases			number of cases			%				number of cases			%[1]						number of cases			% to cases covered by DST		
		2008	2009	2010	2008	2009	2010	2008	2009	2010	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
57	Sverdlovsk	4001	3530	3572	1121	947	942	28.0	26.8	26.4	96.1	1573	1415	1293	39.3	40.1	36.2	96.3	94.8	95.9	92	90	111	6.1	6.7	8.9
58	Tyumen	2721	2705	2425	672	725	621	24.7	26.8	25.6	98.3	980	1047	932	36.0	38.7	38.4	97.8	98.9	99.6	141	190	166	14.7	18.3	17.9
	Khanty-Mansiyskiy AD	1052	1035	981	291	267	225	27.7	25.8	22.9	99.9	417	388	347	39.6	37.5	35.4	97.1	98.7	100.0	58	54	45	14.3	14.1	13.0
	Yamal-Nenetskiy AD	300	339	314	87	99	81	29.0	29.2	25.8	96.7	105	115	117	35.0	33.9	37.2	90.5	94.8	96.6	25	27	39	26.3	24.8	34.5
	Tyumen region (not including ADs)	1369	1331	1130	294	359	315	21.5	27.0	27.9	97.3	458	544	468	33.5	40.9	41.4	100.0	100.0	100.0	58	109	82	12.7	20.0	17.5
59	Chelyabinsk	2159	2131	2132	738	669	616	34.2	31.4	28.9	99.5	869	830	742	40.3	38.9	34.8	65.6	75.3	85.5	43	35	25	7.5	5.6	3.9
DISTRICT: Siberian		20380	19896	18533	6849	6781	6380	33.6	34.1	34.4	94.9	8153	8339	8080	40.0	40.1	43.6	94.5	96.2	95.9	1038	1343	1414	13.5	17.1	18.2
60	**Republics:** Altai	211	191	185	51	32	42	24.2	16.8	22.7	100.0	96	90	90	45.5	47.1	48.7	99.0	100.0	95.6	18	11	15	18.9	12.2	17.4
61	Buryatia	1276	1271	1096	414	385	390	32.4	30.3	35.6	96.9	362	432	470	28.4	34.0	42.9	97.0	100.0	98.3	40	26	55	11.4	6.0	11.9
62	Tyva	518	500	538	168	149	194	32.4	29.8	36.1	98.7	223	219	247	43.1	43.8	46.0	74.4	65.8	90.7	46	63	103	27.7	43.8	46.0
63	Khakassia	522	549	451	184	168	134	35.2	30.6	29.7	97.8	292	289	233	55.9	52.6	51.6	100.0	100.0	100.0	71	68	63	24.3	23.5	27.0
64	**Krai:** Altaiskiy	2752	2656	2306	687	783	711	25.0	29.5	30.8	93.5	593	711	717	21.5	26.8	31.1	93.1	99.4	96.7	37	45	26	6.7	6.4	3.7
65	Trans-Baikal	1090	958	923	368	358	331	33.8	37.4	35.9	99.0	481	457	435	44.1	47.7	47.1	89.8	98.5	93.8	14	32	57	3.2	7.1	14.0
66	Krasnoyarskiy	2396	2321	2180	798	728	694	33.3	31.4	31.8	97.8	1100	1029	1022	45.9	44.3	46.9	99.2	99.7	99.7	176	164	179	16.1	16.0	17.6
67	**Regions:** Irkutsk	2885	2634	2827	949	927	893	32.9	35.2	31.6	85.3	1044	1076	1035	36.2	40.9	36.6	92.0	92.7	94.6	64	139	125	6.7	13.9	12.8
68	Kemerovo	3114	3199	2867	1204	1251	1188	38.7	39.1	41.4	97.6	1570	1662	1611	50.4	52.0	56.2	99.7	100.0	100.0	280	377	339	17.9	22.7	21.0
69	Novosibirsk	2779	2749	2661	932	873	857	33.5	31.8	32.2	96.1	1142	1086	1054	41.1	39.5	39.6	89.1	92.0	84.8	226	245	228	22.2	24.5	25.5
70	Omsk	2099	2112	1829	755	799	647	36.0	37.8	35.4	95.1	822	849	766	39.2	40.2	41.9	91.7	92.8	97.5	111	124	155	14.7	15.7	20.7
71	Tomsk	738	756	670	339	328	299	45.9	43.4	44.6	99.3	428	439	396	58.0	58.1	59.1	99.1	99.1	98.5	55	79	69	13.0	18.0	17.7
DISTRICT: Far-Eastern		7183	7171	6751	2464	2594	2447	34.3	36.2	36.2	75.8	2557	2875	2883	35.6	41.8	42.7	68.4	80.2	84.4	216	399	527	12.3	17.3	21.7
72	**Republic:** Sakha (Yakutia)	580	559	572	204	238	236	35.2	42.6	41.3	93.7	295	287	306	50.9	51.3	53.5	86.1	81.9	80.1	57	63	83	22.4	26.8	33.9
73	**Krai:** Kamchatka	249	255	170	98	83	74	39.4	32.5	43.5	71.2	14	91	71	5.6	35.7	41.8		75.8	80.3	0	15	11	0.0	21.7	19.3
74	Primorskiy	2904	2998	2846	1076	1159	1069	37.1	38.7	37.6	80.4	1199	1280	1264	41.3	42.7	44.4	68.6	78.7	80.0	79	148	210	9.6	14.7	20.8
75	Khabarovskiy	1512	1593	1423	530	563	521	35.1	35.3	36.6	88.6	562	750	758	37.2	47.1	53.3	45.0	80.1	90.4	34	118	160	13.4	19.6	23.4
76	**Regions:** Amur	1039	948	910	248	235	224	23.9	24.8	24.6	10.2	47	36	30	4.5	3.8	3.3	19.1	0.0	0.0	3	0	0	33.3	0.0	0.0
77	Magadan	93	92	74	30	25	25	32.3	27.2	33.8	100.0	37	46	45	39.8	50.0	60.8	100.0	100.0	100.0	5	4	5	13.5	8.7	11.1
78	Sakhalin	430	383	394	185	194	190	43.0	50.7	48.2	100.0	239	239	243	55.6	62.4	61.7	88.7	84.9	92.6	31	51	53	14.6	25.1	23.6
79	**A.R.:** Jewish	336	304	315	85	88	94	25.3	28.9	29.8	96.8	142	120	130	42.3	39.5	41.3	100.0	100.0	100.0	5	0	2	3.5	0.0	1.5
80	**A.D.:** Chukotskiy	40	39	47	8	9	14	20.0	23.1	29.8	100.0	22	26	35	55.0	66.7	74.4	95.5	100.0	100.0	2	0	3	9.5	0.0	8.6

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[1] Calculated for the entire cohort of the new pulmonary TB cases including those without culture results.

Table 6 (continuation)

Laboratory TB diagnostics in the Russian Federation, 2008–2010
(TB facilities in the constituent entities of the Russian Federation, MH&SD data: Form No. 7-TB)

№	Federal districts, constituent entities of the Russian Federation	From the cohort of new pulmonary TB cases							
		Proportion of patients with destruction of lung tissues and diagnosis confirmed by bacterioscopy, %			Proportion of patients with positive microscopy results not confirmed by positive cultures, %			Patients with positive microscopy results detected at the PHC facilities, %	
		2008	2009	2010	2008	2009	2010	2009	2010
RUSSIAN FEDERATION		**57.7**	**59.1**	**59.0**	**7.9**	**7.4**	**6.7**	**17.1**	**18.1**
DISTRICT: Central		59.3	60.7	60.9	8.0	7.8	7.6	14.9	15.5
1	**Regions:** Belgorod	58.2	61.7	68.0	2.4	4.1	1.4	27.3	31.8
2	Bryansk	52.1	47.1	58.6	9.2	6.5	7.2	20.8	17.0
3	Vladimir	85.6	83.0	86.1	6.5	4.0	5.9	43.0	50.5
4	Voronezh	50.7	51.0	50.8	1.3	0.5	1.0	23.4	23.9
5	Ivanovo	87.4	85.6	90.0	1.6	2.2	1.6	48.9	54.7
6	Kaluga	68.5	70.6	63.8	9.3	6.7	9.9	15.3	17.7
7	Kostroma	72.2	83.1	74.0	2.3	4.9	2.4	45.1	49.3
8	Kursk	55.9	62.2	65.2	4.8	7.6	4.7	1.7	5.9
9	Lipetsk	45.5	42.1	59.8	1.2	2.7	2.0	35.5	31.5
10	Moscow	55.1	63.1	57.8	14.9	20.6	17.2	2.0	0.9
11	Orel	87.5	85.1	86.8	2.7	1.4	2.8	48.3	55.1
12	Ryazan	63.6	63.0	58.8	4.4	3.6	7.5	19.3	18.4
13	Smolensk	31.6	34.6	34.6	8.1	7.4	8.0	18.2	16.6
14	Tambov	73.1	76.1	70.0	4.1	1.9	1.7	14.0	14.2
15	Tver	73.8	62.2	64.0	38.1	16.8	14.5	14.4	14.3
16	Tula	50.9	51.8	53.8	3.8	3.8	6.1	13.1	6.2
17	Yaroslavl	45.9	50.0	46.8	0.2		0.4	3.1	2.4
18	**City:** Moscow	61.1	62.2	64.0	6.1	6.7	6.9	0.6	0.9
DISTRICT: Northwestern		59.5	56.5	58.5	8.3	5.2	4.6	28.5	29.7
19	**Republics:** Kareliya	64.7	59.0	65.2	14.8	2.6	3.0	27.0	29.2
20	Komi	68.4	59.6	67.9	10.6	3.3	7.8	27.7	15.7
21	**Regions:** Arkhangelsk	65.8	67.9	69.5	4.2	4.8	3.5	68.7	65.5
22	Vologda	61.4	62.7	58.7				6.4	2.0
23	Kaliningrad	69.5	69.8	65.2	6.2	7.6	7.4	38.6	37.4
24	Leningrad	45.0	37.4	47.1	8.3	7.0	5.1	42.9	40.0
25	Murmansk	51.6	57.4	66.7	2.5	2.5	4.5	36.8	55.0
26	Novgorod	82.7	76.3	72.6	1.1	0.3	0.7	10.6	33.3
27	Pskov	65.1	65.9	58.9	2.3	2.3	1.9	19.6	25.7
28	**City:** St. Petersburg	49.7	49.5	47.3	17.5	8.4	5.8	2.9	3.9
DISTRICT: Southern		48.9	52.1	50.4	7.2	11.3	5.6	13.4	17.9
29	**Republics:** Adygeya	69.9	63.5	57.1	0.9	3.1	1.4	19.1	8.8
30	Kalmykiya	55.0	60.4	54.4	4.2	4.2	4.7	6.8	33.3

№	Federal districts, constituent entities of the Russian Federation	From the cohort of new pulmonary TB cases							
		Proportion of patients with destruction of lung tissues and diagnosis confirmed by bacterioscopy, %			Proportion of patients with positive microscopy results not confirmed by positive cultures, %			Patients with positive microscopy results detected at the PHC facilities, %	
		2008	2009	2010	2008	2009	2010	2009	2010
31	**Krai:** Krasnodarsky	43.5	49.4	50.8	7.0	6.7	5.7	12.4	15.4
32	**Regions:** Astrakhan	76.6	79.7	84.7	17.0	11.0	11.9	27.4	26.4
33	Volgograd	49.0	54.4	48.4	8.2	8.6	5.2	17.0	20.2
34	Rostov	47.4	46.4	42.9	5.3	4.2	4.6	5.6	15.4
DISTRICT: North-Caucasian		59.8	59.9	56.1	22.6	11.3	19.2	16.7	17.1
35	**Republics:** Dagestan	63.6	60.5	55.2	26.6	21.4	24.2		0.6
36	Ingushetia	64.9	61.8	56.4	2.3	7.2	2.6	40.0	40.0
37	Kabardino-Balkaria	46.4	39.6	41.3	30.7	27.6	25.3	12.2	28.2
38	Karachai-Cherkes	19.4	40.9	40.3	2.0	7.5	10.2	14.3	30.0
39	North Ossetia – Alania	63.5	62.4	62.0	19.0	27.1	28.0	6.8	7.8
40	Chechnya	59.0	56.5	52.5	43.9	40.4	37.2	18.5	21.8
41	**Krai:** Stavropolskiy	69.6	72.7	69.2	9.5	6.0	2.8	38.0	30.3
DISTRICT: Privolzhskiy		57.2	59.5	58.7	4.6	4.7	5.2	17.4	20.3
42	**Republics:** Bashkortostan	67.0	58.6	58.4	6.4	4.8	3.5		3.0
43	Mari El	72.5	73.5	69.2	7.0	2.3	0.6	30.8	34.8
44	Mordovia	40.3	51.3	56.4	2.5	2.3	3.6	47.4	36.5
45	Tatarstan	56.7	60.7	60.6	5.9	6.1	7.0	14.8	13.1
46	Udmurtia	54.1	55.2	52.2	2.1	5.7	3.1	5.9	17.6
47	Chuvash	88.1	89.4	90.1	4.8	5.2	3.8	63.4	66.8
48	**Krai:** Permskiy	52.7	60.5	61.2	10.0	6.6	12.8	1.9	2.3
49	**Regions:** Kirov	46.3	56.1	57.7	3.6	6.6	14.1	11.9	18.5
50	Nizhny Novgorod	49.3	52.4	52.3	3.2	3.6	3.5	14.7	13.1
51	Orenburg	44.2	41.7	41.9	4.4	3.2	4.9	1.5	1.9
52	Penza	70.9	64.9	62.4	4.1	0.9	2.0	37.9	60.9
53	Samara	57.9	65.6	62.8	2.9	5.0	3.1	5.8	9.6
54	Saratov	61.2	65.5	59.2	2.8	3.4	2.1	30.0	38.0
55	Ulyanovsk	67.7	65.8	62.6		8.8	4.1	13.7	12.9
DISTRICT: Ural		54.3	57.5	56.1	5.9	6.3	5.5	6.1	5.7
56	**Regions:** Kurgan	45.6	54.3	76.8	12.8	17.9	10.2	6.9	0.9
57	Sverdlovsk	54.8	61.4	54.9	4.9	5.0	6.3	8.0	8.8
58	Tyumen								
	Khanty-Mansiyskiy AD	61.1	52.8	47.7	4.4	4.0	2.5	3.4	5.3
	Yamal-Nenetskiy AD	54.4	51.4	51.2	6.7	9.1	4.8	0.0	0.0
	Tyumen region (not including ADs)	48.7	67.0	60.3	2.3	3.2	2.8	10.0	13.7
59	Chelyabinsk	58.5	52.7	50.4	7.4	6.2	5.1	2.8	1.0
DISTRICT: Siberian		60.3	60.3	62.2	7.1	7.2	5.6	20.8	19.7
60	**Republics:** Altai	43.6	29.7	38.7	2.4	1.0	0.5	43.8	26.2
61	Buryatia	60.8	53.2	61.0	15.4	11.7	9.9	26.8	25.1

№	Federal districts, constituent entities of the Russian Federation	From the cohort of new pulmonary TB cases							
		Proportion of patients with destruction of lung tissues and diagnosis confirmed by bacterioscopy, %			Proportion of patients with positive microscopy results not confirmed by positive cultures, %			Patients with positive microscopy results detected at the PHC facilities, %	
		2008	2009	2010	2008	2009	2010	2009	2010
62	Tyva	54.7	47.4	59.3	9.8	8.4	6.5	20.8	17.5
63	Khakassia	63.7	51.3	59.1	1.3	1.1	0.9	23.2	14.9
64	**Krai:** Altaiskiy	47.4	51.6	53.7	10.9	10.7	9.2	45.0	44.0
65	Trans-Baikal	66.7	71.7	78.1	2.8	4.8	3.1	40.2	46.2
66	Krasnoyarskiy	57.9	57.2	59.3	4.0	4.0	3.9	10.0	9.2
67	**Regions:** Irkutsk	53.2	56.9	52.0	9.8	9.6	7.9	8.5	12.0
68	Kemerovo	68.9	69.2	71.7	6.0	6.4	3.2	17.5	14.8
69	Novosibirsk	64.0	63.2	63.6	5.1	4.5	4.2	7.8	11.8
70	Omsk	67.5	68.2	73.2	5.9	8.9	5.7	22.0	14.4
71	Tomsk	79.2	74.7	75.4	4.3	4.2	3.4	34.1	30.1
DISTRICT: Far-Eastern		60.4	64.5	64.3	12.0	9.7	8.9	16.9	18.7
72	**Republic:** Sakha (Yakutia)	59.5	70.5	70.1	9.1	8.6	8.6	37.0	42.4
73	**Krai:** Kamchatka	55.4	49.1	60.7	34.1	10.2	12.4	20.5	21.6
74	Primorskiy	67.5	72.4	72.5	9.2	8.7	7.6	14.6	16.8
75	Khabarovskiy	64.0	63.8	64.9	10.5	4.6	3.3	7.3	4.2
76	**Regions:** Amur	42.6	46.2	40.8	22.0	23.6	23.2	26.4	29.9
77	Magadan	58.3	53.2	52.3	9.7		2.7	4.0	20.0
78	Sakhalin	61.1	73.7	69.4	7.9	8.1	5.8	22.2	22.1
79	**A.R.:** Jewish	54.5	62.8	63.0	7.1	9.5	8.9	19.3	26.6
80	**A.D.:** Chukotskiy	42.1	34.8	41.2	2.5	5.1	4.3		

Notification of pulmonary TB with destruction of lung tissues and FCTB in the Russian Federation, 2006–2010 (resident population) (Form No. 33)

