

PUDUCHERRY TB ELIMINATION MISSION

STRATEGY DOCUMENT

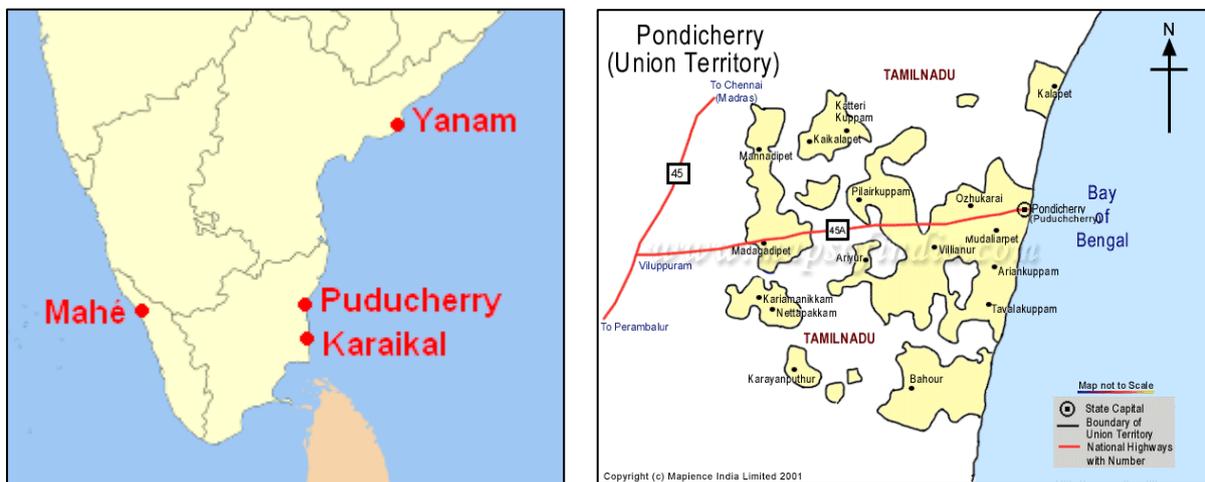
2020-2025

Content	Page No
Foreword	1
1. Introduction	3
• Geography & Demography	
2. Governance	5
• Health care system	
3. Determinants of TB	8
• Standards of living	
• Malnutrition	
• Diabetes Mellitus	
• Tobacco & Alcohol	
• Air pollution	
• • Migration	
4. TB Scenario in Puducherry	11
5. Moving towards elimination	15
6. Principles for TB Elimination	16
7. Strategies for TB Elimination	17
• Advocacy, Communication, and Social Mobilization	
• Airborne infection control	
• Establish a robust TB active surveillance system	
• Complete treatment of all forms of TB	
• Universal access to drug susceptibility testing	
• Screening for comorbidities including HIV and their management	
• Establishment of cross-border collaboration with hospitals inTamilNadu	
• Addressing major TB vulnerabilities	
• Plan for targeted testing and treatment of LTBI	
8. Conclusion	51

1. INTRODUCTION - GEOGRAPHY AND DEMOGRAPHY OF PUDUCHERRY

The Union territory of Puducherry comprises the former French Establishment Puducherry, Karaikal, Mahe and Yanam, which lie scattered in South India. Puducherry is the capital of Union territory of Puducherry. It is bounded on the east by the Bay of Bengal and on three sides by Tamil Nadu. About 150 kms south to Puducherry on the East Coast lies Karaikal. Mahe is situated on the Malabar coast on the Western ghats surrounded by Kerala. Yanam is situated adjoining the East Godavari district of Andhra Pradesh.

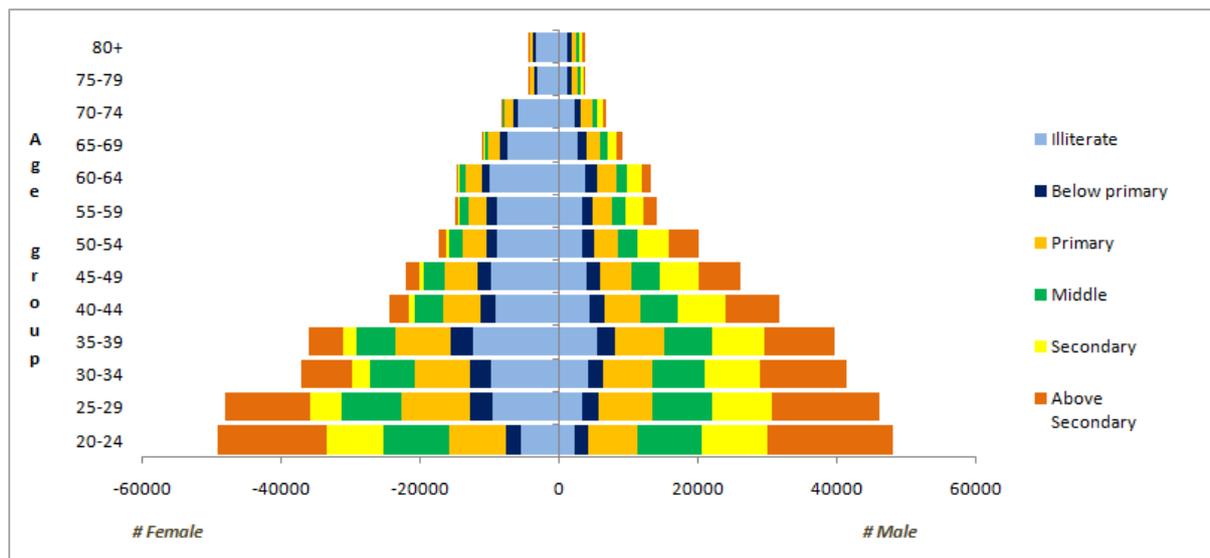
(a) Map of South India with Union Territory of Puducherry; (b) Map of Puducherry town



Puducherry has a tropical climate. The average annual temperature is 28.3 °C in Puducherry. Puducherry encompasses an area of 492 square km with Pondicherry town and its village covering 294 square km, Karaikal town and its villages covering 157 square km, Mahe and its village covering 9 square km and Yanam covering 30 square km.

