Thailand Operational Plan
To End Tuberculosis, Phase 2
(2023 – 2027)

Division of Tuberculosis, Department of Disease Control, Ministry of Public Health, Thailand

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Contents

Introduction

Tuberculosis (TB) has been a public health problem at the international and national levels. Since 2015, the World Health Organization (WHO) has announced the End TB Strategy to guide the TB-related efforts in member countries. The goal of this strategy's is to end TB by 2035. Thailand, as a member country of the WHO, developed an operational plan to end TB from 2017 to 2021, which was later extended to 2022. This extension was intended to align with the review timeframe of Thailand's national strategy which spans 20 years from 2018 to 2037 and undergoes assessment every five years. The extension aimed to accelerate the country's efforts to end TB.

The Thailand operational plan to end TB, Phase 2 (2023 – 2027), aims to achieve its goal through a 5 - year implementation period. Its direction for implementing TB-related efforts is consistent with the End TB Strategy which is set to be achieved by 2035.

Thailand Operational Plan to End Tuberculosis, Phase 2 (2023 – 2027)

This Thailand Operational Plan to End Tuberculosis, Phase 2 (2023 – 2027) has as goal "to reduce the problem of TB epidemic in Thailand" and target to reduce TB incidence from 143/100,000 population in 2021 to 89/1000,000 population in 2027. To ensure that the Operational Plan is fully consistent with the Global End TB Plan, as recommended by WHO, the Plan consists of five strategies and their associated strategic objectives and interventions as follows.

Strategy 1 — Intensify TB case finding and the diagnosis of TB and drug-resistant TB

Objective: To enable TB patients and drug-resistant TB patients to undergo early and effective treatment process, which helps break the cycle of TB transmission within families and communities. Strategic interventions include:

1.1 Intensify TB case finding in children (0-14 years old) and adults from the early stage (Early detection)

1.2 Use molecular testing for diagnosing TB and drug-resistant-TB

1.3 Strengthen the TB laboratory network

Strategy 2: Enhance the care and treatment of TB patients and drug-resistant TB patients according to international standards.

Objective: To improve the effectiveness of care and treatment for TB patients and drug-resistant TB patients, with a particular focus on reducing deaths during treatment. Strategic interventions include:

2.1 Improve the effectiveness of care and treatment for TB patients

2.2 Improve the effectiveness of Programmatic management of Drug-resistant TB (PMDT)

2.3 Support the management of caring children with TB

Strategy 3: Enhance the effectiveness and accessibility of diagnosis and treatment of latent TB infection and TB infection control

Objective: To prevent the development of TB disease among the population in the future.

3.1 Expand the screening for latent TB infection

3.2 Improve the effectiveness of TB preventive treatment (TPT)

3.3 Strengthen TB infection control in healthcare facilities, high-risk settings, and community

Strategy 4: Strengthen the support system for implementing the TB program

Objective: To build sustainability in driving the TB program towards end TB.

4.1 Enhance strategic management mechanisms

4.2 Accelerate the monitoring of program implementation and surveillance of TB

4.3 Develop the capacity of TB personnel

4.4 Accelerate the implementation of public communication and community engagement

4.5 Collaborate with the network of stakeholders to create equal access to standardized care and treatment for TB patients.

Strategy 5: Promote research and innovation in TB prevention and control

Objective: To enable the public and network to access the utilization of research and innovation in ending TB.

5.1 Promote research projects

5.2 Develop and support the application of innovations

Strategy, international goals related to global tuberculosis control,

Thailand's national strategy, and core plan related to public health
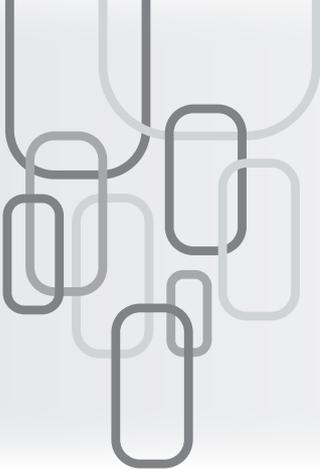
Strategy, international goals related to global tuberculosis control,

Thailand's national strategy, and core plan related to public health

The End TB Strategy

In 2015, the WHO announced the End TB Strategy, which has a vision a world free from TB and aims to end the global TB epidemic by reducing mortality by 95% and reducing TB incidence by 90% by the year 2035. The strategy also aims to ensure that no family experiences catastrophic costs due to TB.

Table 1 Indicators and Targets of The End TB Strategy

Indicator	Targets			
	Milestones		SDGs	End TB
	2020	2025	2030	2035
Reduction in number of TB deaths compared to 2015 (%)	35	75	90	95
Reduction in TB incidence rate compared to 2015 (%)	20	50	80	90
TB-affected families facing catastrophic costs due to TB	0	0	0	0

The End TB strategy builds on three strategic pillars (Table 2) and four principles (Table 3)

Table 2 Pillars of the Global End TB Strategy

Pillar	Pillar
1. Integrated, patient-centered care and prevention	1.1 Early diagnosis of TB including universal drug susceptibility testing, and systematic screening of contacts and high-risk groups. 1.2 Treatment of all people with TB, including drug-resistant, and patient support. 1.3 Collaborative TB/HIV activities and management of co-morbidities. 1.4 Preventive treatment ofpersons at highrisk and vaccination against TB.
2. Bold policies and supportive system	2.1 Political commitment with adequate resources for TB care and prevention 2.2 Engagement of communities, civil society organizations, and all public and private care providers. 2.3 Universal health coverage policy and regulatory frameworks for case notification, quality and rational use of medicines, and infection control. 2.4 Social protection, poverty alleviation and intervention to address social determinants of TB
3. Intensified research and innovation	3.1 Discovery, development and rapid uptake of new tools, intervention and strategies. 3.2 Research to optimize implementation and impact; and promote innovations.

Table 3 Principles of the End TB Strategy

Principles	Key component
1	Government stewardship and accountability, with monitoring and evaluation
2	Building a strong coalition with civil society and communities
3	Protecting and promoting human rights, ethics and equity
4	Adaptation of the strategy and targets at country level, with global collaboration

Sustainable Development Goals: SDGs

The SDGs were endorsed at the United Nations General Assembly (UNGA) meeting in 2010 as a continuation of the Millennium Development Goals (MDGs), which concluded in 2015. Since then, the UN has developed the SDGs to achieve the development targets by 2030. The SDGs focus on addressing challenges, fostering collaboration among various sectors and countries, and promoting balancing development in three dimensions: economic growth, environmental sustainability, and social inclusion. The key factors for development opportunities include inclusiveness, universality, integration, local focus, and technology-driven approaches. There are a total of 17 main goals included in the SDGs.

Ending TB has been set as Goal 3: Ensure healthy lives and promote well-being for all at all ages, under Target 3.3: End the epidemics of AIDS, TB, malaria, and neglected tropical diseases, and combat hepatitis, water-borne diseases, and other communicable diseases. Ending TB is a crucial indicator that Thailand aims to achieve by reducing the incidence rate to 20 per 100,000 population by the year 2030.

Thailand's national strategy 20 years, from 2018 to 2037

Thailand has set its national development goals as follows: "national security, public contentment, sustained economic growth, just society, and a foundation of sustainable natural resources. It has formulated a 20-year development framework on creating balanced development, a strong economy, and a high-quality society that fosters the development of individuals in all dimensions and stages of life, making them good, skilled, and of high quality. It aims to create opportunities and social equality and promote growth based on a quality of life that is friendly to the environment. The key driving force is to develop Thailand into "Thailand 4.0," which involves transforming the country from being driven by heavy industries to being driving by innovation, adhering to the principle of doing more with less to enhance the country's potential in various dimensions and move away from the middle-income trap towards high-income status. This is achieved by establishing six strategies, as follows:

1. The strategy for national security
2. The strategy for national competitiveness enhancement
3. The strategy for human capital development and strengthening
4. The strategy for social cohesion and just society
5. The strategy for eco-friendly development and growth
6. The strategy for public sector rebalancing and development

Master plans under the national strategy, 2018 - 2037

The master plan under the national strategy is a framework designed to achieve the set goals in the national strategy. It has implications for relevant government agencies which are required to implement it accordingly. The master plan under the national strategy consists of six dimensions, 23 issues, and specific actions plans under the national strategy, which are a result of the COVID-19 pandemic situation in the year 2021-2022. The master plan under the national strategy includes the relevant situation and trends, targets and indicators, as well as the annual budget allocation for implementation, divided into four five-year periods. It provides guidance for development and important plans/projects under the national strategy, serving as a framework for the operations of related agencies to achieve the defined national development goals in the national strategy. Among the directly related issues, Topic 13 focuses on enhancing the well-being of Thai people.

Thailand's 13th national economic and social development plan

The 13th national economic and social development plan (2023-2027) is the first plan that initiates the process of formulating the framework plan under the national strategy and have implications for use as a framework to establish the master plan under the national strategy and the operational plan for the second five-year period of the 20-year national strategy. The plan sets the direction for national development during the period and draws upon the sufficiency economy philosophy as the guiding principle for driving and planning the country's development towards achieving various dimensions under the national strategy in a sustainable manner. During a time when the world, including Thailand, is facing challenges from external and internal factors characterized by high volatility and increasing uncertainties in the future, partly as a result of the COVID-19 pandemic situation and the limitations of the internal structure that require improvements in various dimensions, it is necessary to prioritize both external and internal factors as well as the impacts of changing factors on the country's structure and dynamics in all dimensions. This is crucial for analyzing and incorporating the results into the formulation of the future direction of the country's development based on the sufficiency economy philosophy that aligns with the SDGs, targeting all 13 aspects divided into four dimensions.

Dimension of production and service target:

Objective 1: Thailand aims to be a leading country in high-value agricultural products and agricultural processing.

Objective 2: Thailand aims to be a destination for tourism focused on quality and sustainability.

Objective 3: Thailand aims to be a significant hub for electric vehicle production globally.

Objective 4: Thailand aims to be a center for high-value medical and health services.

Objective 5: Thailand aims to be a gateway for trade, investment, and important logistics strategies in the region.

Objective 6: Thailand aims to be a significant hub for the production of smart electronic devices globally.

Dimension of opportunities and economic and social equality:

Objective 7: Thailand has strong and competitive medium-sized and small-sized enterprises with high potential.

Objective 8: Thailand has smart and livable cities and areas that are safe and sustainable for sustainable growth.

Objective 9: Thailand has reduced intergenerational poverty and ensures social protection that is sufficient and appropriate for all Thai people.

Dimension of sustainable natural Resources and environment:

Objective 10: Thailand has a low-carbon economy and society with a circular economy approach.

Objective 11: Thailand is able to reduce risks and impacts from natural disasters and climate change.

Dimension of factors driving national transformation:

Objective 12: Thailand has a highly capable workforce that is continuously learning and meets the demands of future development.

Objective 13: Thailand has a modern, efficient, and responsive public sector that meets the needs of the people.

Related to healthcare operations and disease control, the following objectives and goals are: Objective 4: Thailand is a center for high-value medical and health services; Goal 3: Thai people receive equitable access to healthcare services, and Goal 4: The health emergency management system is prepared to respond to health risks and emergencies.

The Department of Disease Control as the main agency responsible for the prevention and control of diseases and health risks in the country has developed the 20 - year national operational plan for the prevention and control of diseases and health risks. The operational plan serves as a framework for guiding the country's disease prevention and control efforts, with a focus on developing a disease prevention and control system centered around the population, utilizing knowledge, technology, and innovation as driving forces, while adhering to the principles of sufficiency economy, good governance, and value for money. The plan was revised in 2021 and encompasses five strategic objectives, which are:

Strategy 1: Development of policies, measures, and services for the prevention and control of diseases and health risks.

Strategy 2: Strengthening public health emergency operation systems.

Strategy 3: Upgrading the basic infrastructure of the system for the prevention and control of diseases and health risks.

Strategy 4: Improvement of management systems and the development of collaborations.

Strategy 5: Development of human resources for the prevention and control of diseases and health risks.

The process of developing the operational plan

The process of developing the Thailand operational plan to end TB, Phase 2 (2023 - 2027) consists of the following key steps:

1. Reviewing past activities, documents, articles, research, and guidelines on TB by the WHO or related agencies.

2. Seeking input and perspectives from stakeholders, experts, and administrators from within and outside the Ministry of Public Health.

3. Setting strategies, measures, targets, indicators, and budgets.

4. Soliciting feedback and suggestions from stakeholders of the Thailand operational plan to end TB, Phase 2 (2023 - 2027).

5. Presenting the operation plan to the Ministry of Public Health's administrators for approval and submitting it to National Communicable Disease Committee for endorsement as a framework for driving the country's TB control efforts.
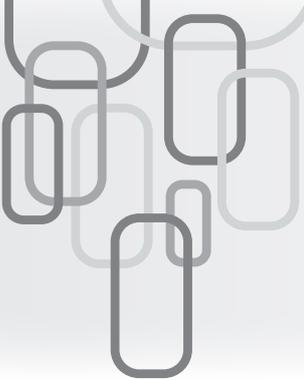
Basic information and the situation of TB in Thailand

Demography

Thailand is located in the Southeast Asia region. It has a population of approximately 70 million people (https://www.worldometers.info/world-population/thailand-population, data as of March 7, 2023, based on Worldometer elaboration of the latest United Nations data). It shares borders with Myanmar, Laos, Cambodia, and Malaysia.

Since the year 2005, Thailand's population structure has transitioned into an aging society. This transformation is primarily driven by significant declines in fertility rates, decreases in mortality rates, and an increase in the average life expectancy of the population. In 2020, the estimated average life expectancy at birth for Thai males was 74 years, while for Thai females, it was 81 years. The proportion of the older population, defined as individuals aged 60 years and above, reached 15.5 percent of the total population, and the trend of an increasing older population has been continuous. Furthermore, in 2020, approximately 51 percent of the population resided in urban areas, accounting for around 5.1 million people living in the Bangkok Metropolitan Region and its surrounding areas.