№	Federal districts, constituent entities of the Russian Federation	Pulmonary TB with destruction of lung tissues										Fibro-cavitary TB (FCTB)												
		number of cases					to PTB, %					number of cases					per 100,000 population					to PTB, %		
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2008	2009	2010
RUSSIAN FEDERATION		**43166**	**42438**	**41663**	**38968**	**36371**	**50.3**	**49.4**	**47.3**	**45.8**	**45.9**	**1905**	**2022**	**1816**	**1702**	**1427**	**1.3**	**1.4**	**1.3**	**1.2**	**1.0**	**2.1**	**2.0**	**1.8**
DISTRICT: Central		7610	7354	7138	6558	5864	49.0	47.9	45.1	43.5	42.8	435	427	360	321	247	1.2	1.1	1.0	0.9	0.7	2.3	2.1	1.8
1	**Regions:** Belgorod	373	320	354	262	214	50.7	45.4	45.5	42.5	37.4	25	17	13	6	4	1.7	1.1	0.9	0.4	0.3	1.7	1.0	0.7
2	Bryansk	536	553	509	475	372	59.0	56.1	49.8	48.1	45.1	24	18	26	15	15	1.8	1.4	2.0	1.2	1.2	2.5	1.5	1.8
3	Vladimir	338	287	292	281	236	42.9	37.7	37.6	36.6	36.1	8	15	9	12	7	0.5	1.0	0.6	0.8	0.5	1.2	1.6	1.1
4	Voronezh	540	533	573	443	437	53.0	47.7	52.0	43.7	47.5	39	29	40	35	21	1.7	1.3	1.7	1.5	0.9	3.6	3.5	2.3
5	Ivanovo	234	204	207	174	135	49.0	49.8	46.3	40.7	39.9	6	6	7	5	1	0.5	0.6	0.6	0.5	0.1	1.6	1.2	0.3
6	Kaluga	238	226	216	190	172	50.0	49.0	44.5	42.4	41.6	25	21	22	25	20	2.5	2.1	2.2	2.5	2.0	4.5	5.6	4.8
7	Kostroma	97	88	90	81	71	41.1	41.5	42.1	34.3	35.0	4	2	1	0	2	0.6	0.3	0.1	0.0	0.3	0.5	0.0	1.0
8	Kursk	402	386	389	403	300	58.5	57.0	51.0	54.2	53.7	43	57	46	35	35	3.7	4.9	3.9	3.0	3.0	6.0	4.7	6.3
9	Lipetsk	242	255	204	174	164	39.2	37.0	30.4	30.4	33.2	19	25	11	18	13	1.6	2.1	0.9	1.5	1.1	1.6	3.1	2.6
10	Moscow	1213	1263	1144	1139	1035	46.7	45.1	42.4	43.9	41.4	64	79	50	55	41	1.0	1.2	0.8	0.8	0.6	1.9	2.1	1.6
11	Orel	235	193	152	145	130	61.8	54.4	45.8	42.5	43.2	12	6	6	3	5	1.4	0.7	0.7	0.4	0.6	1.8	0.9	1.7
12	Ryazan	368	343	321	280	239	52.0	52.8	52.5	47.8	46.3	37	38	31	32	17	3.1	3.3	2.6	2.8	1.5	5.1	5.5	3.3
13	Smolensk	384	378	374	378	382	58.9	63.1	55.6	58.1	57.4	10	16	13	12	13	1.0	1.6	1.3	1.2	1.3	1.9	1.8	2.0
14	Tambov	302	321	296	313	252	53.9	56.8	51.1	52.7	45.4	16	10	11	8	5	1.4	0.9	1.0	0.7	0.5	1.9	1.3	0.9
15	Tver	426	413	367	330	322	54.2	54.7	47.7	46.7	48.9	31	16	17	19	13	2.2	1.2	1.2	1.4	1.0	2.2	2.7	2.0
16	Tula	339	359	380	318	327	39.7	46.4	42.8	36.9	44.9	23	25	15	14	18	1.4	1.6	0.9	0.9	1.2	1.7	1.6	2.5
17	Yaroslavl	240	256	211	185	199	51.7	51.8	49.9	47.3	50.9	3	7	3	2	4	0.2	0.5	0.2	0.2	0.3	0.7	0.5	1.0
18	**City:** Moscow	1103	976	1059	987	877	42.8	41.5	40.7	38.9	36.7	46	40	39	25	13	0.4	0.4	0.4	0.2	0.1	1.5	1.0	0.5
DISTRICT: Northwestern		3438	3403	3351	3143	2912	58.8	58.8	57.2	55.3	53.9	55	63	41	48	54	0.4	0.5	0.3	0.4	0.4	0.7	0.8	1.0
19	**Republics:** Kareliya	233	231	183	183	176	66.6	62.3	61.4	58.3	57.3	3	2	0	1	3	0.4	0.3	0.0	0.1	0.4	0.0	0.3	1.0
20	Komi	339	389	397	356	299	68.3	65.4	69.2	65.6	66.3	14	15	8	6	5	1.4	1.5	0.8	0.6	0.5	1.4	1.1	1.1
21	**Regions:** Arkhangelsk	355	328	316	317	320	62.8	65.1	63.3	63.9	63.1	5	1	0	3	3	0.4	0.1	0.0	0.2	0.2	0.0	0.6	0.6
22	Vologda	220	217	218	190	213	55.1	54.4	50.8	48.5	48.4	1	5	7	2	2	0.1	0.4	0.6	0.2	0.2	1.6	0.5	0.5
23	Kaliningrad	501	479	375	348	278	61.6	56.7	50.3	57.0	47.4	10	12	4	8	18	1.1	1.3	0.4	0.9	1.9	0.5	1.3	3.1
24	Leningrad	478	406	523	485	459	51.8	51.7	54.5	53.0	48.4	8	9	11	16	15	0.5	0.6	0.7	1.0	0.9	1.1	1.7	1.6
25	Murmansk	192	216	151	189	153	57.1	57.6	51.4	57.6	55.4	6	3	1	1	0	0.7	0.4	0.1	0.1	0.0	0.3	0.3	0.0
26	Novgorod	148	155	128	94	106	45.8	50.3	40.8	29.7	37.3	0	2	0	0	0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
27	Pskov	253	264	286	235	271	58.4	57.9	61.0	55.3	62.6	0	2	2	2	1	0.0	0.3	0.3	0.3	0.1	0.4	0.5	0.2
28	**City:** St. Petersburg	719	718	774	746	637	59.7	62.3	60.5	55.7	54.5	8	12	8	9	7	0.2	0.3	0.2	0.2	0.2	0.6	0.7	0.6
DISTRICT: Southern		6830	7457	6934	4048	3920	54.9	55.4	53.0	49.3	50.4	173	229	161	142	147	0.8	1.0	0.7	1.0	1.1	1.2	1.7	1.9
29	**Republics:** Adygeya	158	171	153	127	137	64.5	56.4	55.0	45.8	50.7	7	7	5	9	8	1.6	1.6	1.1	2.0	1.8	1.8	3.2	3.0
30	Kalmykiya	111	122	111	100	67	40.1	43.9	42.5	47.2	31.6	10	9	0	0	0	3.5	3.1	0.0	0.0	0.0	0.0	0.0	0.0
31	**Krai:** Krasnodarsky	1483	1865	1571	1515	1627	60.9	62.6	56.0	58.1	61.1	35	47	41	82	92	0.7	0.9	0.8	1.6	1.8	1.5	3.1	3.5
32	**Regions:** Astrakhan	257	242	222	212	237	38.6	35.6	33.3	32.4	37.8	13	12	8	8	5	1.3	1.2	0.8	0.8	0.5	1.2	1.2	0.8
33	Volgograd	1136	1276	1220	1095	971	59.1	60.7	60.8	55.3	53.5	30	50	37	36	39	1.1	1.9	1.4	1.4	1.5	1.8	1.8	2.1

№	Federal districts, constituent entities of the Russian Federation	Pulmonary TB with destruction of lung tissues										Fibro-cavitary TB (FCTB)												
		number of cases					to PTB, %					number of cases					per 100,000 population					to PTB, %		
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2008	2009	2010
34	Rostov	1075	1064	1042	999	881	41.6	40.0	39.4	40.3	40.1	9	7	5	7	3	0.2	0.2	0.1	0.2	0.1	0.2	0.3	0.1
	DISTRICT: North-Caucasian				2518	2400				58.0	59.6				90	73				1.0	0.8		2.1	1.8
35	**Republics:** Dagestan	916	880	856	828	817	69.0	67.7	64.6	65.9	68.8	15	9	9	10	5	0.6	0.3	0.3	0.4	0.2	0.7	0.8	0.4
36	Ingushetia	111	116	94	80	91	73.0	61.1	72.3	56.7	56.5	5	8	3	5	5	1.0	1.6	0.6	1.0	1.0	2.3	3.5	3.1
37	Kabardino-Balkaria	281	278	252	237	201	72.4	73.2	74.8	72.5	68.6	9	12	7	14	22	1.0	1.3	0.8	1.6	2.5	2.1	4.3	7.5
38	Karachai-Cherkes	97	125	127	93	98	60.6	68.7	63.5	58.1	55.1	2	1	0	4	3	0.5	0.2	0.0	0.9	0.7	0.0	2.5	1.7
39	North Ossetia – Alania	512	585	554	169	131	64.4	67.5	69.5	49.4	43.7	9	6	6	8	2	1.3	0.9	0.9	1.1	0.3	1.8	2.3	0.7
40	Chechnya	164	178	174	540	558	54.3	53.6	52.9	65.1	73.5	11	38	22	36	29	0.9	3.2	1.8	2.9	2.3	2.8	4.3	3.8
41	**Krai:** Stavropolskiy	529	555	558	571	504	44.6	45.7	42.8	44.3	43.9	18	23	18	13	7	0.7	0.9	0.7	0.5	0.3	1.4	1.0	0.6
	DISTRICT: Privolzhskiy	8297	7665	7492	7101	6526	48.5	47.1	44.5	42.4	43.1	262	268	266	275	209	0.9	0.9	0.9	0.9	0.7	1.6	1.6	1.4
42	**Republics:** Bashkortostan	613	519	494	473	438	38.0	34.0	33.9	33.7	30.9	21	18	12	11	7	0.5	0.4	0.3	0.3	0.2	0.8	0.8	0.5
43	Mari El	196	234	180	176	170	49.9	48.2	37.5	34.2	36.3	2	4	1	0	0	0.3	0.6	0.1	0.0	0.0	0.2	0.0	0.0
44	Mordovia	314	251	211	191	147	60.5	50.9	43.4	40.8	41.5	17	13	13	15	10	2.0	1.5	1.5	1.8	1.2	2.7	3.2	2.8
45	Tatarstan	743	660	645	645	584	41.5	39.8	38.7	38.6	39.4	9	13	14	16	12	0.2	0.3	0.4	0.4	0.3	0.8	1.0	0.8
46	Udmurtia	586	625	534	511	472	60.8	63.3	52.8	56.8	59.1	6	12	12	39	20	0.4	0.8	0.8	2.6	1.3	1.2	4.3	2.5
47	Chuvash	506	438	412	320	323	60.0	54.4	45.9	36.9	41.1	12	12	14	7	14	0.9	0.9	1.1	0.5	1.1	1.6	0.8	1.8
48	**Krai:** Permskiy	1035	886	909	819	774	47.7	45.7	43.3	42.3	41.9	11	8	8	8	12	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.6
49	**Regions:** Kirov	393	376	387	348	267	55.5	60.5	55.5	54.8	48.3	5	9	6	3	3	0.3	0.6	0.4	0.2	0.2	0.9	0.5	0.5
50	Nizhny Novgorod	1065	995	1019	1007	948	57.2	58.8	59.4	54.4	56.7	106	119	113	121	87	3.1	3.5	3.3	3.6	2.6	6.6	6.5	5.2
51	Orenburg	821	745	714	697	603	52.3	49.1	45.8	45.2	44.1	5	1	4	3	3	0.2	0.0	0.2	0.1	0.1	0.3	0.2	0.2
52	Penza	397	372	359	344	313	52.3	49.1	46.4	40.3	46.8	21	12	12	11	8	1.5	0.9	0.9	0.8	0.6	1.6	1.3	1.2
53	Samara	733	707	761	791	703	43.0	43.2	42.6	42.2	41.7	25	20	25	17	9	0.8	0.6	0.8	0.5	0.3	1.4	0.9	0.5
54	Saratov	563	529	497	465	475	37.3	37.3	35.1	32.2	35.2	9	12	10	12	7	0.3	0.5	0.4	0.5	0.3	0.7	0.8	0.5
55	Ulyanovsk	332	328	370	314	309	47.6	43.6	46.1	39.3	43.4	13	15	22	12	17	1.0	1.1	1.7	0.9	1.3	2.7	1.5	2.4
	DISTRICT: Ural	3930	3746	3742	3310	3262	42.6	40.7	40.4	38.5	38.5	125	131	97	72	86	1.0	1.1	0.8	0.6	0.7	1.0	0.8	1.0
56	**Regions:** Kurgan	537	456	496	443	405	55.1	45.6	53.9	47.9	43.8	13	16	18	20	21	1.3	1.7	1.9	2.1	2.2	2.0	2.2	2.3
57	Sverdlovsk	1389	1373	1352	1060	1161	41.5	39.0	36.5	32.9	35.9	43	49	39	22	30	1.0	1.1	0.9	0.5	0.7	1.1	0.7	0.9
58	Tyumen	1140	997	941	915	815	38.0	38.5	37.7	38.9	36.4	51	43	27	21	22	1.5	1.3	0.8	0.6	0.6	1.1	0.9	1.0
	Khanty-Mansiyskiy AD	421	372	339	321	284	36.4	36.4	32.2	34.9	32.5	10	5	2	2	0	0.7	0.3	0.1	0.1	0.0	0.2	0.2	0.0
	Yamal-Nenetskiy AD	139	117	136	142	120	45.1	38.7	44.6	45.2	41.2	2	0	2	1	2	0.4	0.0	0.4	0.2	0.4	0.7	0.3	0.7
	Tyumen region (not including ADs)	580	508	466	452	411	37.9	40.2	41.0	40.5	38.3	39	38	23	18	20	3.0	2.9	1.7	1.3	1.5	2.0	1.6	1.9
59	Chelyabinsk	864	920	953	892	881	45.2	44.0	44.2	42.4	42.3	18	23	13	9	13	0.5	0.7	0.4	0.3	0.4	0.6	0.4	0.6
	DISTRICT: Siberian	9858	9632	9516	9113	8508	50.7	49.7	47.5	46.8	46.9	560	621	601	540	438	2.9	3.2	3.1	2.8	2.2	3.0	2.8	2.4
60	**Republics:** Altai	104	104	110	99	106	47.3	51.2	53.1	50.8	58.6	7	5	13	3	2	3.4	2.4	6.3	1.4	0.9	6.3	1.5	1.1
61	Buryatia	621	640	582	547	492	50.1	51.4	47.5	46.1	47.4	11	27	23	11	13	1.1	2.8	2.4	1.1	1.3	1.9	0.9	1.3
62	Tyva	259	254	254	231	248	48.1	51.8	50.3	47.3	49.2	20	14	17	7	12	6.5	4.5	5.5	2.2	3.8	3.4	1.4	2.4
63	Khakassia	335	276	257	269	178	67.7	57.0	49.6	49.7	41.0	13	10	9	5	8	2.4	1.9	1.7	0.9	1.5	1.7	0.9	1.8
64	**Krai:** Altaiskiy	1522	1291	1307	1325	1219	53.3	48.7	48.2	50.6	53.4	45	43	32	47	26	1.8	1.7	1.3	1.9	1.0	1.2	1.8	1.1

№	Federal districts, constituent entities of the Russian Federation	Pulmonary TB with destruction of lung tissues										Fibro-cavitary TB (FCTB)												
		number of cases					to PTB, %					number of cases					per 100,000 population					to PTB, %		
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2008	2009	2010
65	Trans-Baikal	401	404	434	347	315	46.8	44.0	40.4	36.6	35.0	24	36	38	32	25	2.1	3.2	3.4	2.9	2.2	3.5	3.4	2.8
66	Krasnoyarskiy	1284	1280	1231	1118	1036	57.0	57.1	52.4	50.5	48.8	48	45	40	35	32	1.7	1.6	1.4	1.2	1.1	1.7	1.6	1.5
67	**Regions:** Irkutsk	1305	1491	1522	1382	1427	53.1	55.3	53.1	52.7	50.7	138	156	195	174	138	5.5	6.2	7.8	6.9	5.5	6.8	6.6	4.9
68	Kemerovo	1590	1504	1467	1467	1384	49.7	48.9	47.1	46.0	48.4	64	76	87	71	46	2.3	2.7	3.1	2.5	1.6	2.8	2.2	1.6
69	Novosibirsk	1233	1143	1170	1125	1136	45.6	42.4	42.3	41.3	43.1	45	66	64	58	42	1.7	2.5	2.4	2.2	1.6	2.3	2.1	1.6
70	Omsk	798	875	817	840	642	43.4	45.7	42.6	42.2	37.9	132	128	83	86	79	6.5	6.3	4.1	4.3	3.9	4.3	4.3	4.7
71	Tomsk	406	370	365	363	325	51.3	48.1	47.1	48.1	48.8	13	15	0	11	15	1.3	1.5	0.0	1.1	1.4	0.0	1.5	2.3
DISTRICT: Far-Eastern		3203	3181	3489	3177	2977	51.8	49.3	49.1	45.6	45.3	295	282	290	214	173	4.5	4.3	4.5	3.3	2.7	4.1	3.1	2.6
72	**Republic:** Sakha (Yakutia)	289	240	278	267	287	54.6	46.2	47.7	47.8	50.9	5	10	1	8	2	0.5	1.1	0.1	0.8	0.2	0.2	1.4	0.4
73	**Krai:** Kamchatka	125	116	163	159	108	59.2	58.3	66.8	62.4	65.1	24	16	29	13	12	6.9	4.6	8.4	3.8	3.5	11.9	5.1	7.2
74	Primorskiy	1256	1241	1330	1186	1127	51.6	45.6	45.8	39.7	39.6	188	186	183	147	106	9.3	9.3	9.1	7.4	5.3	6.3	4.9	3.7
75	Khabarovskiy	566	620	710	699	582	42.9	45.0	48.1	48.0	44.4	26	26	29	12	15	1.8	1.9	2.1	0.9	1.1	2.0	0.8	1.1
76	**Regions:** Amur	513	528	536	468	439	52.8	56.8	51.8	49.6	49.0	12	18	10	5	6	1.4	2.1	1.1	0.6	0.7	1.0	0.5	0.7
77	Magadan	52	51	47	45	46	56.5	62.2	54.7	54.9	63.0	0	1	2	2	0	0.0	0.6	1.2	1.2	0.0	2.3	2.4	0.0
78	Sakhalin	275	231	270	213	231	70.3	71.3	62.8	55.6	61.1	30	17	25	16	18	5.7	3.3	4.8	3.1	3.5	5.8	4.2	4.8
79	**A.R.:** Jewish	107	141	137	117	123	50.7	50.9	43.9	43.8	42.7	7	7	10	10	13	3.8	3.8	5.4	5.4	7.0	3.2	3.7	4.5
80	**A.D.:** Chukotskiy	20	13	18	23	34	74.1	48.1	50.0	65.7	72.3	3	1	1	1	1	5.9	2.0	2.0	2.0	2.1	2.8	2.9	2.1

Table 8

TB mortality in the Russian Federation, 2006–2010

№	Federal districts, constituent entities of the Russian Federation	TB mortality incl. mortality from remote consequences of TB (FSSS)¹								Deaths from TB of TB paients unknown to TB facilities (by territories, Form No. 8)										Deaths from TB reported within a year after notification (Form No. 33)										Deaths due to HIV-TB co-infection (Form No. 61)	
		number of cases			per 100, 000 population					number of cases					related to new TB cases (Form No. 8), %					number of cases					related to new TB cases (Form No. 33), %					number of cases	
		2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2009	2010
RUSSIAN FEDERATION		**25388**	**23892**	**21829**	**20.0**	**18.4**	**17.9**	**16.8**	**15.4**	**2773**	**2465**	**2161**	**2064**	**2015**	**2.4**	**2.1**	**1.8**	**1.8**	**1.8**	**4443**	**4103**	**4042**	**3593**	**3135**	**4.6**	**4.3**	**4.1**	**3.8**	**3.5**	**3069**	**3560**
DISTRICT: Central		4461	3979	3378	13.8	12.6	12.0	10.7	9.1	822	782	615	619	635	3.7	3.4	2.6	2.8	3.1	910	811	819	699	588	5.2	4.7	4.6	4.1	3.8	464	481
	Regions:																														
1	Belgorod	77	53	42	7.6	5.7	5.1	3.5	2.7	19	7	7	10	9	2.0	0.8	0.7	1.3	1.3	25	16	18	8	9	3.1	2.1	2.1	1.2	1.4	4	2
2	Bryansk	279	243	219	25.1	20.9	21.4	18.8	16.9	37	51	29	29	28	3.2	4.1	2.3	2.3	2.5	85	70	93	62	76	8.1	6.3	8.0	5.5	8.0	18	14
3	Vladimir	190	176	140	18.8	16.3	13.2	12.3	9.8	42	35	17	18	14	3.5	3.0	1.5	1.6	1.5	47	54	42	50	25	5.2	6.2	4.8	5.7	3.4	22	23
4	Voronezh	255	273	246	13.2	11.9	11.2	12.1	10.9	10	9	11	9	10	0.7	0.6	0.7	0.6	0.8	33	31	36	38	30	2.8	2.5	2.9	3.3	2.9	8	9
5	Ivanovo	126	118	89	13.4	13.1	11.7	11.1	8.3	11	9	8	6	2	1.6	1.6	1.3	1.0	0.4	23	17	18	15	19	4.3	3.7	3.7	3.1	4.9	10	36
6	Kaluga	167	137	133	16.6	15.0	16.6	13.7	13.3	24	31	29	24	17	3.2	4.3	3.9	3.5	2.6	31	27	28	19	17	5.6	5.1	5.3	3.7	3.5	6	6
7	Kostroma	41	37	24	10.2	7.0	5.9	5.4	3.5	9	13	12	9	5	2.8	4.3	4.0	2.5	1.7	22	15	11	15	9	8.2	6.2	4.5	5.4	3.9	3	0
8	Kursk	188	166	132	19.5	18.2	16.2	14.5	11.5	37	30	27	19	11	4.0	3.4	2.8	2.1	1.5	46	26	30	28	22	5.9	3.4	3.7	3.5	3.6	2	7
9	Lipetsk	105	79	65	10.4	9.7	9.0	6.8	5.6	5	9	10	4	1	0.6	1.0	1.1	0.6	0.1	26	26	19	10	10	3.8	3.5	2.7	1.6	1.9	4	3
10	Moscow	895	821	611	15.4	14.6	13.4	12.2	9.0	342	307	219	171	135	9.8	7.8	5.8	4.7	4.0	221	212	173	160	120	7.6	6.8	5.8	5.5	4.3	41	60
11	Orel	34	40	27	6.0	5.1	4.1	4.9	3.3	7	4	5	8	7	1.4	0.8	1.1	1.7	1.8	22	12	9	8	6	5.1	3.0	2.4	2.1	1.8	1	1
12	Ryazan	166	115	100	14.4	12.4	14.3	10.0	8.7	36	29	36	26	25	3.9	3.0	3.7	2.9	3.1	29	17	29	24	13	3.7	2.3	4.2	3.6	2.2	15	9
13	Smolensk	296	242	235	32.5	32.2	30.2	25.1	24.3	38	23	35	28	25	3.8	2.6	3.6	3.0	2.9	22	30	45	39	40	2.9	4.4	6.0	5.3	5.6	5	14
14	Tambov	155	144	119	16.1	13.0	14.1	13.2	10.9	4	7	8	7	3	0.5	0.9	1.1	0.9	0.4	25	26	23	23	11	4.0	4.1	3.7	3.6	1.8	7	7
15	Tver	310	301	266	21.8	23.4	22.6	22.1	19.6	31	41	29	33	20	2.7	3.7	2.7	3.2	2.2	79	72	67	68	58	9.1	8.4	7.7	8.5	7.8	50	30
16	Tula	347	291	292	25.2	21.7	22.2	18.9	19.0	49	63	48	36	42	3.9	5.1	3.7	2.6	3.9	65	55	77	41	39	6.6	6.1	7.7	4.2	4.8	61	58
17	Yaroslavl	149	121	100	12.2	11.7	11.4	9.3	7.7	32	22	27	23	16	4.0	2.7	3.9	3.7	2.6	34	37	24	21	11	5.7	6.2	4.6	4.5	2.2	5	19
18	**City:** Moscow	681	622	538	7.3	6.6	6.5	5.9	5.1	89	92	58	159	265	2.3	1.9	1.1	3.3	5.5	75	68	77	70	73	2.6	2.5	2.5	2.4	2.6	202	183
DISTRICT: Northwestern		2009	1749	1534	17.7	15.7	14.9	13.0	11.4	316	267	269	231	194	3.6	3.2	3.1	2.7	2.5	499	428	401	400	332	7.2	6.4	6.0	6.1	5.4	467	370
19	**Republics:** Kareliya	125	123	102	20.6	21.7	18.1	18.0	14.9	19	12	5	11	9	4.0	2.4	1.1	2.6	2.1	37	30	30	23	25	9.3	7.1	8.9	6.5	7.4	7	7
20	Komi	168	175	181	19.4	14.2	17.4	18.4	19.0	26	29	21	27	42	3.3	3.1	2.4	3.3	5.9	40	38	33	40	34	6.8	5.7	5.1	6.5	6.6	2	2
	Regions:																														
21	Arkhangelsk	125	96	103	15.1	12.7	9.9	7.7	8.2	36	16	29	21	30	3.8	2.1	3.9	3.0	4.5	62	66	46	41	31	9.8	11.7	8.3	7.5	5.7	12	7
22	Vologda	121	98	97	10.2	10.0	9.9	8.1	8.0	9	12	14	9	4	1.6	2.1	2.3	1.7	0.7	54	27	21	30	24	11.6	6.0	4.4	6.8	5.0	9	11
23	Kaliningrad	149	150	112	28.8	18.3	15.9	16.0	11.9	91	52	49	40	37	7.2	4.1	4.4	4.3	4.2	71	35	27	39	26	7.0	3.5	3.1	5.3	3.8	51	59
24	Leningrad	401	335	297	30.2	24.2	24.6	20.6	18.2	51	75	70	63	25	4.2	6.6	5.4	4.4	2.1	96	106	123	122	127	9.5	12.1	11.8	12.1	12.7	108	69
25	Murmansk	70	69	49	10.8	10.0	8.3	8.2	5.9	24	18	14	12	15	4.8	3.6	3.3	2.6	3.8	31	31	21	25	16	8.2	7.8	6.4	7.0	5.1	4	8
26	Novgorod	161	111	93	27.5	28.2	24.8	17.3	14.5	5	3	4	4	3	1.1	0.7	0.9	0.9	0.8	21	18	12	8	4	5.8	5.1	3.4	2.3	1.3	3	6
27	Pskov	157	122	117	17.4	15.4	22.4	17.7	17.0	12	11	22	12	9	1.9	1.7	3.3	2.0	1.6	29	27	35	25	25	6.2	5.5	7.2	5.4	5.4	6	5