As per Census of India 2011, population of U.T. of Puducherry is 12,47,953. Of which, Male population is 6,12,511 (49.1%) and female population is 6,35,442 (50.9%). Puducherry U.T. consists of 5 Municipalities, 10 commune panchayats, 8 Taluks, 6 Statutory towns, 4 Census towns and 3 community Development Blocks.

Fig 2: Demographic Dividend of Puducherry



Average literacy rate in U.T. of Puducherry has seen upward trend and is 85.8 percent as per 2011 population census. Male female sex ratio in Puducherry is 1037 female per 1000 male.

2. GOVERNANCE - HEALTH CARE SYSTEM

Puducherry's health infrastructure is well established. For a population of 12.47 lakhs¹, it has nine medical colleges including central government-run Institute-Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) to provide tertiary care. The state of Puducherry is considered to be a single district for RNTCP statistical purpose.

For administrative purpose the Union territory of Puducherry has been divided into 4 districts namely Puducherry, Mahe, Yanam and Karaikal. For local administration purpose the district is divided into Municipalities for Urban areas & Commune Panchayats for rural areas.

Puducherry spends about 2.42% of GDP on health and the per capita health spending is about Rs.3137². Puducherry's success, however, is due also to consistency. It has been investing in healthcare since 30-40 years. The life expectancy at birth is 72.1 years².

The health department is led by Director of health and family welfare services and is also assisted by various sub-officers for better health service delivery. There are 4 district general hospitals, 1 maternity and children hospital, 1 TB & Chest diseases hospital, 1 hospital for Leprosy and one ESI hospital. Also there are 39 PHC's, 4 CHCs and 81 subcentres.

The State has a systematically organized health service to cater health for all. There is also an integrated system of Medicine for AYUSH and Naturopathy to render quality services. Having established efficient systems to manage maternal and child health as well as communicable diseases, Puducherry is now focusing on managing non-communicable diseases (NCD), which are usually connected with lifestyle. Puducherry is witnessing an increase in reporting of lifestyle diseases such as diabetes, obesity and hypertension.

Source: 1- Census 2011 2- National Health Profile 2019

In the age group of 15-49 years, 36.7% of women and 37.1% of men are obese; 12% women and 12.6% men report high blood glucose levels, a sign of diabetes; and 9.2% women and 15.3% men have high blood pressure, according to the latest National Family Health Survey (2015-16).

The total ANC coverage with at-least 4 check-up is 87.7% (Urban - 90.3%, Rural – 81.8%) with 99.9% having Institutional deliveries. The Infant Mortality Rates have considerably come down over decades and according to the latest NFHS -4 it is 10 per 1000 live births. The MMR is 60.17 per 100,000 and the maternal death for the year of 2018-19 is 24 (including Tamil Nadu patients) and has been considerably reduced. This is due to the care at primary, secondary and tertiary level. The under 5 mortality rate is 17 per 1000 live births².

In UT of Puducherry, the implementation of AB-PMJAY was started in IGGGH&PGI on 31st August by Hon'ble Chief Minister and around 1.03 lakhs families have been identified under this scheme in UT of Puducherry. Puducherry has an urban Population of 8.5 Lakhs is covered by Urban PHC under DHFWS, Govt of Puducherry and slum population is 2,10,788 where it aims to improve the health status of the urban population particularly slum dwellers and other vulnerable sections by facilitating their access to quality health care. Puducherry's health system aims at patient centric care. They provide 1,000 seats in undergraduate medicine courses (MBBS, or Bachelor of Medicine, Bachelor of Surgery) and 720 seats in undergraduate nursing courses, more than enough to meet the needs of the population². There has also been mapping of all the Medical colleges towards the established health and wellness centres to provide care at grass root level. To render services Human Resources play a pivotal role and the vacancies at all the levels are replete. The following is the distribution at various sectors².

Source: 1- National Family Health survey-4 (2015-16)

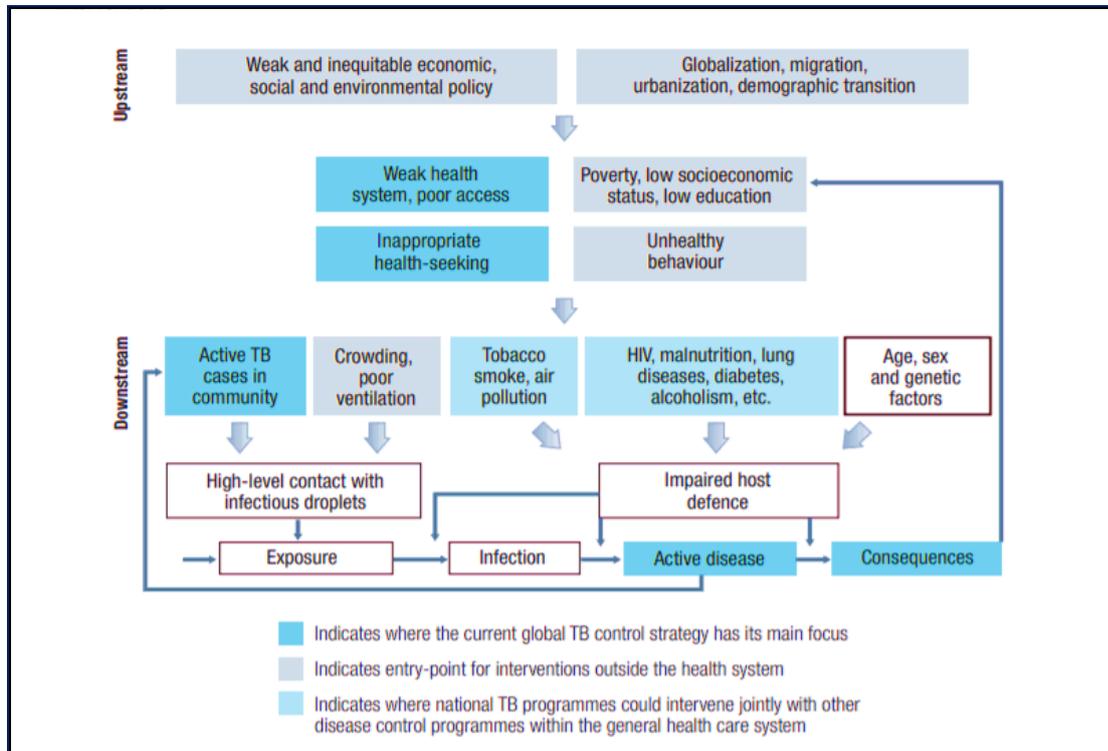
2- NHM, Puducherry

NHM		DPH		RNTCP	
Medical Officer	28	Medical Officer	123	Medical Officer	6
Paramedical Staff	146	Paramedical Staff	322	Paramedical Staff	26
Other Staff	297	Other Staff	368	Other Staff	19