The economic growth and below-replacement fertility rates in Thailand have resulted in a demand for labor from neighboring countries. According to the International Organization for Migration (IOM) report on Thailand's migration, it is estimated that in 2020, there were approximately 4.9 million international migrant workers residing in Thailand. Out of these, 2.5 million were registered with the Ministry of Labor. However, a significant portion of undocumented migrant workers face challenges in accessing healthcare services. Additionally, there are approximately 95,000 displaced persons living in Thai-Myanmar border camps, and around 1,000,000 stateless individuals, primarily residing in the northern and northeastern regions of the country.

Economy, society, and health

Thailand is classified as an upper middle-income country. However, in the past decade, the economy has experienced a slowdown with an average annual GDP growth rate of only 3.5 percent. The outbreak of the COVID-19 in 2019 further impacted the Thai economy, causing it to go into a recession. It is expected to take at least two years for the economy to recover and return to its previous level. (https://www.bot.or.th/Thai/ResearchAndPublications/articles/Pages/Article_5Jan2021.aspx)

In terms of healthcare investment for the population, in 2017, the government supported approximately three-fourths of the total healthcare expenses for the population, with the remaining 10 percent being out-of-pocket expenditure.

Table 4 Basic economic and health indicators in Thailand

Indicators	Unit	Latest data	Value	Annual change	5 years ago
Gross domestic product (GDP) per capita	USD	2564	7,056.53	+1.5 %	7,091.48
Current health expenditure, % of GDP	%	2562	3.79	-0.77 %	3.78
Current health expenditure per capita	USD	2562	296.17	+6.29 %	253.48
Domestic general government health expenditure, % of current health expenditure	%	2562	71.66	+1.69 %	73
Domestic private health expenditure, % of current health expenditure	%	2562	28.23	-3.92 %	26.85
Out-of-pocket expenditure, % of current health expenditure	%	2562	8.67	-15.41 %	10.93

Source: World Development Indicators database

Structure and organization of the health services

In Thailand's healthcare management system, there is a network of operations at all levels, including regions, provinces, districts, sub-districts, and villages. At the regional level, it serves as the central administrative unit where regional offices are located. Currently, the regional level is divided into 13 offices of regional health inspectors. At the provincial level, the provincial health office oversees the agencies in the area, except in Bangkok, which is a special administrative area with its own self-governing system. Hospitals are distributed in every district, with general hospitals or regional hospitals providing more than 120 beds located in the main city or larger districts. Community hospitals offering 10 to 120 beds for inpatient departments are located in the districts. At the sub-district level, there are sub-district health promotion hospitals, most of which do not admit patients or have resident physicians. They collaborate with physicians from community hospitals, and there are village health volunteers who coordinate community healthcare with hospitals. Additionally, some areas have specialized hospitals and private hospitals providing services to the public.

The healthcare insurance system in Thailand consists of three main systems, covering 99 percent of the population. The system that covers the largest population is the universal coverage scheme, covering 75 percent. The next system is the social security scheme, covering 17 percent, followed by the civil servant medical benefits scheme for government officials, covering 7 percent (Parliamentary Budget Office, 7/2017, Budgetary Burden for Health Service Systems, Office of the Secretary of the House of Representatives).

These three systems differ in terms of the characteristics of the population they cover, basic benefit entitlements, and healthcare benefits, leading to inequalities in access to healthcare. These issues are currently being addressed and awaiting resolution. As for migrant workers employed in Thailand, they can either utilize social security benefits or purchase health insurance while awaiting social security entitlements. Migrants' dependents can also purchase health insurance for migrant workers.

The organizational structure for the implementation of National TB Program
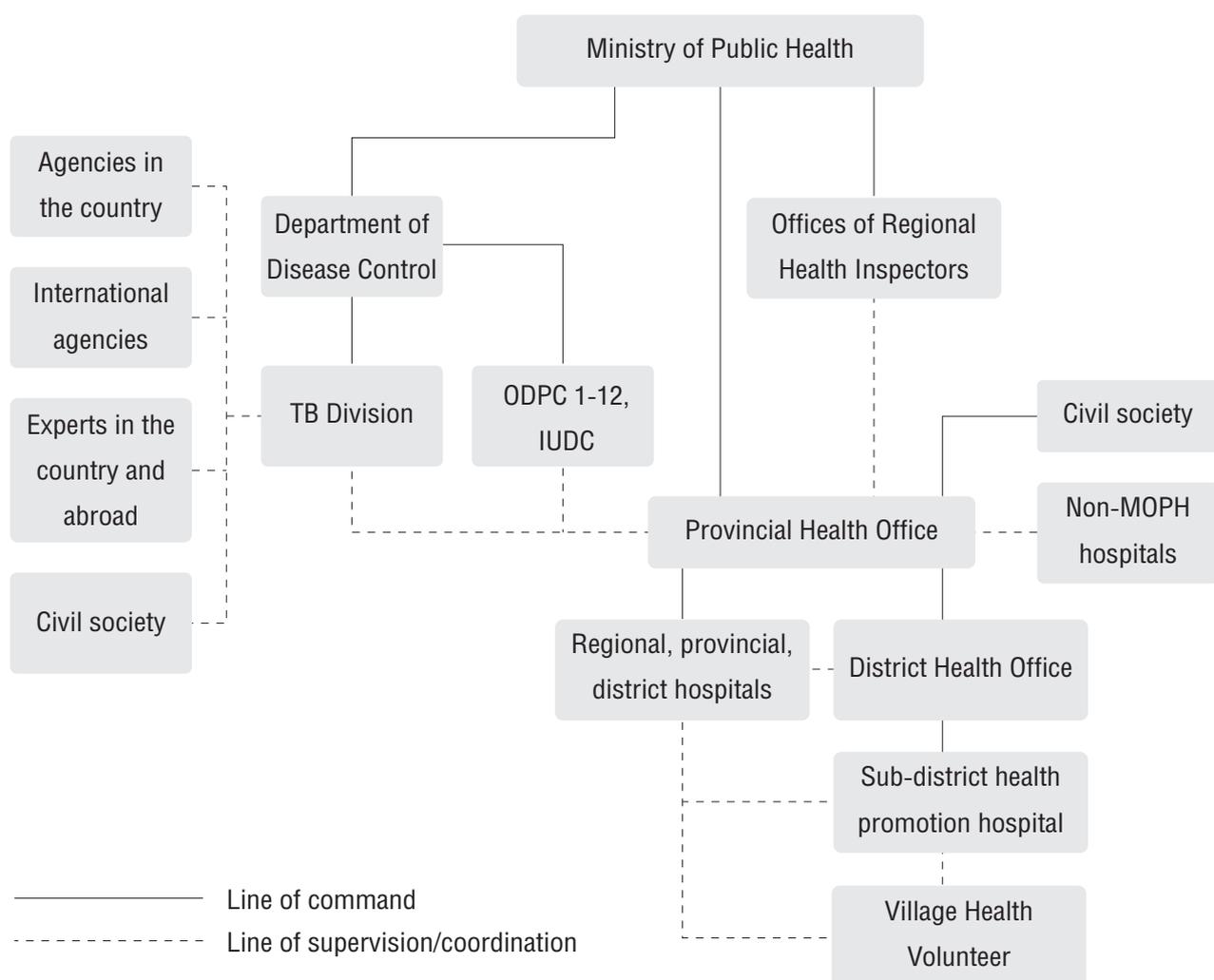
The TB situation in Thailand

1. TB incidence

According to the WHO, the estimated TB incidence in Thailand has been gradually decreasing over the past decade (2012-2021). The incidence of TB has decreased by an average of 2.0 cases per 100,000 population per year during this period. In 2021, the TB incidence in Thailand was reported as 143 cases per 100,000 population, which is approximately 103,000 cases (WHO, Global Tuberculosis Report 2022).

The estimated TB incidence in Thailand provided by the WHO
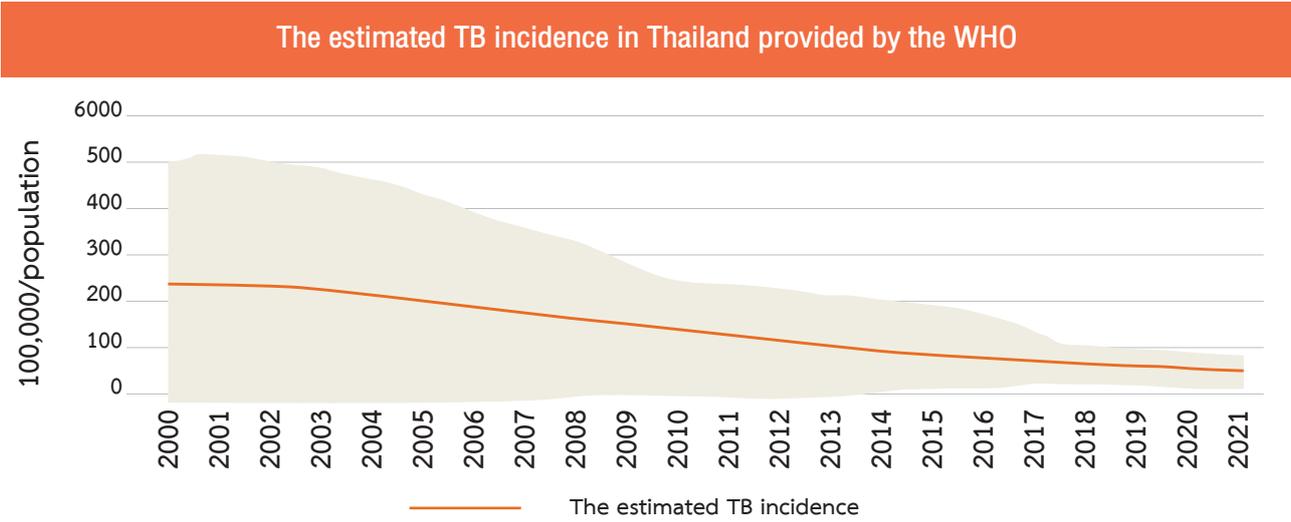
2. TB mortality

Due to limitations in Thailand's death certificate system, the mortality rate of TB patients in Thailand is referenced from the estimated data provided by the WHO. In 2021, the TB mortality rate (including both TB-HIV co-infected and TB patients without HIV infection) was estimated to be 16 (13-19) per 100,000 population, which corresponds to approximately 11,400 individuals (9,070-13,900).

According to the estimated TB mortality rate since 2000, the mortality rate of TB-HIV co-infected patients has significantly decreased. However, the mortality rate of TB patients without HIV infection has been decreasing slowly, remaining relatively stable at around 14 per 100,000 population between 2007 and 2021.

The estimated mortality rate of TB patients in Thailand provided by the WHO
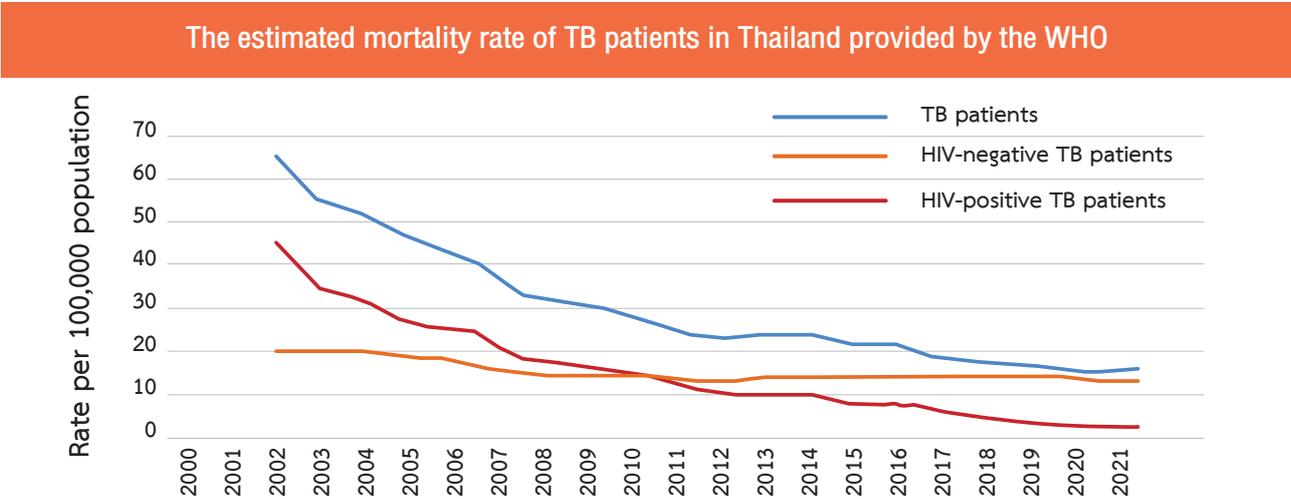
Source: Global TB database

3. TB registration

The trend of registering new and relapse patients undergoing treatment in Thailand between 2014 and 2020 showed an increasing pattern, with a subsequent decrease in 2021-2022 due to the impact of the COVID-19 pandemic. Registration of extrapulmonary TB patients accounted for 9 to 16% of total registrations, and starting from 2016, there has been a clear upward trend in the registration of new and relapse patients. This is attributed to the implementation of a centralized individual-based database in the country, which began as an offline and online system in 2018. (National TB Information Program; NTIP)

The number of new and relapse TB patients registered for treatment in Thailand, both pulmonary and extrapulmonary TB

