

# DOWNLOAD PDF THE CHALLENGE OF TUBERCULOSIS CONTROL IN CHINA

## Chapter 1 : Tuberculosis in China - Wikipedia

*China achieved the tuberculosis control targets of the UN's Millennium Development Goals 5 years ahead of the target date, and has made a great contribution towards realising the global goal. However, huge challenges still exist.*

**Disclaimer** Tuberculosis control in China: Correspondence to Hsien-Ho Lin email: Bulletin of the World Health Organization ; People with tuberculosis can access care either via the Chinese CDC system of tuberculosis dispensaries or the hospital system. The Chinese CDC system generally diagnoses and treats patients according to national guidelines on tuberculosis control. Whereas people treated by the Chinese CDC have high rates of treatment completion and success, people treated by hospitals often do not take their medications regularly or discontinue treatment prematurely. An effective programme to prevent as well as to diagnose and treat MDR tuberculosis is urgently needed in China. The World Health Assembly recently agreed upon new post global targets for tuberculosis control: Fortunately, innovations in tuberculosis diagnosis and treatment are either already available or will soon be available. One major concern is that, as part of ongoing health reform, the government is gradually shifting tuberculosis treatment from the Chinese CDC system to designated hospitals. This shift may adversely affect tuberculosis control if the designated hospitals cannot match or exceed the quality of care currently provided by the Chinese CDC. In this paper we describe this analysis and its potential impact on future policies and interventions for tuberculosis control in China.

**Model-based analysis** The analysis was developed by a group of tuberculosis modellers, officers of the Chinese CDC and Chinese experts on tuberculosis control. The engagement of policy and field experts ensured that key policy questions were addressed and country-specific contexts were addressed. Following the suggestions of the policy and field experts, five main scenarios for the future control of tuberculosis were analysed. Scenarios of tuberculosis control considered in the modelled analysis, China, Scenario 1: Status quo The current control programme remains unchanged. The designated hospitals have lower cure rates than the Chinese CDC system but higher cure rates than the other public hospitals: Improving treatment outcome for drug-susceptible DS tuberculosis by referral to Chinese CDC system People currently treated in the hospital system are referred to the Chinese CDC system and treated in the Chinese CDC system. Every person with tuberculosis is therefore treated in the Chinese CDC system. Improving treatment outcome for DS-tuberculosis by use of new treatment regimen The treatment outcomes for DS-tuberculosis, in both the Chinese CDC and hospital systems, are improved by the use of a new and better treatment regimen and the use of adherence technologies. Use of optimized programmes for the diagnosis and treatment of MDR tuberculosis New diagnostic tools are used. Combination of Scenarios 3A, 3B and 4B Every person with tuberculosis is treated in the Chinese CDC system, the treatment outcomes for DS-tuberculosis are improved by the use of a new and better treatment regimen and adherence technologies, and the detection and treatment of MDR tuberculosis is improved. In all of our analyses we ignored active detection of people with tuberculosis and prophylactic treatment for latent infections. All the interventions were assumed to be implemented from 2012. Model of transmission We used a dynamic compartmental model of tuberculosis transmission in which the whole population is divided into mutually exclusive compartments based on the natural history of tuberculosis. We categorized the treatment of active tuberculosis as in the Chinese CDC system or in the hospital system. The model was further stratified by two different phenotypes of tuberculosis: Some of the values we used for the input parameters of the model were based on the reported tuberculosis epidemic in China, using the Bayesian melding approach, accounting for uncertainty in the input parameters. Chinese Center for Disease Control and Prevention. The green lines represent pathways in which drug-resistant tuberculosis can be generated. Using the calibrated model, we projected the impact of alternative control interventions on the epidemiology of tuberculosis. The cumulative reduction of tuberculosis incidence and mortality between 2012 and 2050 was projected for each scenario and compared with the post targets for global tuberculosis control. Using tornado diagrams and univariable uncertainty analyses, we explored the

influence of uncertainty in our parameter values on the reduction of tuberculosis and MDR tuberculosis. Using the posterior resamples from the Bayesian melding procedure, we also conducted multivariable uncertainty analysis of the additional reduction in tuberculosis and MDR tuberculosis under each scenario. Details of the uncertainty analysis are available from the corresponding author. The overall prevalence of tuberculosis Fig. Between and , however, tuberculosis incidence and mortality in China Fig. Projected impact of different scenarios of tuberculosis control on the prevalence of pulmonary tuberculosis, China, “ Note: The scenarios are as follows: Projected impact of different scenarios of tuberculosis control on the annual incidence of pulmonary tuberculosis, China, “ Note: Projected impact of different scenarios of tuberculosis control on mortality associated with pulmonary tuberculosis, China, “ Note: Under this scenario, the cumulative reduction of tuberculosis incidence and mortality by would only be Further improvement in the treatment outcomes for drug-susceptible tuberculosis would accelerate the decline in the general tuberculosis epidemic Fig. This decline would be mainly driven by the overall general decline in tuberculosis prevalence Fig. Improvement in the treatment outcomes for drug-susceptible tuberculosis and provision of diagnosis and treatment for MDR tuberculosis would further decrease the prevalence of MDR tuberculosis in the general population. Projected impact of different scenarios of tuberculosis control on the prevalence of multidrug-resistant tuberculosis in the general population, China, “ Note: Projected impact of different scenarios of tuberculosis control on multidrug resistance among patients with tuberculosis, China, “ Note: Policy implications Post targets The key finding from this analysis is that it is probably not possible for China to achieve the current global targets set for tuberculosis control. This indicates that, with passive surveillance, current targets will not be reached by even if all the changes and interventions considered in our analysis were implemented. Active and enhanced surveillance might further accelerate the overall declines seen in tuberculosis, although the individual and community-level benefits are not clear. There is no evidence from the survey of tuberculosis prevalence 1 or the opinions of national tuberculosis experts to indicate that this proportion has since decreased. While attempting to integrate all of the available sources of relevant information, our analysis indicates that, under the status quo, this proportion will not change much by “ although the absolute prevalence of MDR tuberculosis in the general population will decline as the overall prevalence of tuberculosis continues to fall. Further reductions in the prevalence of MDR tuberculosis in the general population might be achieved by improving treatment of drug-susceptible tuberculosis “ thereby reducing the prevalence of tuberculosis and preventing the emergence of acquired resistance “ or by providing MDR tuberculosis diagnosis and treatment and thereby reducing the transmission of MDR tuberculosis. Our analysis indicates that either of these interventions could accelerate the reduction of MDR tuberculosis prevalence in China and that the combination of both interventions would achieve the greatest impact: Model limitations It is important to acknowledge the limitations of the modelling when interpreting the projected results. As with other modelling studies, the results of this analysis are sensitive to the parameter values and model structure. For example, we could not identify reliable information, from China, on the treatment outcomes of MDR tuberculosis using the first-line regimen or tuberculosis treated in the hospital system. For these variables, we used estimates of the national experts after they had reviewed the limited relevant data. Modelling provides an approach to make such estimates and assumptions explicit and to explore, using uncertainty analysis, the influence of assumptions and parameter uncertainty on the major findings. In our uncertainty analysis, we found that our qualitative conclusions were not affected by the uncertainty in most parameter values available from the corresponding author. The Chinese CDC is the main technical agency supporting this work. Our modelling analysis has provided the Chinese CDC with several important inputs for this process of policy development. First, it is clear that China cannot simply adopt the global post tuberculosis-control targets. The tuberculosis incidence and mortality targets for China will have to be more modest, partly because China has already greatly reduced its tuberculosis burden since Second, our analysis indicates that it should be possible to achieve a substantial reduction in the epidemic of MDR tuberculosis by improving the treatment of both drug-susceptible and MDR tuberculosis. Finally, our analysis