In RNTCP, we have moved towards early detection of presumptive TB cases with the activity of Active case finding done by carrying out House to House visit in few areas of Puducherry and capturing of data, by improving the private sector notification and preventing the sale of anti TB drugs from Private sector and Pharmacies(375 private pharmacies). In RNTCP we have special focus on early and comprehensive capturing of patient data through TB notification especially private sector notification. Another area that needs urgent attention on identifying and treating drug resistant TB. The state has roped in research activities taken up by various Medical colleges to find the adherence to TB drugs and the factors affecting the outcomes before and after FDC.

3. Determinants of TB

Framework for downstream risk factors and upstream determinants of TB, and related entry-points for interventions



Source: social determinants of Tuberculosis, WHO document 2016

3.1 Poverty / Standard of Living:

According to the Pondicherry statistics Annual report 2018-2019, it is reported that in Puducherry district 1.35lakh (52.3%) households have Below Poverty Line (BPL) ration cards while in Karaikal 29453 (48.7%), Mahe -213 (2.6%) Yanam-11716 (71.5%) households have BPL card. The Quick Estimates of GSDP for the U.T. of Puducherry in 2017-18 is estimated at Rs.32,215.20 Crores at current prices. The per capita income (on the base of NSDP) for the year 2017-18 (Quick Estimates) is estimated at Rs.1,97,999/-¹.

Source: 1. Annual Report 2018-19, Directorate of Economics and Statistics, Puducherry

According to the Census 2011, the literacy rate of overall UT of Puducherry is 85.8%.The overall life expectancy in Puducherry is 72.1years.The birth rate in Puducherry is 13.2 per 1000 population while death rate is 7.3 per 1000¹.

3.2 Malnutrition:

As per National Family Health Survey 4 (2015-16) in UT of Puducherry, prevalence of under-nutrition was found to be 22% while that of stunting was 23.7% and wasting was 3.6%.Body Mass Index (BMI) below normal (BMI < 18.5 kg/m²) was found in 11.2% of women and 10.2% of men.

3.3 Tobacco and Alcohol:

According to NFHS-4, tobacco usage (any form of tobacco) in UT of Puducherry was found to be 15.4% while that of alcohol consumption was found to be 41.6%.

3.4 Co-morbid Medical conditions

3.4.1 HIV infection: The prevalence of HIV infection in the U.T, region of Puducherry is 0.15% according to NACO 2017 report.

3.4.2 Diabetes mellitus:

According to NFHS-4 of UT, Puducherry region, high Blood sugar level was found in 7.5% of Women and 7.5% of Men while very high blood sugar level was found in 4.5% of women and 5.1% of men. Diabetes is a potential risk factor for TB in Puducherry as approximately 25% of the TB patients diagnosed in Puducherry had increased blood sugar levels.

Source: 1. National Family and Health Survey -4 (2015-16)

3.5 Industrialisation / Occupational Hazard:

Farming of Paddy, whole grains, sugarcane, poultry, milk factories and fishing are the main source of income. Total number of Industries including small, medium and large scale and located in Pondicherry is 7520 while Karaikal has 1119, Mahe has 250 and Yanam has 436 industries and for the Overall UT it is 9325. Some of the significant industries in Pondicherry are chemicals, textiles, light engineering, metals, food processing, sugarcane factories, tyre industries and beer factory¹.

3.6 Tourism:

The figures of Tourists who arrived in the year 2018 are as follows; Pondicherry- 14,46,038, Karaikal- 2,63,649, Mahe-27,640, Yanam- 20,466 and over all in the UT of Puducherry -17,57,793. The Foreign Tourists were 1,41,133 and the Domestic Tourist were 16,16,660 in numbers¹.

3.7 Vulnerable population:

The vulnerable sections of the society found in Puducherry are urban slums, rural community, homeless people residing in shelter homes, inmates of old age homes, jail inmates, transgender and nomadic gypsy community.

3.8 Air Pollution: Air quality index in Puducherry is around 143 which is moderate with high particulate matter (PM_{2.5}) of 74.47 microgram/m³ and carbon monoxide²

3.9 Movement across the borders: Since Puducherry borders with Tamil Nadu, a high influx of patients from Tamil Nadu and other state occur in Puducherry. Out of 4570 patients notified for TB in Puducherry, only 1665 were residents of Puducherry UT while the rest belonged to other states.

Source: 1. Annual Report 2018-19, Directorate of Economics and Statistics, Puducherry,

2. <https://airpollutionapi.com>

4. TB Scenario in Puducherry

Revised National TB Control Programme (RNTCP) was implemented in Puducherry UT on 20th February 2004. The goal of RNTCP is to decrease the mortality and morbidity due to TB and cut transmission of infection until TB ceases to be a major public health problem. National Tuberculosis Control Programme is being implemented by integration with the general health care system. There are 28 Designated Microscopy centres in Puducherry UT which includes CHCs, PHCs, district hospitals and medical college hospitals. IRL Puducherry received the National accreditation certificate for 1st line Anti TB drugs, Culture and DST by all three types of technologies namely solid media, liquid media and molecular diagnosis (LPA and CBNAAT). It also received national accreditation certificate for 2nd line Anti TB drugs Culture and DST by liquid media.