Year	Extrapulmonary TB	Pulmonary TB
2014	8,943	46,643
2015	9,853	49,961
2016	10,961	57,362
2017	11,490	61,468
2018	11,583	64,492
2019	12,132	66,614
2020	11,818	66,562
2021	10,067	57,945
2022	9,509	59,054
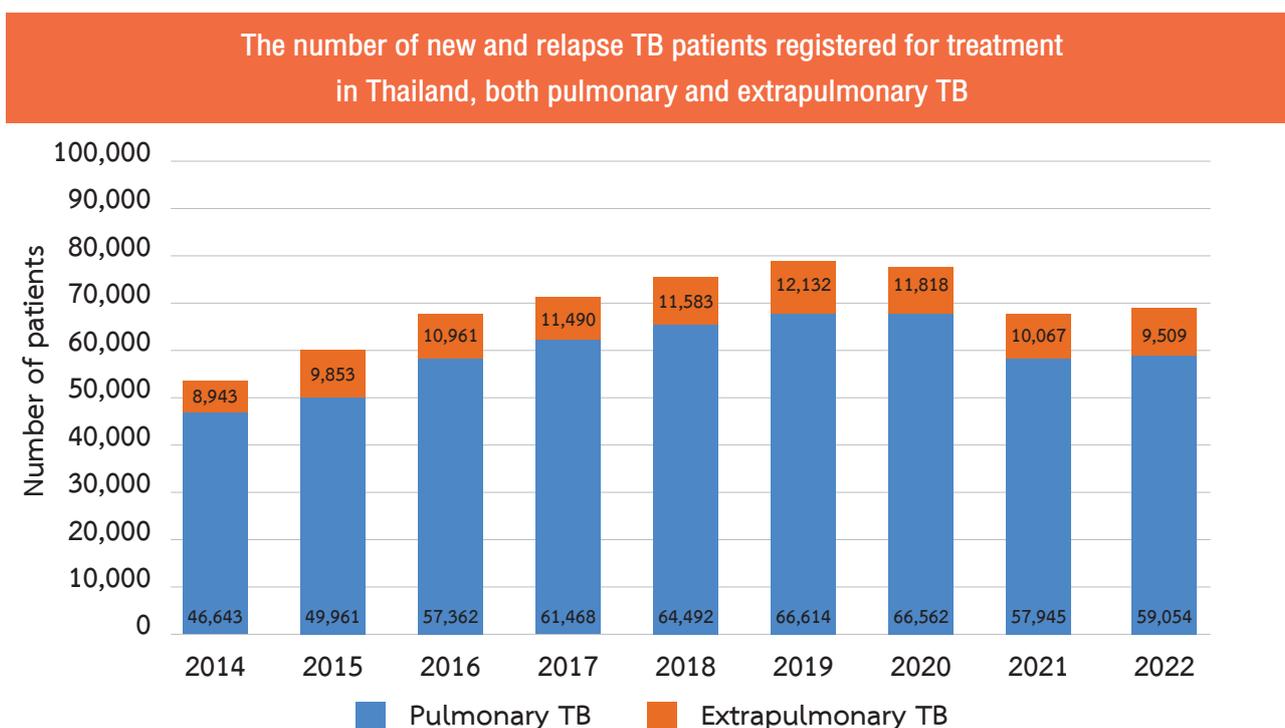
Source: National TB Information Program: NTIP, January 26, 2023

According to the Global TTB Report 2022 by the WHO, Thailand had a total of 71,488 new and relapse TB patients registered for treatment in the year 2021. This represented a treatment coverage rate of 70% when compared to the estimated number of tuberculosis patients in the country, which is approximately 103,000 cases. The proportion of male to female tuberculosis patients is 2:1, with 48,612 male patients and 22,876 female patients.

4. TB treatment outcomes

The treatment outcomes of new and relapse TB patients in Thailand have been below the global target (90%). The treatment success rate for TB patients in Thailand from 2014 to 2021 ranged from 81.5% to 86.3%. Several factors contributing to the lower-than-targeted treatment success rate include deaths during TB treatment, ranging from 7.8% to 9.3% (with the highest mortality rate among patients over the age of 65, ranging from 16.7% to 17.9%), and loss to follow-up, ranging from 5.4% to 4.7%. These rates show a decreasing trend over time.

Treatment outcomes of new and relapse TB patients in Thailand

Legend: Treatment Success, Failure, Died, Loss to follow-up, Transfer Out, Not Evaluated
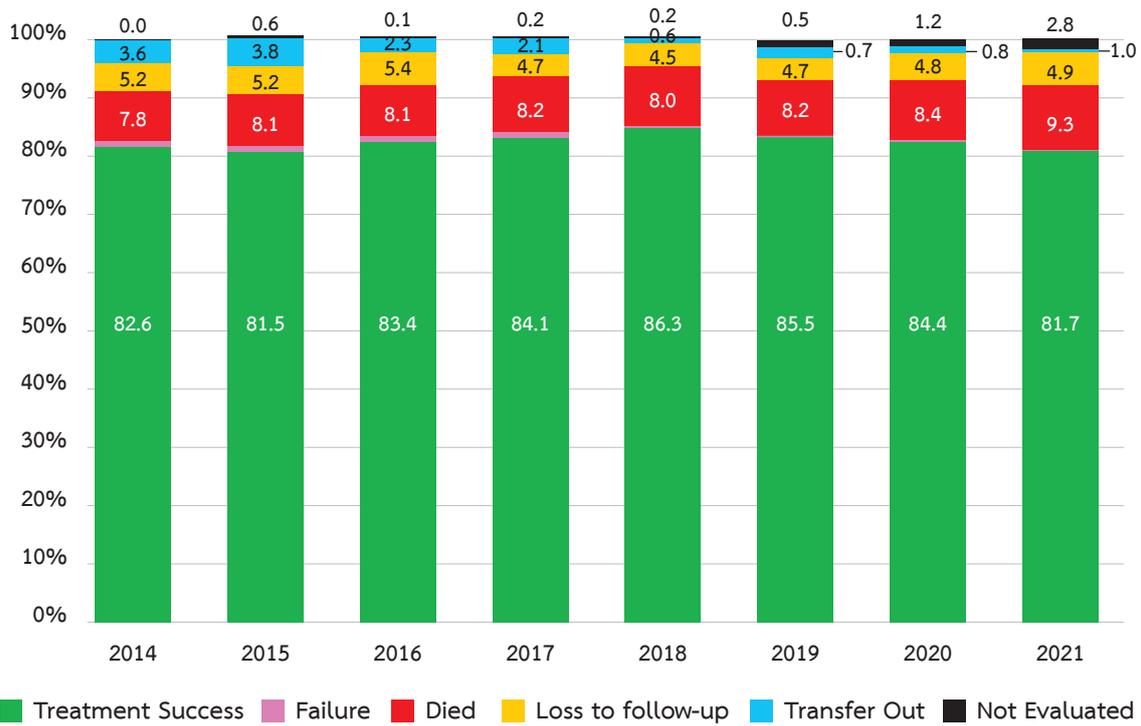
Source: National TB Information Program: NTIP, January 26, 2023

Treatment outcomes of new and relapse TB patients by age group in Thailand

Legend: Treatment Success, Failure, Died, Loss to follow-up, Transfer Out, Not Evaluated
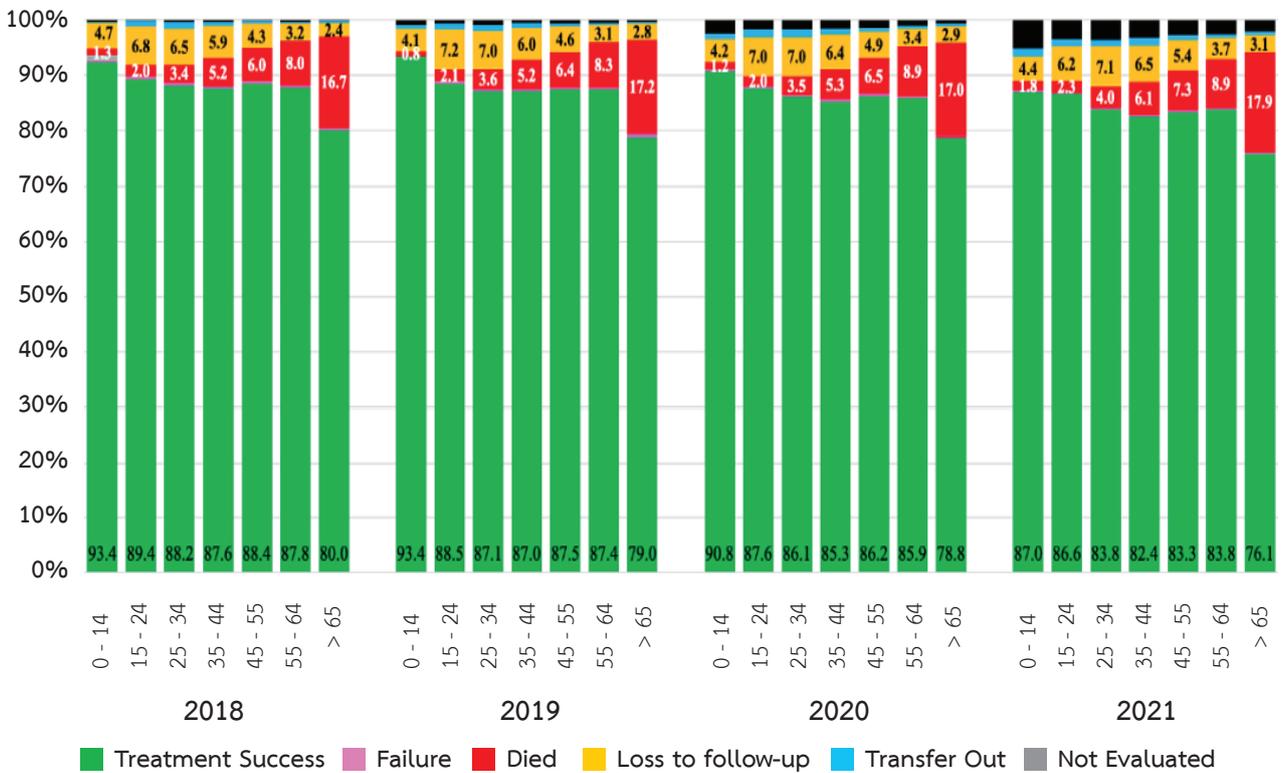
Source: National TB Information Program: NTIP, January 26, 2023

5. TB in children

In the year 2021, the WHO estimated that there were 103,000 new and relapse TB cases in Thailand. Among these cases, there were approximately 3,500 children aged 0-14, accounting for 3% of the total cases. However, based on reports of TB cases in children in Thailand from 2014 to 2022, it was found that the reported cases accounted for only around 1% of the total cases across all age groups. This is still lower than the estimation by the WHO.

The treatment outcomes for TB patients in children aged 0-14 have shown a high treatment success rate between 2018 and 2021, ranging from 87.0% to 93.4%. The main cause of unsuccessful treatment in these cases was loss to follow up, which ranged from 4.1% to 4.7%.

The number of new and relapse TB patients aged 0-14 years and the percentage of new and relapse TB patients aged 0-14 years compared to the registered TB patients
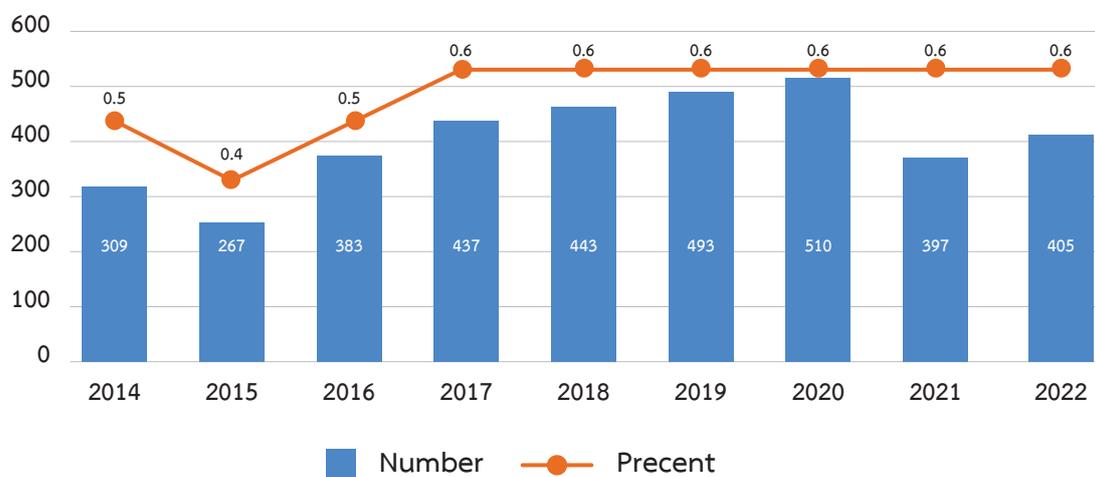
Source: National TB Information Program: NTIP, January 26, 2023

Incidence and notified cases by age group and sex in 2021 in Thailand
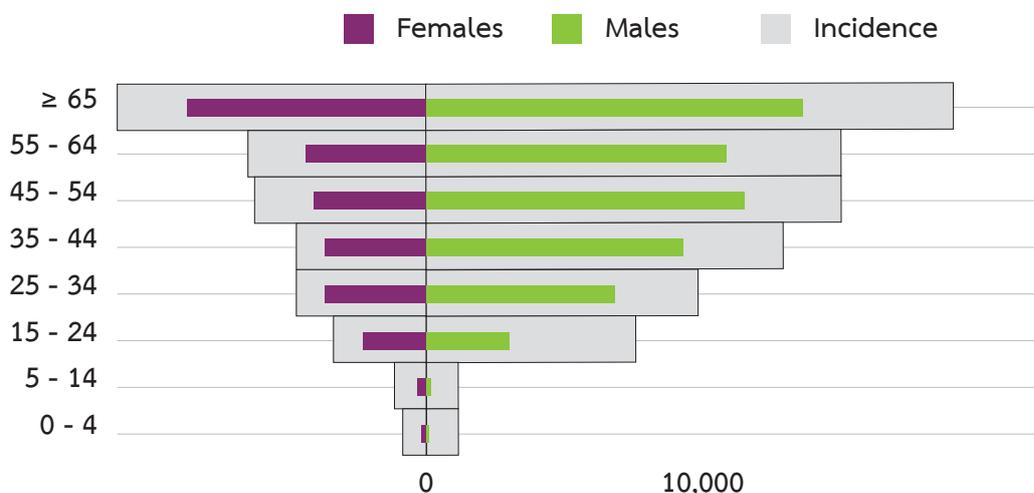
Source: htpp://worldhealthorg_shinyapps.ia/tb_profiles/

6. TB/HIV collaborative activities

The results of the TB/HIV collaborative activities from 2016 to 2021 showed that among new and relapse TB patients, HIV testing rates ranged from 83.1% to 88.5%. The percentage of TB patients co-infected with HIV (TB/HIV) has gradually decreased from 10.9% to 7.6%. However, there has been an increasing trend in the provision of antiretroviral therapy to TB/HIV patients. This was due to the policy of providing antiretroviral therapy to all HIV-infected individuals with any level of CD4 count, which had increased from 66.6% to 87.3%. The provision of co-trimoxazole (CPT) prophylaxis has also shown an increasing trend, ranging from 59.1% to 70.7%.