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indicates the importance of ensuring the high quality of tuberculosis treatment as patient care shifts from the Chinese CDC system to the hospital system. **Conclusion** With new government policies, treatment of tuberculosis patients is being shifted from the Chinese CDC to designated hospitals. There is a risk that the treatment outcome in these designated hospitals will not achieve the level observed in the Chinese CDC system. Our result highlights the importance of ensuring high treatment quality as the new policy to shift patients is implemented. In the planning of post tuberculosis control in China, a rational process of policy development that is tailored to the country-specific context will be important. In this process, modelling could be used to integrate the different sources of relevant information and take account of any data uncertainty. A team of policy and field experts and modellers can facilitate the translation of modelling results into policy and practice. The approach that we followed may be useful in other settings and for other diseases. **Acknowledgements** The authors thank Chu-Chang Ku.

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## Chapter 2 : WPRO | Tuberculosis in China

*Tuberculosis is a major public health problem in China. China has the world's third largest cases of tuberculosis (after India and Indonesia), but progress in tuberculosis control was slow during the 1990s.*

Many male migrants are at risk of unprotected sex when away from home. And men are also at higher risk of tuberculosis than women in China because the male-to-female ratio of adults with pulmonary tuberculosis is about 2:1. Indeed, they may not be able to get treated at all unless they return to their home village in the poor interior, because subsidized management of tuberculosis and other social welfare is only available through facilities in the area where they were registered at birth. They have been allowed to leave their area temporarily or work since and now number more than million. Going home for rural healthcare in China is not ideal either. Over the past 30 years, that part of the health system has run down because government funding has fallen while everything else has become more expensive. Health facilities attempted to make up shortfalls by charging ever larger fees for diagnosis and treatment, especially for a difficult disease like tuberculosis. Their own jobs depend on adequate operational funds, which are largely generated through user fees. Meanwhile, over the same 30 years, the socialist system of universal rural health-insurance collapsed and was not replaced apart from some pilot tests of an under-resourced community-based scheme in the 1990s. China developed and implemented two 5-year national plans in the 1990s and one year plan in the 2000s to control tuberculosis. On the basis of national surveys in 1990 and 1995, the prevalence of tuberculosis fell by an average of 3%. The project funded by the World Bank led to several important achievements. In the half of China that did not implement the project funded by the World Bank, the prevalence of tuberculosis did not fall during the 1990s. The national tuberculosis survey revealed that one in ten patients with tuberculosis had multi-drug resistant MDR disease (10%). Hospitals and clinics essentially functioned and continue to function as for-profit entities. For those patients with tuberculosis who eventually ended up in the public health system, the problems did not end there. Governmental funding for public health had also declined over the years. There was little incentive to undertake tuberculosis control activities, which are labor-intensive and create little income. Even in areas where government subsidies support free diagnosis and treatment of tuberculosis, many CDCs continue to charge patients for ancillary tests and drugs, some of which are of questionable benefit. Against this backdrop, the central government began efforts to revitalise its tuberculosis control program in 2000. Most important was the increased political commitment to tackle tuberculosis. In December 2000, the State Council of China held a nationwide video-teleconference on tuberculosis. Vice-Premier Li Lanqing gave explicit instructions to strengthen the tuberculosis control effort. In October 2001, the government issued the second year plan (2001-2002) to control tuberculosis. The Damien Foundation Belgium and the Canadian International Development Agency have supported efforts to control tuberculosis in several provinces. WHO served as the lead technical agency, providing policy and technical support to the national tuberculosis program. By late 2002, with increased governmental and international support, DOTS began to expand to all provinces. Most tuberculosis control activities came to a stop. However, after the SARS epidemic had been successfully controlled, tuberculosis control activities picked up rapidly in the second half of the year. The acceleration of efforts to control tuberculosis after the SARS epidemic would not have been possible if the government had not laid the foundation to revitalize the tuberculosis control program before 2003. However, the gains in tuberculosis control after SARS also resulted from measures to improve the public health system. The first of the key measures that have been implemented in the 3 years since the SARS crisis ended was greatly increased commitment and leadership from the government to tackle public health problems. During the SARS epidemic, governmental and communist party leaders at all levels—from Paramount leader Hu Jintao, Premier Wen Jiabao and members of the State Council down to village leaders—were involved in tackling a single public-health issue. The epidemic and its eventual control convinced Chinese leaders that the government should be much more involved in addressing public-health problems. The increased political commitment to public health has