Fig 1. Presumptive TB Examination rate/ 100000 population [2006-2019]

The trend of presumptive TB cases tested per one lakh population in UT of Puducherry shows that the number of cases tested gradually increased from 1581 in 2006 to 2233 in 2015. Though there is a decline in the number of presumptive TB examined over the last four years it is well above the national average of 908 presumptive TB examined per 100000 population in 2018.

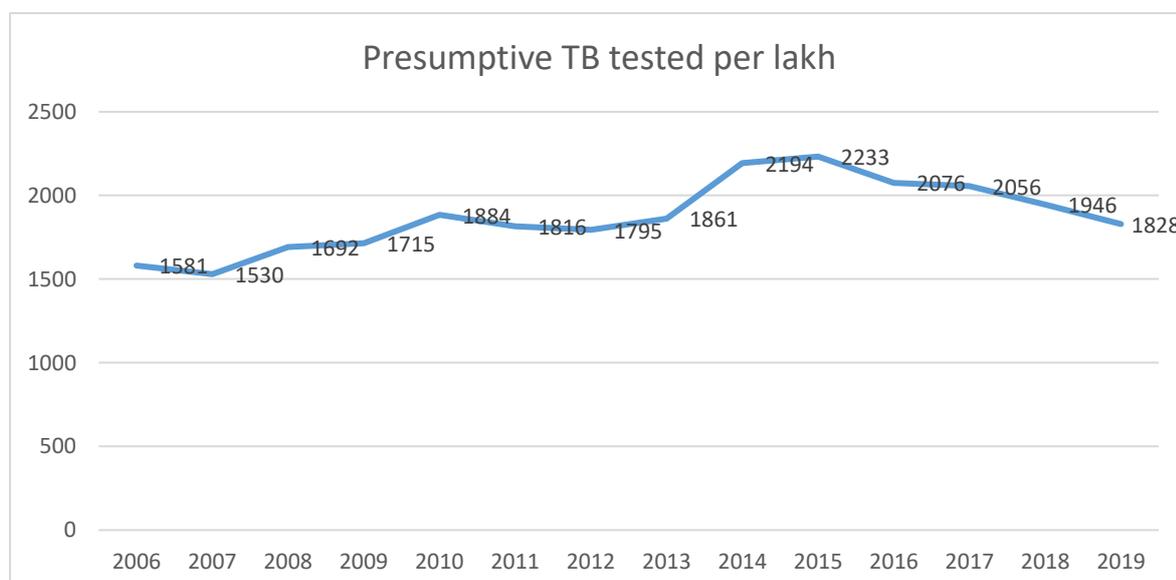
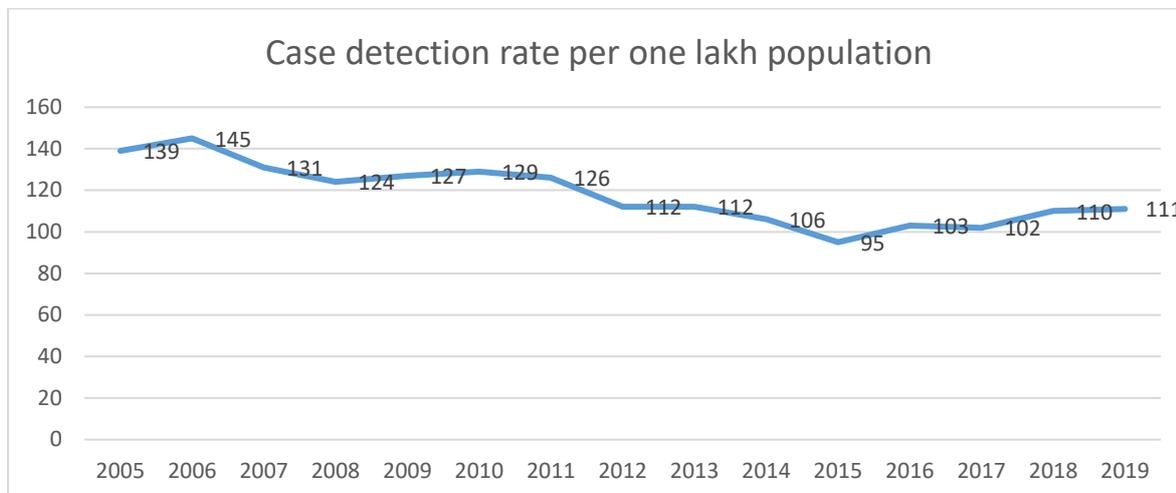


Figure 2: Case detection rate trends in Puducherry since 2005:



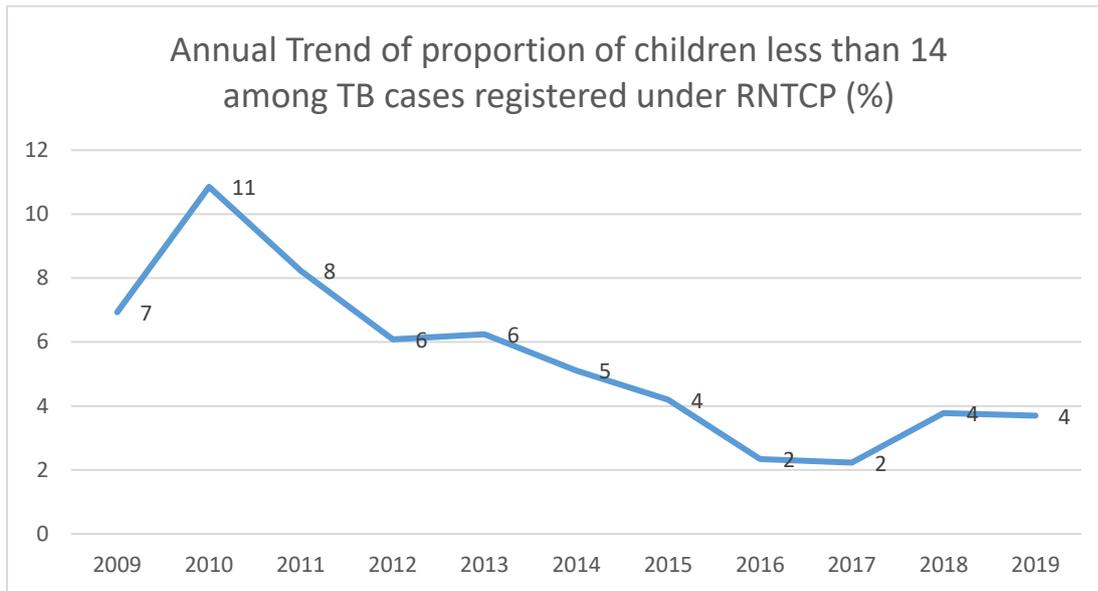
The annual case detection rate in Puducherry has been consistently more than hundred per one lakh population since 2005, however this is less than the national average as Puducherry comes under low incidence states category.