In terms of the treatment outcomes for new and relapse TB/HIV patients registered for the treatment between 2016 and 2020, there has been a slight increase in treatment success rates over the past five years, from 71.2% to 76.8% in 2018 and a slight decrease to 74.8% and 73.6% in 2019 and 2020, respectively. However, there has been a consistently high mortality rate throughout the five-year period, ranging from 16.1% to 17.7%, along with a high rate of loss to follow up.

The percentage of outcomes from TB/HIV collaborative activities among new and relapse TB patients registered for treatment from 2016 to 2021
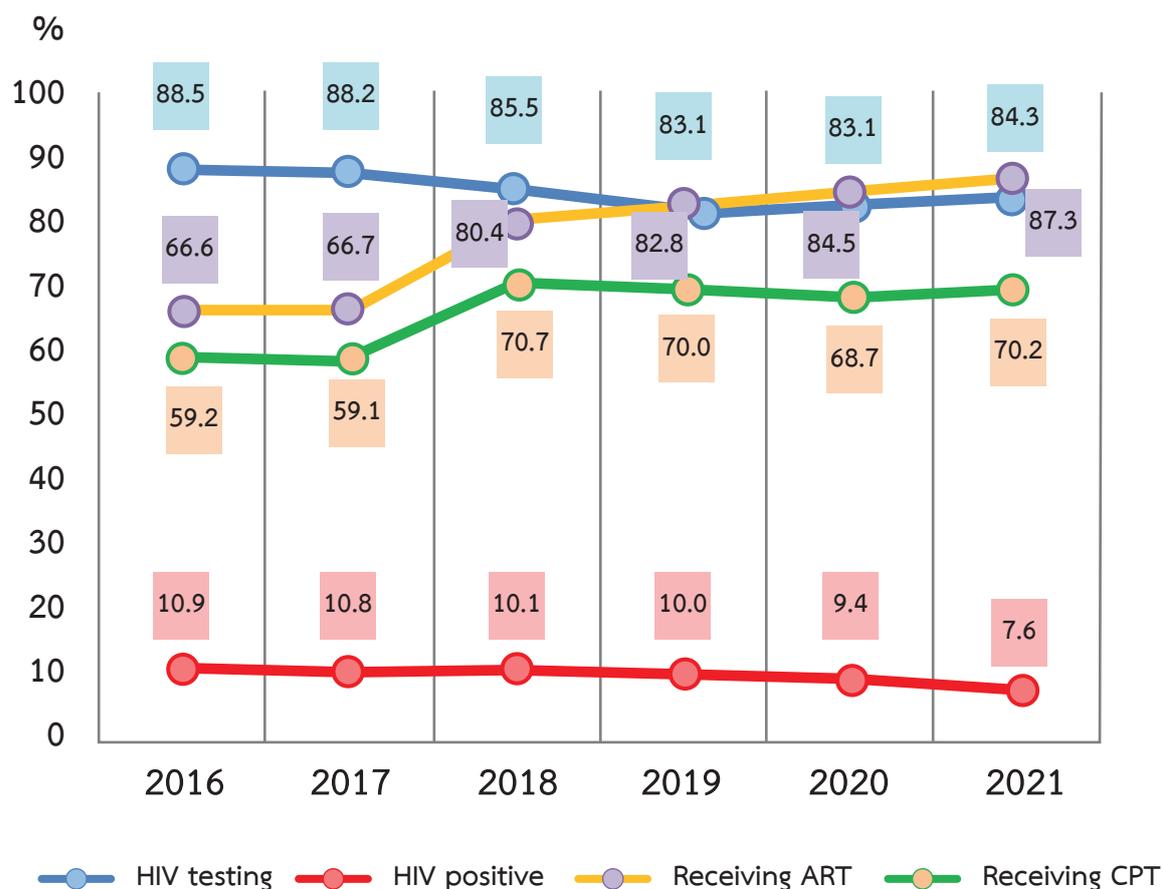
The treatment outcomes of new and relapse TB patients by HIV status in Thailand

HIV Positive

Year	Treatment Success	Failure	Died	Loss to follow-up	Transfer Out	Not Evaluated
2015	71.2	0.7	16.2	5.8	5.3	0.8
2016	73.7	0.7	16.1	6.0	3.2	3
2017	72.8	0.7	17.7	5.5	3.0	4
2018	76.8	0.2	16.2	5.3	0.6	
2019	74.8	0.4	16.4	5.5	1.2	
2020	73.6	0.4	16.5	5.6	1.0	

HIV Negative

Year	Treatment Success	Failure	Died	Loss to follow-up	Transfer Out	Not Evaluated
2015	84.2		6.6	4.3	2.9	
2016	86.0		6.8	4.5	1.7	
2017	86.6		6.9	3.9	1.6	
2018	88.3		6.8	3.6		
2019	87.7		7.2	3.6		
2020	86.4		7.6	3.8	0.7	

7. Programmatic management of drug resistant-TB

According to the WHO's report on TB in the year 2022, the estimated proportions of new and previously treated TB patients with multidrug-resistant or rifampicin-resistant TB (MDR/RR-TB) were 1.7% (1.1-2.6) and 9.8% (9.2-11), respectively. The estimated incidence of MDR/RR-TB was 3.4 (1.7-5.1) per 100,000 population, equivalent to 2,400 (1,200-3,600) cases.

In the previous years, from 2016 to 2021, there has been an increasing trend in the drug susceptibility testing of anti-TB drugs among both new and previously treated TB patients who had bacteriologically confirmed (B+) results. The proportion increased from 14.5% in 2016 to 62.0% in 2020 among new TB patients, and from 29.4% in 2016 to 75.1% in 2020 among previously treated TB patients. However, in 2021, there was a decrease in the trend of drug susceptibility testing among both groups, which may be attributed

to the COVID-19 pandemic. Laboratory-confirmed cases of MDR/RR-TB were 955 in 2016, 1,339 in 2017, 1,312 in 2018, 1,221 in 2019, and 1,237 in 2020. Among these, the number of patients enrolled for treatment were 952, 851, 910, 1,095, and 1,142, respectively, with an enrolment rate of 99%, 64%, 69%, 90%, and 92%, respectively. In terms of extensively drug-resistant TB (XDR-TB), there were 8, 8, 21, 17, 15, and 7 patients registered for treatment in the years 2016-2021, respectively.

The percentage of newly diagnosed TB patients and previously treated TB patients with bacteriologically confirmed (B+) results and drug susceptibility testing results 2016-2021
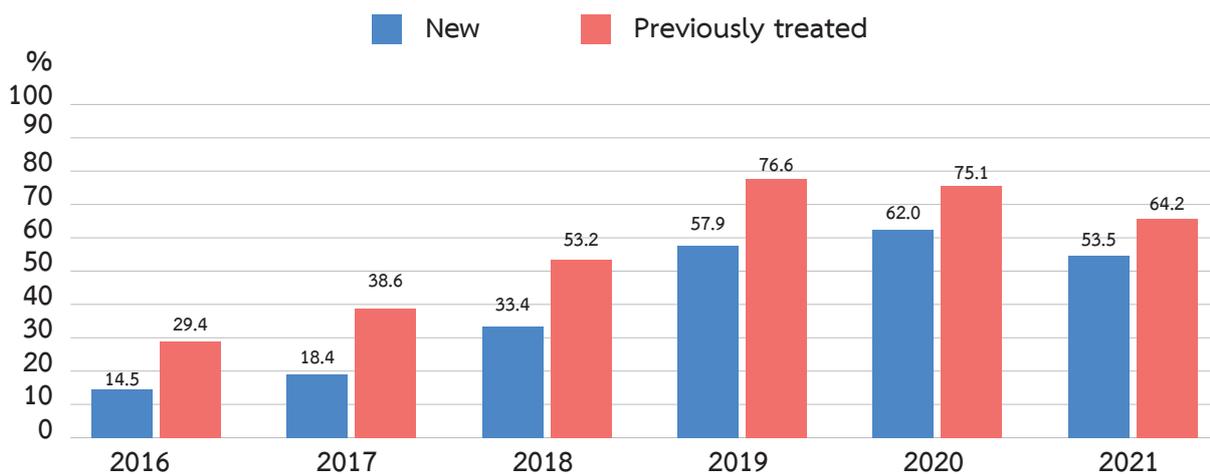
The number of patients notified and registered for the treatment of MDR/RR/pre-XDR-TB and XDR-TB from 2016 to 2021

Year	MDR/RR/pre-XDR-TB	XDR-TB
2559		8
2560		8
2561		21
2562		17
2563		15
2564		7

Legend: ▇ MDR/RR/pre-XDR-TB ▇ XDR-TB

The treatment outcomes of all MDR/RR/pre-XDR-TB patients from 2016 (B.E. 2559) to 2019 (B.E. 2562) showed a decrease in treatment success in 2017 and an increase in 2018-2019. The treatment success rates were 62.9% and 62.6% respectively. The main reasons for the unsuccessful treatment outcomes of MDR/XDR-TB were attributed to deaths of 16.2% to 19.2%, a decrease from 3.3% to 2.2% for treatment failure, and a persistently high rate of loss to follow-up at 10.6% and 11% respectively.

Percentage of treatment outcomes of patients with MDR/RR/pre-XDR-TB and registered for treatment from 2016 to 2019

Year	Treatment Success	Failure	Died	Loss to follow-up	Transfer Out	Not Evaluated
2016	60.9	3.3	16.2	8.7	3.7	7.2
2017	53.9	3.3	18.4	11.8	5.2	7.4
2018	62.9	2.2	19.2	10.6	2.8	2.3
2019	62.6	3.0	18.8	11.0	2.4	2.3

Legend: ▇ Treatment Success ▇ Failure ▇ Died ▇ Loss to follow-up ▇ Transfer Out ▇ Not Evaluated
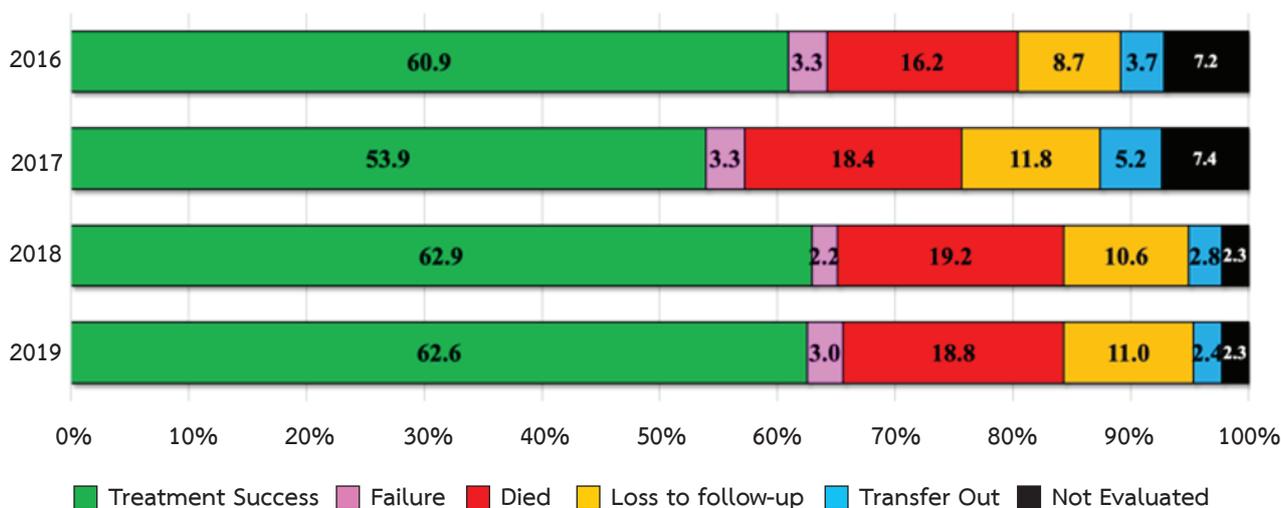
Percentage of treatment outcomes of XDR-TB patients and registerred for treatment from 2016 to 2019

Year	Treatment Success	Failure	Died	Loss to follow-up
2016	75.0		25.0	
2017	62.5	12.5	25.0	
2018	80.9	4.8	9.5	4.8
2019	62.5	4.2	33.3	0.0
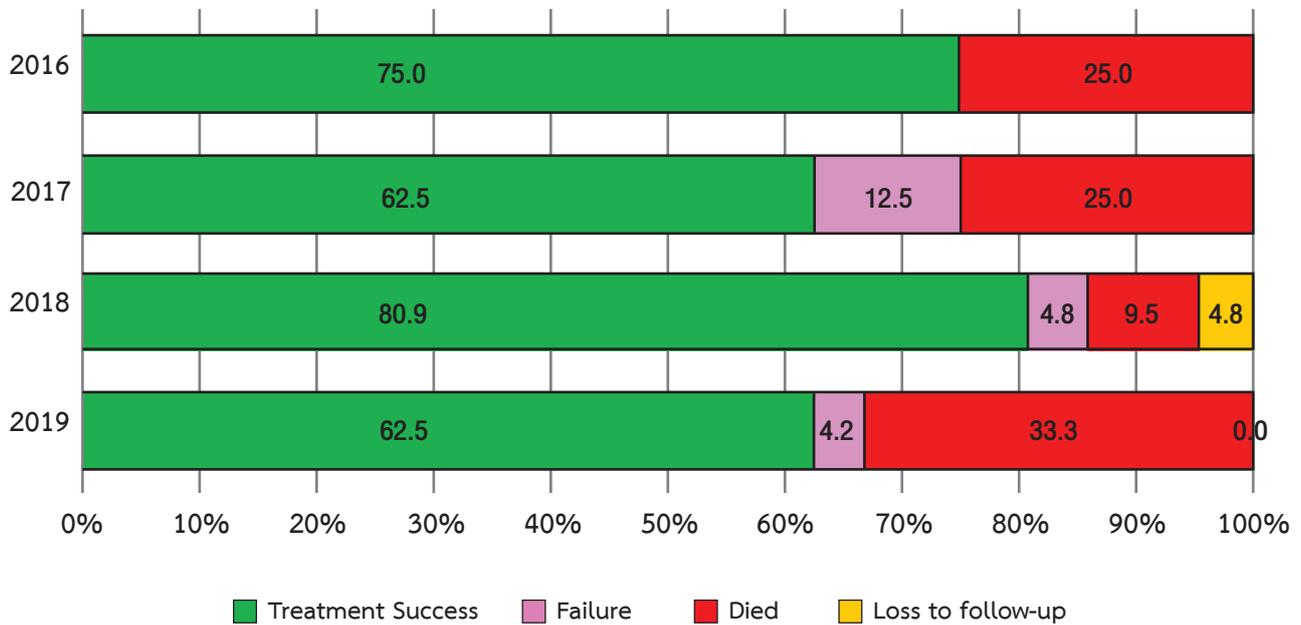
8. TB prevention and control in prisons

Prisoners are a significant at-risk group for TB and drug-resistant TB due to continuous inmate transfers and the limited environment of correctional facilities in terms of space, infrastructure, and overcrowding. The proportion of prisoners exceeds the capacity of the correctional facilities, leading to easy and rapid transmission and infection within the prisons. On average, TB incidence in prisons is about 6-8 times higher than in the general population. The spread of TB in prisons directly impacts the health and quality of life of inmates and has consequences for the current prison personnel. Currently, there are approximately 350,000 prisoners nationwide.