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benefited tuberculosis control. In June, the State Council held a video-teleconference with provincial Vice-Governors to discuss steps to accelerate efforts to control tuberculosis. Governmental leaders from the 12 provinces participated, including the Vice-Governors from eight provinces. The additional funding has been used to expand health promotion activities, to provide financial incentives to village workers to find and treat tuberculosis, and to provide free treatment for people with smear-negative pulmonary tuberculosis for the first time. Furthermore, the central government revised the law on the control of infectious diseases [23] in March. The revision provides instructions to tackle infectious-disease outbreaks, improve the reporting of infectious diseases, implement interventions to control the spread of such diseases, provide clinical services, and fund the control of infectious diseases. This law directly benefited tuberculosis control by addressing the under-reporting of tuberculosis by health facilities. Tuberculosis now has to be reported to local public-health authorities within 24 hours. Because failure to report is now a crime, hospitals have begun to take the reporting of tuberculosis very seriously. The mean length of time to report from a county-level health facility to the central level has been reduced from 29 days to 1 day. This information is being used to trace patients with tuberculosis and ensure their proper diagnosis and treatment. In 2003, suspected or confirmed cases of tuberculosis were reported from hospitals. The government has also started a massive program to rebuild local public-health facilities. SARS revealed that public-health facilities were largely outdated and inadequate to tackle existing public-health problems, not to mention addressing new or emerging challenges. Although a strengthened public-health system has accelerated the national tuberculosis control effort, progress in tuberculosis control has also strengthened the public-health system. In terms of policy, the national tuberculosis control program has clear targets and well-defined technical policies based on the DOTS strategy. National and international partners work in a cohesive manner toward the same targets, with the same implementation framework. Other public-health programs are learning from this successful model. In financial terms, funding from different partners is harmonized under one financing plan with clear funding needs and gaps—another model for other programs. Furthermore, the failure to control tuberculosis in the past—when tuberculosis services were not free—and the success in tuberculosis control over the past few years—when tuberculosis services have been free—have provided policymakers with arguments to increase funding for public health from the government. With regard to management, several features of DOTS are. Furthermore, although many public-health workers are being trained to implement DOTS, setbacks caused by inadequate numbers of trained workers have shown governmental leaders the importance of such resources in public health, and thus they have increased planning for them. With the new internet-based reporting system for communicable diseases, the tuberculosis program leads the way in the use of information to improve public-health outcomes. Finally, the model of collaboration between hospitals and CDC facilities provided by the tuberculosis control program is one of the best examples to date of how hospitals should be involved in the prevention and control of infectious diseases, and has influenced the development of new policies that involve hospitals in the work of public health. Tuberculosis in China was most effectively prevented through spreading awareness. Cutting edge diagnostic tests, drug regimens that reduce the number of pills a patient needs to take, and innovative ways of ensuring patients take their drugs—such as mobile phone text messaging—are to be rolled out under a program led by the Chinese Ministry of Health. It will be implemented in five designated provinces and one municipality—covering 20 million people at risk of TB. And DNA testing, which can determine which strains of *Mycobacterium tuberculosis* are present in sputum with 98 per cent accuracy and can be used to detect drug-resistant strains in as little as a day. DNA-based diagnosis is also cost-effective. Drug combinations—where different drugs are combined in the same pill—will also be used to reduce the number of pills a patient has to take from around 13 to three or four a day. After two-and-a-half years effective interventions will be scaled up. Reviewing of strategy[ edit ] Although China achieved the global targets for tuberculosis control, these are only targets for implementation and monitoring in the national and international efforts to control tuberculosis. More important are the targets of halving the prevalence of, and mortality from, tuberculosis. Countries in the Western Pacific region committed

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to these targets in , as did the wider international community as part of the MDGs. Foremost is the serious epidemic of MDR tuberculosis. But reduction of the existing burden of multidrug resistance will take time, especially since poor-quality DOTS services in some areas and inappropriate treatment of tuberculosis in parts of the hospital system continue to generate new cases of MDR tuberculosis. The absence of a sound financing mechanism to fully fund tuberculosis services is a further problem. Additionally, more than a quarter of current funding comes from external grants and loans , making sustainable funding a major challenge. Another challenge is to make tuberculosis services accessible to the entire population. Although China has a policy of free tuberculosis services, in most places these are available only to permanent residents in a particular community. Urban migrants, who have relocated from poor rural areas to seek a better livelihood, are not eligible for such free services. These vulnerable, predominantly young migrants—now numbering more than million—tend to live and work in crowded environments and are unlikely to seek medical care when they become ill. Such individuals contribute to the spread of tuberculosis, HIV infection, and other infectious diseases within urban centers. The growing epidemic of co-infection with tuberculosis and HIV if left unchecked will substantially increase the number of tuberculosis cases and deaths. CDC facilities are being rebuilt across the country but many are staffed inadequately or by poorly trained and unmotivated health-care workers. Finally, and perhaps most importantly, is the challenge of sustaining and further increasing long-term governmental commitment to the control of tuberculosis, which is essential to tackle the other challenges. China is developing tuberculosis-specific policies and interventions to address these challenges. The new 5-year implementation plan of the national tuberculosis control program —10 [29] has incorporated key elements of the new Stop TB Strategy [30] and the second Global Plan to Stop TB. Although disease-specific interventions are important, further strengthening of the public-health system will be needed if China is to halve the prevalence of tuberculosis and the number of deaths caused by the disease. To increase access, a package of essential public-health services for rural inhabitants and urban migrants should be provided with governmental subsidies. Finally, the government should provide operational costs for public-health services and full salaries for health-care workers, especially at and below the county level, where most of the rural population live. Without this, the development and maintenance of a motivated and skilled public-health workforce to meet the challenges of the 21st century will be difficult. In conclusion, the Chinese experience has shown that investment in both control programs and health systems—rather than investment in one or the other alone—was needed, and indeed essential, to achieve the global targets for tuberculosis, and provides an example for developing countries scaling-up efforts to achieve health -related MDGs.

## Chapter 3 : Drug-resistant tuberculosis control in China: progress and challenges

*Challenges on MDR-TB control in China and the way forward Efforts to combat TB/MDR-TB in China have made substantial progress. However, critical weaknesses could jeopardize effective implementation of the current strategy.*

