

Understanding Reasons for Lack of Effectiveness of National TB Program in Peru: Qualitative Analysis of MDRTB Control

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Abstract

Drug-resistant tuberculosis (DR-TB) is the most urgent public health problem to solve in Peru, according to the Ministry of Health [1]. In the WHO Global TB Report 2021, Peru has the highest burden of DR-TB in the Americas (Table 1), with 38% of TB cases either RR or MDR. In addition, the Ministry reports an estimated prevalence rate of DR-TB of 5.7% in new cases and 24.2% in previously treated cases. A total of 2493 new cases of DR-TB were reported in 2022, with 18.5% treatment dropout in 2019 believed to have increased by at least 52% in 2022 [1]. The post-pandemic context has created additional challenges for the control of DR-TB in Peru. A complex multiplicity of factors connects this disease to groups with high vulnerability, such as populations in extreme poverty and overcrowding or deprived of freedom; those who have immune system disorders, such as HIV and diabetes; and isolated indigenous populations.

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Introduction

Drug-resistant tuberculosis (DR-TB) is the most urgent public health problem to solve in Peru, according to the Ministry of Health [1]. In the WHO Global TB Report 2021, Peru has the highest burden of DR-TB in the Americas (Table 1), with 38% of TB cases either RR or MDR. In addition, the Ministry reports an estimated prevalence rate of DR-TB of 5.7% in new cases and 24.2% in previously treated cases. A total of 2493 new cases of DR-TB were reported in 2022, with 18.5% treatment dropout in 2019 believed to have increased by at least 52% in 2022 [1].

The post-pandemic context has created additional challenges for the control of DR-TB in Peru. A complex multiplicity of factors connects this disease to groups with high vulnerability, such as populations in extreme poverty and overcrowding or deprived of freedom; those who have immune system disorders, such as HIV and diabetes; and isolated indigenous populations.

Peru's national DR-TB control program, implemented since 1996, has shown an uneven performance, compared to other countries in the region, as shown in the WHO World TB Report 2021 (Table 1).

Table 1. Selected Countries with highest Rifampicin Resistant (RR) and MDR TB reported cases

Country	Reported MDR/RR-TB cases		
	Number	Percentage	Rate
Peru	1424	38%	4.3
Brazil	881	23%	0.4
Mexico	270	7%	0.2
Ecuador	253	7%	1.4
Dominican Republic	149	4%	1.4
Colombia	134	4%	0.3
Argentina	110	3%	0.2
Bolivia (Plurinational State of)	98	3%	0.8
Haiti	93	2%	0.8
Guatemala	77	2%	0.4
Total	3489	92%	

Note: Rates per 100 000 population

MDR/RR-TB: multidrug-resistant or rifampicin-resistant tuberculosis.

Source: World Health Organization. Global Tuberculosis Report 2021. Geneva: WHO, 2021. Available at: <https://www.who.int/publications/i/item/9789240037021>

Research question

What are the main causes for poor performance of Peru's National TB Program (NTBP) in control of MDRTB?

Objective: To identify the factors contributing to the ineffectiveness of Peru's NTBP and propose solutions that could be implemented to improve its effectiveness.

Methodology

To explore reasons for the ineffectiveness of Peru's TB Program, we conducted a qualitative study with a group of NTB Program managers. Interviews were conducted with 102 individuals (out of 162 from the sample framework sampled accordingly with sampling method), all national and provincial NTBP managers. They were asked about the main reasons for poor outcomes of MDRTB control in Peru, and to understand its strengths, weaknesses and current implementation failures.

A structured interview guide, based on a prior WHO survey for evaluating TB services [15], was piloted with managers, and then modified based on pilot responses.

The interviews were conducted in Spanish by one individual (SM), in one or two meetings lasting a maximum of 15 minutes each. All interviews were recorded and then transcribed in Spanish, translated into English, and entered into the NVIVO V11 software program for Windows.

NVIVO assigned responses with 3 possible conceptual codes: (1) providers; (2) patients; and (3) policy considerations.