Since 2017 (B.E. 2560), TB situation in prisons has been influenced by policies implementing active TB case finding through mass chest x-ray screening for all prisoners. This has resulted in an increased detection of TB cases within the reporting system. Regarding the treatment outcomes in prisons, the success rate has been consistently high, at around 90%.

The number of new and relapse TB patients in all prisons from 2008 to 2021

Number (Cases)

Year	Cases
2008	1751
2009	2265
2010	1531
2011	1751
2012	1848
2013	1072
2014	1691
2015	1563
2016	1586
2017	2788
2018	3883
2019	4035
2020	3610
2021	2922
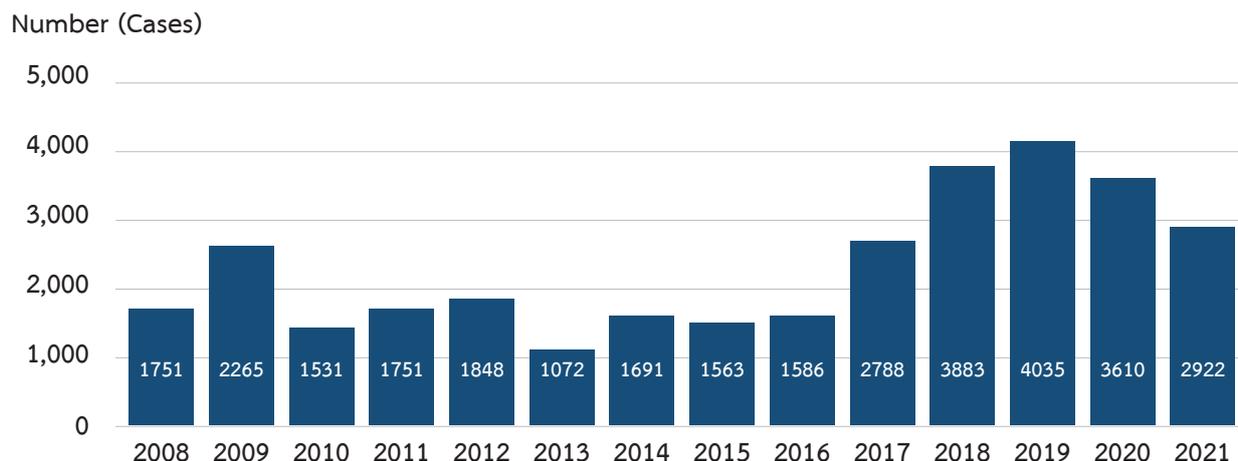
Percentages of treatment outcomes
of new and relapse TB patients in all prisons from 2016 to 2021

Year	Success	Failed	LTF	Transfer Out	On treatment
2021	85	1	3	4	2	5
2022	90	0	3	2	3	2
2023	94	0	2	3	1	0
2024	93	0	3	3	1	0
2025	92	0	3	2	3	0
2026	87	1	6	3	3	0

Legend: ■ Success ■ Failed ■ LTF ■ Transfer Out ■ On treatment
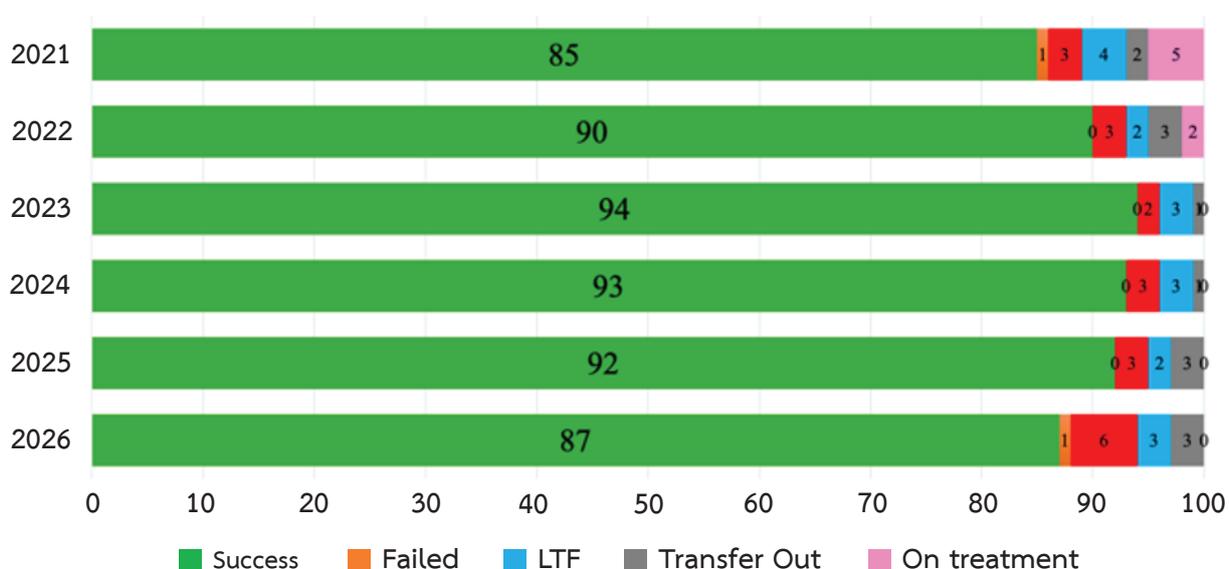
9. TB prevention and control in migrants

With Thailand's economic growth, the domestic workforce is insufficient to meet the demand. This has resulted in a need for labor from neighboring countries, which often have higher incidence of TB compared to Thailand. Additionally, most migrant workers reside in crowded areas, making it easier for diseases to spread. If they are ill, there are limitations in accessing healthcare facilities, especially for migrant workers who are not legally authorized to work. According to a report on migration in Thailand, it was

estimated that in the year 2019, there were approximately 4.9 million migrant workers living in Thailand, with 3 million of them registered with the Ministry of Labor. However, in the years 2020-2021, it was found that the number of migrant workers decreased. In the year 2021 (as of December 25, 2021), there were 2.35 million migrant workers authorized to work throughout the Kingdom of Thailand.

According to the report from the TB Division, Department of Disease Control, it was found that between the years 2013-2020, there was an increasing trend of new and relapse TB cases who were registered for treatment and were migrant population. However, in the years 2021-2022, there has been a decreasing trend. This may be attributed to various factors, such as the COVID-19 pandemic, which led to changes in population structure and the relocation of migrant workers. As a result, the number of new and relapse TB cases among migrant population decreased from a total of 4,268 cases in the year 2020 to 3,067 cases in the year 2022.The majority of these cases were concentrated in the Bangkok, industrial provinces, and border provinces. The treatment outcomes for the new and relapse TB cases among the migrant population, from the years 2016-2021, showed an average treatment success rate of 79.9%. The average rate of loss to follow-up was 10.4%, the average death rate was 3.2%, and the average transfer-out rate was 4.7%. The main contributing factor to unsuccessful treatment outcome was loss to follow-up (according to data from the NTIP as of September 30, 2022).

The number of new and relapse TB patients among non-Thai nationals detected and registered for TB treatment from 2013 to 2022

Number (Cases)
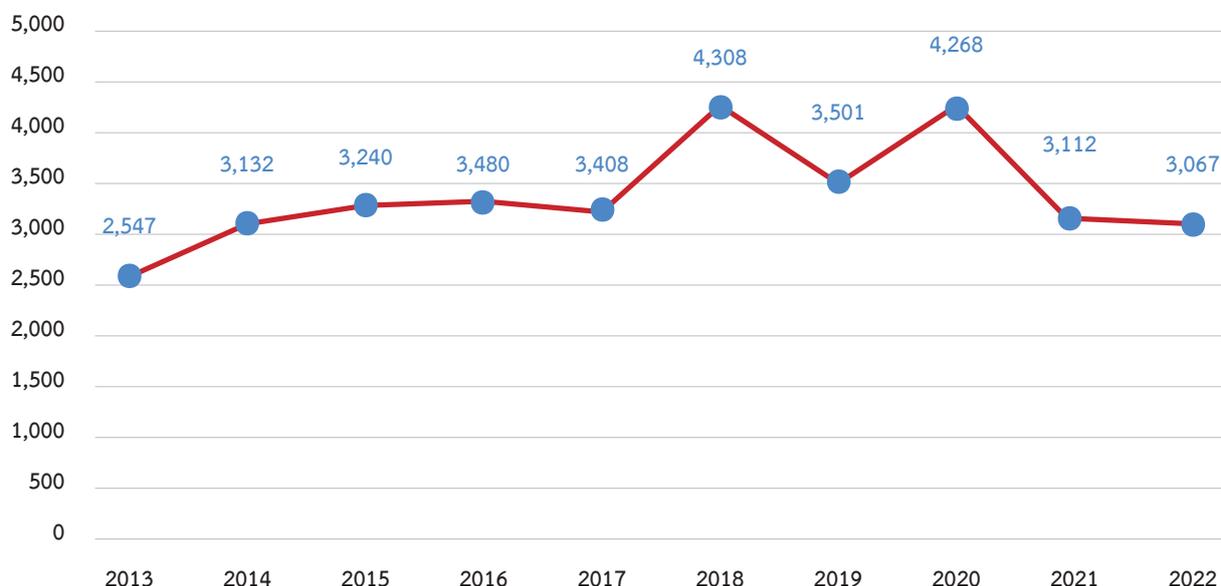
Percentages of treatment outcomes of new and relapse TB patients among migrant populations registered for treatment from 2016 to 2021

Year	Treatment Success	Failure	Died	Loss to follow-up	Transfer Out	Not Evaluated
2021	79.1		4.2	9.6	3.1	3.7
2020	81.3		2.7	8.7	5.2	
2019	78.6		3.1	10.8	5.4	
2018	82.3		2.6	9.7	4.9	
2017	80.8		3.7	9.6	4.9	
2016	77.8		2.9	13.8	4.6	

Legend: ■ Treatment Success ■ Failure ■ Died ■ Loss to follow-up ■ Transfer Out ■ Not Evaluated
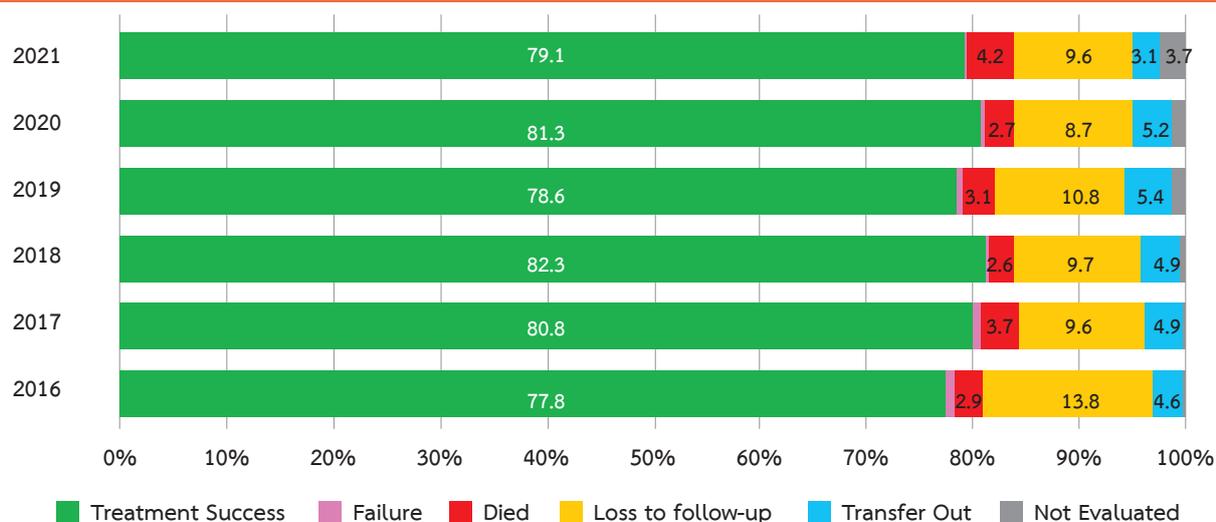
In addition to that, the epidemic trend of TB in Thailand is influenced by factors that contribute to its increase. One such factor is the changing population structure towards aging societies, where older persons are at a higher risk of TB compared to the general population. This is due to their prolonged exposure to TB and weakened immune systems. According to data from the TB prevalence survey in Thailand for the years 2012-2013, which covered the entire population of 67,000 individuals, 142 confirmed cases of pulmonary TB were found among individuals aged 60 and above, accounting for 44% of the cases. Currently, Thailand is entering an era of an aging society, which will result in an increased number of older individuals which would affect the TB epidemic.