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		number of cases			per 100, 000 population					number of cases					related to new TB cases (Form No. 8), %					number of cases					related to new TB cases (Form No. 33), %					number of cases	
		2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2009	2010
28	**City:** St. Petersburg	532	470	383	12.8	13.1	11.6	10.2	8.3	43	39	41	32	20	2.3	2.3	2.0	1.5	1.0	58	50	53	47	20	3.7	3.4	3.3	2.8	1.3	265	196
DISTRICT: Southern		4172	2814	2716	21.3	19.1	18.2	20.5	19.8	101	91	58	56	49	0.6	0.5	0.3	0.5	0.5	303	315	291	234	154	2.2	2.1	2.0	2.6	1.8	222	174
29	**Republics:** Adygeya	93	76	61	21.0	24.5	21.0	17.1	13.8	23	17	19	11	6	6.6	4.1	5.1	3.1	1.9	*20*	16	16	65	17	7.1	4.8	5.1	20.5	5.8	0	2
30	Kalmykiya	63	81	65	23.6	21.0	22.1	28.6	23.0	8	8	3	4	3	2.2	2.2	0.9	1.3	1.0	9	16	8	21	13	2.6	4.8	2.7	8.4	5.3	0	2
31	**Krai:** Krasnodarsky	950	761	708	22.0	20.5	18.5	14.7	13.7	4	4	1	12	14	0.1	0.1	0.0	0.3	0.4	73	70	81	70	58	2.8	2.2	2.7	2.5	2.1	74	81
32	**Regions:** Astrakhan	303	315	295	39.8	37.1	30.2	31.3	29.3	0	0	0	4	3	0.0	0.0	0.0	0.4	0.3	5	10	6	8	3	0.7	1.3	0.8	1.1	0.4	5	1
33	Volgograd	522	488	468	25.9	20.8	20.0	18.8	18.1	42	29	13	14	10	1.5	0.9	0.5	0.5	0.4	57	60	51	55	48	2.7	2.6	2.4	2.6	2.5	66	24
34	Rostov	1236	1093	1119	30.9	26.8	29.1	25.8	26.5	7	6	7	11	13	0.2	0.2	0.2	0.4	0.4	20	22	16	15	15	0.7	0.8	0.6	0.6	0.6	77	64
DISTRICT: North-Caucasian			1181	980	0.0	0.0	0.0	12.8	10.6	0	0	0	28	14	0.0	0.0	0.0	0.5	0.3	0	0	0	109	88	0.0	0.0	0.0	2.2	1.9	44	45
35	**Republics:** Dagestan	265	262	235	14.3	9.8	9.8	9.6	8.6	0	0	0	1	0	0.0	0.0	0.0	0.1	0.0	20	20	17	16	11	1.3	1.3	1.1	1.1	0.8	5	10
36	Ingushetia	35	39	46	11.0	7.7	6.9	7.5	8.9	1	2	0	0	0	0.5	0.9	0.0	0.0	0.0	5	5	2	10	10	2.7	2.4	1.3	5.7	5.1	5	4
37	Kabardino-Balkaria	127	138	128	15.9	18.4	14.2	15.4	14.3	0	2	1	6	0	0.0	0.4	0.2	1.4	0.0	10	9	9	5	3	2.3	0.0	2.4	1.4	0.9	0	2
38	Karachai-Cherkes	47	45	30	10.9	10.0	11.0	10.5	7.0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	7	8	5	5	3	3.6	3.8	2.2	2.6	1.5	1	0
39	North Ossetia – Alania	126	108	99	16.4	17.0	17.9	15.4	14.1	2	0	1	0	0	0.5	0.0	0.2	0.0	0.0	16	17	11	15	11	4.0	3.9	2.7	3.5	2.9	9	5
40	Chechnya	106	242	147	7.2	7.4	8.7	19.1	11.6	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	19	35	36	29	23	2.1	0.0	3.9	3.0	2.6	15	15
41	**Krai:** Stavropolskiy	299	347	295	12.9	13.6	11.0	12.8	10.9	14	23	13	21	14	0.8	1.3	0.7	1.1	0.8	*42*	27	33	29	27	2.9	1.8	2.1	1.9	2.0	9	9
DISTRICT: Privolzhskiy		4616	4476	4017	16.8	16.0	15.3	14.9	13.3	488	427	405	346	311	2.0	1.9	1.7	1.5	1.5	881	742	698	621	519	4.5	4.1	3.7	3.4	3.1	602	680
42	**Republics:** Bashkortostan	536	561	494	13.8	13.8	13.2	13.8	12.1	10	10	8	8	6	0.4	0.5	0.4	0.4	0.3	72	47	28	26	24	3.9	2.7	1.7	1.6	1.5	70	80
43	Mari El	87	81	62	11.4	11.9	12.4	11.6	8.9	6	12	5	8	10	1.3	2.1	0.9	1.3	1.7	19	15	21	20	14	4.2	2.8	3.9	3.5	2.7	7	1
44	Mordovia	83	81	57	13.3	11.3	9.9	9.8	6.9	0	2	1	5	3	0.0	0.3	0.2	0.7	0.6	16	7	8	10	7	2.9	1.3	1.5	2.0	1.8	17	22
45	Tatarstan	373	371	338	10.2	10.4	9.9	9.8	8.9	35	45	54	44	51	1.5	2.0	2.4	2.0	2.5	73	77	48	55	43	3.6	4.1	2.5	2.9	2.5	62	69
46	Udmurtia	246	251	238	18.0	20.1	16.1	16.4	15.6	46	22	19	17	24	3.6	1.8	1.5	1.5	2.4	70	81	69	66	49	6.5	7.4	6.3	6.7	5.6	20	30
47	Chuvash	172	153	140	14.3	13.8	13.4	12.0	11.0	20	29	28	18	14	1.9	2.9	2.6	1.7	1.5	42	31	35	34	28	4.7	3.6	3.7	3.7	3.4	4	6
48	**Krai:** Permskiy	562	574	553	23.8	21.8	20.7	21.3	20.5	87	64	39	44	40	2.7	2.3	1.3	1.6	1.5	143	94	93	97	86	5.8	4.3	4.0	4.5	4.1	32	40
49	**Regions:** Kirov	172	159	129	13.5	11.8	12.2	11.4	9.3	34	21	26	33	22	3.4	2.3	2.6	3.5	2.5	40	35	50	24	24	4.8	4.9	6.3	3.3	3.8	2	3
50	Nizhny Novgorod	656	560	432	21.8	20.2	19.6	16.8	13.0	163	127	131	84	95	5.7	5.1	5.2	3.2	4.1	145	105	111	103	82	7.0	5.6	5.9	5.1	4.5	10	42
51	Orenburg	363	364	308	19.7	17.2	17.2	17.2	14.6	3	6	5	4	1	0.1	0.3	0.2	0.2	0.0	38	38	35	27	18	2.1	2.1	1.9	1.5	1.1	106	38
52	Penza	148	141	127	12.6	11.1	10.7	10.3	9.2	10	5	8	3	3	1.0	0.5	0.7	0.3	0.3	40	33	36	28	23	4.3	3.9	4.2	3.1	3.1	4	11
53	Samara	619	669	641	21.2	19.7	19.5	21.1	20.2	50	58	62	59	24	2.0	2.3	2.3	2.1	1.0	94	67	47	49	52	5.0	3.6	2.4	2.4	2.8	126	203
54	Saratov	386	325	303	16.9	16.7	15.0	12.7	11.8	17	16	16	16	9	0.9	0.9	0.9	0.8	0.5	31	48	36	20	36	1.9	3.1	2.3	1.3	2.4	52	71
55	Ulyanovsk	213	186	195	15.7	15.8	16.3	14.3	15.0	7	10	3	3	9	0.7	0.9	0.3	0.3	0.9	58	64	81	62	33	7.1	7.5	9.1	6.9	4.2	90	64

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		number of cases			per 100, 000 population					number of cases					related to new TB cases (Form No. 8), %					number of cases					related to new TB cases (Form No. 33), %					number of cases	
		2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2009	2010
DISTRICT: Ural		2657	2480	2233	36.2	21.6	21.7	20.2	18.2	212	225	158	205	202	1.7	1.8	1.2	1.7	1.7	454	441	408	334	315	4.3	4.3	3.9	3.4	3.3	626	733
56	**Regions:** Kurgan	361	364	339	36.2	36.3	37.7	38.4	35.8	13	9	6	28	47	1.0	0.7	0.4	2.2	3.6	46	56	63	63	51	4.0	5.0	5.6	6.3	5.0	19	24
57	Sverdlovsk	924	877	771	22.9	21.4	21.0	20.0	17.5	118	119	93	113	96	2.6	2.4	1.8	2.4	2.1	192	173	155	131	119	5.1	4.4	3.8	3.6	3.3	274	347
58	Tyumen	688	648	528	22.3	20.2	20.3	18.9	15.4	28	27	24	28	21	0.7	0.8	0.8	0.9	0.7	111	120	86	70	59	3.3	4.1	3.1	2.6	2.3	180	192
	Khanty-Mansiyskiy AD	199	207	160	15.7	13.0	13.2	13.5	10.4	14	9	9	14	11	1.0	0.7	0.7	1.1	0.9	42	40	33	22	26	3.3	3.5	2.9	2.2	2.7	89	95
	Yamal-Nenetskiy AD	72	79	67	14.6	13.5	13.3	14.5	12.3	3	2	4	8	4	0.7	0.5	1.0	1.8	1.0	12	9	15	12	7	3.3	2.6	4.4	3.3	2.1	13	0
	Tyumen region (not including ADs)	417	362	301	–	–	31.5	26.9	22.4	11	16	11	6	6	0.5	0.9	0.7	0.4	0.4	57	71	38	36	26	3.3	5.0	2.9	2.8	2.1	78	97
59	Chelyabinsk	684	591	595	19.6	19.0	19.5	16.8	17.0	53	70	35	36	38	2.0	2.3	1.2	1.2	1.3	105	92	104	70	86	4.8	3.9	4.3	3.0	3.7	153	170
DISTRICT: Siberian		5723	5449	5384	32.3	29.1	29.3	27.9	27.5	721	554	510	438	529	2.8	2.2	2.0	1.7	2.2	1159	1044	1072	954	922	5.4	4.9	4.9	4.5	4.6	576	982
60	**Republics:** Altai	37	43	36	30.7	19.4	17.8	20.4	17.1	3	1	1	0	2	1.2	0.4	0.4	0.0	0.9	8	7	12	4	3	3.1	3.0	4.8	1.8	1.4	1	0
61	Buryatia	241	190	214	22.4	19.7	25.1	19.7	22.2	37	32	24	38	35	2.2	2.3	1.6	2.4	2.5	32	26	34	22	32	2.3	1.9	2.5	1.7	2.8	46	80
62	Tyva	233	253	234	66.7	79.5	74.5	79.8	73.8	14	11	29	25	26	1.8	1.5	3.9	3.5	3.5	29	28	34	20	30	4.6	4.9	5.9	3.5	5.1	0	1
63	Khakassia	130	118	77	28.3	23.5	24.2	21.9	14.3	24	8	7	9	5	3.8	1.5	1.2	1.4	0.9	29	33	33	21	17	5.4	6.5	5.9	3.7	3.6	7	3
64	**Krai:** Altaiskiy	802	724	747	35.2	33.2	32.0	29.1	30.0	82	60	57	58	70	2.3	1.8	1.7	1.8	2.4	156	126	129	117	109	5.0	4.4	4.4	4.1	4.4	72	129
65	Trans-Baikal	221	227	193	25.6	18.3	19.8	20.3	17.3	7	6	8	7	13	0.6	0.5	0.6	0.6	1.1	49	33	24	28	21	5.1	3.3	2.1	2.7	2.2	24	39
66	Krasnoyarskiy	726	654	610	28.4	25.9	25.1	22.6	21.1	109	96	89	67	68	3.6	3.2	2.9	2.2	2.4	146	140	137	113	113	5.9	5.7	5.4	4.7	4.8	48	64
67	**Regions:** Irkutsk	1047	1039	1136	38.5	35.4	41.8	41.5	45.4	148	74	92	75	130	4.7	2.2	2.6	2.2	3.5	185	186	210	221	236	6.8	6.2	6.7	7.5	7.3	215	411
68	Kemerovo	952	893	882	38.3	33.5	33.7	31.7	31.3	128	94	77	63	70	2.9	2.3	1.8	1.5	1.9	269	225	209	178	178	7.4	6.4	5.9	4.9	5.5	54	162
69	Novosibirsk	759	756	747	35.6	30.9	28.8	28.5	28.2	64	67	45	39	49	1.8	1.9	1.3	1.1	1.4	149	137	138	149	115	5.1	4.8	4.7	5.2	4.1	98	80
70	Omsk	478	444	418	28.0	26.6	23.7	22.1	20.8	89	97	72	51	50	3.6	3.8	2.7	1.9	2.2	62	73	76	51	41	3.1	3.5	3.6	2.4	2.2	9	10
71	Tomsk	97	108	90	12.7	11.9	9.4	10.3	8.6	16	8	9	6	11	1.4	0.8	0.9	0.6	1.3	45	30	36	30	27	5.1	3.5	4.1	3.5	3.6	2	3
DISTRICT: Far-Eastern		1750	1764	1587	29.0	28.1	27.0	27.4	24.6	113	119	146	141	81	1.4	1.4	1.5	1.5	0.9	237	322	353	242	217	3.4	4.6	4.6	3.2	3.0	68	95
72	**Republic:** Sakha (Yakutia)	93	96	50	7.3	6.9	9.8	10.1	5.3	8	4	9	4	1	1.0	0.5	1.0	0.5	0.1	19	34	29	19	12	2.7	5.5	4.4	3.0	1.9	5	5
73	**Krai:** Kamchatka	53	65	52	15.2	18.2	15.4	19.0	15.2	5	3	10	8	12	1.7	1.1	3.1	2.4	4.9	11	16	10	10	10	4.3	6.7	3.6	3.4	5.0	1	0
74	Primorskiy	662	665	585	40.4	34.8	33.2	33.6	29.5	27	76	79	58	18	0.8	2.1	2.1	1.4	0.5	131	106	141	96	88	4.8	3.6	4.5	3.0	2.8	39	54
75	Khabarovskiy	359	390	334	23.7	27.2	25.6	27.8	23.8	2	8	3	6	9	0.1	0.4	0.2	0.3	0.5	28	94	107	66	54	2.0	6.4	6.9	4.3	3.9	17	26
76	**Regions:** Amur	330	324	342	43.2	41.7	38.1	37.6	39.7	29	4	7	27	11	2.3	0.3	0.5	2.2	0.9	21	41	30	24	27	2.0	4.1	2.7	2.3	2.8	2	3
77	Magadan	18	17	15	10.0	10.8	10.9	10.5	9.3	3	3	5	4	2	2.2	2.3	3.5	2.8	1.8	0	2	5	1	4	0.0	1.8	5.1	1.0	4.1	1	1
78	Sakhalin	108	117	88	26.2	22.1	20.9	22.9	17.2	35	13	23	29	19	6.0	2.6	3.9	5.2	3.8	19	17	13	11	9	4.3	4.3	2.8	2.7	2.2	2	1
79	**A.R.:** Jewish	121	84	108	47.3	63.0	65.2	45.4	58.4	4	7	9	5	7	1.6	2.3	2.6	1.6	2.2	8	12	16	14	12	3.6	0.0	5.0	5.0	4.0	1	3
80	**A.D.:** Chukotskiy	6	6	13	7.9	9.9	12.0	12.3	26.8	0	1	1	0	2	0.0	3.4	2.4	0.0	3.7	0	0	2	1	1	0.0	0.0	4.9	2.3	1.9	0	2

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[1] The information is based od data published in [16, 18–20] and on the demographic data from the FSS Form No. 4.