Dependent Variable

Effectiveness of the NTBP, according to four indicators:

- Delay in diagnosis

- Lack of Adherence to treatment LTFU
- Failure of treatment
- Mortality

Inclusion criteria for interviewees

- TB health managers who were health personnel dedicated to the health care of people living with MDR-TB, and
- Working continuously during six or more than six months of experience in the care of MDR-TB patients and
- Whose position involved decision making or administrative management of the program, regardless of their profession, and
- Belonging to one healthcare type: Physicians, nurses, psychologists, dentists, nutritionists, physiotherapists, and midwives.

Data collection

Closed-ended surveys and structured interviews were conducted with the selected individuals, to obtain their opinion on the performance of the NTBP (according to the four indicators above), and possible solutions to performance problems.

Informed consent was obtained from 162 NTBP managers, divided into two groups: 60 took a online survey (See Annex 2 for the Google form used) to select the key performance outcomes for the NTBP (they selected the four key indicators above); and 42 in a different group were interviewed for 15 minutes in person to ask their opinions about the main causes for poor performance of Peru's NTBP in control of MDRTB.

To ensure the confidentiality of their interviewees, each person signed an Informed Consent agreement assuring that their identity would be protected. See Informed consent used in Annex Number 1

Definition of Performance Indicators

The four outcomes selected by the first group of interviewees (and the current values using the SIGTB11) are:

- *Delay in diagnosis:* Delay in diagnosing DRTB, including drug sensitivity testing and contact study screenings, especially in high-risk contacts (currently, median delay of 57 days (interquartile range: 28-126)).
- *Lack of adherence to treatment (LTFU):* The patient's inability or refusal to take TB medications according to prescribed by health professional (currently, 30.6% (CI 24.3-41.3%) LTFU).
- *Failure of treatment:* When the treatment regimen is carried out effectively and the patient, after completion of treatment, still shows positive sputum examination (currently, 3.9% (CI 1.3-4.9%))
- *Mortality:* When death is attributed to MDRTB as the direct cause of death (currently, 5.1% (CI 4.2-7.8))

Sampling Method

To decide on persons to interview, we first selected the current health services frame at the national, regional and local levels, designated to provide Tuberculosis care in Peru, with a sampling framework shown in Table 2.²

Table 2. Tuberculosis Health Services as total frame to calculate the study sample for the qualitative research, using by Simple random sampling method.

TB Health Services Type	Year 2021
Hospitals	591
Health Care Centers (PHC)	2,717
Health Post (PHC)	8,904
Total	12,212

Then, applying purposive sampling, we selected participants who possess relevant experience on tuberculosis clinical, operational and programmatic management, ensuring each one can provide insights into the causes for the ineffectiveness of Peru's TB Program.

The criteria for participant selection considered factors such as number of years of experience as NTBP manager, type of health service where the person works, occupation, expertise, specific experiences related to clinical, operational, and programmatic expertise.

We identified an initial set of participants who met the selection criteria and asked them to rate on a scale the most relevant programmatic outcome indicators to evaluate the effectiveness of the NTBP. After obtaining the selected outcome indicators, we proceeded to target individuals who are recognized experts or key informants in the clinical, operational and programmatic management of NTBP.

Once potential participants were identified, we contacted them to explain the research purpose, the method to ensure confidentiality, the interview process, and how their information would be used and how their privacy would be protected. We requested their participation by signing the informed consent agreement (See Annex 4).

The number of participants selected has been based on the research scope, and the richness of data required. We continued sampling until reaching a point of data saturation or theoretical saturation, ensuring that a sufficient depth of understanding was achieved.

We used a total simple random sampling method, with EPI INFO V 12.0 for Windows, according to the Population Survey design study. The Population Survey with design effect & cluster =1 Confidence level=80%, 50% of expected frequency and error margin of 5%, as shown in Table 3.

The initial calculated sample was 162 with loss of 5% during the study, resulting in 102 managers interviewed (40 national staff and 62 from provincial level) out of 12,212 total.

Qualitative methods used for this study

Several qualitative methods were used in this study to assess the reasons for poor performance of Peru's NTBP.

An online Google Form-based survey was conducted with 60 managers, to identify the key indicators of performance for Peru's MTBP. The most commonly cited four indicators were selected through a process of voting by participants. This process identified the main outcome variables (delay in diagnosis; lack of adherence to treatment; failure of treatment; and mortality).

Face-to-face interviews were then conducted with 42 managers. The interviews were conducted in Spanish, transcribed and translated into English. NVIVO V 11 for Windows software was used, creating three final conceptual codes and analysis of the qualitative data.