Population in 1990   Population in 2000   Population in 2030

Males   Females   Males   Females   Males   Females

Population (millions)
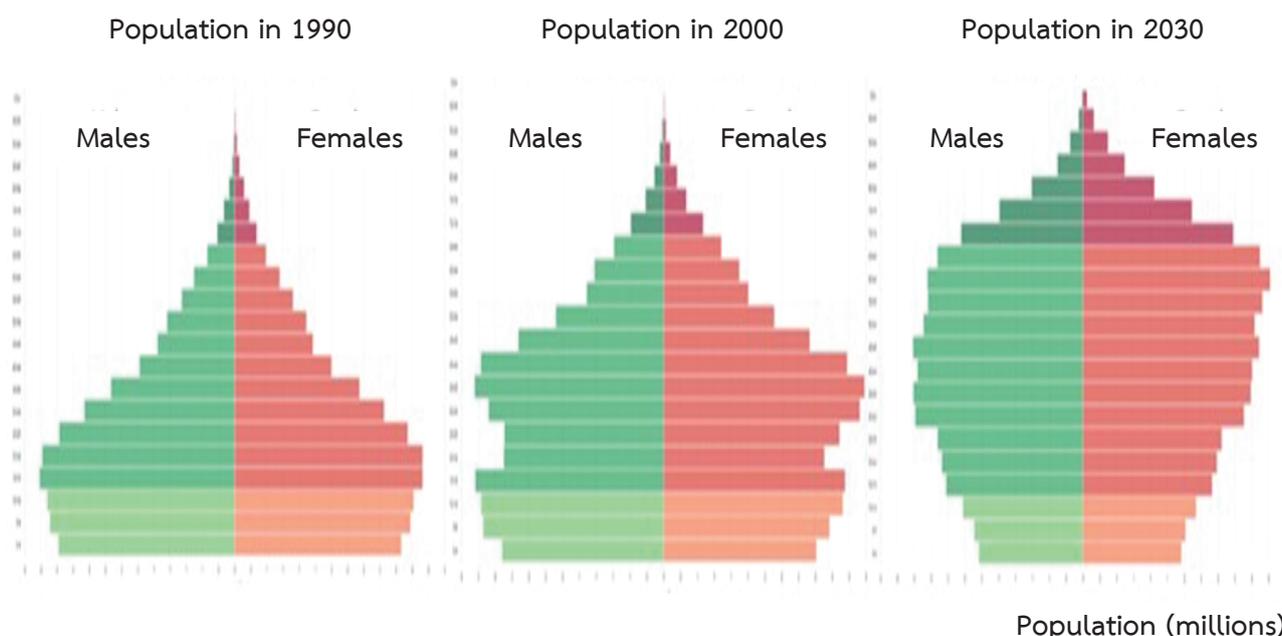
Source: United Nation, Population Division2 *World Population Prospects 2022*

The growth of urban communities, where currently more than 50% of the population resides, brings along certain problems. These include the migration of people from rural areas, overcrowded living conditions and workplaces, limited access to healthcare services for the underprivileged population, which has implications for public health, disease transmission, and an increasing trend of non-communicable diseases, particularly among diabetes patients who are associated with TB. This is because individuals with diabetes have a weakened immune system, making them more susceptible to TB compared to non-diabetic individuals, with a threefold higher risk. (TB Division, Department of Disease Control, National TB Control Program guidelines, 2021).

10.TB research

In the Thailand operational plan to end TB (2017 to 2021), previous research projects supported by the National Research Council of Thailand (NRCT) and data from the TB Research Network of the Health Systems Research Institute have shown that these research activities have focused on health economics and have contributed to policy advocacy. Examples of such contributions include the use of molecular diagnostics for TB detection, latent tuberculosis infection diagnosis and treatment, TB culture and drug susceptibility testing for all TB patients. These efforts aim to ensure access to the benefits of the universal health coverage. This has enabled Thailand to utilize government budget for TB diagnosis, treatment, and control in accordance with international standards, accelerating the country's efforts to end tuberculosis.

Collaborating with the network of stakeholders, TB Division had conducted the national anti-TB drug resistance survey in Thailand to assess the situation of drug resistant-TB in the country. As of 2021, Thailand has been declared by the WHO as a country that is not included in the list of countries with a high burden of drug-resistant TB.

Review of Thailand operational plan to end TB 2017 - 2021

According to the evaluation of the Thailand operational plan to end TB for the years 2017-2021, it was found that out of a total of 34 indicators, 29 indicators have achieved their targets, while there are 5 indicators that have not yet achieved their targets, posing challenges in TB control. Among the top 10 indicators that all countries must implement, 9 indicators have been achieved, while 1 indicator has not yet reached its target. This indicator is the percentage of households experiencing catastrophic costs due to TB treatment.

From the evaluation of the 34 indicators, it can be observed that the majority of indicators that have achieved their targets are those with activities within the regular system. On the other hand, the indicators that have not yet reached their targets and pose significant challenges are mostly related to new activities and indicators that are not directly associated with TB implementation. In light of this, policy recommendations have been proposed for decision-makers to use as information for developing future national operational plans to end TB as follows:

1. Promote the Thailand operational plan to end TB and a policy to accelerate the development of a network for TB implementation in healthcare facilities, including public, private, and community sectors, to ensure continuity and sustainability.

2. Enhance laboratory capacity by supporting the procurement of molecular diagnostics equipment and expanding coverage for rapid diagnosis using molecular technology. This should be accompanied by monitoring and supervision to provide technical support and resources to regional and local laboratories.

3. Improve and develop the database in the NTIP to record data on children under 5 years of age living in households with TB patients and record the number of household contacts.

4. Intensify screening and case-finding efforts using chest radiography combined with molecular diagnostic technology in 7 high-risk groups, including household contacts, HIV co-infected individuals, diabetes patients, older people, incarcerated individuals, migrant workers, and healthcare workers.

5. Accelerate the integration and collaboration with the AIDS program to provide comprehensive care for latent TB infection in HIV-infected individuals.

6. Accelerate the development of the programmatic management of drug-resistant TB (PMDT) to cover the entire country, with a policy of universal drug susceptibility testing (DST) to test the drug sensitivity of every TB patient.

7. Enhance the capacity of personnel by creating a clear development plan for personnel in terms of TB control, prevention, and research.

8. Strengthen and ensure continuity in the supervision, monitoring, and evaluation of various projects, including multiple indicators that have not achieved their targets due to lack of supervision, monitoring, and evaluation.

9. Identify budget allocation to assist and support TB-affected patients and households.

10. In the development of future national operational plans to end TB, certain indicators should be adjusted to align with the current and future context, including their effectiveness in measuring outcomes in terms of time, quantity, and quality.

The 6th joint international monitoring mission to review National TB Program in Thailand

The joint international monitoring mission by the experts of the WHO and international organizations took place from June 31 to July 6, 2022. The objectives were to review progress, achievements, challenges, and analyze factors influencing the success or challenges in implementing the country's TB plan. The experts provided recommendations and guidance to address TB issues. They summarized the monitoring results of the National TB Program as follows:

Strengths of the National TB Program:

1. Strong policies:
    1.1. Continuous budget support for TB activities.
    1.2. Integration of three health insurance funding schemes at the same standard

2. Effective program management:

    2.1. Adequate monitoring of National TB Program.

    2.2. Development of a draft of the second phase of the Thailand operational plan to end TB (2566 - 2570).

    2.3. Utilization of the National TB Information Program, an online registration system for all TB patients.

    2.4. Continuous allocation of anti-TB drugs from the Government Pharmaceutical Organization.

    2.5. High standards in TB infection control in hospitals.

3. Comprehensive implementation:

    3.1. Rapid updating of the guidelines according to international standards.

    3.2. High coverage in case finding and successful treatment outcomes.

    3.3. Intensive screening in seven high-risk groups.

    3.4. Well-implemented screening services for presumptive TB cases in hospitals.

4. Innovations:

Adoption of health technologies such as AI Chest X-Ray and Video DOT.

Challenges of program implementation:

1. TB case finding

    1.1 Community participation in active case finding is limited to specific groups, such as close contacts, prisoners, and migrant workers in certain areas. However, this approach lacks inclusion for marginalized groups in society, such as overcrowded communities and vulnerable populations. In addition, TB screening using X-ray among high-risk groups is insufficient

    1.2 TB patients face delays in accessing rapid molecular testing for diagnosis as hospitals still rely on smear microscopy. There are low rates of molecular testing (52% in new TB cases and relapse cases in the year 2021). Additionally, the turnaround time for test results is longer than the designated timeframe, for example, 1-2 weeks for testing with molecular WHO-recommended rapid diagnostic test (mWRD).

    1.3 TB prevention and care in children remain inadequate, with insufficient implementation of molecular testing for diagnosis in children using nasopharyngeal aspiration (NPA) and stool samples.

2. Treatment

    2.1 The number of deaths during treatment and cases of loss to follow-up are high due to comorbidities among TB patients, delays in accessing diagnosis, and insufficient care for TB patients in certain areas (centralized treatment).

    2.2 Fixed-dose combination (FDC) pills and pediatric syrup formulations for treatment are not used, and some patients do not receive treatment according to the country's TB guidelines.

3. Prevention

    3.1 The treatment for latent tuberculosis infection is insufficient, and the data is not linked to active case finding.

    3.2 The treatment for latent tuberculosis infection in HIV-infected individuals is still not adequately implemented.

    3.3 The use of treatment regimens for latent tuberculosis infection, such as 3HP and 1HP, is still limited.

    3.4 There is no TB screening conducted among the high-risk occupational groups.

4. Monitoring and evaluation

4.1 The reporting systems in the NTIP and NAP programs lack interconnectivity, and some private hospitals do not report TB program activities.

4.2 The information systems in laboratories are not integrated, and there is no system for connecting with external laboratory platforms, such as the GxAlert program.

5. Program management

5.1 The budget is insufficient for rapid molecular testing, treatment of latent tuberculosis infection, and adoption of innovations.

5.2 TB patients experiencing financial crises (catastrophic costs) account for 31% (based on a survey in 2020). These costs are related to expenses other than medical treatment, such as transportation, food, accommodation, and loss of income. The financial assistance provided to tuberculosis patients is insufficient, and there is no specific policy to support them.

5.3 Procurement and management of medications for TB patients under social security and government employee healthcare schemes are more complex and challenging than the universal health coverage. There is no mandatory requirement for migrant workers to purchase health insurance cards.

5.4 Collaboration among community health systems in screening, follow-up, empowering communities, and preventing stigmatization is weak.

5.5 Increased budget support is needed for TB program targeting individuals with malnutrition, smoking, alcohol consumption, and substance abuse.

Major recommendation of the experts from the WHO and international organization in the 6th joint international monitoring mission to review National TB Program in Thailand

In order for Thailand to achieve its goal of ending TB, the following recommendations should be considered to adjust the strategies for the care and treatment of TB patients, while increasing prevention efforts and social support:

1. Policy Implementation:

1.1 Address social determinants (poverty, malnutrition, alcohol related problems, and smoking) by integrating efforts with relevant ministries or agencies that have operational goals aligned with achieving SDGs. Examples include the Ministry of Public Health (non-communicable diseases, alcohol use, and smoking), the Ministry of Social Development and Human Security (financial assistance for underprivileged TB patients, social welfare, stigma reduction), and the Ministry of Labour (health insurance for migrant workers).

1.2 Advocate for an increased budget allocation in the benefit package of the National Health Security Office (NHSO) and promote expedited activities, while pushing for insured individuals under Social Security Scheme to receive standardized TB care and prevention.

1.3 Expand the use of short-course regimens for the treatment of latent tuberculosis infection among household contacts, people living with HIV, and other high-risk groups.

1.4 Utilize molecular tests for early TB diagnosis and drug susceptibility testing to identify drug-resistant tuberculosis strains from the first diagnostic test.

2. Case finding

    2.1   Prepare a budget plan to expedite the case finding for TB patients who have not access to the treatment system due to the COVID-19 pandemic.

    2.2   Increase coverage in active case finding among high-risk groups, using appropriate strategies, and expand coverage to other high-risk groups such as overcrowded communities and malnourished individuals.

    2.3   Accelerate the use of molecular tests for TB diagnosis as the first diagnostic test in individuals with presumptive TB and abnormal X-ray findings consistent with TB.

    2.4   Expand TB screening to cover more high-risk groups and support community participation in screening and raising awareness within the community.

    2.5   Utilize the most efficient screening methods for TB in children, including diagnosing TB through nucleic acid amplification tests on nasopharyngeal aspirates (NPAs) and stool samples.

    2.6   Establish a fast and efficient transportation system for laboratory specimens.

    2.7   Develop a Laboratory Management Information System (LMIS) with dashboards to monitor operations and provide real-time reporting of results.

    2.8   Enhance the drug-resistant tuberculosis (DR-TB) surveillance mechanism by integrating drug-resistant tuberculosis testing data from the tuberculosis laboratory network.

    2.9   Strengthen external quality assurance (EQA) and conduct regular verification of the accuracy of RT-PCR testing for TB and MDR-TB in all healthcare facilities.

3. Treatment

    3.1   Consider using new drug regimens (4 months) for both children and adults with mild symptoms.

    3.2   Promote and support continuous quality care for patients.

    3.3   Provide treatment aligned with standards and establish confidence in implementing patient care through a digital-based approach as the standard in all healthcare facilities.

    3.4   Reduce the burden and support medication adherence by utilizing fixed-dose combination (FDC) drugs as the primary approach.

4. Treatment of latent TB infection

    4.1   Expand the treatment of latent tuberculosis infection and integrate data with active case finding using short-course regimens such as 1HP and 3HP, following the guidelines for latent tuberculosis infection screening, diagnosis, and treatment.

    4.2   Communicate and enhance the capacity of healthcare providers, patients, and stakeholders involved in the treatment of latent tuberculosis infection.