Registered TB prevalence in the Russian Federation, 2005–2009 (Form No. 33)

№	Federal districts, constituent entities of the Russian Federation	TB patients registered in the follow-up register as of the end of the year														
		Total										Of them MbT+				
		Number of cases					per 100,000 population					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
RUSSIAN FEDERATION		**289015**	**276554**	**270544**	**262718**	**253555**	**202.5**	**194.5**	**190.5**	**185.1**	**178.7**	**83.9**	**80.9**	**80.2**	**77.8**	**73.4**
DISTRICT: Central		52827	49504	46908	43503	41030	141.4	133.0	126.3	117.2	110.5	57.1	53.8	52.4	50.1	46.6
1	**Regions:** Belgorod	1522	1254	1298	1154	1095	100.7	82.8	85.4	75.7	71.6	58.3	53.2	53.6	50.2	49.7
2	Bryansk	3365	3284	3217	2327	1920	252.7	249.2	245.9	179.0	148.6	104.3	103.8	110.7	91.5	80.3
3	Vladimir	2159	2035	1966	1976	1838	146.6	139.4	135.6	137.2	128.5	67.7	57.4	60.7	66.0	57.8
4	Voronezh	3575	3532	3199	3073	2869	154.5	153.9	140.3	135.4	126.9	82.2	80.5	73.2	75.0	68.0
5	Ivanovo	1133	1003	1048	1003	852	103.0	92.2	97.1	93.5	79.9	61.8	58.6	59.7	53.5	46.7
6	Kaluga	1345	1164	1145	1059	1023	132.6	115.4	113.9	105.6	102.1	61.9	61.0	52.7	54.1	43.4
7	Kostroma	526	487	474	444	373	74.2	69.4	68.0	64.1	54.2	40.6	36.2	32.6	27.3	25.6
8	Kursk	2286	2255	2212	2142	1946	193.1	192.6	190.3	185.4	169.4	76.7	74.4	76.6	76.4	76.0
9	Lipetsk	1910	1826	1767	1551	1278	161.7	155.6	151.2	133.3	110.4	60.5	56.7	56.7	50.6	42.4
10	Moscow	11322	10515	9695	9091	8844	170.8	158.2	145.3	135.4	131.0	46.8	44.0	42.4	41.0	40.4
11	Orel	977	898	808	737	720	117.2	108.6	98.3	90.2	88.6	43.1	38.8	33.3	37.7	32.7
12	Ryazan	1942	1982	1848	1751	1606	164.3	169.1	158.7	151.2	139.5	67.0	78.9	82.1	77.5	62.8
13	Smolensk	2435	2263	2133	2044	2038	242.1	227.8	216.9	209.8	211.0	115.3	106.9	99.8	103.4	102.5
14	Tambov	1726	1538	1422	1402	1340	152.7	137.7	128.6	127.8	123.1	84.9	77.1	71.4	70.9	69.7
15	Tver	2381	2306	2268	2119	2117	169.3	165.8	164.4	154.7	155.6	66.7	56.6	61.8	60.5	62.9
16	Tula	3075	2814	2745	2705	2499	192.2	178.0	175.3	174.2	162.2	80.9	73.0	72.8	69.0	64.7
17	Yaroslavl	1613	1614	1502	1409	1414	121.5	122.3	114.2	107.5	108.2	55.3	55.0	52.2	45.5	43.6
18	**City:** Moscow	9535	8734	8161	7516	7258	91.5	83.6	77.9	71.5	68.7	34.5	32.1	30.6	28.3	26.3
DISTRICT: Northwestern		18824	18247	17592	17185	16031	138.1	134.7	130.3	127.7	119.3	66.6	64.3	62.9	60.2	56.7
19	**Republics:** Kareliya	1087	1045	982	948	894	155.8	150.8	142.2	137.9	130.7	75.4	73.1	66.0	63.7	64.7
20	Komi	1607	1631	1585	1577	1390	163.1	167.3	163.7	164.5	146.1	75.8	85.9	91.7	93.8	84.3
21	**Regions:** Arkhangelsk	1451	1275	1088	1018	874	112.4	99.6	85.5	80.7	69.7	69.5	54.1	46.5	41.4	37.3
22	Vologda	1241	1244	1260	1136	1100	100.5	101.3	103.0	93.2	90.6	59.3	57.1	57.7	52.2	52.7
23	Kaliningrad	2608	2448	2186	1933	1644	277.5	261.2	233.2	206.2	175.3	148.7	144.9	147.0	131.8	113.7
24	Leningrad	2208	2072	2201	2253	2215	134.3	126.5	134.8	138.1	135.9	68.9	64.2	67.8	64.9	62.7
25	Murmansk	1073	1110	1002	1016	949	124.1	129.5	117.8	120.6	113.4	73.9	76.7	71.0	68.7	65.6
26	Novgorod	1152	1182	1105	1062	951	173.1	179.7	169.4	164.4	148.5	79.1	75.6	71.1	69.7	68.7
27	Pskov	1245	1341	1276	1326	1222	171.8	188.0	180.9	190.4	177.5	71.8	76.5	80.3	78.4	79.4
28	**City:** St. Petersburg	5152	4899	4907	4916	4792	112.5	107.2	107.4	107.3	104.2	42.9	40.8	37.8	38.0	35.8
DISTRICT: Southern		54099	52442	50630	29912	28644	237.4	230.2	221.7	218.1	208.9	79.0	77.4	75.3	83.8	79.5
29	**Republics:** Adygeya	726	695	718	633	668	164.0	157.5	162.7	143.0	150.7	90.1	87.7	89.3	73.9	82.8
30	Kalmykiya	1287	1069	910	881	870	445.8	372.2	318.7	310.2	307.2	138.6	132.3	143.2	144.7	132.4
31	**Krai:** Krasnodarsky	9521	9372	9045	8348	7978	186.8	183.7	176.6	162.4	154.6	89.9	88.2	86.6	75.6	71.8
32	**Regions:** Astrakhan	2579	2593	2497	2520	2539	259.4	260.8	249.5	250.7	252.1	92.1	85.9	80.9	79.3	85.6

№	Federal districts, constituent entities of the Russian Federation	TB patients registered in the follow-up register as of the end of the year														
		Total										Of them MbT+				
		Number of cases					per 100,000 population					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
33	Volgograd	7619	7327	6713	6462	6005	289.1	279.7	257.3	248.6	231.9	101.6	98.8	89.9	94.1	85.4
34	Rostov	11588	11538	11337	11068	10584	269.3	269.8	266.5	260.9	250.2	86.1	86.6	85.4	85.4	80.0
DISTRICT: North-Caucasian					19123	18047				208.2	195.0				52.1	48.3
35	**Republics:** Dagestan	5513	4879	4517	4382	4138	208.7	183.5	168.1	161.6	151.2	50.2	45.9	44.4	45.2	39.9
36	Ingushetia	1368	1289	1195	1160	1115	280.9	261.6	239.2	228.3	215.8	41.1	40.4	37.8	37.6	38.9
37	Kabardino-Balkaria	1625	1549	1489	1433	1468	181.8	173.8	167.1	160.6	164.2	55.0	49.3	48.5	39.6	41.4
38	Karachai-Cherkes	928	955	960	914	874	215.1	222.8	224.6	214.0	204.7	40.6	53.2	52.6	47.5	48.5
39	North Ossetia – Alania	1644	1638	1563	1525	1399	234.1	233.5	222.5	217.3	199.6	86.0	81.8	70.8	64.3	62.5
40	Chechnya	4258	4090	4100	4058	3754	366.2	345.5	339.1	327.7	296.0	88.5	98.2	106.6	83.7	78.5
41	**Krai:** Stavropolskiy	5443	5448	5586	5651	5299	200.8	201.7	206.5	208.7	195.4	55.0	51.4	49.7	49.0	42.9
DISTRICT: Privolzhskiy		55538	52485	51314	49599	47829	182.0	173.0	169.7	164.5	158.9	83.2	79.4	78.4	75.1	68.4
42	**Republics:** Bashkortostan	5224	5152	5007	4960	4873	128.6	127.2	123.5	122.2	119.8	57.7	53.3	51.6	46.6	45.8
43	Mari El	787	833	831	906	936	110.6	117.9	118.2	129.4	134.1	74.9	76.8	66.4	71.6	68.5
44	Mordovia	1620	1469	1437	1424	1307	189.1	173.3	171.0	170.9	158.1	61.0	52.6	49.1	48.6	46.6
45	Tatarstan	4845	4158	3897	3850	3707	128.8	110.6	103.6	102.2	98.1	65.3	58.4	54.4	54.8	47.1
46	Udmurtia	3725	3662	3584	3533	3404	241.2	238.1	233.8	231.1	223.0	103.2	98.9	96.6	93.2	86.9
47	Chuvash	1912	1699	1709	1535	1439	148.0	132.1	133.2	120.0	112.6	107.2	101.4	104.9	94.2	85.7
48	**Krai:** Permskiy	6695	6315	6259	5953	5702	243.6	231.2	230.3	219.8	211.1	105.0	99.1	98.3	94.2	77.7
49	**Regions:** Kirov	2489	2443	2362	2209	2066	172.5	171.2	167.1	157.7	148.5	105.9	108.4	103.6	94.2	87.1
50	Nizhny Novgorod	6984	6543	6372	6303	6100	204.7	193.5	189.7	188.7	183.5	81.4	78.3	76.6	73.5	67.9
51	Orenburg	4425	4545	4634	4601	4518	207.0	213.8	218.7	217.9	213.8	94.5	92.3	89.9	88.8	83.0
52	Penza	2250	2179	2182	2195	2080	159.8	156.1	157.2	159.1	151.5	64.8	65.7	66.1	68.5	60.1
53	Samara	6089	5733	5568	5154	4999	190.9	180.4	175.5	162.5	157.7	89.2	86.5	89.7	89.7	85.4
54	Saratov	5996	5555	5231	4738	4522	229.9	214.0	202.5	184.2	176.3	98.9	94.4	95.1	78.5	69.8
55	Ulyanovsk	2497	2199	2241	2238	2176	186.9	166.4	170.8	171.5	167.6	75.9	72.6	78.6	87.1	78.6
DISTRICT: Ural		29629	28807	28169	27485	27305	242.0	235.5	230.1	224.3	222.4	92.2	92.6	91.1	87.5	84.3
56	**Regions:** Kurgan	2900	2989	3140	2988	2971	295.9	308.4	326.9	313.6	313.5	115.9	115.5	130.4	129.7	134.4
57	Sverdlovsk	11198	11374	11496	11347	11334	253.9	258.5	261.5	258.2	258.0	95.3	96.7	98.4	97.6	93.9
58	Tyumen	9567	8206	7239	6726	6515	287.9	245.3	214.6	197.9	189.9	105.2	101.4	91.6	80.7	74.9
	Khanty-Mansiyskiy AD	3429	3177	2922	2679	2521	232.0	213.5	194.1	176.3	163.8	95.1	90.4	85.9	76.6	66.4
	Yamal-Nenetskiy AD	1386	1247	1228	1283	1325	261.2	231.5	226.3	236.0	242.4	93.3	84.5	91.6	97.5	102.3
	Tyumen region (not including ADs)	4752	3782	3089	2764	2669	361.5	286.9	233.1	207.0	198.4	121.3	120.8	98.2	78.6	73.4
59	Chelyabinsk	5964	6238	6294	6424	6485	168.9	177.4	179.3	183.1	184.8	69.6	72.9	70.8	69.8	68.1
DISTRICT: Siberian		59485	57011	57080	56197	55033	302.3	291.0	291.9	287.5	281.3	132.0	126.7	126.0	126.0	122.4
60	**Republics:** Altai	545	516	581	601	627	266.5	251.2	280.5	287.3	297.5	102.2	111.5	129.9	121.9	106.8
61	Buryatia	2857	2689	2819	2420	2350	296.6	280.1	293.7	251.9	243.9	161.9	158.4	168.1	141.8	139.4
62	Tyva	2026	1990	2088	2183	2207	656.7	643.1	670.0	695.4	696.1	341.3	327.4	349.8	359.9	389.2

№	Federal districts, constituent entities of the Russian Federation	TB patients registered in the follow-up register as of the end of the year														
		Total										Of them MbT+				
		Number of cases					per 100,000 population					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
63	Khakassia	1770	1691	1676	1585	1445	328.9	315.1	312.0	294.6	268.0	182.1	172.4	158.0	138.1	126.9
64	**Krai:** Altaiskiy	8526	8165	8154	8390	7987	335.2	323.6	325.1	336.0	320.7	111.9	105.3	108.4	119.8	122.1
65	Trans-Baikal	2616	2590	2600	2377	2363	231.9	230.8	232.4	212.8	211.6	79.1	78.4	82.8	79.0	82.0
66	Krasnoyarskiy	7355	7276	7582	7395	7212	253.1	251.4	262.3	255.9	249.2	108.2	106.6	104.5	100.6	94.2
67	**Regions:** Irkutsk	9134	9398	9452	9347	9906	361.5	373.9	376.9	373.0	395.8	144.2	149.5	148.5	159.8	154.4
68	Kemerovo	8607	7676	7360	7021	6911	303.2	271.6	260.7	248.8	245.0	160.0	146.0	140.1	137.9	139.3
69	Novosibirsk	7189	6880	6829	6942	6656	271.3	260.5	259.1	263.0	251.2	138.2	133.2	131.0	130.4	119.9
70	Omsk	6984	6384	6415	6565	6153	343.3	315.2	317.9	325.9	305.8	105.1	94.5	98.1	103.6	96.8
71	Tomsk	1876	1756	1524	1371	1216	181.4	170.0	147.2	132.0	116.5	126.0	116.1	100.4	89.4	81.6
DISTRICT: Far-Eastern		18579	18017	18809	19668	19588	283.8	276.8	290.0	304.5	304.1	133.4	130.3	142.0	146.5	139.4
72	**Republic:** Sakha (Yakutia)	1974	1854	1853	1783	1826	207.8	195.2	194.8	187.7	192.3	95.4	88.8	96.7	97.2	100.5
73	**Krai:** Kamchatka	727	654	702	785	724	208.2	188.4	203.1	228.5	211.5	95.1	78.4	83.9	96.9	100.5
74	Primorskiy	5388	5660	6431	7411	7278	266.8	282.2	322.2	372.8	367.2	158.3	164.8	186.3	197.5	171.7
75	Khabarovskiy	3257	3191	3218	3196	3273	230.6	227.0	229.2	228.0	233.7	105.1	98.7	112.5	120.8	132.8
76	**Regions:** Amur	4184	3821	3780	3703	3661	474.9	436.9	434.7	428.4	425.4	169.3	157.2	158.2	149.3	132.5
77	Magadan	362	275	263	284	284	211.0	163.2	158.6	174.3	176.1	57.7	51.0	59.7	66.3	70.7
78	Sakhalin	1859	1724	1716	1714	1739	353.3	330.8	330.9	333.1	340.4	140.1	131.4	130.6	132.9	123.1
79	**A.R.:** Jewish	724	741	746	674	669	388.1	399.1	402.1	363.5	361.5	231.6	252.6	258.7	235.2	244.8
80	**A.D.:** Chukotskiy	104	97	100	118	134	205.8	192.1	199.0	238.3	275.8	112.8	118.8	139.3	143.4	164.6

Table 10

Registered prevalence of some TB forms in the Russian Federation, 2006–2010 (Form No. 33)

№	Federal districts, constituent entities of the Russian Federation	Pulmonary TB cases with destruction of lung tissues										Fibro-cavitary pulmonary TB									
		number of cases					per 100,000 population					number of cases					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
RUSSIAN FEDERATION		**111089**	**107610**	**104331**	**102415**	**98474**	**77.8**	**75.7**	**73.5**	**72.2**	**69.4**	**34999**	**33922**	**32319**	**31130**	**29446**	**24.5**	**23.9**	**22.8**	**21.9**	**20.7**
DISTRICT: Central		17548	16695	15721	14892	14035	47.0	44.9	42.3	40.1	37.8	5241	5022	4751	4464	4187	14.0	13.5	12.8	12.0	11.3
1	**Regions:** Belgorod	589	498	443	358	294	39.0	32.9	29.2	23.5	19.2	196	172	121	91	77	13.0	11.4	8.0	6.0	5.0
2	Bryansk	1375	1411	1395	1170	943	103.3	107.1	106.6	90.0	73.0	397	395	391	335	276	29.8	30.0	29.9	25.8	21.4
3	Vladimir	762	616	548	582	524	51.7	42.2	37.8	40.4	36.6	160	154	133	133	127	10.9	10.6	9.2	9.2	8.9
4	Voronezh	1469	1416	1458	1407	1290	63.5	61.7	63.9	62.0	57.0	464	487	495	492	457	20.1	21.2	21.7	21.7	20.2
5	Ivanovo	439	437	416	343	297	39.9	40.2	38.5	32.0	27.8	102	98	7	80	67	9.3	9.0	0.6	7.5	6.3
6	Kaluga	416	413	351	317	281	41.0	40.9	34.9	31.6	28.1	168	163	137	113	101	16.6	16.2	13.6	11.3	10.1
7	Kostroma	144	135	142	106	93	20.3	19.2	20.4	15.3	13.5	40	30	27	27	17	5.6	4.3	3.9	3.9	2.5
8	Kursk	823	848	804	859	858	69.5	72.4	69.2	74.3	74.7	372	378	373	388	389	31.4	32.3	32.1	33.6	33.9
9	Lipetsk	439	435	392	391	335	37.2	37.1	33.5	33.6	28.9	155	147	155	149	137	13.1	12.5	13.3	12.8	11.8
10	Moscow	3182	3057	2809	2793	2743	48.0	46.0	42.1	41.6	40.6	864	859	854	806	746	13.0	12.9	12.8	12.0	11.0
11	Orel	257	250	205	194	145	30.8	30.2	24.9	23.7	17.8	52	38	31	23	22	6.2	4.6	3.8	2.8	2.7
12	Ryazan	811	814	823	796	684	68.6	69.4	70.7	68.8	59.4	364	347	345	317	303	30.8	29.6	29.6	27.4	26.3
13	Smolensk	1142	1095	1046	1000	1076	113.5	110.2	106.4	102.7	111.4	240	237	266	247	269	23.9	23.9	27.1	25.4	27.8
14	Tambov	737	684	585	595	562	65.2	61.2	52.9	54.2	51.6	239	201	182	145	122	21.1	18.0	16.5	13.2	11.2
15	Tver	1124	1049	979	911	925	79.9	75.4	71.0	66.5	68.0	248	221	222	216	217	17.6	15.9	16.1	15.8	16.0
16	Tula	909	848	793	750	747	56.8	53.7	50.6	48.3	48.5	390	338	313	297	294	24.4	21.4	20.0	19.1	19.1
17	Yaroslavl	531	551	524	455	472	40.0	41.7	39.8	34.7	36.1	147	140	131	127	104	11.1	10.6	10.0	9.7	8.0
18	**City:** Moscow	2399	2138	2008	1865	1766	23.0	20.5	19.2	17.7	16.7	643	617	568	478	462	6.2	5.9	5.4	4.5	4.4
DISTRICT: Northwestern		8111	7887	7422	7151	6804	59.5	58.2	55.0	53.1	50.6	1210	1216	1150	1150	1028	8.9	9.0	8.5	8.5	7.7
19	**Republics:** Kareliya	457	449	404	391	366	65.5	64.8	58.5	56.9	53.5	89	83	79	61	77	12.8	12.0	11.4	8.9	11.3
20	Komi	727	767	804	836	766	73.8	78.7	83.0	87.2	80.5	87	118	116	139	106	8.8	12.1	12.0	14.5	11.1
21	**Regions:** Arkhangelsk	858	670	602	522	466	66.4	52.3	47.3	41.4	37.1	74	44	42	18	20	5.7	3.4	3.3	1.4	1.6
22	Vologda	617	624	656	600	558	49.9	50.8	53.6	49.3	46.0	75	78	83	94	89	6.1	6.4	6.8	7.7	7.3
23	Kaliningrad	904	912	731	702	616	96.2	97.3	78.0	74.9	65.7	243	257	227	242	250	25.9	27.4	24.2	25.8	26.7
24	Leningrad	1136	1101	1132	1136	1071	69.1	67.2	69.3	69.6	65.7	146	132	150	173	157	8.9	8.1	9.2	10.6	9.6
25	Murmansk	391	446	336	383	356	45.2	52.0	39.5	45.5	42.5	93	81	72	76	31	10.8	9.5	8.5	9.0	3.7
26	Novgorod	410	382	345	330	319	61.6	58.1	52.9	51.1	49.8	35	39	44	38	34	5.3	5.9	6.7	5.9	5.3
27	Pskov	518	546	576	556	559	71.5	76.5	81.7	79.8	81.2	75	88	85	78	70	10.4	12.3	12.1	11.2	10.2
28	**City:** St. Petersburg	2093	1990	1836	1695	1727	45.7	43.5	40.2	37.0	37.5	293	296	252	231	194	6.4	6.5	5.5	5.0	4.2
DISTRICT: Southern		21170	21007	19700	12810	12168	92.9	92.2	86.3	93.4	88.7	8029	7939	6896	4492	4351	35.2	34.9	30.2	32.8	31.7
29	**Republics:** Adygeya	365	354	300	268	287	82.4	80.2	68.0	60.5	64.8	118	128	125	103	96	26.7	29.0	28.3	23.3	21.7
30	Kalmykiya	434	394	344	327	283	150.3	137.2	120.5	115.1	99.9	244	220	175	138	77	84.5	76.6	61.3	48.6	27.2
31	**Krai:** Krasnodarsky	5206	5453	4946	4591	4480	102.1	106.9	96.6	89.3	86.8	2327	2474	2427	2125	2178	45.7	48.5	47.4	41.3	42.2
32	**Regions:** Astrakhan	916	928	870	852	838	92.1	93.3	86.9	84.8	83.2	440	412	358	365	361	44.3	41.4	35.8	36.3	35.8
33	Volgograd	3187	3238	3124	3108	2870	120.9	123.6	119.8	119.6	110.8	967	1007	1025	1018	980	36.7	38.4	39.3	39.2	37.8