Table 1: Trend of Smear positivity Rate among the presumptive TB cases:

YEAR	Presumptive TB tested per lakh	Smear Positivity rate (%)
2006	1581	9
2007	1530	12
2008	1692	13
2009	1715	13
2010	1884	12
2011	1816	12
2012	1795	12
2013	1861	11
2014	2194	10
2015	2233	9
2016	2076	10
2017	2056	10
2018	1946	9
2019	1834	9

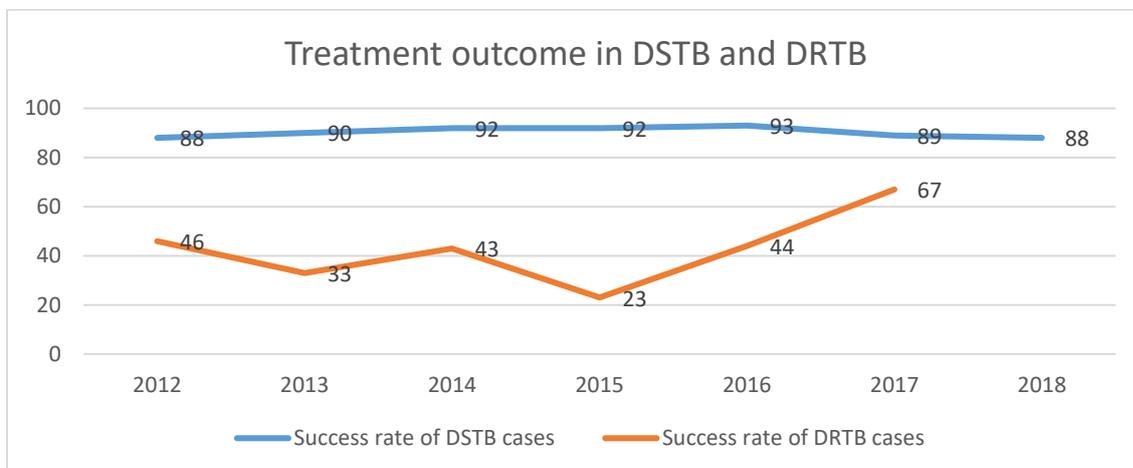
The smear positivity rate of the presumptive TB cases examined ranged from 9 to 13 percent, well within the acceptable range of 5 to 15% suggested by the programme

Figure:3 Annual trend of Childhood TB (Age less than 14 years) (2009-2019):



There has been a decline in the trend of proportion of childhood TB cases reported at Puducherry

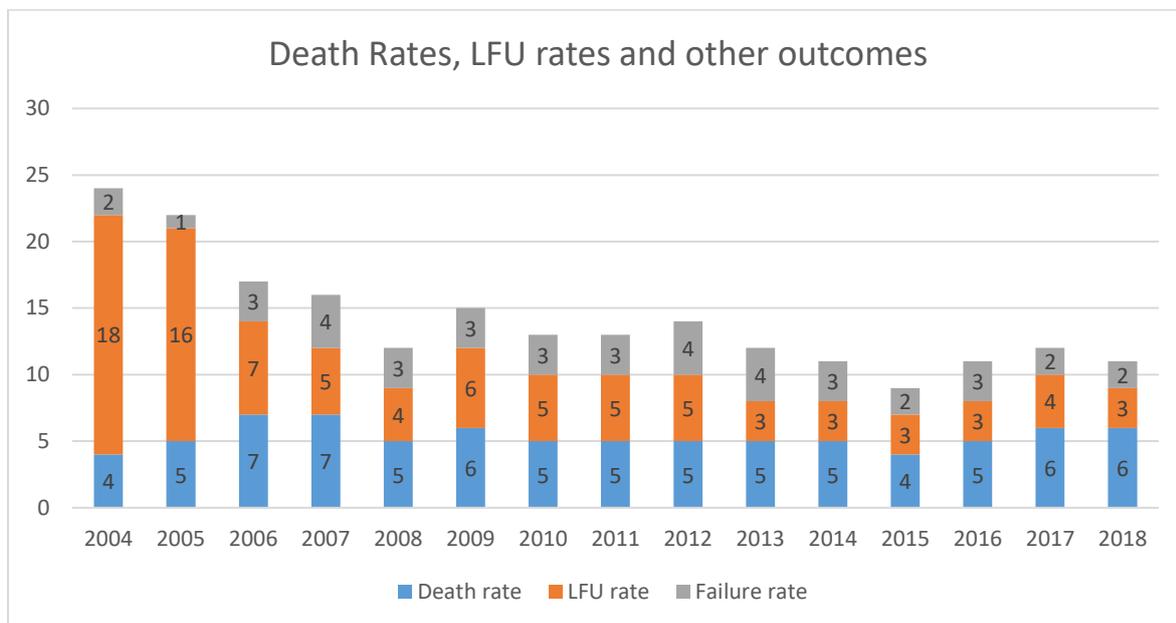
Figure: 4 Treatment outcome trends in DSTB and DRTB



The trend of favourable outcome in Drug sensitive TB has been consistently around 90% since 2012 while the success rate of DRTB has significantly improved in the last few years to a maximum of 67% in 2017