5. Monitoring and evaluation

    5.1   Prepare for a TB prevalence survey to assess the TB incidence using new technologies.

    5.2   Analyze data and conduct research to understand the tuberculosis situation in children.

    5.3   Consider linking data between the NTIP and NAP programs to enhance the effectiveness of TB-HIV operations.

6. TB program management

      6.1   Allocate budget for implementing the molecular WHO-recommended rapid diagnostic test (mWRD), treatment of latent tuberculosis infection or TB preventive treatment (TPT), social protection measures, and the expansion of TB screening in the national operation plan for ending TB in Phase 2 (2023-2027), utilizing funding from both domestic and international sources.

      6.2   Train and continuously develop healthcare personnel following standard operating procedures, including the development of mobile applications to support operations.

      6.3   Develop training curricula and enhance the capacity of personnel and communities to reduce stigma and discriminatory practices through appropriate laws and regulations.

7. Research and innovation

      7.1   Conduct an analysis of the cost-effectiveness of TB preventive treatment (TPT) among adults and high-risk groups.

      7.2   Expand the utilization of Artificial Intelligence (AI) in screening for TB.

      7.3   Evaluate the relationship between nutritional status and TB and develop innovative modeling for monitoring TB treatment and treatment adherence.

Gap analysis

The results of the SWOT analysis of current implementation of TB program in Thailand

Strengths	Weakness
• High-ranking officials of the Ministry of Public Health prioritize and expedite the implementation of TB program. • The country has a health insurance system that covers 99% of the population. • There is a well-established healthcare infrastructure distributed nationwide. • The country has a centralized TB database (NTIP) that is utilized at all levels for monitoring the implementation and patient referrals.	• The current monitoring and evaluation system is not sufficiently efficient, both in terms of tools and personnel, to achieve the end of TB. • In some areas, there is a lack of alignment between equipment or personnel and the accelerated policy. • Developing the capacity of new personnel to replace existing staff takes a long time (2-3 years). • There are limitations in providing treatment to migrant populations without health insurance benefits.

Opportunities	Threats
• The government prioritizes the end of TB to achieve the SDGs as Thailand committed to the United Nations.	• Economic hardships lead to some individuals neglecting their health.
• There are non-MOPH organizations, both governmental and non-governmental, ready to support the implementation.	• There is population migration from neighboring countries.
• The introduction of new drugs and tools enhances treatment effectiveness.	• Treatment duration takes a long time, and drug-resistant TB increases.
• There are domestic and international experts as well as funding agencies (such as from the Global Fund) to support the implementation.	• The country undergoes changes, such as an aging population and increasing population density in overcrowded communities.

Strategy and measures
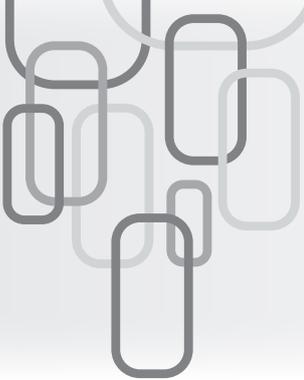
Strategy and measures

Vision

To end TB in Thailand within the year 2035 (B.E. 2578)

Goal

To reduce the problem of TB epidemic in Thailand

Target

To reduce TB incidence from 143/100,000 population in 2021 to 89/1000,000 population in 2027

Strategy, measure, and strategic interventions

Strategy 1: Intensify TB case finding and the diagnosis of TB and drug-resistant TB.

Objective: To enable TB patients and drug-resistant TB patients to undergo early and effective treatment process, which helps break the cycle of TB transmission within families and communities

Measures	Strategic interventions
1.1 Intensify TB case finding in children (0-14 years old) and adults from the early stage (Early detection)	1. Expand active case finding through chest X-ray screening in high-risk groups for TB by increasing coverage in the existing high-risk group targets and expanding to other high-risk groups, such as patients seeking hospital care for pneumonia related to COVID-19 infection, vulnerable populations including older persons, young children, cancer patients, persons with disabilities, mental health patients, dementia patients, incarcerated individuals, migrant populations, and individuals involved in illegal occupations. 2. Implement effective TB screening strategies for children and expedite TB case finding among contacts who are children. 3. Promote the use of modern tools and technologies to enhance the effectiveness of TB screening, such as Artificial Intelligence (AI) and Portable X-ray machines.

Measures	Strategic interventions
1.2 Use molecular testing for diagnosing TB and drug-resistant-TB	1. Diagnose TB using molecular tests in patients with abnormal chest X-ray results consistent with TB or in patients with presumptive symptoms but unable to access chest X-ray, such as incarcerated individuals, bedridden older persons, disabled individuals, or vulnerable individuals. 2. Support TB diagnosis in children using molecular methods from alternative specimens other than sputum, such as stool or gastric aspirate. 3. Perform genotypic drug susceptibility testing (DST) for TB before initiating treatment in all cases, including new patients and those with a history of previous TB treatment.
1.3 Strengthen the TB laboratory network	1. Develop a Laboratory Information Management System (LIMS) to enhance operational effectiveness and improve the management of TB laboratory network. 2. Support laboratories in performing diagnosis of TB and drug resistant-TB in accordance with standards (EQA, ISO). 3. Strengthen the capacity of laboratory personnel to support the implementation of TB program.

Strategy 2: Enhance the care and treatment of TB patients and drug-resistant TB patients according to international standards.

Objective: To improve the effectiveness of care and treatment for TB patients and drug-resistant TB patients, with a particular focus on reducing deaths during treatment.

Measures	Strategic interventions
2.1 Improve the effectiveness of care and treatment for TB patients	1. Diagnosed TB patients access the treatment process promptly. 2. Provide standardized TB treatment regimens following the Thai National TB Program Guidelines in all healthcare facilities, supporting the use of Fixed-Dose Combination (FDC) and new TB drugs as recommended by WHO. 3. Test HIV infection in all TB patients and provide ART to TB patients co-infected with HIV during TB treatment. 4. Support multidisciplinary teams in caring for TB patients, with the patient-centered care (PCC) approach, including nutrition support and palliative care for TB patients who cannot be cured with TB drugs. 5. Enhance the effectiveness of patient care to ensure patient cooperation and adherence to treatment through digital Directly Observed Treatment (DOT). 6. Treat comorbidities alongside TB treatment, particularly in older patients, considering in-patient care to reduce the risk of death.
2.2 Improve the effectiveness of Programmatic management of Drug-resistant TB (PMDT)	1. Expand the drug-resistant TB treatment services in community hospitals. 2. Support local-level expert mechanisms in drug-resistant TB to provide treatment consultations through telemedicine services. 3. Treat multidrug-resistant TB patients with new drug regimens, such as Shorter all-oral including BPaL regimen, and enhance the effectiveness of active drug safety monitoring and management (aDSM).

Measures	Strategic interventions
	4. Improve and develop information systems to support the implementation of PMDT for caring drug resistant-TB patient. 5. Advocate for the inclusion of benefits from health insurance schemes for extensively drug-resistant TB (XDR-TB) patients and advocate for healthcare personal to receive benefits in accordance with the conditions of this highly dangerous infectious disease.
2.3 Support the management of caring children with TB	1. Provide pediatric drugs or child-friendly formulations of TB drugs. 2. Coordinate the implementation between pediatric clinics and TB clinics for the management and treatment of pediatric TB patients.

Strategy 3: Enhance the effectiveness and accessibility of diagnosis and treatment of latent tuberculosis infection and TB infection control.

Objective: To prevent the development of TB disease among the population in the future.

Measures	Strategic interventions
3.1 Expand the screening for latent TB infection	1. Accelerate the screening of TB infection among close contacts to TB patients, HIV-infected individuals, and other high-risk individuals for TB infection (according to specified criteria). 2. Promote new technologies for testing TB infection, such as Interferon-gamma release assay (IGRA) and expand the number of laboratories for testing TB infection to cover a wider population. 3. Support data for research purposes and drive policy development to expedite the implementation in the screening for individuals with TB infection.
3.2 Improve the effectiveness of TB preventive treatment (TPT)	1. Promote short-course regimens (1HP and 3HP) for the TB preventive treatment and advocate for the benefits of short-course regimens in the healthcare insurance schemes. 2. Coordinate collaboration with the Royal Thai Colleges and associations related to the provision of treatment and care for TB patients, aiming to develop and expand the implementation of TB preventive treatment. 3. Expedite communication for treatment guidelines and support for medications for TB preventive treatment to medical doctors and stakeholders. 4. Support the Directly Observed Therapy (DOT) in the administration of medication for TB preventive treatment.
3.3 Strengthen TB infection control in healthcare facilities, high-risk settings, and community	1. Expedite the implementation of administrative measures, environmental control, and personal protection measures to prevent TB transmission in healthcare facilities and high-risk settings, such as correctional facilities, crowded communities, and public transportation. 2. Carry out surveillance of TB infection and TB disease among healthcare personnel in healthcare facilities. 3. Foster community understanding and engagement in preventing the TB transmission. 4. Analyze situation and epidemiology in each area to identify sources of TB transmission and implement appropriate disease control measures tailored to each specific disease hotspot.

Strategy 4: Strengthen the support system for implementing the TB program.

Objective: To build sustainability in driving the TB program towards end TB.

Measures	Strategic interventions
4.1 Enhance strategic management mechanisms	1. Utilize the Communicable Disease Act of 2015 and other relevant regulations to support the implementation of the TB program, driving the efforts to end TB through the National Communicable Disease Committee mechanism. 2. Develop and expand collaborations for TB control with governmental agencies outside the Ministry of Public Health, private sector, local authorities, village leaders, and civil society, engaging them according to their respective roles and responsibilities. This includes supporting health screening for TB among workers before employment, in collaboration with the Ministry of Labor, and providing financial support for patients in need to mitigate the economic impact (catastrophic costs), in collaboration with the Ministry of Social Development and Human Security. 3. Establish systems or procure support for patients in terms of economic and social aspects (social support) from government organizations, private sector, and civil society to reduce both direct and indirect costs of TB treatment for patients and their families. 4. Prepare readiness and adapt the TB program's operational framework under various outbreak situations of emerging or re-emerging diseases, such as the COVID-19 pandemic.
4.2 Accelerate the monitoring of program implementation and surveillance of TB	1. Accelerate the monitoring of program implementation in collaboration with other disease programs or relevant agencies at all levels to achieve shared indicators. 2. Improve the effectiveness of Thailand's National Tuberculosis Information Program (NTIP) data reporting system to support the prioritized areas of monitoring and surveillance. 3. Develop a surveillance mechanism for drug-resistant tuberculosis (DR-TB) based on the data system of drug resistance testing results of the TB laboratory network. 4. Carry out the surveillance of TB transmission of distinct genetic patterns that help distinguish different strains of Mycobacterium tuberculosis, supporting outbreak investigation and understanding the epidemiological

Measures	Strategic interventions
	situation of TB in each area. Additionally, the results can be used to design disease control measures according to the different strains of M. tuberculosis and epidemiology of TB. 5. Conduct a TB prevalence survey or other methods to review TB incidence in the country.
4.3 Develop the capacity of TB personnel	1. Develop a strategic plan to enhance the capacity of healthcare professionals engaged in TB program and expedite the implementation according to the designated plan. 2. Develop and enhance the content of guidelines, training curriculum, and training guidelines to ensure that they are up-to-date with the latest knowledge. 3. Enhance learning through an e-learning system. 4. Strengthen the technical capacity of the network members.
4.4 Accelerate the implementation of public communication and community engagement	1. Communicate and share knowledge and understanding of TB with the public, in order to raise awareness about the importance of care and treatment, utilizing t the public communication network involving both public and private sectors. 2. Stimulate community participation in the TB program and empower community leaders and village health volunteers (VHV) to play a role in case finding and caring for TB patients.
4.5 Collaborate with the network of stakeholders to create equal access to standardized care and treatment for TB patients.	1. Promote the case finding, diagnosis, and treatment of TB patients according to the standards within the health insurance schemes of Thailand across all schemes. 2. Enhance access to standardized care and treatment services for uninsured TB patients regardless of their nationality. 3. Foster social measures and human rights to reduce stigmatization and discrimination against TB patients.

Strategy 5: Promote research and innovation in TB prevention and control.

Objective: To enable the public and network to access the utilization of research and innovation in ending TB.

Measures	Strategic interventions
5.1 Promote research projects	1. Develop the national TB research roadmap for ending TB through involving funding agencies, research institutions, and research support organizations. 2. Drive the implementation of the national TB research roadmap, ensuring research activities being carried out at all levels. 3. Advocate for policy recommendations based on evidence from research findings.
5.2 Develop and support the application of innovations	1. Support innovations recommended by the WHO by expanding their implementation in the country, such as short-course treatment regimens for TB and drug-resistant TB, and the use of diagnostic technology for TB disease and TB infection. 2. Promote the development of innovations to enhance the effectiveness of local-level TB programs.
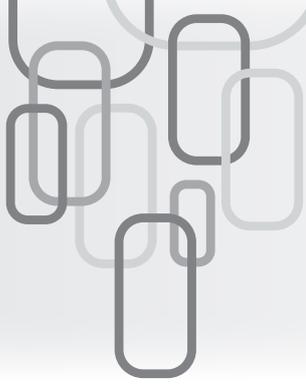
Strategy, objectives, measures,
and responsible organization

Strategy	Objective/Measure	Responsible agencies
Strategy 1:	**Intensify TB case finding and the diagnosis of TB and drug-resistant TB.**	
Objective	To enable TB patients and drug-resistant TB patients to undergo early and effective treatment process, which helps break the cycle of TB transmission within families and communities.	
Measure 1.1	Intensify TB case finding in children (0-14 years old) and adults from the early stage (Early detection)	- Ministry of Public Health (MOPH hospitals) - Ministry of Labour - Ministry of Higher Education, Science, Research, and Innovation - Ministry of Defense (Royal Thai Army Medical Department, Royal Thai Navy Medical Department, Royal Thai Air Force Medical Department) - Royal Thai Police (Police Hospital) - University hospitals - Bangkok Metropolitan Administration (hospitals under BMA) - Department of Local Administration (Hospitals under Department of Local Administration) - Private hospitals/clinics - National Health Security Office
Measure 1.2	Use molecular testing for diagnosing TB and drug-resistant-TB	- Ministry of Public Health (Department of Medical Services, hospitals under Department of Medical Services) - Ministry of Defense (Royal Thai Army Medical Department, Royal Thai Navy Medical Department, Royal Thai Air Force Medical Department)