Two focus groups were organized through the Google Meet platform with two people in each group,

with the use of participatory digital tools (Jamboard, Kahoot) that facilitate the recording of information and generate a participatory dynamic. These focus groups addressed the same issues as the individual interviews, in order to select the most important factors contributing to the poor performance of the NTBP.

Annex 3 provides the text of the closed-ended online survey and the questions used in the semi-structured interviews.

Limitations

This study has various limitations:

Subjectivity and bias: The interviews with participants and subsequent analysis may be influenced by the interviewer's personal biases, assumptions, and preconceptions. We sought to minimize the potential biases by using the Conceptual codes given by NVIVO software.

Sampling method: The participants selected through purposeful sampling may not be statistically representative, but the sampling method could still generate useful insights and understanding of the problems with effectiveness of Peru's NTBP and could also help propose solutions.

Social desirability bias: The participants in interviews may respond in ways that they think can please the interviewer. To address this potential limitation, we ensured total confidentiality on the responses, and emphasized that there are not correct responses.

Recall bias: To reduce the unintentional omission or distortion of information, we conducted the interview in a flexible and dynamic semi-structured interview method.

Time and resource constraints: The interviews were time-consuming and resource-intensive, which could influence the quality of the information collected. To recruit participants, conduct interviews, transcribe and analyze data, and derive meaningful insights, we received the support and collaboration of Peru's NTBP, Asociacion Latino Americana de Torax (ALAT), and Sociedad Peruana de Neumologia.

Lack of standardization: This study used methods that do not have strict standardization. By not proceeding with structured surveys, we gave flexibility in the interview process, allowing for deeper exploration of the experiences of NTBP managers. However, this flexibility could also result in variations in the data collected. Standardization did occur, however, in the use of the NVIVO coincidence rate.

In this study, we sought to mitigate all of these limitations through rigorous methodology and careful analysis and interpretation of the collected data.

Results

The main results of the study are presented in Table 3 below, with a synthetic summary of the most

Table 3. Factors contributing to poor performance of Peru's NTBP

Four Indicators of Poor Performance of Peru's NTBP	Factors Related to Providers	Factors Related to Patients	Factors Related to Policies
Delay in Resistance diagnosis	Skilled HCW concentrated at hospital level Misclassification of RR,	Educational boundaries Competing prioritization: Economic needs	Poor incentives to alter PHCs' HCW practices. Misallocation of resources overfocus on

	MDR, RI: lack of training. At ESSALUD protocols demand RR patients must be hospitalized. Overfocus in high specialized TB services.	survival /Health related needs Lack of trust in HCW capacity/skills at PHC. Cultural, social and ethnic diversity, are a setback. HS not designed for it.	hospitals, versus lab atpoint of care, contact tracing, community based funded services. Centralization
	Lack of RR & RR, MDR, Rapid test identification laboratory methods at community and point of care level	Stigma- Discrimination- Poor sensibilization, lack education, competing prioritization Informal workers: health services seek behaviors.	The poorest bear the financial burden. Bureaucratic barriers, mean that 12% to 45% of the annual budget for MDR-TB control is not spent.
Lack of Adherence to treatment	Negative attitudes toward MDR-TB patient. Old drug scheme too long treatments, high toxicity. Miss classification of RR as MDR or IR	Health-seeking behaviors (following hemoptysis). Competing needs Self-medication Practices of the private clinic	Lack of political will. International aid undermined institutional strengthening. Lack of Resources at PHCL
	No interdisciplinary team's Poor capacity at PCH. Lack of HR, Mental health services. Conflict of interest Pneumologist.	Increasing burden of mental illness, substance's abuse. High rate of migration internal external	Lack of follow up of HLTBC. Financing Inequity in HC delivery to MDR TB. Policy: recent March 25 ^a , 2023 approved new drugs short treatment scheme.
Treatment failure	Inefficiency in financing approved protocols & guidelines. Lack of knowledge-resources to search for co-morbidities. Bad TB Drugs quality	High comorbidities burden. Health-seeking behaviors: Too late. The severity of the illness	Centralized purchases. Inequity in financing MDR TB management Lack of governance to implement new drugs policy. Poor understanding of the economic consequences. Lack of Modeling exercise
	Lack of drugs supply, and medical devices equipment to perform diagnosis of comorbidities. Chain supply shortage.	Motivations for Self-medication for MDR. Private clinics.	