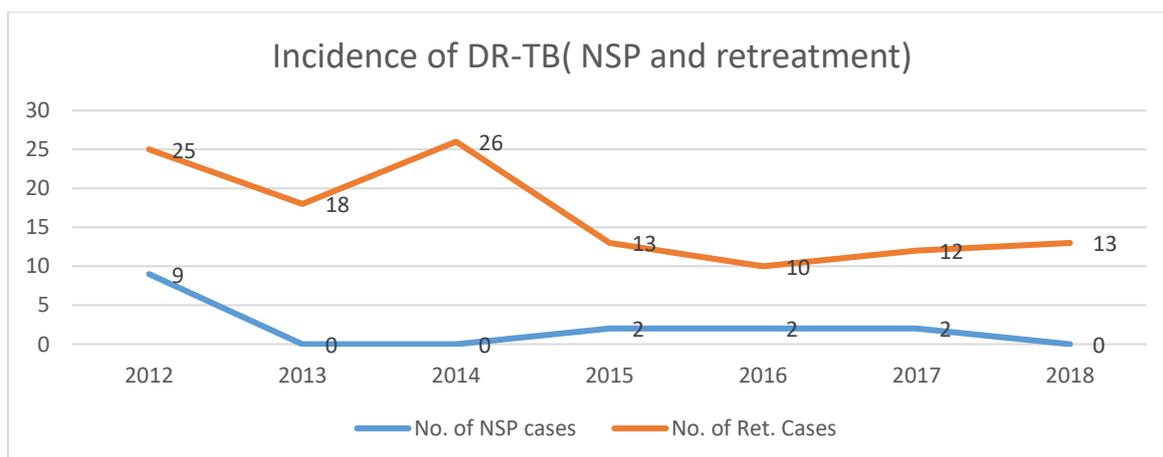
- For DSTB: Treatment outcome of cases diagnosed during 2018 reported in 2019
- For DRTB: Treatment outcome of cases diagnosed during 2018 will be reported in 2020

Figure 5: Trends of unfavourable treatment outcomes for TB



The trend of unfavourable treatment outcomes shows that death rate is consistently around 5% while the lost to follow up cases has decreased significantly over the years. The failure rates were also consistent around 2 to 4 percent since 2004.

Figure 6: Drug Resistant Tuberculosis among New and Retreatment cases trends since 2012:



The incidence of DR TB was around 10% to 13% in retreatment cases against the national average of 12% to 18%, however there has been a decrease in the trend in the last four years.

5. Moving towards elimination in Puducherry

1. Strengths of Puducherry to achieve elimination

- High Political and Administrative commitment for TB Elimination
- TB control is fully integrated with the health system
- Availability of Nine medical colleges for a small population and their active contribution to RNTCP
- Better Health indicators such as low prevalence of malnutrition, good literacy rate and easy access to health facilities
- Availability of IRL with National Accreditation certificate

2. Challenges in Puducherry towards achieving elimination

- High influx of patients from Tamil Nadu and other states
- Easy availability and cheaper cost of alcohol which results in non-adherence to treatment regimen among alcoholics.
- IRL is overburdened with the load of samples from both Puducherry and TamilNadu.
- High burden of diabetes and about 25% of the TB patients diagnosed are diabetic.

3. Will it be possible to bring down incidence to elimination level in Puducherry.

Puducherry reported an incidence around 100 cases per lakh population since 2015. It will be possible to reduce it to less than 25 cases per lakh population by focussing on diagnosing all cases earlier by a strong surveillance system and identifying major vulnerabilities especially household contacts and screening for and treating LTBI in high risk groups and special focus on diabetic individuals might drastically bring down TB in Puducherry. Puducherry can be an ideal setting to achieve TB Elimination in true sense

6. Principles for TB elimination in Puducherry

Four core principles lay foundation to the strategies for TB elimination in Puducherry.

Each foundational principle is further divided into subprinciples

1. Stop new TB infections

1.1. Airborne Infection Control in health facilities, households and community

1.2. Find and treat cases as soon as they occur

2. Prevent active breakdown of disease among the infected

2.1. Detect and Manage Comorbidities

2.2. Manage risk factors including smoking and substance abuse

2.3. Prevent and manage malnutrition

2.4. Detect and treat Latent TB Infection

3. Diagnose TB early and completely

3.1. Identify individuals vulnerable to develop TB in the community

3.2. Actively search for TB among vulnerable periodically

3.3. Universal access to TB diagnostics and Drug Susceptibility Testing

4. Treat TB correctly and completely

4.1. DST guided regimen for treatment

4.2 Detect and Manage co-morbidity among the TB patients.

7. Strategies for TB Elimination in Puducherry

The strategy has nine components.

1. Advocacy, Communication, and Social Mobilization for generating demand and awareness
2. Airborne infection control in health facilities, households and community
3. Establish a robust TB active surveillance system facilitating early diagnosis, treatment and public health actions.
4. Complete treatment of all forms of TB including drug resistant TB
5. Universal access to drug susceptibility testing and DST guided treatment
6. Screening for comorbidities including HIV and their management
7. Establishment of cross-border collaboration with DTOs of Tamilnadu
8. Addressing major TB vulnerabilities including tobacco, malnutrition and indoor air pollution
9. Plan for targeted testing and treatment of Latent TB Infection

1. Generation of awareness and demand through advocacy, communication and social mobilization

A) Advocacy for TB elimination

i. Advocacy of the Government agencies and people's representatives

At national level:

NTEP support from central government will be the key to success of TB elimination in our state. For this purpose we plan to use our in-charge officers in NTEP and MOHFW for swift approval of proposals and aids. We plan to invite central ministry officers and representations for all major activities and meetings. Involve Indian railways for train based and station based advertisements, awareness videos display and campaigns

At state and local self-governance level:

NTEP and state TB cell will actively collaborate and involve state health department and ministry and also the local self-government representatives at the village, block and district levels wherever found necessary in our activities and projects.

The district collectors will be made part of the core committees and similar involvement with other government officials and people's representatives will be made a key strategy for advocacy. The sense of involvement from the side of these stakeholders is expected to give the program the much needed advocacy among the power centers.

Get advocacy from departments other than health by involving them in relevant activities (eg. Education department for school based campaigns and health education, road transport department for vehicle and station based advertisements, awareness videos display and campaigns, police department and social justice for access to special and vulnerable population etc.).

ii. Advocacy among media and press

Newspapers and other mass media publications:

Support for the program in the form of news about its activities, helping in making announcements of events and activities, about achievements and how people can help in eliminating TB which would help greatly in advocacy of the program among public.