WHO, , Figure 5. Reproduced with the permission of the publisher. The first, he said, is filling the current gap in global leadership. Formation of the G20, for example, provides a new platform that could give a global campaign on TB control the visibility it urgently needs. If the BRICS countries invested in TB control at the same rate at which their economies are growing, the results would be large investments in local as well as global TB control. Third, the BRICS countries have the opportunity to build on their current experience and become a major source of innovation in six areas related to TB control: The National Academies Press. The BRICS countries are emerging as an important voice in global economic, political, and financial discourse. First, Brazil has had success in alleviating poverty through programs such as Bolsa Familia. Relatedly, Brazil has emphasized innovation not only in the development of drugs and technologies for high-burden conditions but also in the delivery of health care services and the manufacturing of health care products. It is a proactive system that provides comprehensive care while fostering active outreach to communities and households, including those in congregate settings and difficult-to-access slums. The family health program is underpinned by a good information system, strong supply chains, and strong management. Atun characterized the program as being part of a community and civil society movement that has created an enabling platform for the treatment of TB and other conditions. Page 15 Share Cite Suggested Citation: At the same time, the drugs are not available for purchase in private drugstores, an approach that has helped prevent the development of MDR TB by reducing the injudicious use of drugs. Brazil also has made TB treatment a priority in primary health care delivery settings as a means of reaching the entire population. Thus, he said, it can play a critical role not only for the BRICS countries but for all countries that need to improve their health systems and the health of their populations. The official figure is about per , population, compared with about per , in India, 75 per , in China, and just 4 per , in the United States. Page 16 Share Cite Suggested Citation: In addition, a postmortem study in a peri-urban public hospital in the province found that more than two-thirds of deceased patients had TB, including 17 percent of patients in whom TB was not suspected Cohen et al. The majority of the patients who were culture positive when they died, despite receiving TB treatment, were infected with drug-susceptible TB, suggesting that the diagnosis of TB was made too late to alter the course of their infection. Wallengren described several areas in which some progress has been achieved, noting challenges that remain: Despite important progress, surveillance remains a major challenge in South Africa. In light of a number of TB patients failing to thrive despite being on antiretroviral treatment ART , two medical students in need of a project were assigned the task of collecting samples from all the TB patients at the Church of Scotland Hospital in Tugela Ferry and sending them to the provincial laboratory to be cultured. That laboratory had an unusual policy in place that called for testing all six FLDs and SLDs, not just the drugs requested by a physician. And the laboratory manager, to prepare for a conference, noticed in looking at some recent laboratory results that a large number of people from the hospital in Tugela Ferry were resistant to all six drugs. Nevertheless, the current system has greatly improved surveillance in the country. In the past, many patients with MDR TB died within a few weeks of having their sputum collected for testing. Diagnosis is faster with GeneXpert, which improves the outcomes of treatment and reduces transmission in the community. Better diagnosis also has revealed the extent of the problem in South Africa. The country has piloted and is starting to roll out community-based MDR TB treatment, and the initial results are promising. In addition, increased use of antiretroviral therapy has improved the prospects for patients with MDR TB. Documentation and evaluation of the programs occur separately and do not reinforce each other. To the extent that the programs have been coordinated, the result has so far been simply a third silo: Infection control also has improved dramatically in recent years, said Wallengren. At the time of the Tugela Ferry outbreak, few health

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care workers in the country knew what an N95 respirator was, but now they know that they should be wearing one routinely. Finally, Wallengren described several important capacity-building initiatives in Africa. It is currently supporting investigations into a large variety of research questions, including the pharmacokinetics of TB treatment in children, new biomarkers and response to treatment, new diagnostic tools, assessment of drug resistance through whole genome sequencing, clinical trials of new treatment regimens, and investigation of the effects of anti-TB drugs on *Mycobacterium tuberculosis* M. Page 18 Share Cite Suggested Citation:

## Chapter 4 : China: Tuberculosis Control Project

*The China Tuberculosis Control Project was the largest tuberculosis (TB) control project funded by the World Bank in the world. The project objective was fully achieved and targets for case detection and cure rates for TB were exceeded. The project registered and treated close to million new.*

Gursimrat K Sandhu, E-mail: This article has been cited by other articles in PMC. Abstract Tuberculosis TB is one of the most ancient diseases of mankind, with molecular evidence going back to over 17, years. In spite of newer modalities for diagnosis and treatment of TB, unfortunately, people are still suffering, and worldwide it is among the top 10 killer infectious diseases, second only to HIV. It is a leading cause of death among HIV-infected people. In India, historically speaking, fight against TB can be broadly classified into three periods: Major challenges to control TB in India include poor primary health-care infrastructure in rural areas of many states; unregulated private health care leading to widespread irrational use of first-line and second-line anti-TB drugs; spreading HIV infection; lack of political will; and, above all, corrupt administration. Today the principal cause of human tuberculosis is *Mycobacterium tuberculosis*. Other members of the M. Humans become infected by M. TB is one of the top three infectious killing diseases in the world: Since the immune system in healthy people walls off the causative bacteria, TB infection in healthy people is often asymptomatic. Infection with TB can result in two stages: Among the 15 countries with the highest estimated TB incidence rates, 13 are in Africa, while half of all new cases are in six Asian countries, viz. According to it, every second, someone in the world is newly infected with TB bacilli and 1 in every 10 of these newly infected people will become sick or infectious later in life. The same fact sheet[ 10 ] stated that in , globally speaking, there were 9. However, the estimated incidence rate in Sub-Saharan Africa is nearly twice that in the SEAR with over cases per , individuals of the human population. In the same year , an estimated 1. The highest number of deaths was in SEAR, while the highest mortality per capita was in the African region. Now the revised time limit to achieve that MDG is by It is not simply a clinical approach to patients, but rather a management strategy for public health systems, including political commitment, case-detection through quality-assured bacteriology, short-course chemotherapy, ensuring patient adherence to treatment, adequate drug supply and sound reporting and recording systems. Progress in global health will not be possible without visible progress in this region. This region is distinguished by a complex, heterogeneous HIV epidemic at different stages, both within countries and across the region. In the four states in southern India, the HIV prevalence appears to be slowly decreasing. In other countries, such as Bangladesh and Nepal, increasing HIV prevalence among high-risk groups, such as intravenous drug users IDUs , has raised concerns about the potential risk of a generalized HIV epidemic in these countries. Historically speaking, fight against TB in India can be broadly classified into three periods: Early period of TB control It was marked with non-availability of any chemotherapeutic agents, absence of diagnostic x-ray facilities and lack of any TB control program. This period lasted around middle of the 20th century. By , the capability of this apparatus was enhanced to embody the MMR mass miniature radiography version. The first genuine success against TB was in immunizing against tuberculosis. This was the first nationwide campaign against TB[ 17 ] ; and for the first time in the history of India, message of health and prevention of disease was taken to the remotest parts of the country. Post-independence initial nationwide TB control programs This period can be conveniently subdivided into the following two phases: This program was aimed at integration of TB control schemes with the existing government health services to reduce the TB problem in the community as economically as possible. Era of short-course chemotherapy In the middle of the 20th century, around the time India gained independence in , effective drugs against TB started becoming available Streptomycin: This center provided information on the mass domiciliary application of chemotherapy in the treatment of pulmonary TB. In , National Tuberculosis Institute NTI was established at Bangalore to evolve, through research, a practicable TB program that could be applied in all parts of the country by training medical and paramedical workers to