№	Federal districts, constituent entities of the Russian Federation	Pulmonary TB cases with destruction of lung tissues										Fibro-cavitary pulmonary TB									
		number of cases					per 100,000 population					number of cases					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
34	Rostov	3613	3623	3566	3664	3410	84.0	84.7	83.8	86.4	80.6	1004	883	789	743	659	23.3	20.7	18.5	17.5	15.6
DISTRICT: North-Caucasian					7328	6865				79.8	74.2				2510	2327				27.3	25.1
35	**Republics:** Dagestan	2745	2461	2326	2331	2282	103.9	92.6	86.5	86.0	83.4	1179	1063	902	850	767	44.6	40.0	33.6	31.3	28.0
36	Ingushetia	307	257	242	265	264	63.0	52.2	48.4	52.2	51.1	151	137	127	114	117	31.0	27.8	25.4	22.4	22.6
37	Kabardino-Balkaria	876	688	630	684	623	98.0	77.2	70.7	76.6	69.7	324	321	301	260	270	36.2	36.0	33.8	29.1	30.2
38	Karachai-Cherkes	231	266	257	221	258	53.5	62.0	60.1	51.7	60.4	81	117	107	124	95	18.8	27.3	25.0	29.0	22.2
39	North Ossetia – Alania	637	349	0	612	567	90.7	49.8	0.0	87.2	80.9	362	336	0	326	309	51.5	47.9	0.0	46.5	44.1
40	Chechnya	1138	1478	1613	1573	1440	97.9	124.9	133.4	127.0	113.6	418	441	452	453	453	35.9	37.3	37.4	36.6	35.7
41	**Krai:** Stavropolskiy	1515	1518	1482	1642	1431	55.9	56.2	54.8	60.7	52.8	414	400	108	383	316	15.3	14.8	4.0	14.1	11.7
DISTRICT: Privolzhskiy		21356	19944	19684	18649	17808	70.0	65.7	65.1	61.8	59.1	5711	5474	5313	4998	4643	18.7	18.0	17.6	16.6	15.4
42	**Republics:** Bashkortostan	2049	1918	1885	1813	1793	50.4	47.3	46.5	44.7	44.1	803	802	776	682	643	19.8	19.8	19.1	16.8	15.8
43	Mari El	300	311	269	264	254	42.2	44.0	38.3	37.7	36.4	61	52	49	39	36	8.6	7.4	7.0	5.6	5.2
44	Mordovia	601	508	453	428	376	70.1	59.9	53.9	51.4	45.5	167	166	142	151	121	19.5	19.6	16.9	18.1	14.6
45	Tatarstan	1924	1616	1548	1504	1491	51.1	43.0	41.1	39.9	39.5	452	392	360	354	313	12.0	10.4	9.6	9.4	8.3
46	Udmurtia	1284	1254	1192	1130	1161	83.1	81.5	77.8	73.9	76.1	283	286	275	290	290	18.3	18.6	17.9	19.0	19.0
47	Chuvash	1035	971	900	714	688	80.1	75.5	70.2	55.8	53.8	159	164	163	134	111	12.3	12.8	12.7	10.5	8.7
48	**Krai:** Permskiy	2578	2459	2450	2262	2170	93.8	90.0	90.1	83.5	80.3	800	731	720	609	612	29.1	26.8	26.5	22.5	22.7
49	**Regions:** Kirov	766	698	733	686	546	53.1	48.9	51.9	49.0	39.3	96	104	116	112	95	6.7	7.3	8.2	8.0	6.8
50	Nizhny Novgorod	2831	2723	2594	2606	2422	83.0	80.5	77.2	78.0	72.9	956	964	947	960	850	28.0	28.5	28.2	28.7	25.6
51	Orenburg	2065	1921	1985	1893	1836	96.6	90.4	93.7	89.7	86.9	254	250	251	259	232	11.9	11.8	11.8	12.3	11.0
52	Penza	812	712	728	662	592	57.7	51.0	52.4	48.0	43.1	241	207	201	177	142	17.1	14.8	14.5	12.8	10.3
53	Samara	2321	2272	2357	2235	2190	72.8	71.5	74.3	70.5	69.1	702	660	637	567	537	22.0	20.8	20.1	17.9	16.9
54	Saratov	1820	1676	1656	1502	1426	69.8	64.6	64.1	58.4	55.6	491	464	435	414	409	18.8	17.9	16.8	16.1	15.9
55	Ulyanovsk	970	905	934	950	863	72.6	68.5	71.2	72.8	66.5	246	232	241	250	252	18.4	17.6	18.4	19.2	19.4
DISTRICT: Ural		9403	9417	8984	8864	8944	76.8	77.0	73.4	72.3	72.8	3077	2845	3104	3013	2967	25.1	23.3	25.4	24.6	24.2
56	**Regions:** Kurgan	1017	1051	956	1019	994	103.8	108.4	99.5	107.0	104.9	442	449	466	518	491	45.1	46.3	48.5	54.4	51.8
57	Sverdlovsk	3215	3300	3272	3188	3307	72.9	75.0	74.4	72.5	75.3	1042	1020	1099	1090	1158	23.6	23.2	25.0	24.8	26.4
58	Tyumen	3091	2967	2645	2597	2490	93.0	88.7	78.4	76.4	72.6	987	795	1010	923	854	29.7	23.8	29.9	27.2	24.9
	Khanty-Mansiyskiy AD	1096	1039	978	942	828	74.1	69.8	65.0	62.0	53.8	270	226	194	174	158	18.3	15.2	12.9	11.4	10.3
	Yamal-Nenetskiy AD	424	394	400	429	412	79.9	73.2	73.7	78.9	75.4	135	137	135	141	124	25.4	25.4	24.9	25.9	22.7
	Tyumen region (not including ADs)	1571	1534	1267	1226	1250	119.5	116.4	95.6	91.8	92.9	582	432	681	608	572	44.3	32.8	51.4	45.5	42.5
59	Chelyabinsk	2080	2099	2111	2060	2153	58.9	59.7	60.1	58.7	61.4	606	581	529	482	464	17.2	16.5	15.1	13.7	13.2
DISTRICT: Siberian		25384	24519	24074	23817	23438	129.0	125.2	123.1	121.9	119.8	8722	8390	8125	7743	7311	44.3	42.8	41.6	39.6	37.4
60	**Republics:** Altai	214	176	185	216	222	104.7	85.7	89.3	103.2	105.4	108	101	103	95	74	52.8	49.2	49.7	45.4	35.1
61	Buryatia	1737	1683	1682	1343	1360	180.3	175.3	175.2	139.8	141.2	527	517	471	335	320	54.7	53.9	49.1	34.9	33.2
62	Tyva	867	825	840	870	900	281.0	266.6	269.6	277.1	283.9	427	407	435	412	427	138.4	131.5	139.6	131.2	134.7
63	Khakassia	843	830	712	604	576	156.6	154.7	132.5	112.3	106.8	121	152	123	114	103	22.5	28.3	22.9	21.2	19.1

№	Federal districts, constituent entities of the Russian Federation	Pulmonary TB cases with destruction of lung tissues										Fibro-cavitary pulmonary TB									
		number of cases					per 100,000 population					number of cases					per 100,000 population				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
64	**Krai:** Altaiskiy	3979	3703	3443	3802	3591	156.5	146.8	137.3	152.3	144.2	1169	1058	939	834	795	46.0	41.9	37.4	33.4	31.9
65	Trans-Baikal	845	860	938	909	875	74.9	76.6	83.8	81.4	78.3	324	313	340	341	314	28.7	27.9	30.4	30.5	28.1
66	Krasnoyarskiy	3271	3276	3296	3080	2831	112.6	113.2	114.0	106.6	97.8	849	809	775	733	672	29.2	28.0	26.8	25.4	23.2
67	**Regions:** Irkutsk	4112	4259	4377	4502	4607	162.7	169.4	174.5	179.7	184.1	1594	1690	1756	1845	1774	63.1	67.2	70.0	73.6	70.9
68	Kemerovo	3609	3298	3080	2988	3030	127.1	116.7	109.1	105.9	107.4	1495	1310	1187	1049	969	52.7	46.4	42.0	37.2	34.4
69	Novosibirsk	3016	2984	2845	2900	2897	113.8	113.0	107.9	109.9	109.3	923	925	893	881	808	34.8	35.0	33.9	33.4	30.5
70	Omsk	2156	2017	2145	2119	2077	106.0	99.6	106.3	105.2	103.2	1083	1030	1024	1044	993	53.2	50.8	50.7	51.8	49.4
71	Tomsk	735	608	531	484	472	71.1	58.9	51.3	46.6	45.2	102	78	79	60	62	9.9	7.6	7.6	5.8	5.9
DISTRICT: Far-Eastern		8117	8140	8745	8904	8409	124.0	125.1	134.8	137.8	130.6	3009	3035	2980	2759	2631	46.0	46.6	45.9	42.7	40.9
72	**Republic:** Sakha (Yakutia)	571	589	598	616	638	60.1	62.0	62.9	64.9	67.2	101	109	111	105	99	10.6	11.5	11.7	11.1	10.4
73	**Krai:** Kamchatka	327	335	376	398	401	93.6	96.5	108.8	115.9	117.2	152	140	160	152	148	43.5	40.3	46.3	44.2	43.2
74	Primorskiy	2992	3060	3442	3530	3249	148.2	152.5	172.5	177.6	163.9	1290	1328	1330	1317	1229	63.9	66.2	66.6	66.2	62.0
75	Khabarovskiy	1304	1352	1442	1478	1534	92.3	96.2	102.7	105.4	109.5	401	402	409	346	316	28.4	28.6	29.1	24.7	22.6
76	**Regions:** Amur	1776	1691	1732	1788	1520	201.6	193.3	199.2	206.8	176.6	655	668	568	483	481	74.3	76.4	65.3	55.9	55.9
77	Magadan	112	94	98	112	113	65.3	55.8	59.1	68.7	70.1	25	27	32	32	23	14.6	16.0	19.3	19.6	14.3
78	Sakhalin	714	669	694	638	633	135.7	128.4	133.8	124.0	123.9	258	230	241	206	219	49.0	44.1	46.5	40.0	42.9
79	**A.R.:** Jewish	268	298	300	275	247	143.7	160.5	161.7	148.3	133.5	97	102	100	89	97	52.0	54.9	53.9	48.0	52.4
80	**A.D.:** Chukotskiy	53	52	63	69	74	104.9	103.0	125.3	139.3	152.3	30	29	29	29	19	59.4	57.4	57.7	58.6	39.1

Table 10 (continuatin)

Registered prevalence of some TB forms in the Russian Federation, 2006–2010 (Form No. 33)

№	Federal districts, constituent entities of the Russian Federation	Registered MDR-TB cases among prevalent cases															RTB patients registered in DFG II (chronic TB forms)									
		number of cases					% among RTB MbT+ cases					per 100,000 population					number of cases					% among all RTB cases				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009[1]	2010[1]	2006	2007	2008	2009[1]	2010[1]
RUSSIAN FEDERATION		**24055**	**24445**	**26448**	**29031**	**31359**	**20.3**	**21.4**	**23.4**	**26.5**	**30.3**	**16.9**	**17.2**	**18.6**	**20.5**	**22.1**	**116898**	**102733**	**98037**	**85049**	**82670**	**43.1**	**39.5**	**38.4**	**35.1**	**35.3**
DISTRICT: Central		4290	4075	4398	5264	5326	20.4	20.6	22.8	28.6	31.1	11.5	10.9	11.8	14.2	14.3	20343	18594	17369	13453	12782	41.7	40.7	40.1	34.2	34.7
	Regions:																									
1	Belgorod	231	301	333	372	374	26.4	37.8	41.4	49.1	49.7	15.3	19.9	21.9	24.4	24.4	320	251	182	154	139	22.3	21.0	14.8	14.3	13.6
2	Bryansk	357	283	357	321	368	26.1	21.0	25.0	27.4	35.9	26.8	21.5	27.3	24.7	28.5	1528	1631	1587	947	707	48.1	52.5	51.5	45.2	41.9
3	Vladimir	343	288	319	387	352	34.8	34.7	36.8	41.0	42.9	23.3	19.7	22.0	26.9	24.6	631	684	664	664	693	31.8	36.7	36.7	37.8	42.7
4	Voronezh	564	447	460	659	716	30.1	24.5	27.8	38.9	46.9	24.4	19.5	20.2	29.0	31.7	1335	1210	1087	1009	955	41.9	38.7	38.2	37.1	37.6
5	Ivanovo	293	244	0	258	242	43.6	38.5	40.7	45.3	49.1	26.6	22.4	0.0	24.0	22.7	234	239	219	184	162	22.2	25.3	22.1	20.2	21.0
6	Kaluga	81	106	151	136	147	13.5	18.2	29.4	25.7	33.8	8.0	10.5	15.0	13.6	14.7	1227	1069	1069	270	243	100.0	100.0	100.0	28.0	26.5
7	Kostroma	91	81	74	49	55	31.7	31.9	32.6	25.9	31.4	12.8	11.5	10.6	7.1	8.0	140	150	124	91	78	28.1	31.9	26.5	21.7	22.3
8	Kursk	25	50	100	135	164	2.8	5.8	11.3	15.4	18.9	2.1	4.3	8.6	11.7	14.3	838	974	989	795	749	38.1	44.8	46.2	38.5	40.2
9	Lipetsk	143	101	173	191	176	20.2	15.2	26.2	32.5	36.0	12.1	8.6	14.8	16.4	15.2	710	653	674	639	557	42.2	40.1	42.3	46.3	49.9
10	Moscow	503	550	605	624	662	16.4	19.0	21.6	22.9	24.5	7.6	8.3	9.1	9.3	9.8	4875	3979	3710	3402	3345	46.6	41.1	41.7	41.4	41.6
11	Orel	73	71	79	65	61	20.4	22.5	28.9	21.2	23.1	8.8	8.6	9.6	8.0	7.5	88	66	64	52	55	9.6	7.8	8.4	7.6	8.2
12	Ryazan	75	152	289	269	219	9.6	16.6	30.6	30.4	30.8	6.3	13.0	24.8	23.2	19.0	553	497	454	446	510	31.3	27.5	27.3	29.2	37.0
13	Smolensk	121	87	99	116	121	10.5	8.3	10.2	11.6	12.3	12.0	8.8	10.1	11.9	12.5	718	708	665	627	617	32.1	34.1	33.8	34.1	33.1
14	Tambov	143	183	193	228	257	15.3	21.9	25.0	29.9	35.2	12.7	16.4	17.4	20.8	23.6	677	560	562	479	419	42.1	39.0	42.4	36.8	34.1
15	Tver	57	19	20	182	188	6.1	2.4	2.4	22.2	22.3	4.1	1.4	1.4	13.3	13.8	761	676	751	529	542	33.7	31.0	35.1	27.0	27.8
16	Tula	285	279	297	352	308	22.2	24.6	26.3	33.3	31.2	17.8	17.7	19.0	22.7	20.0	918	829	788	733	699	31.4	31.1	30.2	29.7	30.7
17	Yaroslavl	87	119	121	145	161	12.0	16.6	17.8	24.5	28.3	6.6	9.0	9.2	11.1	12.3	1484	1499	1396	444	403	100.0	100.0	100.0	34.7	32.1
18	**City:** Moscow	818	714	728	775	755	23.0	21.5	23.0	26.4	27.6	7.8	6.8	7.0	7.4	7.1	3306	2919	2384	1988	1909	37.8	36.7	32.3	30.0	30.2
DISTRICT: Northwestern		2560	2847	2873	2658	2854	28.5	33.0	34.1	33.0	37.7	18.8	21.0	21.3	19.7	21.2	6198	5943	5820	5745	5319	34.9	34.5	34.9	36.0	35.5
19	**Republics:** Kareliya	133	156	160	174	188	25.4	30.8	35.2	39.8	42.5	19.1	22.5	23.2	25.3	27.5	223	192	224	170	168	22.7	20.1	24.4	19.4	20.0
20	Komi	193	263	287	309	336	26.2	31.8	33.0	34.7	42.1	19.6	27.0	29.6	32.2	35.3	505	517	460	449	405	35.2	35.1	31.8	31.4	31.8
	Regions:																									
21	Arkhangelsk	430	326	262	248	233	48.3	47.7	44.6	47.8	50.0	33.3	25.5	20.6	19.7	18.6	379	439	421	421	375	26.8	35.4	39.9	43.6	44.6
22	Vologda	0	149	163	155	187	0.0	21.6	23.4	24.5	29.5	0.0	12.1	13.3	12.7	15.4	273	282	290	312	274	23.8	24.3	24.4	29.4	26.5
23	Kaliningrad	313	331	330	371	369	22.6	24.5	24.1	30.3	34.9	33.3	35.3	35.2	39.6	39.3	820	651	545	492	438	33.2	28.1	26.4	27.9	29.3
24	Leningrad	279	327	335	391	335	24.8	31.2	30.3	37.1	32.9	17.0	20.0	20.5	24.0	20.6	760	720	746	733	634	35.2	35.5	34.7	34.1	29.8
25	Murmansk	248	260	263	244	232	39.9	40.4	44.3	42.9	42.8	28.7	30.3	30.9	29.0	27.7	220	243	239	259	220	21.8	22.8	24.9	26.8	24.4
26	Novgorod	225	200	207	195	230	43.2	40.7	45.0	43.4	52.3	33.8	30.4	31.7	30.2	35.9	501	554	448	475	433	44.9	48.9	41.9	47.1	48.0
27	Pskov	155	192	246	285	303	29.9	35.2	43.6	52.5	55.8	21.4	26.9	34.9	40.9	44.0	380	422	429	424	405	32.6	33.4	35.5	34.2	35.8
28	**City:** St. Petersburg	584	643	620	286	441	30.1	34.8	36.2	16.6	27.1	12.7	14.1	13.6	6.2	9.6	2137	1923	2018	2010	1967	44.2	41.8	43.8	44.5	44.5
DISTRICT: Southern		2014	2396	2822	2634	2996	11.3	13.7	16.5	23.0	27.6	9.3	10.5	12.4	19.2	21.8	19952	18791	18404	10742	10350	39.0	37.8	38.3	38.0	38.2
29	**Republics:** Adygeya	28	24	33	32	39	7.2	6.3	8.4	9.9	10.7	6.3	5.4	7.5	7.2	8.8	168	159	174	123	122	25.3	24.3	25.5	21.4	20.1
30	Kalmykiya	92	81	99	94	73	23.8	21.5	24.2	22.9	19.5	31.9	28.2	34.7	33.1	25.8	480	426	338	318	306	41.0	43.6	40.8	40.6	39.2