High Mortality Burden	Lack of capacity to perform earliest diagnosis.	Initial reactions to symptoms. Poor Knowledge prior to infection. Health seeking behaviors	Catastrophic expenditures, not covered by Health Insurance. (Pulmonary complications, severe Respiratory failure) High OOE due to dysregulation
	Lack of skills to manage Severity of Respiratory insufficiency, pulmonary diseases & comorbidities.	Seek for hospitals care when other alternatives failed as the last resource, late seeking of HC	Lack of understanding of the importance of mortality due to MDRTB. Disregard of AVISA and YALY due MDRTB

important findings in the text below, for each of the four indicators of poor performance of Peru's NTBP.

Delay in Resistance diagnosis

Factors related to Providers

Providers' motivation and incentives are low and they often feel underpaid, burdened by an excessive workload that has no results and perceived lack of governance and leadership. Skilled HCW concentrated at hospital level Misclassification of RR, MDR, RI: lack of training. At ESSALUD protocols demand RR patients must be hospitalized. Overfocus in high specialized TB services. Delays in diagnosing drug resistance are more frequent now than before the Covid 19 pandemic. Insufficient number of GenXpert in the first level of care.

Providers often face low motivation and incentives, are undervalued and are overwhelmed by heavy workloads without tangible outcomes, compounded by a perceived lack of effective governance and leadership. There is a concentration of skilled healthcare workers at the hospital level, leading to the misclassification of resistant tuberculosis cases in the community. There is inadequate availability of GenXpert at the primary care level, hindering the timely diagnosis of drug resistance.

Factors Related to Patients

Competing prioritization: Economic needs survival /Health related needs. Educational boundaries. Lack of trust in HCW capacity/skills at PHC. Cultural, social and ethnic diversity, are a setback. HS not designed for it. Stigma- Discrimination- Poor sensibilization, lack education, competing prioritization Informal workers: health services seek behaviors.

International aid, and its efforts far from contributing to technical assistance: little or no adhesion of international donors to the National Plan for Prevention and Control of TB. Political decision-makers push for greater investment in the third level of care, the most complex, without extending funding to services that are closer to the community.

Competing priorities between economic survival and health-related needs, coupled with educational limitations, contribute to a lack of trust in the capacity and skills of healthcare workers at the primary healthcare level.

Cultural, social, and ethnic diversity is not taken into consideration at the policy-making level, and the TB healthcare system is not adequately designed to address these challenges.

Stigma, discrimination, and poor awareness, among informal workers, shape seek health care behavior.

Factors related to Policies

The managers consider that at the systemic level exist poor incentives to alter PHCs' HCW practices. Misallocation of resources overfocus on hospitals, versus lab at point of care, contact tracing, community based funded services. Excessive centralization on financing, evaluating, supervising the resources allocated to control MDRTB.

The poorest bear the financial burden. Bureaucratic barriers, mean that 12% to 45% of the annual budget for MDR-TB control is not spent.

Managers perceive a lack of effective incentives to drive changes in healthcare practices at the primary healthcare level, resulting in a misallocation of resources with a disproportionate focus on hospitals rather than investing in point-of-care laboratories, contact tracing, and community-based funded services.

Furthermore, excessive centralization in financing, evaluation, and supervision of resources allocated for controlling multidrug-resistant tuberculosis (MDRTB) leads to bureaucratic barriers, resulting in significant unspent portions of the annual budget (ranging from 12% to 45%), burdening the poorest individuals who bear the financial consequences.

international aid efforts have shown limited alignment with the National Plan for Prevention and Control of Tuberculosis, while political decision-makers prioritize investment in highly complex tertiary care without extending funding to community-based services.

Lack of Adherence to treatment

Factors related to Providers

The factors most strongly associated to poor performance of the health system in controlling MDRTB are:

Insufficient number of rapid molecular test of RR, MDR, RI, GenXpert in the first level of care. Old scheme of treatment is still based on injectable drugs and lasts more than 12 months, which makes patient adherence difficult (Norma Técnica Sanitaria No. 200/25 March 2023). One important factor is that the MDR-TB approach teams are only doctors and nurses; existing an urgent need to include mental health specialist since the managers perceive that mental support is needed, also anthropologists, psychologists, social workers, architects, urban planners are not incorporated to address the other social determinants of the phenomenon.