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efficiently apply proven methods in rural and urban areas. These drugs allowed short-course chemotherapy SCC and made it possible to simplify treatment and reduce its duration. Discovery of Rifampicin is considered to be one of the greatest achievements in the history of development of anti-TB drugs. Since its discovery, no new drug has been discovered yet that is as efficacious as Rifampicin against TB. Current WHO-assisted ongoing TB control program In , Government of India, together with the WHO and the Swedish International Development Agency SIDA , reviewed the national program and concluded that it suffered from managerial weaknesses, inadequate funding, over-reliance on x-ray, nonstandard treatment regimens, low rates of treatment compliance and completion and lack of systematic information on treatment outcomes. This strategy was built on five pillars, viz. World Bank acknowledged that the DOTS strategy was the most economical health intervention and agreed to provide credit assistance for the NTCP, initially for the coverage of a population of million persons, which was later revised to cover a population of million persons. Political and administrative commitment to ensure the provision of organized and comprehensive TB control services; reliable and early diagnosis through smear microscopy; an uninterrupted supply of good-quality anti-TB drugs; effective and patient-friendly treatment with short-course chemotherapy SCC given under direct observation; and accountability through proper reporting and recording and through effective supervision was heavily emphasized. The level of immunosuppression determines clinical presentation of the resulting disease. Indian government plans to cover the entire country with the intensified package by It further classifies the currently available antiretroviral ART agents as follows: Tuberculosis is the most frequent pathogen associated with IRIS, of which, lymph node enlargement is the commonest manifestation. Major challenges to control TB in India include poor primary health-care infrastructure in rural areas of many states; unregulated private health care leading to widespread irrational use of first-line and second-line anti-TB drugs; spreading HIV infection; poverty; lack of political will; and, above all, corrupt administration. Surprisingly, in India, people are still under the impression that TB is a disease of poor people, mostly of those living in slums. The consumption of unpasteurized milk or dairy products made from raw milk is another potential source of TB for humans, as there is ample evidence that bovine TB *Mycobacterium bovis* gets transmitted to humans. These forms of TB do not respond to the standard six-month treatment with first-line anti-TB drugs and can take up to two years or more to treat with drugs that are less potent, more toxic and much more expensive. The development of drug resistance may be a tragedy not only for the patient himself but also for others, for he can infect other people with his drug-resistant organisms. Drug resistance in a patient who has never received anti-TB treatment previously is termed as primary resistance. Acquired resistance is that which occurs as a result of specific previous treatment. WHO and the IUATLD have now replaced the term primary resistance with the term drug resistance among new cases; and acquired resistance, with the term drug resistance among previously treated cases. Factors related to the development of drug resistance include the following: Surgery should be considered for a patient with bacilli resistant, or probably resistant, to all except two or three relatively weak drugs. If the patient has a large localized cavity with little other disease, reasonable lung function and only two or three weak drugs available, surgery should be seriously considered. Since current drug resistance data have a bearing on the design of the treatment regimens and policies, reliable information on these at the national level is both urgently and regularly needed. In the year , 0. Services to control MDR-TB are now available at designated sites in six states, with culture and DST facilities offered in five state-level laboratories. Government should ensure and promote rational use of anti-TB drugs outside the revised national TB control program. There is dire need to regulate the rational use of first- and second-line anti-TB drugs. They should absolutely not be sold as over the counter drugs. In India and in other developing countries, local governments should put in and encourage wholehearted efforts for local manufacturing of anti-TB drugs, thus resulting in more efficient monitoring of their manufacturing and quality control standards. Monitoring the quality of products available in the marketplace should involve identifying products that are defective because of poor manufacturing practices; deteriorated because of inadequate distribution and storage; and adulterated, tampered or counterfeit because of vested interests. Many

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studies have documented the circulation of counterfeit and substandard medicines, especially antimalarials, in developing countries. Working association between physicians; private sector; religious bodies; and other local nonprofit organizations, e. Better diagnostic tests for quick screening of this disease at field level should be developed and made available at the grass-root level. The links between primary health centers and DOTS centers should be strengthened, and special attention should be given to prioritizing the groups which need to be followed first; utilizing human resources of related public health programs, e. Vaccination of our livestock against TB and routine screening of livestock e. Our fight against TB will be incomplete without considering this zoonotic aspect of this deadly disease. Footnotes Conflict of Interest: Stable association between strains of *Mycobacterium tuberculosis* and their human host populations. Detection and molecular characterization of year-old *Mycobacterium tuberculosis* from a neolithic settlement in the Eastern Mediterranean. The Nobel Prize in Physiology or Medicine Bovine tuberculosis in India: Potential basis for zoonosis. Isolation of *Mycobacterium bovis* and *M. Indian J Med Res. Mycobacterium bovis* in England and Wales: Past, present and future. The epidemiology of *Mycobacterium bovis* infections in animals and man: Deciphering the biology of *Mycobacterium tuberculosis* from the complete genome sequence. A new evolutionary scenario for the *Mycobacterium tuberculosis* complex. The key to the sanatoria. J R Soc Med. Proceedings of the Tuberculosis Association of India. Tuberculosis Association of India; Tuberculosis Control in India. The history of Tuberculosis Control in India: Glimpses through decades; pp. Indian Council of Medical Research. A national sample survey Indian Council of Medical Research; Domicilliary treatment-results of antibiotic therapy. TB Association of Trivandrum; The status and prospects of tuberculosis control in India. Int J Tuberc Lung Dis.

## Chapter 5 : Tuberculosis: Current Situation, Challenges and Overview of its Control Programs in India

*Background: China has the second highest caseload of multidrug-resistant tuberculosis (MDR-TB) in the world. In , the Chinese government agreed to draw up a plan for MDR-TB prevention and.*