Television channel and other multimedia:

Advocacy from television channels and other mass media sources in the form of advertisements, news, health education videos etc. will help the program gain much popularity because of the reach of the resources.

Channel heads and newspaper editors will be involved in the program activities to gain their support naturally.

iii. Advocacy among celebrities and popular figures

Celebrities from film field, music industry, sports & games, literature, painting, social service etc. have great following and approval among public. Getting their advocacy in terms of health awareness messages, videos and advertisements will help the program reach the masses and get us familiar with households. Making these local, regional and national level celebrities the brand ambassadors of the program at various levels will help us attain our mission.

iv. Advocacy at grass root level

In common life there are locally influential people apart from politicians and local self-government representatives, like medical officers of PHC's, bank managers, school headmasters, college principals, school teachers, Anganwadi workers, sub centre nurses, post masters/post man, priests, etc. who are more appealing to local population than other influential figures. These people can be involved for advocating our TB elimination program to the local population.

B) Communication for TB elimination

i. Awareness creation and making fight against TB popular

Even though awareness creation on TB has been happening from the start of anti TB struggle in India, still its potential is great, because a vast majority of people are still unaware of the real threats of the disease, its spread and effective treatment options. So simple, catchy, sustained, repeated information on TB needs to be given to the public to make it reach those who are still unaware or fully aware or those who don't give much importance.

Local language adopted, local culture and tradition based messages would be the core of our awareness campaigns. Involving celebrities, popular figures and locally influential people would make program popular among public. There will be measures to remove the taboo and reluctance on discussing TB related issues, by involving children from schools, self-helpgroups, youth clubs, village development committees, etc. so as to penetrate into people's

minds that TB is not a thing to be shunned away from, but it has to be taken head on as one of the most important threat to our public health.

ii. Health Education

Health education on TB should be clear, evidence based and effective by using simple language, being maximum illustrative, using innovative and interesting methods like storytelling, role plays, street dramas, puppet shows, etc. Definitely the health education must be in native language, most preferably by persons known to the population, in environments and timings convenient and comfortable for the population/target audience.

iii. Behaviour change communication

There must be effort for behaviour change communication (BCC) and not just delivery of health related information, by enabling the advocated change. For this convenient BCC models like health belief model, social learning and cognitive theory, trans theoretical/stages of change model etc. will be used. Interventions with multi-sectoral collaborations for improving housing/ventilation standards, creating and availing more TB care centers and personnel, providing personnel protective measures for pollution related occupations, ensuring control of malnutrition in target populations, privacy and anonymity bases measures for TB screening, diagnosis and treatment, etc. are planned to work in synergy with IEC and other BCC interventions to enable TB elimination.

iv. Strategy changes in communication

There should be strategic change in communication methods and campaigns for effective TB elimination based on lessons learned and barriers identified from past efforts. Apart from just delivering information on symptoms, diagnostic methods and treatment; we need to make ardent and successful efforts to make these information really reach people. This can be done by targeted interventions like grass root level dissemination; dissemination among vulnerable populations; providing information in native languages; disseminating information in more popular meeting places like local tea shops, beedi,cigarette and pan

shops and liquor shops, game and sports ground, religious festivals, fairs, markets etc.; making information delivery methods more interesting and attention catching like posts in social networking websites and messengers (through sharing of posts by NSS volunteers and other students), advertisement stickers on packaging material and other consumables (with the help of shop owners and marketing agencies, goods delivery systems, newspaper agencies, etc.), T-shirt and other printed dress materials, etc.; shifting of thrust area of messages from just “cough for more than two weeks” to “any of the four - cough, fever, night sweats and weight loss”; etc.

v. Some of the other specific planned advertising methods and campaigns are:

- a. Printing the backside of the bus tickets which are run by state corporation
- b. Telecasting of the awareness campaign in various FM channels repeatedly.
- c. Telecasting of the awareness campaign in various local TV channels repeatedly
- d. Organizing skit at the panchayat offices emphasizing the need for early deduction of symptomatic persons.
- e. Periodic sensitization of the adolescent population by roping in the NSS Volunteers in various educational institutions.
- f. Creating awareness to the women in reproductive age group by periodic sensitization of the Anganwadiworkers for early deduction of symptomatic persons in the service area catered by them.
- g. Creating awareness to the teachers working in various schools for early deduction of symptomatic persons in the schools
- h. Setting up of a task force consisting of various departments of Women and Child Development, Education and social welfare along with health
- i. Periodic sensitisation of the drug inspectors for strict adherence on the sale of anti-tubercular drugs.

j. Periodic sensitisation of the private practitioners for swift notification of the presumptive TB symptomatic persons attending their clinics.

C) Social mobilization

Social mobilization will be key to the TB elimination struggle. Because what we lack in the existing efforts is also by and large adequate social mobilization. We plan to ensure efficient social mobilization through:

i. Community engagement

Existing patient centered care must be enhanced with patient rights based care approach and local community involvement in such levels and measures so as to equip efficient TB care, but at the same time not infringing upon the desired privacy and anonymity levels of the patients. Community engagement will enable the empowering of the community in matters of TB elimination and evoke better response from them as they will develop a sense of ownership.

Community engagement will be enabled through involvement of self-help groups, youth clubs/organizations, local cricket and football clubs, school student groups, adolescent groups, etc. Proper health education on TB will be done to these groups and motivated for engaging their community members in the TB elimination struggle. These groups once get empowered with the task will be more acceptable in their local community for the task of TB elimination than governmental or non-governmental agencies which would do the same job. The community members will listen to them better and trust their words more. Thus there is better chance of community engagement.