The primary factors associated are the insufficient availability of rapid molecular tests (such as GenXpert) at the primary care level, hindering early diagnosis, and the persistence of an outdated treatment regimen relying on injectable drugs and lasting over 12 months, leading to challenges in patient adherence. Lack of a multidisciplinary approach in MDR-TB teams, which currently consist only of doctors and nurses. There is an urgent need to incorporate mental health specialists, anthropologists, psychologists, social

workers, architects or urban planners to address the broader social determinants of the MDRTB phenomenon.

Factors related to Patients

On the patient side is notorious than certain health-seeking behaviors just following serious illness symptoms like: hemoptysis, is the most frequent. Also practices of self-medication, seeking medical care at private sector. And an increasing burden of mental illness, substance's abuse. High rate of migration internal external.

Patients often exhibit health-seeking behaviors primarily focused on addressing severe illness symptoms, with hemoptysis being the most reported symptom. Self-medication practices and seeking medical care

from the private sector are prevalent. Moreover, there is a growing burden of mental illnesses and substance abuse, while high rates of internal and external migration further make difficult the following up of patients.

Factors related to Policies

The managers consider than exist lack of political will. International aid undermined institutional strengthening. Lack of Resources at Primary Health Care Level and community-based, funded activities. lack of political will as a significant barrier, while international aid efforts have hindered institutional strengthening. Furthermore, there is a shortage of resources allocated to the primary healthcare level, including community-based funded activities, exacerbating the challenges faced in delivering effective healthcare services.

Treatment failure

Factors related to Providers

Inefficiency in financing approved protocols & guidelines. Lack of knowledge-resources to search for co - morbidities. Bad TB Drugs quality.

Lack of drugs supply, and medical devices equipment to perform diagnosis of comorbidities. Chain supply shortage.

The NTBP experiences inefficiencies in financing approved protocols and guidelines, which impacts the implementation of effective practices. Moreover, there is a shortage of drug supplies and medical equipment needed for diagnosing comorbidities, contributing to challenges in the healthcare supply chain.

Factors related to Patients

High comorbidities burden (specially diabetes, hypertension, Covid). Health-seeking behaviors: The patient seeks for health care when feels severely ill or cannot work when is too late. The severity of the illness is not perceived until is too late.

Motivations for Self-medication or seeking for miraculously treatment or private clinics.

There is a significant burden of comorbidities, particularly diabetes, hypertension, and the added impact of Covid-19. Health-seeking behaviors among patients are often characterized by seeking healthcare only when they feel severely ill or when their ability to work is compromised, resulting in delayed medical attention. This, coupled with motivations for self-medication and the pursuit of alternative treatments or private clinics, further contributes to treatment failure.

Factors related to Policies

Centralized purchases. Inequity in financing MDR TB management Lack of governance to implement new drugs policy. Poor understanding of the economic consequences. Lack of Modeling exercise

Additionally, there is a lack of interest at the policy-making level to finance and address co-morbidities, along with concerns about the quality of TB drugs.

High Mortality Burden

Factors related to Providers

Lack of capacity to perform the earliest diagnosis. Lack of training to manage Respiratory Failure

Lack of skills to manage the Severity of Respiratory insufficiency, pulmonary diseases & comorbidities.

There is a lack of capacity to perform resistance early diagnosis, resulting in delays in identifying and

treating conditions promptly. Additionally, healthcare professionals face a lack of training in managing respiratory failure, which includes addressing the severity of respiratory insufficiency, pulmonary diseases, and associated comorbidities.

Factors Related to Patients

Initial reactions to symptoms. Poor knowledge prior to infection. Health-seeking behaviors due to competing priorities, the patient go to the hospital when symptoms are obvious.

Seek for hospitals care when other alternatives failed as the last resource, reactive seeking of Health Care.

Individuals tend to react to symptoms only when they become noticeable, indicating a lack of prior knowledge about potential health issues. Due to competing priorities, patients often resort to seeking hospital care as a last resort when other alternatives have failed, leading to a reactive approach to healthcare seeking.