Received Jul 22; Accepted Dec This article has been cited by other articles in PMC. In , the Chinese government agreed to draw up a plan for MDR-TB prevention and control in the context of a comprehensive health system reform launched in the same year. Most households with an affected member suffer a heavy financial burden because of a combination of treatment and other related costs. However, this programme has a fixed timeline and cannot provide a long term solution. Summary Along with the on-going Chinese health system reform, sustained government financing and social health protection schemes will be critical to ensure universal access to appropriate TB treatment in order to reduce risk of developing MDR-TB and systematic MDR-TB treatment and management. Electronic supplementary material The online version of this article doi: Multidrug-resistant tuberculosis, Health financing, Health system strengthening, China Multilingual abstracts Please see Additional file 1 for translations of the abstract into the six official working languages of the United Nations. In , there were an estimated , patients suffering from multidrug-resistant tuberculosis MDR-TB defined as tuberculosis caused by strains of Mycobacterium tuberculosis that are at least resistant to rifampicin and isoniazid treatment , and an estimated , deaths from MDR-TB [ 1 ]. This situation is generally ascribed to a combination of insufficient laboratory facilities, a lack of appropriately qualified health professionals and weak TB surveillance systems. The WHO recommends a TB control strategy that includes government commitment, early diagnosis by bacteriologic testing, standardized treatment and regular patient management. This DOTS directly observed treatment, short-course strategy [ 2 ] has made notable progress in global TB control, saving an estimated 6 million lives between and [ 3 ]. In , the Stop TB Partnership launched a new strategy for “”, which specified financing and management interventions for both drug-susceptible and drug-resistant TB control. However, it has been argued that both funding and implementation have lagged far behind the action plan targets, and that political commitment on MDR-TB prevention and control is insufficient [ 4 ]. In the meeting, China reported a serious MDR-TB epidemic and agreed to draw up a plan for MDR-TB prevention and control in the context of a comprehensive health system reform launched in the same year. The new round of health system reforms in China has emphasized the role of government in funding and supervision, and aims to achieving equitable and affordable access to quality health care for all. The achievements over these three years are impressive, including universal health insurance coverage, improved infrastructure of primary health facilities and increased uptake of services [ 7 ]. The reform has recently entered a second phase to tackle remaining challenges. The government commitment to health system reform remains strong and the process is followed keenly by national and international stakeholders. It has been argued that they can be at least partially attributed to health system failures, in particular the reliance on a fee-for-services approach to financing public health facilities. TB has been seen as a disease of the poor. Most cases are found in the less developed northeast and southwest regions [ 13 ]. In the s, the national TB control programme required the prompt referral of TB suspects who had a cough for more than three weeks, hemoptysis or blood in a sputum sample to TB dispensaries for diagnosis, and provided free first-line anti-TB drugs for diagnosed patients. This was seen as essential in order to remove, or at least substantially decrease, financial barriers to accessing standard TB care by the poor. Most patients spent more than half of their annual income on treatment before being diagnosed with TB [ 16 ]. In addition, many studies in China have reported that TB patients are charged for longer treatment periods than recommended by the TB control programme and that drugs and tests are administered to an extent considerably beyond that specified in the standard treatment regimen [ 17 , 18 ]. In addition, a lack of proper training has often resulted in irrational prescriptions and treatments [ 12 ]. Treatment of MDR-TB is complicated, expensive and often unsuccessful, resulting in a low cure rate, high mortality rate and low follow-up rate [ 20 ]. The WHO guidelines for MDR-TB

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recommend 18–24 months of chemotherapy using a combination of first- and second-line drugs including daily injections in the first 6–8 months. One study in China reported average daily medical costs for MDR-TB treatment were more than three times the average cost of household daily non-food consumption in Tianjin city and one and a half times in Henan province [ 22 ]. National and provincial TB prevention and control centers were usually responsible for programme administration, TB care supervision and case reporting. Lower level TB dispensaries focused on the diagnosis of TB suspects, treatment and management. TB patients with complications were referred to public hospitals. The central government provided annual earmarked funding to cover the costs of first-line anti-TB drugs, two X-ray examinations and five sputum smear tests for TB, but there was no designated fund for MDR-TB diagnosis and treatment at the national level [ 24 ]. For example, over the Global Fund supported a programme on strengthening MDR-TB management that was implemented in 89 prefectures of 30 provinces [ 25 ]. The main contents of this programme included: Matching funds from both provincial and prefecture levels were required to co-financing the programme [ 25 ]. However, the Global Fund programme is time-limited and sustainable long-term interventions need to be established. In , a comprehensive programme that aims to improve MDR-TB diagnosis and the quality and affordability of treatment was developed and implemented in four cities, supported by the Government of China and the Melinda and Bill Gates Foundation. The effects of the programme have been impressive, with a substantial increase in the number of diagnosed patients and use of appropriate treatment. There has also been a significant decrease in the average ratio of out-of-pocket payment to annual household income [ 27 ]. Health financing and payment reform is a critical component of the overall Chinese health system reforms. Good practice and lessons drawn from this ongoing TB control programme will be valuable for the ongoing development of health financing policy. However, critical weaknesses could jeopardize effective implementation of the current strategy. A survey carried out in three prefectures in found that the annual funding allocated to TB control was only one third of that required in two prefectures in the eastern and central regions and much less in the western prefecture [ 24 ]. Funding for MDR-TB was far below the suggested level in all three prefectures, and largely relied on the Global Fund, even in the developed eastern region [ 24 ]. This reflects the limited funds allocated to health services in general, which can in turn be linked to their overall poor fiscal status. With the decline in international donor funding, it has been proposed that low- and middle-income countries, especially the emerging economies e. In some settings, smear-positive and treatment failure patients are recommended to visit city or higher level facilities in person for DST. After diagnosis, it is recommended that all MDR-TB patients should be admitted to a prefecture TB designated hospital for an initial 1–2 month period and then should continue outpatient treatment for 16–18 months. Treatment is individualized, being determined by the specific drugs to which a patient exhibits resistance, and the cost is some ten times that of standard TB treatment [ 28 ]. Although most rural patients have NCMS coverage, the reimbursement rate for hospital admission is usually low based on the NCMS principle of lower reimbursement rates at higher level health facilities and outpatient costs are often not covered. Non-medical costs including fees for transport and accommodation during treatment were around one third of the medical cost. In this survey, almost all patients reported that the financial burden on their households was heavy or very heavy and half reported borrowing money from their relatives or a bank to pay for treatment. These three prefectures were all sites covered by the Global Fund programme, which provided financial support for treatment and transport. It may be inferred that MDR-TB treatment would be less affordable in non-project sites and might give rise to more serious economic and social consequences. However, it was recognized that without appropriate incentives to both TB designated hospitals and their TB care providers, there was a risk of undermining this intervention. At the prefecture level, the revenues of TB designated hospitals were still largely from service charges [ 24 ]. Another important consideration is that the salaries of TB care providers in hospitals are directly related to the associated service fees. Most TB care providers interviewed were not satisfied with their current salaries, which were typically less than their colleagues in other departments. There was also concern that they might be exposed to a high occupational

risk in treating infectious diseases. This had made it difficult to recruit TB doctors [ 24 ]. Financial and material incentives have been directed at individual healthcare providers and organizations both public and private in many other low- and middle-income countries, aiming to improve the quality of TB diagnosis and treatment, typically alongside system changes intended to promote improved outcomes. For example, in Romania and Honduras incentives e. In India, the Philippines and Myanmar, private healthcare providers were supplied free anti-TB drugs on condition that patients did not pay for these [ 29 , 30 ]. Dispensing free drugs is seen as an incentive for private providers because they can charge consultation fees and develop their reputation for curing TB patients, which might raise client demand for other services. There have also been trials involving the provision of conditional financial incentives at organization level e. It is difficult to fully attribute performance changes to these incentives given that they were often just one component of multifaceted interventions. Findings from studies in a number of countries emphasise the need for great care in both the design of such incentives and their implementation, which requires a detailed understanding of the environment within which providers operate and their needs, as well as scientific evaluation of effectiveness. These international experiences should be considered in the on-going reform of TB diagnosis and treatment financing in China. Developing a hospital compensation strategy that includes appropriate incentives for TB care providers will be an essential component of an effective intervention. Radical policy changes were required which would involve the strengthening of health systems and services and increased government accountability [ 31 , 32 ]. Although these efforts appear to be in the right direction, they may not be sufficient unless: Overall, the policies required to achieve these objectives cannot be limited to the health sector but will need cooperation across sectors including finance, social welfare and labour.