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		number of cases					% among RTB MbT+ cases					per 100,000 population					number of cases					% among all RTB cases				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009[1]	2010[1]	2006	2007	2008	2009[1]	2010[1]
31	**Krai:** Krasnodarsky	833	959	1047	1082	1234	18.2	21.3	23.6	27.9	33.3	16.3	18.8	20.4	21.0	23.9	2912	2975	3207	3265	3139	31.5	32.4	36.1	40.4	40.7
32	**Regions:** Astrakhan	119	144	163	147	305	13.0	16.9	20.1	18.5	35.4	12.0	14.5	16.3	14.6	30.3	739	894	714	718	710	30.3	36.3	30.0	30.9	30.5
33	Volgograd	275	344	368	455	521	10.4	13.4	15.8	18.8	23.8	10.4	13.1	14.1	17.5	20.1	2791	2818	2532	2381	2244	39.1	41.1	40.5	40.0	40.6
34	Rostov	293	357	590	824	824	7.9	9.7	16.3	22.8	24.4	6.8	8.3	13.9	19.4	19.5	4343	4268	3671	3937	3829	38.6	38.2	33.4	37.3	37.9
DISTRICT: North-Caucasian					514	613				10.8	13.8				5.6	6.6				6738	6234				39.4	38.7
	Republics:																									
35	Dagestan	65	101	129	67	148	4.9	8.3	10.8	5.5	13.6	2.5	3.8	4.8	2.5	5.4	3063	1891	1846	1641	1584	57.2	39.8	41.7	40.1	40.7
36	Ingushetia	33	49	47	70	80	16.5	24.6	24.9	36.6	39.8	6.8	9.9	9.4	13.8	15.5	775	715	1073	568	538	62.6	61.3	100.0	58.9	57.2
37	Kabardino-Balkaria	0	0	0	0	13	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	1.5	662	625	628	561	544	42.5	42.0	44.0	41.6	39.2
38	Karachai-Cherkes	22	29	31	20	30	12.7	12.7	14.0	9.9	14.5	5.1	6.8	7.3	4.7	7.0	238	304	358	354	301	29.6	36.5	40.9	44.3	38.1
39	North Ossetia – Alania	9	53	78	70	69	1.5	9.4	16.1	15.6	15.9	1.3	7.6	11.1	10.0	9.8	487	515	584	545	510	33.5	34.8	41.2	41.6	43.2
40	Chechnya	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		1415	1504	1253	1026	37.9	38.2	40.5	36.0	33.0
41	**Krai:** Stavropolskiy	245	255	237	287	273	16.9	19.0	18.1	21.9	23.7	9.0	9.4	8.8	10.6	10.1	1814	1786	1775	1816	1731	36.7	35.8	34.6	35.5	36.2
DISTRICT: Privolzhskiy		5628	5800	6391	6621	6923	22.4	24.3	27.2	29.5	33.9	18.4	19.1	21.1	22.0	23.0	16950	15731	15508	14852	14274	32.8	32.1	32.3	32.4	32.3
	Republics:																									
42	Bashkortostan	564	548	469	410	389	24.3	25.6	22.6	21.8	21.0	13.9	13.5	11.6	10.1	9.6	1268	1333	1277	1253	1238	27.1	28.8	28.4	28.8	28.7
43	Mari El	175	199	179	190	210	33.0	36.9	38.4	38.1	44.2	24.6	28.2	25.5	27.1	30.1	76	65	88	80	64	10.1	8.1	11.1	9.4	7.2
44	Mordovia	76	73	99	96	94	14.9	16.6	24.5	23.9	24.6	8.9	8.6	11.8	11.5	11.4	498	433	447	439	448	33.5	31.7	33.1	33.2	36.8
45	Tatarstan	387	377	359	324	322	15.9	17.3	17.7	15.8	18.3	10.3	10.0	9.5	8.6	8.5	1051	964	878	830	804	24.0	25.3	24.7	24.1	24.7
46	Udmurtia	239	253	297	299	356	15.1	16.7	20.2	21.1	27.0	15.5	16.5	19.4	19.6	23.3	2043	1293	1396	1293	1236	59.1	38.0	41.6	39.3	38.8
47	Chuvash	314	413	401	358	352	23.1	32.4	30.4	30.2	32.6	24.3	32.1	31.3	28.0	27.5	154	90	0	128	113	8.4	5.6	0.0	8.8	8.3
48	**Krai:** Permskiy	637	762	850	839	736	22.3	28.3	31.9	32.9	35.1	23.2	27.9	31.3	31.0	27.2	2135	1890	2075	2061	1974	33.5	31.5	34.7	36.4	36.4
49	**Regions:** Kirov	333	349	357	348	343	22.1	23.0	24.8	26.8	28.6	23.1	24.5	25.3	24.8	24.7	249	361	306	216	202	10.6	15.5	13.7	10.6	10.6
50	Nizhny Novgorod	808	695	898	958	1045	29.3	26.3	35.0	39.1	46.5	23.7	20.6	26.7	28.7	31.4	2627	2656	2597	2576	2494	39.7	42.4	42.4	43.3	43.3
51	Orenburg	368	437	488	597	574	18.5	22.6	25.8	32.1	33.0	17.2	20.6	23.0	28.3	27.2	1370	1406	1468	1562	1568	32.4	32.3	32.8	35.7	36.6
52	Penza	146	146	256	289	369	16.1	16.1	28.2	30.9	45.1	10.4	10.5	18.4	20.9	26.9	631	656	728	707	692	29.8	31.9	35.1	33.9	35.1
53	Samara	776	736	844	876	978	27.7	27.1	30.1	31.1	36.5	24.3	23.2	26.6	27.6	30.9	2124	1994	1780	1464	1294	38.2	38.3	35.2	31.3	28.6
54	Saratov	539	569	637	703	780	21.1	23.3	26.0	35.0	43.8	20.7	21.9	24.7	27.3	30.4	2004	1854	1708	1531	1459	36.2	36.3	35.7	36.3	36.1
55	Ulyanovsk	266	243	257	334	375	26.5	25.7	25.1	29.7	37.0	19.9	18.4	19.6	25.6	28.9	720	736	760	712	688	31.1	35.8	35.8	34.3	34.4
DISTRICT: Ural		1454	1616	1873	2061	2538	13.0	14.4	17.0	19.4	24.8	11.9	13.2	15.3	16.8	20.7	21126	12752	10970	9639	9554	75.3	46.6	40.9	37.4	37.3
56	**Regions:** Kurgan	89	79	93	259	407	8.1	7.2	7.7	21.6	32.9	9.1	8.2	9.7	27.2	43.0	823	552	963	1188	1097	30.1	19.6	32.5	42.3	39.7
57	Sverdlovsk	469	531	621	740	734	11.3	12.6	14.5	17.4	18.0	10.6	12.1	14.1	16.8	16.7	10680	3643	3967	3844	3974	100.0	33.5	36.0	36.1	37.2
58	Tyumen	587	714	832	732	973	16.9	21.1	27.0	26.8	38.0	17.7	21.3	24.7	21.5	28.4	5308	4947	2897	2716	2461	58.1	63.0	41.6	42.9	39.9
	Khanty-Mansiyskiy AD	255	287	349	396	410	18.2	21.4	27.0	34.0	40.2	17.3	19.3	23.2	26.1	26.6	1341	1296	1149	1056	949	40.1	41.9	40.3	40.8	39.2
	Yamal-Nenetskiy AD	110	113	155	189	228	22.5	25.1	31.5	36.1	41.1	20.7	21.0	28.6	34.8	41.7	708	612	639	708	679	52.7	51.0	54.1	59.5	54.8
	Tyumen region (not including ADs)	222	314	328	147	335	14.0	19.7	25.2	14.1	34.0	16.9	23.8	24.7	11.0	24.9	3259	3039	1109	952	833	73.3	85.6	37.8	37.3	33.3
59	Chelyabinsk	309	292	327	330	424	12.8	11.5	13.3	13.5	17.9	8.8	8.3	9.3	9.4	12.1	4315	3610	3143	1891	2022	78.5	62.2	53.4	31.8	33.6

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		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009[1]	2010[1]	2006	2007	2008	2009[1]	2010[1]
DISTRICT: Siberian		6644	6254	6612	7411	7997	25.8	25.4	27.0	30.3	33.6	33.8	31.9	33.8	37.9	40.9	26000	21746	19934	18678	18763	46.2	40.3	36.8	36.0	37.0
60	**Republics:** Altai	42	101	120	101	90	20.1	44.3	44.6	39.8	40.2	20.5	49.2	57.9	48.3	42.7	157	166	189	126	123	32.9	36.5	36.3	24.3	22.6
61	Buryatia	182	174	232	347	440	11.7	11.5	14.4	25.5	32.8	18.9	18.1	24.2	36.1	45.7	748	2612	734	588	529	27.0	100.0	26.7	26.1	24.2
62	Tyva	614	283	475	394	530	58.3	27.9	43.6	34.9	43.0	199.0	91.5	152.4	125.5	167.2	802	809	841	888	947	42.3	43.6	42.8	44.8	47.2
63	Khakassia	313	321	350	334	317	32.2	34.9	41.4	45.3	46.9	58.2	59.8	65.1	62.1	58.8	696	616	540	420	368	41.1	38.0	33.5	28.0	27.3
64	**Krai:** Altaiskiy	374	344	301	459	468	13.2	13.0	11.1	15.5	15.5	14.7	13.6	12.0	18.4	18.8	3349	3361	3343	3119	3065	40.9	42.9	42.9	39.4	40.9
65	Trans-Baikal	198	145	152	174	236	22.3	16.5	16.5	19.8	25.8	17.5	12.9	13.6	15.6	21.1	836	870	934	708	709	33.0	34.5	36.9	31.5	31.9
66	Krasnoyarskiy	789	823	839	998	1012	25.2	26.8	27.9	34.4	37.3	27.1	28.4	29.0	34.5	35.0	2784	2701	2692	2771	2797	39.7	38.8	37.1	40.0	41.6
67	**Regions:** Irkutsk	300	397	437	501	551	8.3	10.6	11.8	12.6	14.4	11.9	15.8	17.4	20.0	22.0	3110	3049	3137	2926	3120	37.0	35.0	36.0	35.2	35.5
68	Kemerovo	1362	1503	1434	1620	1772	30.2	36.7	36.5	41.9	45.1	48.0	53.2	50.8	57.4	62.8	3746	2974	3195	2934	3009	44.8	39.8	44.5	44.6	45.8
69	Novosibirsk	1120	1070	1250	1502	1500	30.6	30.5	36.3	43.7	47.3	42.3	40.5	47.4	56.9	56.6	3124	2132	1966	1964	1927	45.3	32.5	30.3	30.3	30.7
70	Omsk	757	570	588	606	705	36.6	30.6	30.6	29.9	37.1	37.2	28.1	29.1	30.1	35.0	6311	2125	2142	2088	2042	100.0	37.0	36.9	35.6	37.2
71	Tomsk	593	523	434	375	376	45.9	44.0	41.9	40.6	44.5	57.3	50.6	41.9	36.1	36.0	337	331	221	146	127	19.0	19.7	15.1	11.6	11.4
DISTRICT: Far-Eastern		1465	1457	1479	1868	2112	17.0	17.5	16.3	19.9	23.7	22.4	22.4	22.8	28.9	32.8	6306	9462	10015	5190	5384	35.7	55.3	55.7	28.2	29.4
72	**Republic:** Sakha (Yakutia)	210	291	337	366	419	23.2	34.6	36.7	39.7	43.9	22.1	30.6	35.4	38.5	44.1	523	478	485	416	416	28.8	28.1	28.3	26.1	25.4
73	**Krai:** Kamchatka	22	10	5	71	88	6.6	3.7	1.7	21.3	25.6	6.3	2.9	1.4	20.7	25.7	361	300	245	243	275	51.1	47.0	35.7	34.1	41.2
74	Primorskiy	571	537	489	679	620	18.0	16.4	13.2	17.4	18.3	28.3	26.8	24.5	34.2	31.3	2074	5512	6283	1620	1746	39.6	100.0	100.0	22.8	25.3
75	Khabarovskiy	145	151	194	345	586	9.8	10.9	12.3	20.4	31.5	10.3	10.7	13.8	24.6	41.8	817	804	714	680	716	25.7	25.6	22.6	22.1	22.7
76	**Regions:** Amur	338	284	245	158	96	22.7	20.7	17.8	12.3	8.4	38.4	32.5	28.2	18.3	11.2	1805	1616	1578	1636	1626	45.3	44.4	43.7	47.3	47.0
77	Magadan	19	23	30	34	38	19.2	26.7	30.6	31.5	33.6	11.1	13.6	18.1	20.9	23.6	161	119	97	85	100	47.9	46.9	39.1	34.0	40.8
78	Sakhalin	116	112	112	161	193	18.1	19.7	19.0	26.2	32.0	22.0	21.5	21.6	31.3	37.8	335	340	341	284	290	21.4	24.1	23.6	19.5	19.5
79	**A.R.:** Jewish	16	23	45	37	57	3.7	4.9	9.4	8.5	12.6	8.6	12.4	24.3	20.0	30.8	194	253	235	192	187	27.1	34.4	31.7	29.0	28.5
80	**A.D.:** Chukotskiy	28	26	22	17	15	50.0	43.3	31.4	23.9	18.8	55.4	51.5	43.8	34.3	30.9	36	40	37	34	28	35.6	42.6	37.8	31.8	22.2

[1] Data for 2009–2010 are available only for patients over 17 years of age (adults).

Table 11

TB treatment success rates in the Russian Federation, 2007–2010

№	Federal districts, constituent entities of the Russian Federation	TB treatment success rates based on the dispensary follow-up data										Effectiveness of TB chemotherapy at the TB facilities in the Russian Federation (MH&SD report), cohorts of new MbT+ pulmonary TB cases confiirmed by smear microscopy (M+)															
												2008								2009							
												number	%							number	%						
		Clinical cure of RTB						Conversion in RTB cases, %				Cohort size	Treatment success	Failed	Died			Defaulted	Transferred out	Cohort size	Treatment success	Failed	Died			Defaulted	Transferred out
		%				For new TB cases[1], %									from TB	from other causes	Total						from TB	from other causes	Total		
		2007	2008	2009	2010	2009	2010	2007	2008	2009	2010																
	RUSSIAN FEDERATION	**31.6**	**31.9**	**33.0**	**33.1**	**43.1**	**44.2**	**35.1**	**35.9**	**39.6**	**40.6**	**30104**	**57.6**	**17.3**	**8.3**	**4.2**	**12.5**	**8.9**	**3.8**	**29832**	**55.8**	**20.1**	**7.5**	**4.4**	**11.9**	**8.5**	**3.7**
	DISTRICT: Central	33.9	35.7	39.6	37.7	50.0	49.1	39.9	41.7	44.6	45.4	5935	59.2	15.5	7.9	4.3	12.2	8.2	4.9	5868	57.6	18.9	7.2	4.8	12.0	6.9	4.6
	Regions:																										
1	Belgorod	71.9	63.4	70.3	60.7	79.4	76.1	60.8	59.3	61.5	50.3	279	72.8	15.1	2.9	5.0	7.9	1.1	3.2	242	73.6	14.8	1.7	3.7	5.4	3.3	2.9
2	Bryansk	29.3	27.6	65.9	58.7	66.4	68.6	43.3	47.3	62.7	60.7	368	48.1	17.1	11.1	1.9	13.0	20.9	0.8	349	56.7	20.0	8.3	2.9	11.2	9.7	2.3
3	Vladimir	38.3	43.2	38.0	40.8	49.0	49.0	46.4	44.6	42.0	52.4	386	63.7	14.8	8.0	4.4	12.4	7.0	2.1	380	52.1	25.3	9.5	4.7	14.2	6.6	1.8
4	Voronezh	33.3	44.0	41.1	40.0	58.0	59.6	35.4	42.8	38.1	40.3	333	56.2	24.9	7.5	6.3	13.8	3.6	1.5	274	52.6	28.1	7.3	4.7	12.0	5.5	1.8
5	Ivanovo	50.4	41.8	48.9	58.5	56.9	59.1	52.7	51.2	57.2	66.4	212	67.9	9.5	9.4	5.2	14.6	6.6	1.4	190	60.5	20.5	8.4	7.4	15.8	1.6	1.6
6	Kaluga	43.0	33.4	41.5	39.8	56.0	57.1	39.2	48.9	39.9	57.5	224	58.0	11.1	9.4	6.7	16.1	10.3	4.5	248	62.9	11.7	8.5	4.0	12.5	4.8	8.1
7	Kostroma	45.4	46.9	45.4	68.9	58.3	62.1	55.1	52.8	63.9	65.9	71	53.5	18.3	8.5	2.8	11.3	16.9	0.0	91	60.4	11.0	9.9	9.9	19.8	7.7	1.1
8	Kursk	23.4	26.2	31.2	32.4	40.1	39.6	35.6	35.5	41.5	31.6	249	58.6	12.8	6.8	2.4	9.2	16.5	2.8	288	43.8	25.7	5.9	4.5	10.4	17.0	3.1
9	Lipetsk	43.2	37.7	51.0	55.8	69.6	76.9	50.8	48.9	58.5	60.0	105	65.7	10.5	8.6	1.9	10.5	8.6	4.8	91	60.4	18.7	4.4	7.7	12.1	6.6	2.2
10	Moscow	25.7	28.4	28.2	25.4	36.4	32.2	30.9	32.1	34.6	33.2	828	56.3	15.3	10.5	5.2	15.7	5.9	6.8	959	59.4	14.6	9.3	6.4	15.7	4.1	6.3
11	Orel	43.6	50.0	53.7	44.2	44.5	37.9	103.9	109.0	78.6	98.8	196	81.1	8.2	3.6	5.6	9.2	1.5	0.0	174	84.5	8.6	4.6	1.1	5.7	1.1	0.0
12	Ryazan	29.0	36.2	40.0	38.8	49.2	52.4	18.2	28.5	34.0	47.7	257	43.6	28.0	7.8	4.3	12.1	13.2	3.1	202	42.1	30.2	7.4	7.4	14.8	9.4	3.5
13	Smolensk	25.9	28.1	28.1	26.4	36.8	35.5	23.5	22.3	18.8	20.5	142	56.3	12.7	13.4	4.9	18.3	11.3	1.4	143	37.8	33.6	8.4	4.2	12.6	11.9	4.2
14	Tambov	40.1	43.7	44.8	44.3	52.3	58.2	42.1	40.6	42.0	42.0	228	63.6	18.0	7.0	3.9	10.9	4.8	2.6	257	52.9	22.6	8.6	5.8	14.4	8.6	1.6
15	Tver	32.6	31.3	33.5	28.6	41.4	36.9	42.9	33.0	40.6	36.6	381	58.3	8.7	10.0	8.4	18.4	11.8	2.9	305	59.7	14.1	11.5	5.2	16.7	6.9	2.6
16	Tula	34.1	33.2	31.6	31.3	49.6	46.0	45.3	43.3	48.4	44.1	331	47.1	23.3	13.3	1.8	15.1	13.3	1.2	320	47.8	26.3	6.9	2.2	9.1	15.3	1.6
17	Yaroslavl	32.3	30.5	29.1	29.9	39.6	36.8	29.1	29.0	36.2	32.9	135	66.7	12.6	6.7	1.5	8.2	11.9	0.7	126	54.0	13.4	8.7	2.4	11.1	19.0	2.4
18	**City:** Moscow	37.1	41.2	44.1	42.4	49.8	49.2	41.0	47.0	51.3	53.8	1210	61.6	14.0	4.4	3.3	7.7	4.0	12.6	1229	61.8	15.9	4.2	4.4	8.6	4.2	9.5
	DISTRICT: Northwestern	32.0	33.8	34.0	38.1	39.1	49.8	37.1	36.8	40.6	42.3	2347	56.2	18.7	11.2	5.2	16.4	6.6	2.1	2211	54.0	21.6	10.1	4.4	14.5	7.8	2.1
19	**Republics:** Kareliya	30.1	28.5	27.6	28.6	25.8	27.5	33.8	33.5	34.3	27.5	142	43.0	23.9	15.5	5.6	21.1	9.9	2.1	126	42.1	27.0	10.3	5.6	15.9	12.7	2.4
20	Komi	32.8	33.9	33.2	36.1	38.2	36.6	34.9	32.6	35.3	34.9	296	53.0	24.0	8.8	2.4	11.2	9.8	2.0	224	46.4	29.5	10.7	2.2	12.9	10.3	0.9
21	**Regions:** Arkhangelsk	46.5	53.4	51.0	67.3	52.5	59.3	58.5	54.0	65.1	76.3	218	51.4	27.5	11.5	3.7	15.2	2.8	3.2	233	55.8	26.2	10.3	2.6	12.9	4.7	0.4
22	Vologda	30.8	30.0	36.8	37.9	36.0	42.5	26.5	24.8	27.6	29.4	154	61.0	3.9	14.9	7.1	22.0	10.4	2.6	141	55.3	7.1	19.1	4.3	23.4	10.6	3.5
23	Kaliningrad	35.5	38.4	40.0	47.2	48.6	54.4	27.9	26.4	32.2	33.7	378	50.3	32.3	5.6	6.9	12.5	4.0	1.1	333	55.6	26.4	6.9	5.1	12.0	3.9	2.1
24	Leningrad	39.1	37.5	34.8	35.7	45.7	47.4	43.4	42.6	47.8	44.9	288	57.6	10.1	18.8	5.2	24.0	6.6	1.7	271	48.0	14.4	13.7	7.7	21.4	11.4	4.8
25	Murmansk	18.2	26.0	25.7	26.3	28.9	25.9	16.4	22.0	27.5	26.6	94	26.6	30.8	13.8	5.3	19.1	21.3	2.1	125	32.0	37.6	14.4	1.6	16.0	13.6	0.8
26	Novgorod	25.6	37.0	39.1	45.9	43.3	60.7	48.0	53.6	48.6	51.7	141	63.8	17.0	9.9	4.3	14.2	4.3	0.7	94	67.0	21.3	2.1	3.2	5.3	6.4	–