Factors Related to Policies

Catastrophic expenditures, are not covered by Health Insurance. (Pulmonary complications, severe Respiratory failure) High OOPE due to dysregulation.

Lack of understanding of the importance of mortality due to MDRTB. Disregard of AVISA and YALY due MDRTB

Patients facing severe respiratory failure often incur catastrophic expenditures that are not covered by health insurance, leading to high out-of-pocket expenses due to inadequate regulation. Moreover, there is a lack of understanding regarding the significance of mortality caused by multidrug-resistant tuberculosis (MDRTB).

Recommendations

The recommendations on how to improve the effectiveness of performance of Peru's NTBP are based on results from the second group of face-to-face interviewees (40 participants).

1. *Diagnosis delay:* In order to reduce the MDRTB diagnosis delay, there is a need to expand and finance GenXpert molecular tests and introduce rapid resistance diagnosis methods such as Truenat at the point of care—especially at the provincial level (to avoid sending samples to Lima). Efforts should be made to use the annual budget more completely on rapid molecular diagnosis methods. The goal should be to effectively reduce the time for resistance diagnosis at the district and province levels, with a focus on the most geographically affected areas.
2. *Lack of adherence to treatment:* To improve adherence to treatment, all community health workers should be trained in how to manage followup of patients. The training should include early and appropriate clinical recognition of RR, RI, and MDR comorbidities. Increased financing is needed to improve contact trace capacity, training, monitoring and evaluation.
3. *Treatment failure:* To address failures in medication, it is important to implement and finance the new legal framework of 2023, including new drugs and general use all over Peru (Norma Técnica Sanitaria No. 200/25 March 2023; or NTS 200). This will help increase the capacity for rapid diagnosis and treatment of Acute Severe Respiratory Failure related to treatment failure. Local health workers need to be trained on effective use of budgets, to increase the spending of the annual budget provided to facilities and prevent budget deviation to other programs (45% of the budget is

currently returned to the Ministry unused). New modern TB drugs need to be registered, procured, and effectively used by providers, along with increased accountability of drug quality. Providers need to be trained and encouraged to use the new treatment scheme.

4. *High mortality*: The high mortality related to comorbidities needs to be addressed through increased financing for treatment of comorbidities, and measures to encourage providers to implement the regulations of NTS 200. Increasing financing and utilization of new drugs is important to reduce patient mortality. Increased training and supervision of health care workers will also assist in early identification of failure of treatment and signs of disease severity. Improve the equipment and maintenance at the primary and secondary health care levels will also assist in reducing mortality.

Conclusions

This study emphasizes the importance to take into consideration the experience and views of NTBP managers if you want to improve performance.

Need for financing effectively new drugs scheme, lab for the rapid molecular test at the point of care, mental health services, and ensure the continuum of care.

Need for organizational changes, especially multidisciplinary teams.

Need for regulation changes in the control of pharmacies to avoid Self-medication.

Increase transparency and accountability, especially of international aid.

Articulate international aid together with civil society and the Ministry of Health (MINSA) so that funds are implemented collaboratively. The study highlights the crucial role of incorporating the experience and perspectives of managers responsible for managing national tuberculosis control program (NTBPs) in order to enhance performance.

It underscores the need for effective financing to support the introduction of new drug schemes, establish point-of-care rapid molecular testing laboratories, expand mental health services, and ensure continuity of care.

Furthermore, organizational changes, particularly the establishment of multidisciplinary teams, are essential. Additionally, regulatory changes in private drugstore control, are necessary to address self-medication practices.

The study emphasizes the importance of increasing transparency and accountability, particularly regarding international aid. It recommends fostering collaboration between international aid agencies, civil society, and the Ministry of Health (MINSA) to facilitate the collaborative implementation of funds.