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## Chapter 6 : WHO | Tuberculosis control in China: use of modelling to develop targets and policies

*China has the second highest caseload of multidrug-resistant tuberculosis (MDR-TB) in the world. In , the Chinese government agreed to draw up a plan for MDR-TB prevention and control in the context of a comprehensive health system reform launched in the same year.*

Highlight and copy the desired format. Drug-Resistant Tuberculosis among Children, China, " Emerging Infectious Diseases, 23 11 , Abstract Microbial drug resistance has become a major public health concern worldwide. To acquire epidemiologic data on drug-resistant tuberculosis DR TB among children, a major cause of illness and death for this population, we conducted a retrospective study of " data from 36 TB prevention and control institutions in Shandong Province, China. Among children with TB, Understanding the long-term trends of DR TB among children can shed light on the performance of TB control programs, thereby contributing to global TB control. Tuberculosis TB is one of the leading causes of death worldwide 1. The attention given to TB in children has increased since the publication of the first edition of Guidance for National Tuberculosis Programmes on the Management of Tuberculosis in Children 3. However, expanding prevalence of TB globally, especially drug-resistant DR TB among children, is still a major cause of childhood illness and death 4. Control of TB among children is impeded by the challenges of presentation, diagnosis, reporting, and treatment; the absence of clear targets; and perceptions of low public health importance of TB 5. Difficulties with sputum collection and the paucibacillary nature of TB in children often make TB diagnosis difficult and drug-susceptibility testing DST inaccessible because DST is possible only after bacteriologic confirmation 4 " 7. Accordingly, children initially receive treatment for drug-susceptible TB 7. Because of its paucibacillary nature, childhood TB has been deemed less infectious and neglected by TB prevention and control institutions 4 " 6. Even some diagnosed and treated TB cases in children failed to be recorded in registers or reported to national TB programs 8. Children with TB are especially susceptible to severe disease and death 9 " 12 ; even those with a favorable treatment outcome cure or completion or a latent infection could become a reservoir of disease relapse or reactivation Although children metabolize drugs more rapidly than adults, guidance on drug regimens, dosages, appropriate monitoring, and duration of therapy for children is frequently extrapolated from adult data With few drug options and limited experience, treatment for children with DR TB is complex. TB in children represents recent transmission and can be considered a sentinel of disease spreading throughout the community 13 , From a longitudinal perspective, we comprehensively assessed the burden of DR TB patterns among children. Before analysis, patient records were anonymized and deidentified. Study Population and Data Collection This retrospective cohort study was conducted among 36 monitoring sites: Monitoring site selection was based on convenience and reflection of a range of TB burdens and clinical capacities. New culture-confirmed TB cases that occurred in Shandong Province during " were consecutively collected from the China Information System for Disease Control and Prevention [http:](http://) In , the Center for TB Control and Prevention of Shandong Province established the Katharine Hsu International Research Center of Human Infectious Diseases, the provincial health department where trained researchers collected and recorded patient information on a standard case report form. Mycobacterium tuberculosis was identified by culture; susceptibility to isoniazid, rifampin, ethambutol, and streptomycin was identified by DST. Information for all patients age, sex, TB contact history, disease sites [pulmonary and extrapulmonary], and prior TB treatment history was collected and recorded. Laboratory Methods Pulmonary samples were collected by expectoration, gastric aspiration, and sputum induction. Extrapulmonary samples pleural fluid, spinal fluid, and lymph nodes were collected by pleural tap, lumbar puncture, lymph node biopsy, fine needle aspiration, and other techniques 3. All samples available from suspected sites of involvement were processed for smear and culture. Tissue samples were also examined for the presence of granulomas. To identify the presence of acid-fast bacilli, we used Ziehl-Neelsen staining for smear microscopy. Each sample was cultured on Lowenstein-Jensen culture medium. Samples containing