№	Federal districts, constituent entities of the Russian Federation	TB treatment success rates based on the dispensary follow-up data										**Effectiveness of TB chemotherapy at the TB facilities in the Russian Federation (MH&SD report)**, cohorts of new MbT+ pulmonary TB cases confiirmed by smear microscopy (M+)															
												2008								2009							
		Clinical cure of RTB						Conversion in RTB cases, %				number	%							number	%						
		%				For new TB cases[1], %						Cohort size	Treatment success	Failed	Died			Defaulted	Transferred out	Cohort size	Treatment success	Failed	Died			Defaulted	Transferred out
		2007	2008	2009	2010	2009	2010	2007	2008	2009	2010				from TB	from other causes	Total						from TB	from other causes	Total		
27	Pskov	26.4	31.8	25.8	37.3	33.4	41.9	49.2	47.6	49.5	50.8	234	49.6	21.4	14.5	2.6	17.1	10.7	1.3	204	51.0	20.1	10.3	3.4	13.7	13.7	1.5
28	**City:** St. Petersburg	29.6	28.7	30.8	33.6	31.8	62.6	37.4	39.7	43.3	49.0	402	76.4	3.2	8.0	7.2	15.2	1.5	3.7	455	66.8	15.6	7.3	5.1	12.4	2.9	2.4
DISTRICT: Southern		26.8	27.6	64.6	31.9	49.8	48.9	34.1	35.9	42.6	41.2	2532	63.5	16.5	5.9	3.3	9.2	6.4	4.4	2549	60.0	19.9	4.7	3.8	8.5	6.7	4.7
29	**Republics:** Adygeya	38.7	31.9	47.9	35.3	64.5	52.0	29.8	23.5	36.9	26.1	118	60.2	14.4	12.7	2.5	15.2	5.9	4.2	92	44.6	22.8	12.0	5.4	17.4	5.4	9.8
30	Kalmykiya	47.6	50.7	40.4	39.5	73.0	67.9	46.4	40.5	46.2	40.3	75	57.3	30.7	5.3	1.3	6.6	4.0	1.3	73	54.8	27.4	4.1	2.7	6.8	11.0	0.0
31	**Krai:** Krasnodarsky	29.7	31.7	35.0	34.3	60.1	57.8	29.0	32.0	45.3	41.7	827	57.8	19.1	4.1	3.3	7.4	10.6	5.1	891	49.4	25.8	4.2	5.2	9.4	9.4	6.1
32	**Regions:** Astrakhan	33.2	37.4	35.4	36.5	64.9	65.2	39.8	39.2	43.7	44.3	210	72.9	11.4	1.4	3.3	4.7	4.8	6.2	219	78.1	10.1	1.4	3.7	5.1	1.4	5.5
33	Volgograd	27.1	31.5	32.7	34.4	51.1	51.6	36.5	42.3	41.3	47.8	647	71.4	11.3	6.3	2.6	8.9	4.5	3.9	671	68.0	14.0	5.5	2.2	7.7	6.7	3.6
34	Rostov	25.7	24.7	25.9	26.9	30.3	31.2	37.6	35.6	37.1	37.2	655	61.1	18.6	7.9	4.4	12.3	4.0	4.0	603	63.2	20.1	5.0	3.6	8.6	4.5	3.6
DISTRICT: North-Caucasian				45.6	24.7	27.6	18.4			40.9	40.2	1866	71.7	13.8	3.8	2.3	6.1	5.2	3.3	1751	69.7	15.1	3.1	3.0	6.1	4.3	4.9
35	**Republics:** Dagestan	35.1	33.6	29.7	32.2	28.0	9.9	46.2	56.5	44.0	52.1	676	78.7	14.6	1.8	1.3	3.1	2.1	1.5	619	80.5	12.6	1.9	2.1	4.0	1.0	1.9
36	Ingushetia	16.1	15.5	14.6	16.3	43.0	43.1	40.1	39.7	34.2	30.6	67	67.2	16.4	6.0	1.5	7.5	4.5	4.5	60	66.7	13.3	8.3	0.0	8.3	3.3	8.3
37	Kabardino-Balkaria	21.4	20.2	21.5	15.7	35.0	21.1	42.6	26.4	38.7	21.0	149	59.7	16.1	2.7	1.3	4.0	14.8	5.4	114	57.9	21.1	0.9	1.8	2.7	14.9	3.5
38	Karachai-Cherkes	12.7	15.5	25.1	19.8	31.0	16.9	32.4	37.9	44.3	40.0	27	48.1	37.0	0.0	0.0	0.0	11.1	3.7	18	77.8	22.2	0.0	0.0	0.0	0.0	0.0
39	North Ossetia – Alania	21.4	23.7	26.5	32.0	51.4	43.3	28.0	34.1	34.3	38.1	134	58.2	21.6	6.0	4.5	10.5	4.5	5.2	129	59.7	17.8	3.1	5.4	8.5	3.9	10.1
40	Chechnya	17.7	18.1	18.8	23.3	34.0	23.8	13.2	16.3	27.2	28.0	350	72.6	10.6	4.3	2.9	7.2	5.7	4.0	335	60.3	17.6	3.3	4.8	8.1	6.3	7.8
41	**Krai:** Stavropolskiy	20.7	21.2	19.8	22.7	12.6	12.6	36.1	39.9	48.0	47.3	463	70.4	10.1	6.0	3.0	9.0	6.3	4.1	476	67.9	14.1	4.6	2.9	7.5	5.3	5.3
DISTRICT: Privolzhskiy		32.4	32.9	35.1	34.5	44.4	45.2	34.9	36.0	40.9	43.0	5336	61.0	15.9	7.3	4.6	11.9	8.5	2.6	5483	59.2	19.0	7.1	4.7	11.8	7.8	2.3
42	**Republics:** Bashkortostan	39.7	44.7	42.0	42.0	65.3	65.3	37.9	38.7	39.5	39.5	448	62.9	16.2	6.5	4.7	11.2	7.8	1.8	350	62.9	16.3	8.0	6.0	14.0	5.7	1.1
43	Mari El	54.0	57.5	53.3	48.5	58.6	55.5	58.7	68.3	62.0	68.8	202	64.9	13.9	7.4	6.4	13.8	3.5	4.0	212	64.2	17.0	5.7	6.1	11.8	4.7	2.4
44	Mordovia	38.5	33.8	31.8	32.5	40.2	41.4	51.1	54.9	51.4	47.4	95	71.6	9.5	4.2	9.5	13.7	2.1	3.2	114	67.5	17.5	7.9	2.6	10.5	2.6	1.8
45	Tatarstan	49.6	46.8	46.5	47.4	63.8	62.1	42.1	40.2	40.1	46.8	462	68.8	11.7	6.7	5.2	11.9	5.0	2.6	541	70.1	9.9	4.6	5.2	9.8	7.2	3.0
46	Udmurtia	20.1	23.4	20.0	20.5	21.3	18.0	26.2	28.8	25.7	27.1	315	44.8	16.8	9.2	6.3	15.5	18.4	4.4	306	39.9	23.6	13.1	4.2	17.3	15.7	3.6
47	Chuvash	55.9	49.7	61.6	60.1	71.9	71.0	49.7	44.0	57.5	55.3	474	70.7	15.4	4.4	3.4	7.8	5.3	0.8	433	69.3	17.3	5.3	1.4	6.7	6.2	0.5
48	**Krai:** Permskiy	30.5	31.3	33.2	32.7	37.4	37.8	38.4	38.9	43.6	49.5	593	74.2	10.3	7.1	2.5	9.6	3.2	2.7	581	72.5	10.5	9.8	2.8	12.6	2.6	1.9
49	**Regions:** Kirov	22.0	27.7	28.4	29.3	9.3	7.5	23.7	29.6	33.9	30.6	209	53.1	18.1	11.5	3.3	14.8	11.5	2.4	224	36.2	24.1	9.8	4.9	14.7	22.8	2.2
50	Nizhny Novgorod	21.7	21.2	22.5	22.4	20.8	17.4	29.0	32.5	38.8	41.5	636	55.5	18.0	9.3	3.6	12.9	10.8	2.8	653	55.3	19.7	8.1	4.1	12.2	10.7	2.0
51	Orenburg	30.9	33.3	34.1	33.4	46.4	46.9	39.7	42.5	40.5	43.2	388	58.2	15.0	6.4	6.2	12.6	10.8	3.4	340	51.8	25.0	4.7	7.4	12.1	9.7	1.5
52	Penza	32.4	30.3	32.8	35.1	42.9	39.1	45.4	49.9	53.6	58.9	306	64.7	15.1	6.2	4.2	10.4	8.8	1.0	277	66.8	15.9	7.2	2.2	9.4	6.9	1.1
53	Samara	33.4	34.6	41.2	37.7	47.5	50.3	32.2	33.3	38.7	40.9	513	65.7	11.1	7.4	7.4	14.8	4.3	4.1	716	61.6	22.4	5.4	7.3	12.7	1.5	1.8
54	Saratov	25.7	27.9	37.5	35.0	44.2	48.8	20.8	21.1	43.2	40.7	403	49.9	22.4	4.2	5.5	9.7	15.1	3.0	462	55.4	20.5	3.2	6.9	10.1	9.1	4.8
55	Ulyanovsk	39.3	29.3	34.1	34.6	50.2	70.9	32.1	26.1	30.6	36.1	292	39.0	33.2	12.0	0.7	12.7	13.7	1.4	274	33.6	35.8	10.9	1.5	12.4	13.9	4.4

№	Federal districts, constituent entities of the Russian Federation	TB treatment success rates based on the dispensary follow-up data										Effectiveness of TB chemotherapy at the TB facilities in the Russian Federation (MH&SD report), cohorts of new MbT+ pulmonary TB cases confiirmed by smear microscopy (M+)															
												2008								2009							
												number	%							number	%						
		Clinical cure of RTB						Conversion in RTB cases, %				Cohort size	Treatment success	Failed	Died			Defaulted	Transferred out	Cohort size	Treatment success	Failed	Died			Defaulted	Transferred out
		%				For new TB cases[1], %									from TB	from other causes	Total						from TB	from other causes	Total		
		2007	2008	2009	2010	2009	2010	2007	2008	2009	2010																
DISTRICT: Ural		30.8	31.4	30.1	30.0	35.2	36.5	33.6	37.1	40.9	39.9	2791	56.8	16.8	8.6	5.1	13.7	7.1	5.6	2632	56.7	16.3	8.5	6.0	14.5	6.4	6.1
56	**Regions:** Kurgan	27.4	25.2	27.4	26.5	42.7	37.6	35.2	27.4	34.1	34.6	267	49.4	20.6	12.0	3.0	15.0	8.6	6.4	300	59.3	22.4	10.3	1.0	11.3	1.7	5.3
57	Sverdlovsk	25.5	26.9	26.7	26.4	25.4	30.2	36.3	37.4	38.9	39.4	1119	60.8	13.5	9.0	6.0	15.0	6.1	4.6	945	60.4	13.1	8.8	7.2	16.0	6.6	3.9
58	Tyumen	40.6	42.5	39.9	39.5	51.6	50.6	30.3	40.4	49.7	46.2																
	Khanty-Mansiyskiy AD	36.0	38.6	39.5	38.3	49.3	52.5	34.7	36.5	38.2	39.6	291	51.9	15.5	8.6	6.9	15.5	7.9	9.3	266	53.0	15.4	9.4	5.3	14.7	8.3	8.6
	Yamal-Nenetskiy AD	28.8	27.1	21.6	20.8	30.2	23.4	27.1	27.6	28.0	20.0	87	54.0	27.5	5.7	1.1	6.8	9.2	2.3	96	53.1	30.2	2.1	2.1	4.2	10.4	2.1
	Tyumen region (not including ADs)	48.1	51.8	48.3	49.8	59.4	56.8	27.4	48.2	71.3	67.1	292	65.4	17.1	3.8	5.8	9.6	4.5	3.4	359	60.2	16.1	4.2	7.2	11.4	5.3	7.0
59	Chelyabinsk	27.8	28.9	26.6	28.0	29.2	29.7	33.1	37.0	37.2	36.4	735	52.2	19.6	9.1	3.8	12.9	8.6	6.7	666	50.5	16.8	10.1	6.6	16.7	7.5	8.6
DISTRICT: Siberian		32.9	31.6	33.2	32.7	42.5	45.4	33.9	34.0	36.7	36.6	6836	52.4	18.5	10.2	3.8	14.0	11.2	3.8	6757	49.4	22.3	9.2	4.3	13.5	11.6	3.3
60	**Republics:** Altai	47.2	28.9	32.2	28.4	40.4	34.4	34.8	24.1	38.2	46.4	51	45.1	27.5	17.6	2.0	19.6	5.9	2.0	31	48.4	38.7	12.9	0.0	12.9	0.0	0.0
61	Buryatia	50.5	41.0	48.2	48.6	62.7	65.0	36.1	33.2	40.2	39.7	414	56.3	18.8	6.5	3.1	9.6	14.3	1.0	384	56.0	17.5	4.9	4.2	9.1	16.7	0.8
62	Tyva	23.9	24.8	24.6	28.0	32.3	31.4	27.5	25.5	27.2	26.1	167	25.7	34.8	12.0	3.6	15.6	23.4	0.6	148	29.1	48.0	4.1	2.0	6.1	16.2	0.7
63	Khakassia	29.3	27.3	34.9	38.5	33.2	41.2	31.8	33.8	45.6	42.7	184	50.0	27.7	8.7	1.6	10.3	10.9	1.1	168	61.3	19.6	7.7	3.0	10.7	6.5	1.8
64	**Krai:** Altaiskiy	31.5	29.2	25.9	27.8	46.0	49.2	26.8	24.8	26.2	24.7	682	47.9	17.1	14.5	3.2	17.7	12.3	4.8	777	50.8	15.8	10.4	3.9	14.3	14.9	4.1
65	Trans-Baikal	30.1	36.7	43.5	33.5	48.1	45.5	35.2	38.8	53.4	42.8	366	69.4	11.8	7.4	3.8	11.2	4.9	2.7	358	66.5	17.4	7.0	3.6	10.6	2.8	2.8
66	Krasnoyarskiy	24.5	20.4	26.4	28.4	21.6	28.4	35.0	32.5	36.5	39.6	797	53.7	14.2	10.2	1.9	12.1	16.6	3.5	722	49.3	19.4	8.2	4.0	12.2	15.5	3.6
67	**Regions:** Irkutsk	21.1	26.7	29.2	22.2	27.7	28.7	24.3	30.7	30.9	30.6	948	51.2	15.0	11.2	5.8	17.0	13.6	3.3	925	39.9	19.0	14.7	6.9	21.6	16.4	3.0
68	Kemerovo	42.5	40.6	44.8	39.3	57.8	55.7	41.0	40.6	41.9	39.8	1204	46.2	26.6	12.0	5.2	17.2	6.6	3.5	1251	41.8	34.1	9.7	4.6	14.3	7.0	2.8
69	Novosibirsk	40.3	38.5	35.1	41.0	49.5	53.6	33.4	32.9	33.8	37.2	930	56.2	18.1	7.5	3.1	10.6	7.4	7.5	872	51.9	24.6	9.6	2.9	12.5	7.2	3.8
70	Omsk	30.4	24.9	24.4	28.9	38.9	42.5	38.0	34.9	37.3	42.2	755	49.3	15.9	10.1	4.1	14.2	16.3	4.4	795	51.7	16.1	6.3	3.3	9.6	16.6	6.0
71	Tomsk	54.3	65.8	70.6	71.7	40.6	58.3	49.4	57.5	60.8	59.8	338	73.4	10.4	6.5	3.3	9.8	4.1	2.4	326	66.9	17.5	6.4	6.1	12.5	2.8	0.3
DISTRICT: Far-Eastern		34.3	30.8	28.4	30.8	41.5	43.5	29.2	25.1	28.5	35.4	2461	46.5	23.9	8.4	3.9	12.3	14.9	2.4	2586	48.1	25.3	7.1	3.6	10.7	13.5	2.5
72	**Republic:** Sakha (Yakutia)	38.0	36.5	40.5	34.6	40.4	33.3	41.6	36.9	40.8	35.7	204	57.4	29.9	4.4	1.5	5.9	4.9	2.0	237	57.8	24.9	4.6	3.0	7.6	5.5	4.2
73	**Krai:** Kamchatka	33.9	25.4	22.0	30.5	30.7	41.6	28.8	22.1	21.2	26.3	98	34.7	30.6	10.2	8.2	18.4	14.3	2.0	83	36.1	32.5	7.2	4.8	12.0	18.1	1.2
74	Primorskiy	39.2	30.0	23.2	33.8	41.3	44.8	26.5	18.7	24.7	41.9	1075	48.2	19.7	8.4	3.7	12.1	16.6	3.4	1156	55.3	17.2	6.0	4.6	10.6	14.1	2.9
75	Khabarovskiy	40.5	39.7	38.8	35.2	50.0	53.8	31.4	29.3	31.2	29.6	530	44.9	23.1	11.1	1.7	12.8	18.1	1.1	561	41.0	27.8	10.7	1.6	12.3	16.4	2.5
76	**Regions:** Amur	24.7	24.8	25.4	23.0	39.5	37.3	22.5	22.4	21.3	26.3	248	24.6	39.9	6.0	7.3	13.3	21.0	1.2	233	21.5	48.1	6.0	2.6	8.6	20.6	1.3
77	Magadan	51.9	39.0	27.7	27.4	40.2	38.4	56.2	52.2	42.7	45.2	30	26.7	23.3	13.3	10.0	23.3	20.0	6.7	25	28.0	32.0	4.0	4.0	8.0	32.0	0.0
78	Sakhalin	22.2	23.2	20.0	18.1	21.0	20.9	38.7	37.8	38.0	39.9	183	63.4	19.1	6.6	5.5	12.1	2.2	3.3	194	56.2	34.0	7.2	2.1	9.3	0.0	0.5
79	**A.R.:** Jewish	30.3	31.7	42.1	40.6	50.9	56.3	21.1	26.6	34.9	29.2	85	51.8	24.7	9.4	5.9	15.3	8.2	0.0	88	44.3	28.4	8.0	8.0	16.0	10.2	1.1
80	**A.D.:** Chukotskiy	29.7	36.5	22.0	25.7	32.5	17.9	25.9	26.2	34.0	29.1	8	100.0	0.0	0.0	0.0	0.0	0.0	0.0	9	33.3	33.3	11.1	11.1	22.2	0.0	11.1

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[1] Among registered in the previous year.

Table 12

TB detection in the Russian Federation, 2006–2010

№	Federal districts, constituent entities of the Russian Federation	Population coverage by screening Form No. 30 % of mid-year population				Proportion of TB patients detected by screening of all new and post-mortem cases % (Form No. 33)				
		2007	2008	2009	2010	2006	2007	2008	2009	2010
	RUSSIAN FEDERATION	**63.2**	**61.4**	**62.5**	**63.8**	**54.7**	**56.0**	**57.8**	**61.5**	**58.7**
	DISTRICT: Central	51.6	54.7	56.4	57.9	44.0	46.7	52.1	56.8	55.0
1	**Regions:** Belgorod	64.4	72.1	69.8	68.1	57.4	62.9	66.4	67.1	65.3
2	Bryansk	49.3	52.7	55.2	53.6	36.0	40.5	40.5	48.7	49.1
3	Vladimir	48.0	48.3	48.0	46.5	41.1	42.2	53.6	50.0	52.7
4	Voronezh	67.8	73.2	89.9	92.4	65.8	69.5	71.6	70.9	70.7
5	Ivanovo	63.9	66.8	65.0	72.7	44.4	44.8	44.7	59.4	54.0
6	Kaluga	44.9	46.6	44.6	44.4	39.0	49.7	55.7	54.6	50.7
7	Kostroma	52.8	53.8	54.0	55.8	39.0	46.3	46.9	57.9	58.9
8	Kursk	54.8	56.5	53.1	61.0	47.4	50.5	58.3	57.5	59.2
9	Lipetsk	85.2	87.7	88.6	88.4	61.1	68.3	75.5	73.0	75.0
10	Moscow	41.1	44.6	40.0	42.0	35.6	34.1	40.4	47.1	42.9
11	Orel	56.0	58.5	57.9	58.0	39.9	42.8	52.8	59.1	52.9
12	Ryazan	63.2	65.5	68.3	69.7	55.7	57.6	57.5	63.3	61.4
13	Smolensk	49.0	52.7	55.7	67.1	36.9	37.4	40.5	45.6	44.2
14	Tambov	59.6	63.3	65.6	69.6	58.1	53.6	65.7	65.7	63.1
15	Tver	59.7	59.4	54.9	57.2	38.9	43.9	43.1	43.0	47.7
16	Tula	53.7	54.6	54.2	50.8	46.4	40.3	45.9	54.5	41.2
17	Yaroslavl	51.0	59.1	62.0	60.4	41.9	42.0	48.0	56.8	55.5
18	**City:** Moscow	45.1	48.3	53.7	55.0	38.0	46.5	53.9	63.2	63.4
	DISTRICT: Northwestern	55.1	56.4	56.3	55.0	46.9	45.9	49.3	57.6	50.8
19	**Republics:** Kareliya	51.5	52.9	50.0	44.0	40.6	46.5	47.0	44.0	47.1
20	Komi	70.5	73.0	73.2	75.7	39.5	45.9	49.3	56.1	49.6
21	**Regions:** Arkhangelsk	51.7	50.2	50.9	46.0	35.7	40.0	44.3	47.0	47.7
22	Vologda	63.1	67.4	69.6	68.6	49.3	50.8	55.4	58.5	57.6
23	Kaliningrad	51.8	53.5	56.2	49.6	58.5	49.9	55.4	59.7	54.1
24	Leningrad	51.5	54.1	52.4	51.7	47.3	40.9	44.9	48.1	43.8
25	Murmansk	49.3	49.8	50.5	51.1	39.9	45.0	46.3	46.2	49.2
26	Novgorod	65.6	69.2	71.4	64.4	48.9	48.2	62.3		60.8
27	Pskov	55.7	59.8	58.2	57.1	42.9	42.7	51.8	52.1	47.3
28	**City:** St. Petersburg	52.5	52.5	51.7	52.6	49.9	47.4	46.1	64.5	49.5
	DISTRICT: Southern	57.3	60.3	62.6	64.4	50.6	52.3	57.0	63.9	63.4
29	**Republics:** Adygeya	52.6	53.1	54.3	51.9	42.5	38.1	44.3	45.4	45.6
30	Kalmykiya	65.3	54.7	66.4	64.8	47.7	52.4	42.7	61.0	55.6
31	**Krai:** Krasnodarsky	62.6	64.1	65.5	66.4	48.4	52.6	57.2	55.0	55.5
32	**Regions:** Astrakhan	50.3	54.6	59.8	56.2	52.5	53.8	64.5	65.3	60.6
33	Volgograd	56.9	60.4	69.2	68.9	52.8	58.3	61.5	64.0	64.7
34	Rostov	53.5	52.9	56.4	62.4	68.5	68.8	74.9	75.3	75.4
	DISTRICT: North-Caucasian			64.3	65.4				49.5	43.8
35	**Republics:** Dagestan	71.5	77.7	72.9	78.5	41.8	41.8	47.9	46.6	41.7
36	Ingushetia	39.5	47.8	56.5	68.7	28.6	32.5	43.3	44.0	47.2
37	Kabardino-Balkaria	37.2	69.5	54.4	50.1	28.4	38.1	65.4	45.2	49.4
38	Karachai-Cherkes	53.5	63.1	53.1	51.1	46.4	46.7	46.1	46.6	47.4
39	North Ossetia – Alania	59.8	17.5	72.2	68.1	85.1	81.7	10.9	0.0	55.5
40	Chechnya	15.8	53.6	37.1	34.9	10.3	7.8	48.9	12.8	12.5
41	**Krai:** Stavropolskiy	70.1	73.9	72.8	72.4	52.4	52.9	59.2	63.2	61.0
	DISTRICT: Privolzhskiy	62.6	65.8	67.2	68.3	54.8	55.8	61.0	66.1	62.5
42	**Republics:** Bashkortostan	59.8	67.5	70.5	68.9	53.7	54.7	58.5	59.0	60.8
43	Mari El	64.6	66.6	65.4	65.6	45.4	56.1	54.7	61.9	62.5
44	Mordovia	73.3	76.3	73.0	76.2	56.9	61.8	67.2	70.5	65.1
45	Tatarstan	58.9	57.6	60.4	64.1	55.9	55.3	61.5	64.6	61.1
46	Udmurtia	66.9	69.6	68.4	64.5	50.2	48.8	58.2	59.5	55.9
47	Chuvash	60.6	63.3	68.5	68.5	47.4	48.0	54.7		60.0
48	**Krai:** Permskiy	0.0	70.5	71.2	69.9	53.5	56.1	62.3	62.4	61.2
49	**Regions:** Kirov	61.7	66.1	65.9	66.8	56.5	56.4	57.7	64.6	57.4
50	Nizhny Novgorod	48.5	50.9	53.6	55.3	48.0	48.1	54.7	61.2	60.3
51	Orenburg	66.8	73.0	73.8	73.6	58.0	58.7	65.4	68.5	68.4