Strategy	Objective/Measure	Responsible agencies
		- Royal Thai Police (Police Hospital) - University hospitals - Bangkok Metropolitan Administration (hospitals under BMA) - Department of Local Administration (Hospitals under Department of Local Administration) - Private hospitals/clinics - National Health Security Office
Measure 1.3	Strengthen the TB laboratory network	- Ministry of Public Health (Laboratories under Department of Disease Controls, Department of Medical Sciences, and Department of Medical Services - Laboratories in public hospitals and private hospitals

Strategy	Objective/Measure	Responsible agencies
Strategy 2:	**Enhance the care and treatment of TB patients and drug-resistant TB patients according to international standards.**	
Objective	To improve the effectiveness of care and treatment for TB patients and drug-resistant TB patients, with a particular focus on reducing deaths during treatment.	
Measure 2.1	Improve the effectiveness of care and treatment for TB patients	- Ministry of Public Health (MOPH hospitals) - Ministry of Defense (Royal Thai Army Medical Department, Royal Thai Navy Medical Department, Royal Thai Air Force Medical Department) - Royal Thai Police (Police Hospital) - University hospitals - Bangkok Metropolitan Administration (hospitals under BMA) - Private hospitals/clinics - National Health Security Office
Measure 2.2	Improve the effectiveness of Programmatic management of Drug-resistant TB (PMDT)	
Measure 2.3	Support the management of caring children with TB	

Strategy	Objective/Measure	Responsible agencies
Strategy 3:	**Enhance the effectiveness and accessibility of diagnosis and treatment of latent tuberculosis infection and TB infection control.**	
Objective	To prevent the development of TB disease among the population in the future.	
Measure 3.1	Expand the screening for latent TB infection	- Ministry of Public Health (MOPH hospitals) - Ministry of Defense (Royal Thai Army Medical Department, Royal Thai Navy Medical Department, Royal Thai Air Force Medical Department) - Royal Thai Police (Police Hospital) - University hospitals - Bangkok Metropolitan Administration (hospitals under BMA) - Department of Local Administration (Hospitals under Department of Local Administration) - Private hospitals/clinics - National Health Security Office
Measure 3.2	Improve the effectiveness of TB preventive treatment (TPT)	
Measure 3.3	Strengthen TB infection control in healthcare facilities, high-risk settings, and community	- Ministry of Defense (Royal Thai Army Medical Department, Royal Thai Navy Medical Department, Royal Thai Air Force Medical Department) - Royal Thai Police (Police Hospital) - University hospitals - Bangkok Metropolitan Administration (hospitals under BMA) - Department of Local Administration (Hospitals under Department of Local Administration)

Strategy	Objective/Measure	Responsible agencies
Strategy 4:	**Strengthen the support system for implementing the TB program.**	
Objective	To build sustainability in driving the TB program towards end TB.	
Measure 4.1	Enhance strategic management mechanisms	- Ministry of Public Health - Ministry of Foreign Affairs - Ministry of Interior - Ministry of Social Development and Human Security - National Economic and Social Development Board - International Health Policy Program - Ministry of Higher Education, Science, Research, and Innovation
Measure 4.2	Accelerate the monitoring of program implementation and surveillance of TB	- Ministry of Public Health - Ministry of Defense (Royal Thai Army Medical Department, Royal Thai Navy Medical Department, Royal Thai Air Force Medical Department) - Royal Thai Police (Police Hospital) - University hospitals - Bangkok Metropolitan Administration (hospitals under BMA) - Department of Local Administration (Hospitals under Department of Local Administration) - Private hospitals/clinics - National Statistical Office - Ministry of Higher Education, Science, Research, and Innovation

Strategy	Objective/Measure	Responsible agencies
Measure 4.3	Develop the capacity of TB personnel	- Ministry of Public Health - Ministry of Defense (Royal Thai Army Medical Department, Royal Thai Navy Medical Department, Royal Thai Air Force Medical Department) - Royal Thai Police (Police Hospital) - University hospitals - Bangkok Metropolitan Administration (hospitals under BMA) - Department of Local Administration (Hospitals under Department of Local Administration) - Private hospitals/clinics - Ministry of Higher Education, Science, Research, and Innovation
Measure 4.4	Accelerate the implementation of public communication and community engagement	- Ministry of Public Health - Ministry of Interior
Measure 4.5	Collaborate with the network of stakeholders to create equal access to standardized care and treatment for TB patients	- Ministry of Public Health - Ministry of Social Development and Human Security - National Health Commission - National Health Security Office - Social Security Office - Budget Bureau - Thai Health Promotion Foundation - WHO Thailand - Associations, Foundations, and civil society organizations

Strategy	Objective/Measure	Responsible agencies
Strategy 5:	Promote research and innovation in TB prevention and control	
Objective	To enable the public and network to access the utilization of research and innovation in ending TB.	
Measure 5.1	Promote research projects	- Ministry of Public Health
Measure 5.2	Develop and support the application of innovations	- Ministry of Higher Education, Science, Research, and Innovation - National Research Council of Thailand - Health Systems Research Institute - The Royal Thai College - Funding agencies including Health Systems Research Institute, National Research Council of Thailand, Program Management Unit for Competitiveness, Program Management Unit for Human Resources & Institutional Development, Research and Innovation, Thailand Science Research and Innovation, National Vaccine Institute, Government Pharmaceutical Organization

Monitoring and evaluation plan

Monitoring and evaluation plan to monitor progress of Thailand operational plan to end TB, Phase 2 (2023-2027)

Table 5 Framework of monitoring and evaluation

Indicator	Baseline		Performance target (Fiscal year)					Measure	Data source
	Year	Value	2023	2024	2025	2026	2027		
Target: Reduction of TB incidence from 143/100,000 population in 2021 to 89/1000,000 population in 2027									
TB incidence rate (per 100,000 population)	2021	143	133	122	111	100	89		Global TB Report by WHO
Strategy 1: Intensify TB case finding and the diagnosis of TB and drug-resistant TB.									
Objective: To enable TB patients and drug-resistant TB patients to undergo early and effective treatment process, which helps break the cycle of TB transmission within families and communities.									
Proportion of high-risk groups screened for TB through chest x-ray	2021	NA	75	77.5	80	82.5	85	**Measure 1.1** Intensify TB case finding in children (0-14 years old) and adults from the early stage (Early detection)	National TB Information Program (NTIP)
Proportion of new TB patients receiving drug susceptibility testing (DST)	2021	60	70	80	90	100	100	**Measure 1.2** Use molecular testing for diagnosing TB and drug-resistant-TB	
Proportion of previously treated TB patients receiving DST	2021	67	80	90	100	100	100	**Measure 1.3** Strengthen the TB laboratory network	
Proportion of TB treatment coverage for new and relapse TB patients	2021	70	90	90	≥90	≥90	≥90		Global TB Report by WHO

Strategy 2: Enhance the care and treatment of TB patients and drug-resistant TB patients according to international standards

Objective: To improve the effectiveness of care and treatment for TB patients and drug-resistant TB patients, with a particular focus on reducing deaths during treatment.

Indicator	Baseline Year	Baseline Value	2023	2024	2025	2026	2027	Measure	Data source
Treatment success rate of new and relapse TB patients	2020	83	90	90	≥90	≥90	≥90	**Measure 2.1** Improve the effectiveness of care and treatment for TB patients	Global TB Report by WHO
Proportion of TB patients with HIV testing result	2021	84.5	85	90	90	90	≥90		National TB Information Program (NTIP)
Death rates of TB patients	2021	9	8	7.5	7	6.5	6	**Measure 2.3** Support the management of caring children with TB	National TB Information Program (NTIP)
Percentage of patients with RR/MDR-TB initiating treatment of second line drugs	2021	99	100	100	100	100	100	**Measure 2.2** Improve the effectiveness of Programmatic management of Drug-resistant TB (PMDT)	Global TB Report by WHO

Strategy 3: Enhance the effectiveness and accessibility of diagnosis and treatment of latent tuberculosis infection and TB infection control.

Objective: To prevent the development of TB disease among the population in the future.

Indicator	Baseline		Performance target (Fiscal year)					Measure	Data source
	Year	Value	2023	2024	2025	2026	2027		
Proportion of household contacts of TB patient receiving screening through chest x-ray	2021	NA	50	60	70	80	80	**Measure 3.1** Expand the screening for latent TB infection (LTBI)	National TB Information Program (NTIP)
Proportion of household contacts, aged less than 5 years, of pulmonary TB patients receiving TB preventive treatment (TPT)	2021	100	100	100	100	100	100	**Measure 3.2** Improve the effectiveness of TB preventive treatment (TPT) **Measures 3.3** Strengthen TB infection control in healthcare facilities, high-risk settings, and community	Global TB Report by WHO
Proportion of household contacts, aged 5 years and above, of pulmonary TB patients receiving TB preventive treatment (TPT)	2021	NA	50	60	70	80	80		National TB Information Program (NTIP)

Strategy 4: Strengthen the support system for implementing the TB program.

Objective: To build sustainability in driving the TB program towards end TB.

Indicator	Baseline		Performance target (Fiscal year)					Measure	Data source
	Year	Value	2023	2024	2025	2026	2027		
Proportion of TB patients' families facing catastrophic costs due to TB treatment expenses	2022	30	20	10	0	0	0	**Measure 4.1** Enhance strategic management mechanisms	Research and Survey National TB Information Program (NTIP)
Proportion of public health facilities and hospitals registering TB patients in NTIP								**Measure 4.2** Accelerate the monitoring of program implementation and surveillance of TB	
- MOPH public health facilities and hospitals	2022	100	100	100	100	100	100	**Measure 4.3** Develop the capacity of TB personnel	
- Non-MOPH public health facilities and hospitals	2022	65	70	75	80	85	≥90	**Measure 4.4** Accelerate implementation of public communication and community engagement	
								Measure 4.5 Collaborate with the stakeholder network to create equal access to standardized care and treatment for TB patients.	

Strategy 5: Promote research and innovation in TB prevention and control.

Objective: To enable the public and network to access the utilization of research and innovation in ending TB.

Indicator	Baseline		Performance target (Fiscal year)					Measure	Data source
	Year	Value	2023	2024	2025	2026	2027		
Availability of research findings, innovations, as well as the utilization of research findings and innovation, contributing to the prevention and control of TB	2021	Yes	Yes	Yes	Yes	Yes	Yes	**Measures 5.1** Promote research projects **Measures 5.2** Develop and support the application of innovations	Survey and questionnaire

Monitoring and evaluation

Monitoring and evaluation are crucial for overseeing the implementation of the operational plan, Phase 2 (2023 - 2027) to achieve the set targets. This involves monitoring and tracking indicators as representatives of the measures each year to assess progress. Additionally, identifying factors that impact the success or hinder the progress of the work is essential for expediting or improving future operations. As for the evaluation of the achievements and impacts of the operational plan, Phase 2 (2023 - 2027), it will be conducted in the following stages.

• Mid-term evaluation of the operation plan by coordinating with relevant agencies at all levels, including experts and researchers from both internal and external organizations. This evaluation should encompass both quantitative and qualitative aspects. The evaluation results will be used to review the framework of the operational plan and improve implementation during the remaining period of the plan.

• Final evaluation of the operational plan by experts and researchers from both internal and external organizations. This evaluation will assess the achievements, outcomes, and impacts of the operational plan, which will serve as factors in determining policy directions and strategies for the country's TB program efforts and the development of the next operational plan.

The progress report on the implementation of the operational plan, Phase 2 (2023 - 2027) will be continuously submitted to the Committee of the End TB.
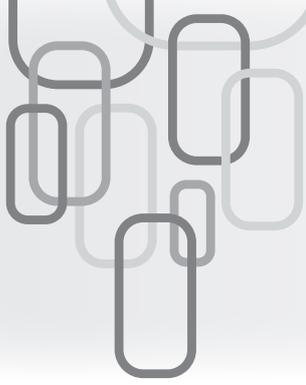
The translation of operational
strategies into action

The translation of operational strategies into action is an important process as it is the driving force behind the implementation of activities under the operational plan, Phase 2 (2023 - 2027) to achieve the desired goals and outcomes. It involves effective communication to create understanding and knowledge about the concepts and key components of the operational plan, including strategic issues, objectives, targets, measures, and indicators, to relevant central and regional levels. This is done to ensure their understanding of roles and responsibilities in supporting the operational plan and developing action plans within each organization that align and are consistent with the Thailand operation plan.

Financial management

Financial management is a crucial tool for driving the implementation of the operational plan, Phase 2 (2023 - 2027) towards effective outcomes. It includes the following components:

1. Integration of the operation plan, Phase 2 (2023 - 2027) with the annual budget planning process is essential to ensure that the budget system effectively supports the achievement of the goals set forth in the operational plan, Phase 2 (2023 - 2027). This integration involves aligning strategies, measures, and operational guidelines within the operational plan, Phase 2 (2023 - 2027) that need to be emphasized each year with the budget allocation.

2. Supporting local-level organizations to flexibly manage budgets and align them with the operational plan, Phase 2 (2023 - 2027) is crucial to drive the implementation of strategies, measures, and implementation that are contextually appropriate and responsive to the diverse contexts, capacities, and needs of each area.

3. Developing and expanding collaboration in TB program with various networked organizations, including government agencies outside the Ministry of Public Health, local administrations, sub-district leaders, community leaders, private sectors, and civil society, to actively participate and support budgeting for TB program within the operational plan, Phase 2 (2023 - 2027). This includes engaging in activities where each sector has expertise under transparent standards and oversight and ensuring efficient and effective budget allocation.

Estimated budget allocation for the 5-year operational plan ((2023 - 2027) of the Ministry of Public Health related to TB program.

Plan 3 Prevention and control of diseases and reduction of health risk factors.

Project 2 Control of diseases and health risks	2023	2024	2025	2026	2027	Remarks
TB control project	75.32 million baht	61.43 million baht	61.43 million baht	61.43 million baht	61.43 million baht	Budget supported by the Department of Disease Control

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กองวัณโรค

Thailand Operational Plan
To End Tuberculosis, Phase 2
(2023 - 2027)

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