nontuberculous mycobacteria were eliminated. DST was performed by using the proportion method on Lowenstein-Jensen medium and the following drug concentrations: We excluded patients with nontuberculous mycobacteria infection and patients with HIV co-infection in China, HIV-positive patients are immediately transferred to HIV-specialized hospitals. A TB isolate susceptible to all 4 of the tested first-line drugs was defined as drug-susceptible. TB contact was defined as contact with family members or schoolmates with TB long enough to enable long-term exposure. Bilateral disease means bilateral lesions such as the tree-in-bud sign, bronchiectasis, cavitory pulmonary disease, and other inflammation signs on radiologic images. Statistical analyses were performed by using SPSS software, version Results Characteristics of Patients We analyzed demographic, clinical, and laboratory information for 14, new TB case-patients in Shandong Province who had had culture-confirmed M. Of the children with TB, Children with TB were more likely to have extrapulmonary disease OR 0. MDR TB was found in 54 6. Resistance to all 4 tested first-line drugs was found for 32 Trends over Time Figure 1 Figure 1. Figure 2 Figure 2. The percentage of a special type of MDR TB resistance to all 4 tested first-line drugs also increased 1. Discussion This year retrospective cohort review of children with TB in the second largest province of China describes the clinical characteristics of TB in children and the epidemiology of DR TB among children. The major findings of this study are as follows: Underreporting was more pronounced for the younger age group worldwide and especially in China 5. The diagnosis of TB in children should be made cautiously by experts after thorough assessment of all evidence derived from a careful history, clinical examination, bacteriological confirmation, and relevant investigations 3. Unfortunately, in most low- and middle-income countries, the recommended contact investigations, including TB contact tracing for children suspected of having disease and contact screening for young children living close to a source case-patient, were rarely and inconsistently conducted. Without effective contact investigation, TB, especially DR TB, in children is rarely diagnosed and treated, which may worsen the situation. Although risks for severe disease and death are highest among children, TB in young children is the least likely to be confirmed bacteriologically. All these factors together suggest that effective diagnostic methods to microbiologically confirm TB, and regular contact investigations are urgently needed to refine future estimates of the incidence of TB and DR TB among children in China. Because drug resistance rarely develops for children during treatment 23, the high proportion of primary cases of MDR TB in children in our study may reflect recent transmission of MDR TB strains in Shandong. Because of the lack of standardized protocols for the therapy of childhood DR TB, children are empirically given the few formulations that are available for children and based on DST results, which are hard to access and often delayed 26, The percentage of DR TB, MDR TB, and overall first-line drug resistance for isoniazid, rifampin, ethambutol, and streptomycin in primary cases of TB in children increased significantly over the study period. Ongoing primary transmission of DR TB strains among children may cause catastrophic consequences. Other studies have reported that independent host factors that predispose to TB recurrence are malnutrition, smoking, HIV infection, and other immunosuppressive states. After the state of the host changes, even a person with a favorable treatment outcome cure or completion or a latent infection could become a reservoir for disease relapse or reactivation. To make things worse, the strongest risk factor for acquired DR and the highest risk for death is retreatment, as has occurred in Limpopo South Africa 31, Uganda 32, and Malaysia. This study had some limitations. First, because we examined only 1 province on the eastern coast of China, the economic and regional disparities limited the generalizability of the results. Second, because we included only children with culture-confirmed TB, we did not analyze those who were treated on the basis of DR TB contact history or who had poor clinical response to therapy. Third, in this retrospective study, medical records provided little information on source cases, education, and living conditions; consequently, we failed to show the relationships between these factors and the DR TB epidemic. Last, the lack of genotyping the standard for identifying the origin of resistant isolates impeded us from correlating the mutations in the observed strains with the source strains in the environment in which the children lived. To control the ongoing primary transmission of DR TB among children, especially among children in close contact with patients with

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diagnosed TB, more effective strategies are urgently needed. For more individualized anti-TB regimens for children, DST should be performed for both first- and second-line anti-TB drugs among children and their sources; regular contact investigations should also be performed. Moreover, ongoing reforms for financing TB diagnosis and treatment for children will be essential components of effective interventions for TB prevention and control in China. If the global TB control strategy continues to pay less attention to the usually asymptomatic, paucibacillary, noncontagious childhood TB<sup>22</sup>, the goal of achieving zero deaths from childhood TB will be difficult to reach<sup>34</sup>; control of TB in children and adults still faces huge challenges. Understanding the long-term trends of DR TB among children can shed light on the performance of TB control programs in China, thereby contributing to global TB control. Tao is a medical master at Shandong University and a resident doctor at Shandong Provincial Hospital. Acknowledgments We express our deep appreciation to everyone who contributed to this work. Extensive drug resistance acquired during treatment of multidrug-resistant tuberculosis. Global tuberculosis report Guidance for national tuberculosis programmes on the management of tuberculosis in children. Burden of childhood tuberculosis in 22 high-burden countries: Multidrug-resistant tuberculosis in children: Culture-confirmed multidrug-resistant tuberculosis in children: Incomplete registration and reporting of culture-confirmed childhood tuberculosis diagnosed in hospital. Recent advances in the diagnosis of childhood tuberculosis. Culture confirmed multidrug resistant tuberculosis: Epidemiology and disease burden of tuberculosis in children: Clinical pharmacology and therapeutic drug monitoring in neonates and children. Epidemiology and clinical characteristics of pediatric drug-resistant tuberculosis in Chongqing, China. National survey of drug-resistant tuberculosis in China. N Engl J Med. Guidelines for surveillance of drug resistance in tuberculosis. Recommendations for investigating contacts of persons with infectious tuberculosis in low- and middle-income countries. Incidence of multidrug-resistant tuberculosis disease in children: Surveillance of antituberculosis drug resistance among children from the Western Cape Province of South Africa—“an upward trend. Am J Public Health. Risk factors for multidrug-resistant tuberculosis in four centers in Burkina Faso, West Africa. Self-reported risks for multiple-drug resistance among new tuberculosis cases: Pediatric formulations of second-line anti-tuberculosis medications: Int J Tuberc Lung Dis. Pediatric use of second-line anti-tuberculosis agents.

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## Chapter 7 : IJERPH | Free Full-Text | The Quality of Tuberculosis Care in Urban Migrant Clinics in China

*TB control in China. A National Tuberculosis Program was established in to reform TB control efforts and to expand the reporting system and TB blog.quintoapp.comr, a lack of money hampered the program's capacity in many areas.*

Tuberculosis TB is an infectious disease that spreads through the air. Only people who are sick with TB in their lungs pulmonary TB are infectious. When infectious people cough, sneeze, talk or spit, they propel TB germs bacilli , into the air. Tuberculosis mostly affects young adults in their most productive years. The immune system "walls off" the TB bacilli which, protected by a thick waxy coat, can lie dormant in the body for years. Left untreated, each person with active TB disease will infect on average of between 10 and 15 people every year. People with HIV are much more likely to develop TB after infection due to their weakened immune systems. The situation China has an estimated 1 million new cases of tuberculosis every year, more than any country except India. In recent years, the Government has made great progress in TB control and prevention, resulting in a significant decline in the burden of TB. The rate of decline was 2. TB mortality in China has declined rapidly, at an average rate of 8. TB incidence rate was estimated to have declined by 3. It is defined as when TB bacilli are resistant to at least isoniazid and rifampicin, the two most powerful anti-TB drugs. Second-line drugs are more costly than first-line drugs, and can cause adverse reactions that are more severe, though manageable. This means, over the past 20 years, China has reduced the TB prevalence and mortality rates by half. Providing global leadership on matters critical to TB; Developing evidence-based policies, strategies and standards for TB prevention, care and control, and monitoring their implementation; Providing technical support to Member States, catalyzing change, and building sustainable capacity; Monitoring the global TB situation, and measuring progress in TB care, control, and financing; Shaping the TB research agenda and stimulating the production, translation and dissemination of valuable knowledge; Facilitating and engage in partnerships for TB action. The aim is to: Pursue high-quality DOTS expansion and enhancement. DOTS is a five-point package to: Secure political commitment, with adequate and sustained financing; Ensure early case detection, and diagnosis through quality-assured bacteriology; Provide standardized treatment with supervision and patient support; Ensure effective drug supply and management; Monitor and evaluate performance and impact.