References

1. Boletín Tuberculosis Diciembre 2022 Dirección General de Prevención y Control de TBC MINSA Peru, disponible en: <https://www.gob.pe/institucion/minsa/informes-publicaciones/3809865>
2. Tuberculosis in the Americas. Regional Report 2021, available at: <https://www.paho.org/en/documents/tuberculosis-americas-regional-report-2021>
3. Health sector reform in Peru and the integration of vertical programs : ensuring the success of the tuberculosis program Gupta, Srishti. / Cambridge, Mass. : John F. Kennedy School of Government / (Policy analysis exercise.) 2003

4. Socioeconomic and Behavioral Factors Associated with Tuberculosis Diagnostic Delay in Lima, Peru. Bonadonna, Lily V. ; Saunders, Matthew J. ; Guio, Heinner ; Zegarra, Roberto ; Evans, Carlton A. *The American journal of tropical medicine and hygiene*, 2018, Vol.98 (6), p.1614-1623.
5. A systematic review of the cost and cost effectiveness of treatment for multidrug-resistant tuberculosis. Fitzpatrick C, Floyd K. *Pharmacoeconomics*. 2012 Jan;30(1):63-80. doi: 10.2165/11595340-000000000-00000. PMID: 22070215 Review.
6. Clinical features, diagnosis, and management of multiple drug-resistant tuberculosis since 2002. Drobniewski F, Balabanova Y, Coker R. *Curr Opin Pulm Med*. 2004 May;10(3):211-7. doi: 10.1097/00063198-200405000-00011. PMID: 15071373 Review.
7. Low-cost diagnostic test for susceptible and drug-resistant tuberculosis in rural Malawi. Zhang A, Jumbe E, Krysiak R, Sidiki S, Kelley HV, Chemey EK, Kamba C, Mwapasa V, García JI, Norris A, Pan XJ, Evans C, Wang SH, Kwiek JJ, Torrelles JB. *Afr J Lab Med*. 2018 Jun 4;7(1):690. doi: 10.4102/ajlm.v7i1.690. eCollection 2018. PMID: 29977794 Free PMC article.
8. Cost-effectiveness of treating multidrug-resistant tuberculosis. Resch SC, Salomon JA, Murray M, Weinstein MC. *PLoS Med*. 2006 Jul;3(7):e241. doi: 10.1371/journal.pmed.0030241. PMID: 16796403
9. Alternative cost-effective media to facilitate MODS culture for diagnostics of tuberculosis. Sheen P, Rodriguez J, Alcántara R, Vargas J, Grandjean L, Moore DAJ, Gilman RH, Zimic M. *Tuberculosis (Edinb)*. 2022 Jul;135:102225. doi: 10.1016/j.tube.2022.102225. Epub 2022 Jun 15. PMID: 35728429
10. Recent tuberculosis advances in Latin America. Pelly T, Moore DA, Gilman R, Evans C. *Curr Opin Infect Dis*. 2004 Oct;17(5):397-403. doi: 10.1097/00001432-200410000-00003. PMID: 15353958 Free PMC article. Review.
11. Frequency and type of microbiological monitoring of multidrug-resistant tuberculosis treatment. Kurbatova EV, Gammino VM, Bayona J, Becerra M, Danilovitz M, Falzon D, Gelmanova I, Keshavjee S, Leimane V, Mitnick CD, Quelapio MI, Riekstina V, Taylor A, Viiklepp P, Zignol M, Cegielski JP. *Int J Tuberc Lung Dis*. 2011 Nov;15(11):1553-5. doi: 10.5588/ijtld.11.0101. PMID: 22008772
12. Household screening and multidrug-resistant tuberculosis. Cox H, van Cutsem G. *Lancet*. 2011 Jan 8;377(9760):103-4. doi: 10.1016/S0140-6736(10)61390-6. Epub 2010 Dec 8. PMID: 21145582 No abstract available.
13. Programmatic management of multidrug-resistant tuberculosis: models from three countries. Furin J, Bayona J, Becerra M, Farmer P, Golubkov A, Hurtado R, Joseph JK, Keshavjee S, Ponomarenko O, Rich M, Shin S. *Int J Tuberc Lung Dis*. 2011 Oct;15(10):1294-300. doi: 10.5588/ijtld.10.0591. Epub 2011 Jun 8. PMID: 21669029.
14. Better than a pound of cure: preventing the development of multidrug-resistant tuberculosis. Byrne AL, Fox GJ, Marais BJ. *Future Microbiol*. 2018 Apr;13:577-588. doi: 10.2217/fmb-2017-0236. Epub 2018 Mar 9. PMID: 29521120 Review.
15. Global Tuberculosis Programme TB Economic evaluation and survey, available at: <https://www.who.int/teams/global-tuberculosis-programme/economics/economic-survey>