№	Federal districts, constituent entities of the Russian Federation	Population coverage by screening Form No. 30 % of mid-year population				Proportion of TB patients detected by screening of all new and post-mortem cases % (Form No. 33)				
		2007	2008	2009	2010	2006	2007	2008	2009	2010
52	Penza	137.3	61.7	64.0	65.2	53.1	60.7	62.5	67.6	67.4
53	Samara	71.4	71.4	72.5	74.5	61.3	61.0	64.1	68.6	64.5
54	Saratov	65.8	71.1	72.0	78.0	68.5	67.6	72.2	72.5	72.5
55	Ulyanovsk	68.0	71.4	68.3	72.3	45.2	45.2	50.6	52.6	51.1
DISTRICT: Ural		66.7	67.7	68.2	70.1	54.4	54.6	60.1	61.8	60.5
56	**Regions:** Kurgan	58.9	60.4	70.1	71.7	54.2	58.5	59.1	59.4	50.1
57	Sverdlovsk	61.2	63.3	64.0	67.6	49.8	51.5	59.0	60.4	59.8
58	Tyumen	78.0	78.6	77.7	79.3	60.4	54.3	60.4	63.5	64.1
	Khanty-Mansiyskiy AD	80.0	78.7	77.8	78.0	66.3	62.8	68.0	64.1	65.7
	Yamal-Nenetskiy AD	88.3	85.7	84.5	83.9	57.0	56.2	60.3	66.4	70.4
	Tyumen region (not including ADs)				78.9					61.2
59	Chelyabinsk	65.0	64.8	63.8	63.8	53.2	58.1	61.9	63.2	62.4
DISTRICT: Siberian		61.0	65.9	65.8	68.2	50.8	53.4	60.8	63.3	59.9
60	**Republics:** Altai	71.9	75.8	73.0	84.5	52.3	0.0	57.4	75.4	68.5
61	Buryatia	61.3	60.5	58.4	59.6	54.9	56.7	62.7	76.1	63.6
62	Tyva	87.7	87.1	76.2	86.8	57.9	57.1	65.4	100.0	58.4
63	Khakassia	63.3	56.4	52.0	53.5	38.3	49.3	54.8	63.5	57.7
64	**Krai:** Altaiskiy	57.8	63.6	64.2	65.8	54.3	55.0	61.5	63.2	61.3
65	Trans-Baikal	72.9	82.0	79.1	78.6	59.3	62.4	69.3	70.7	71.9
66	Krasnoyarskiy	47.2	54.4	52.5	56.0	46.9	57.3	68.9	57.5	56.6
67	**Regions:** Irkutsk	59.2	62.8	64.5	69.7	39.0	45.5	54.7	50.2	50.0
68	Kemerovo	63.7	70.8	70.9	73.1	44.6	46.5	53.3	59.2	56.5
69	Novosibirsk	63.0	68.8	69.9	69.3	57.5	58.4	63.1	65.6	64.6
70	Omsk	76.7	78.3	79.9	83.8	62.0	62.2	66.9	70.2	69.5
71	Tomsk	44.9	50.6	52.2	52.7	52.0	52.5	53.4	61.0	61.9
DISTRICT: Far-Eastern		62.6	67.2	63.9	65.0	53.3	53.9	60.2	64.1	63.3
72	**Republic:** Sakha (Yakutia)	69.8	69.0	69.2	70.3	46.3	56.6	56.8	61.4	65.5
73	**Krai:** Kamchatka	47.1	50.2	48.5	44.9	54.1	57.0	56.5	77.4	64.6
74	Primorskiy	55.0	64.6	53.7	54.1	46.5	48.5	55.5	58.8	58.8
75	Khabarovskiy	70.1	74.0	71.4	69.5	64.7	61.9	66.3	70.8	71.0
76	**Regions:** Amur	65.5	69.1	72.9	82.7	66.3	63.1	71.0	68.4	70.8
77	Magadan	67.7	68.1	71.1	72.7	58.4	46.4	64.6	71.2	68.7
78	Sakhalin	60.1	63.4	64.9	66.0	41.7	41.5	53.5	63.4	52.9
79	**A.R.:** Jewish	60.9	61.7	62.6	60.3	45.4	49.5	58.7	63.0	58.0
80	**A.D.:** Chukotskiy	92.6	87.2	86.0	86.4	68.8	51.7	48.8	56.8	57.7

Table 13

TB/HIV co-infection in the Russian Federation, 2007–2010

№	Federal districts, constituent entities of the Russian Federation	Registered HIV+TB cases (Form No. 61)				Proportion of HIV+ TB patient among all TB patients (Form No. 61, Form No. 33)				New HIV+TB cases (Form No. 61)							
										notified number				per 100,000 population			
		2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
RUSSIAN FEDERATION		**14293**	**16813**	**20755**	**24963**	**3.1**	**3.8**	**4.6**	**6.0**	**5985**	**7387**	**9253**	**10617**	**4.2**	**5.2**	**6.5**	**7.5**
DISTRICT: Central		2061	2020	2520	3035	2.8	2.4	3.0	4.6	923	1070	1230	1519	2.5	2.9	3.3	4.1
1	**Regions:** Belgorod	14	19	42	28	0.6	0.8	2.5	2.4	11	10	25	15	0.7	0.7	1.6	1.0
2	Bryansk	63	48	54	81	1.1	0.9	0.6	2.3	37	21	26	55	2.8	1.6	2.0	4.3
3	Vladimir	63	109	147	123	0.8	2.9	3.1	4.3	41	33	68	65	2.8	2.3	4.7	4.5
4	Voronezh	36	38	40	57	0.6	0.8	0.7	1.1	7	18	17	27	0.3	0.8	0.8	1.2
5	Ivanovo	64	90	152	163	3.8	5.2	7.1	6.6	44	66	94	78	4.1	6.1	8.8	7.3
6	Kaluga	56	45	61	65	2.3	1.7	4.5	3.6	25	20	25	26	2.5	2.0	2.5	2.6
7	Kostroma	24	31	33	48	2.9	3.4	2.9	5.6	11	10	14	23	1.6	1.4	2.0	3.3
8	Kursk	17	15	22	34	0.4	0.3	0.8	1.1	13	12	11	17	1.1	1.0	1.0	1.5
9	Lipetsk	14	25	17	30	0.3	0.7	0.7	0.9	9	19	10	18	0.8	1.6	0.9	1.6
10	Moscow	441	181	333	673	3.2	0.7	2.7	6.1	130	127	108	361	2.0	1.9	1.6	5.3
11	Orel	25	29	27	28	2.2	2.5	1.6	2.6	10	16	10	9	1.2	2.0	1.2	1.1
12	Ryazan	117	155	141	156	3.2	4.0	5.0	6.1	67	61	49	57	5.7	5.3	4.2	5.0
13	Smolensk	36	31	38	54	0.8	1.0	1.0	0.9	18	15	24	29	1.8	1.5	2.5	3.0
14	Tambov	12	28	34	51	0.3	1.5	0.8	1.9	5	10	25	12	0.4	0.9	2.3	1.1
15	Tver	189	189	153	168	5.9	5.3	1.4	1.8	110	123	121	113	7.9	8.9	8.9	8.3
16	Tula	155	198	371	295	2.1	3.2	5.9	7.0	73	122	170	135	4.6	7.8	11.0	8.8
17	Yaroslavl	52	47	63	89	1.9	1.1	3.1	3.1	11	26	19	39	0.8	2.0	1.5	3.0
18	**City:** Moscow	683	742	792	892	6.3	5.8	5.7	8.2	301	361	414	440	2.9	3.4	3.9	4.2
DISTRICT: Northwestern		1253	1969	2437	2670	4.0	7.1	8.1	10.4	697	830	1077	1219	5.2	6.2	8.0	9.1
19	**Republics:** Kareliya	184	221	165	127	0.7	1.5	1.5	1.2	177	6	20	29	25.6	0.9	2.9	4.2
20	Komi	25	19	36	65	1.3	0.9	1.0	0.9	12	9	26	54	1.2	0.9	2.7	5.7
21	**Regions:** Arkhangelsk	5	8	28	37	0.2	0.4	0.8	0.8	2	5	20	18	0.2	0.4	1.6	1.4
22	Vologda	14	33	44	71	0.1	0.6	1.8	2.3	13	16	25	35	1.1	1.3	2.1	2.9
23	Kaliningrad	193	279	210	266	4.5	8.1	5.5	9.5	121	115	121	134	12.9	12.3	12.9	14.3
24	Leningrad	199	391	452	355	6.8	12.2	13.0	9.6	80	192	254	243	4.9	11.8	15.6	14.9
25	Murmansk	29	39	46	73	2.1	1.1	2.9	4.2	20	24	30	48	2.3	2.8	3.6	5.7
26	Novgorod	16	24	30	41	1.0	0.3	1.0	2.4	16	11	8	15	2.4	1.7	1.2	2.3
27	Pskov	14	17	21	31	0.5	0.7	0.4	1.2	7	7	21	21	1.0	1.0	3.0	3.0
28	**City:** St. Petersburg	574	938	1405	1604	8.4	15.0	17.9	24.4	249	445	552	622	5.4	9.7	12.0	13.5
DISTRICT: Southern		1014	1431	1358	1234	1.0	1.9	3.0	2.9	392	438	519	426	1.7	1.9	3.8	3.1
29	**Republics:** Adygeya	11	12	12	20	1.2	1.4	1.6	2.4	6	4	12	10	1.4	0.9	2.7	2.3
30	Kalmykiya	13	8	11	12	1.0	0.5	1.1	1.0	4	6	6	6	1.4	2.1	2.1	2.1
31	**Krai:** Krasnodarsky	345	520	501	384	1.6	3.8	3.8	2.8	177	125	198	121	3.5	2.4	3.8	2.3
32	**Regions:** Astrakhan	28	35	23	22	0.4	1.1	0.4	0.4	10	25	7	8	1.0	2.5	0.7	0.8

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										notified number				per 100,000 population			
		2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
33	Volgograd	255	387	435	391	2.5	3.0	4.3	4.5	101	122	159	94	3.9	4.7	6.1	3.6
34	Rostov	208	305	376	405	0.6	2.2	2.4	2.8	48	105	137	187	1.1	2.5	3.2	4.4
DISTRICT: North-Caucasian				261	308			0.7	1.2			96	85			1.0	0.9
35	**Republics:** Dagestan	46	43	43	97	0.6	0.4	0.3	1.6	8	16	16	27	0.3	0.6	0.6	1.0
36	Ingushetia	21	15	38	33	0.9	0.4	2.5	2.4	12	9	18	11	2.4	1.8	3.5	2.1
37	Kabardino-Balkaria	10	22	30	22	0.6	0.8	0.8	0.8	0	2	6	10	0.0	0.2	0.7	1.1
38	Karachai-Cherkes	2	2	5	5	0.2	0.1	0.4	0.6	2	1	4	2	0.5	0.2	0.9	0.5
39	North Ossetia – Alania	32	35	35	34	0.5	1.7	1.0	1.6	12	5	5	5	1.7	0.7	0.7	0.7
40	Chechnya		17	51	75	0.5	0.3	0.8	1.5	2	8	17	15	0.2	0.7	1.4	1.2
41	**Krai:** Stavropolskiy	21	30	59	42	0.3	0.4	0.6	0.5	10	10	30	15	0.4	0.4	1.1	0.6
DISTRICT: Privolzhskiy		3789	4584	5112	6392	4.4	6.2	6.0	7.5	1346	1707	2128	2195	4.4	5.7	7.1	7.3
	Republics:																
42	Bashkortostan	235	274	305	436	1.7	3.5	3.0	3.9	93	165	176	190	2.3	4.1	4.3	4.7
43	Mari El	20	27	42	41	1.7	2.2	3.3	3.5	11	12	25	21	1.6	1.7	3.6	3.0
44	Mordovia	13	25	74	185	0.7	1.5	1.1	0.1	9	12	62	47	1.1	1.4	7.5	5.7
45	Tatarstan	688	873	1071	456	10.5	14.4	22.3	5.1	187	185	198	191	5.0	4.9	5.2	5.1
46	Udmurtia	139	155	241	289	2.0	2.7	3.3	3.6	50	81	47	67	3.3	5.3	3.1	4.4
47	Chuvash	17	43	42	63	0.6	1.0	0.7	1.3	12	16	17	14	0.9	1.2	1.3	1.1
48	**Krai:** Permskiy	359	478	557	712	3.5	4.6	5.5	8.5	143	195	266	378	5.2	7.2	9.8	14.0
49	**Regions:** Kirov	10	19	27	121	0.4	0.3	0.2	0.7	8	15	27	29	0.6	1.1	1.9	2.1
50	Nizhny Novgorod	79	72	248	376	0.7	0.5	2.1	3.2	56	72	74	115	1.7	2.1	2.2	3.5
51	Orenburg	574	656	648	1057	9.2	11.6	4.6	18.6	177	179	353	279	8.3	8.5	16.7	13.2
52	Penza	44	98	86	125	1.6	2.1	1.7	3.2	18	19	28	41	1.3	1.4	2.0	3.0
53	Samara	988	938	1154	1618	10.2	12.2	15.6	16.3	322	367	455	466	10.1	11.6	14.3	14.7
54	Saratov	310	493	310	439	3.3	7.3	2.4	5.5	130	170	205	190	5.0	6.6	8.0	7.4
55	Ulyanovsk	313	433	307	474	9.2	13.7	6.3	15.9	130	219	195	167	9.9	16.7	15.0	12.9
DISTRICT: Ural		3036	3257	3774	4463	6.3	6.8	8.7	10.7	1058	1589	1623	2006	8.6	13.0	13.2	16.3
56	**Regions:** Kurgan	138	112	117	145	2.2	2.5	1.9	2.5	43	52	88	118	4.5	5.4	9.3	12.5
57	Sverdlovsk	1593	1616	1574	1688	7.0	8.4	10.3	10.9	453	757	645	892	10.3	17.2	14.7	20.3
58	Tyumen	666	903	1217	1410	5.3	6.5	12.0	14.3	322	470	503	579	9.6	13.9	14.7	16.9
	Khanty-Mansiyskiy AD	365	456	598	733	8.2	8.1	12.3	17.5	132	261	207	245	8.8	17.3	13.5	15.9
	Yamal-Nenetskiy AD	38	49	66	39	1.8	2.5	3.6	2.0	30	28	41	19	5.5	5.2	7.5	3.5
	Tyumen region (not including ADs)	263	398	553	638	4.1	6.7	15.6	17.4	160	181	255	315	12.1	13.6	19.0	23.4
59	Chelyabinsk	639	626	866	1220	8.1	6.5	8.3	13.1	240	310	387	417	6.8	8.8	11.0	11.9
DISTRICT: Siberian		2637	3171	4680	6066	2.9	2.8	4.8	6.6	1251	1573	2285	2818	6.4	8.0	11.7	14.4
60	**Republics:** Altai	5	9	5	6	0.4	1.0	0.7	0.8	3	3	3	4	1.5	1.4	1.4	1.9
61	Buryatia	321	316	343	350	8.4	7.1	9.9	8.4	122	132	118	146	12.7	13.7	12.3	15.2

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										notified number				per 100,000 population			
		2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
62	Tyva	2	3	7	5	0.1	0.1	0.3	0.2	0	2	2	2	0.0	0.6	0.6	0.6
63	Khakassia	18	9	23	21	0.8	0.1	0.8	1.2	9	5	16	13	1.7	0.9	3.0	2.4
64	**Krai:** Altaiskiy	399	541	792	1045	3.1	4.4	5.5	8.9	185	296	371	353	7.4	11.8	14.9	14.2
65	Trans-Baikal	112	183	202	215	3.1	5.1	6.5	5.8	50	71	84	76	4.5	6.4	7.5	6.8
66	Krasnoyarskiy	175	325	442	335	1.4	2.9	3.7	2.3	72	129	170	211	2.5	4.5	5.9	7.3
67	**Regions:** Irkutsk	775	422	932	1764	5.5	-0.9	3.9	11.9	421	250	512	611	16.8	10.0	20.4	24.4
68	Kemerovo	654	943	1245	1332	4.9	8.2	11.4	12.3	298	413	530	548	10.5	14.6	18.8	19.4
69	Novosibirsk	91	276	464	757	0.2	1.2	4.1	3.3	50	183	371	757	1.9	6.9	14.0	28.6
70	Omsk	54	90	164	160	0.6	0.9	1.6	2.0	28	62	89	73	1.4	3.1	4.4	3.6
71	Tomsk	31	54	61	76	0.9	1.6	1.6	3.0	13	27	19	24	1.3	2.6	1.8	2.3
DISTRICT: Far-Eastern		503	381	613	795	1.3	1.4	2.1	2.4	318	180	295	349	4.9	2.8	4.6	5.4
72	**Republic:** Sakha (Yakutia)	13	15	22	23	0.4	0.5	0.8	0.7	3	7	8	9	0.3	0.7	0.8	0.9
73	**Krai:** Kamchatka	3	4	2	2	0.0	0.4	0.1	0.3	3	3	0	0	0.9	0.9	0.0	0.0
74	Primorskiy	393	284	499	591	3.0	3.3	5.0	4.9	259	125	247	270	12.9	6.3	12.4	13.6
75	Khabarovskiy	59	23	41	117	1.2			2.4	43	23	26	47	3.1	1.6	1.9	3.4
76	**Regions:** Amur	14	18	15	16	0.3	0.1	0.2	0.3	4	9	3	8	0.5	1.0	0.3	0.9
77	Magadan	3	5	1	1	1.1	1.5	0.0	0.0	2	3	0	1	1.2	1.8	0.0	0.6
78	Sakhalin	8	12	17	17	0.3	0.6	0.8	0.9	4	6	9	8	0.8	1.2	1.8	1.6
79	**A.R.:** Jewish	10	18	14	26	0.1	0.3	0.3	0.1	0	2	2	4	0.0	1.1	1.1	2.2
80	**A.D.:** Chukotskiy	0	2	2	2	0.0	1.0	0.8	0.0	0	2	0	2	0.0	4.0	0.0	4.1

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