Local self-government led popular movements involving community leaders and above mentioned groups will increase demand for TB elimination.

ii. TB survivors led social mobilization

TB survivors from the local community will be another key component of our social mobilization plan. TB survivors can inspire the community to change their views on TB and

remove the stigma on the disease. They can motivate the community to understand the threats of TB infection, importance of early detection and treatment and also believe in the effectiveness of TB treatment. They will be trusted more than others because they have gone through the problems and people narrating lived in experiences have greater chance of educating the community with authority.

iii. TB champions led social mobilization

TB champions are popular and influential figures in the community, celebrities, sports persons etc. who get trained in advocating TB elimination strategies and requirements and are volunteering to accomplish the task of social mobilization of the TB elimination struggle. Due to their popularity and community accepted authority, they can act as conduits of information and awareness on TB infection and importance of TB elimination to the public. In addition these champions against Tuberculosis can use both personal and professional networks to develop partnerships, stimulate policy change and engage in fundraising efforts.

In the Indian perspective, program plans to involve trained TB survivors also as TB champions locally. As recommended in the strategic plans of the program, we plan to have at least 1 or 2 TB survivor turned champions per village or local administrative unit to involve in directed social mobilization.

iv. Social mobilization through religious and special community organizations and their leadership.

Religious groups especially minorities (Muslims and minority castes and ethnicities) are much close knit and listen well to their leaders. So we have plans to involve such organizations and their leaders to improve social mobilization. These leaders and representatives will have better access to such groups and will be able to deliver the messages better and enable effective social mobilization for TB elimination.

2. Airborne infection control

Overview of transmission and pathogenesis of TB

In order for TB to spread, there must be a source patient who has infectious TB disease and a susceptible host (a person to inhale droplet nuclei containing *M. tuberculosis*). Anyone who shares air with a person with infectious TB disease of the lungs or larynx is at risk, although TB is not usually spread by brief contact. TB is spread when another person inhales one or more of these particles and becomes infected with TB.

Standard Precautions

Standard Precautions is the term used for the group of infection control practices to reduce the risk of transmission of pathogens. These are based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents. Standard precautions are applicable to all patients in all health care settings. Standard precautions combine the major features of *Universal Precautions*, *Body Substance Isolation*, and *Airborne Precautions*.

Implementation of these precautions requires *risk assessment* in all health-care activities.

Elements of Standard Precautions

- Hand hygiene
- Selection of personal protective equipment based on assessment of risk
- Respiratory hygiene and cough etiquette
- Prevention of injury from needles and other sharp objects
- Cleaning of the patient care environment
- Linen and waste management
- Cleaning and disinfection of patient-care equipment

WHO has suggested three pronged approach to control airborne infection control

1. Administrative control
2. Environmental control
3. Personal respiratory control

The selection of the combination of controls will be based on the infection control assessment and informed by local epidemiological, climatic and socioeconomic conditions.

Administrative controls: Administrative controls are to identify persons with respiratory symptoms, separate them into appropriate environment, fast-track them through the health care facility to reduce exposure time to others, and diagnose/treat them with minimal delay.

Hospitalization should be reduced or avoided to the greatest extent possible. At facility level, administrative controls play a major role in reducing the risk of TB transmission and are essential for the implementation of other controls (i.e. environmental controls and personal protective equipment).

Environmental Controls: The choice of environmental controls is largely determined local factors and resources. Ventilation should be prioritized to reduce the number of infectious particles in the air. Effective ventilation may be achieved by natural ventilation where possible. In high-risk settings where optimal ventilation cannot be achieved through natural or mechanically-aided means, properly designed, placed and maintained shielded ultraviolet germicidal irradiation devices should be considered as a complementary control.

Personal protective equipment: Personal protective equipment (e.g. particulate respirators certified as N95 or FFP2) should be available as required in high-risk situation, especially drug resistant tuberculosis, and during high-risk aerosol-generating procedures such as bronchoscopy or sputum induction.

Administrative control strategies for health-care facilities

Administrative control measures (policies and work practices) have the greatest impact on preventing TB transmission. They serve as the first line of defence for preventing the spread of TB in health care settings.

Key recommendations on administrative controls

Outpatient Settings

- Screen for respiratory symptoms as early as possible upon patient's arrival at the health care facility
- Provide patient education on cough hygiene and sputum disposal
- Segregate patients with respiratory symptoms
- Fast-track patients with respiratory symptoms

Inpatient settings

- Minimize hospitalization of TB patients
- Establish separate rooms, wards, or areas within wards for patients with infectious respiratory diseases
- Educate inpatients on cough hygiene and provide adequate sputum disposal
- Establish safe radiology procedures for patients with infectious respiratory disease, including smear-positive TB cases or TB suspects

Environmental controls:

Environmental control measures are the second line of defence for preventing the spread of TB in health care settings. Environmental controls work on the same basic principle – dilution of infectious particles through real or 'effective' *air exchange*. In the case of ventilation, that dilution occurs through the introduction of fresh, uninfected air and the removal of infected air. In the case of UVGI or filtration, dilution is 'effective' through the creation and re-circulation of 'cleaned' air, in which infectious particles have been removed by irradiation or physical extraction. Certain circumstances may require *directional control of*

airflow, so that air containing infectious particles is not introduced into clean air where staff or other patients are located

Recommendations on environmental controls

- Health-care facilities should seek to achieve minimum standards for air exchange.
- High-risk settings should be prioritized for immediate assessment and implementation of improved ventilation.
- In most settings, natural ventilation is the preferred method for ensuring adequate air exchange. Specific guidance on design and implementation of natural ventilation in health care facilities is available from WHO.
- In existing health-care facilities relying on natural ventilation, ensure effective ventilation at all times and in all climatic conditions through proper operation and maintenance, and by regular checks to ensure fixed, unrestricted openings. If mechanical ventilation is used, the system should be well designed, maintained and operated, to achieve adequate airflow rates and air exchange.
- In high-risk settings where it is not possible to achieve adequate air exchange using natural ventilation, a complementary option is to use upper room or shielded ultraviolet germicidal irradiation (UVGI) devices.
- Optimal arrangement of patients and staff should be implemented in all outpatient departments, DOT centers, microscopy centers, and radiology
- Directional control of air flow is recommended in specific high-risk settings where infectious patients with drug-resistant TB or other acute respiratory diseases of potential concern are likely to be managed – i.e. airborne precaution rooms, MDR-TB wards and clinics, and bronchoscopy suites

Personal respiratory protection measures

- Patients should be instructed to wear disposable face masks while waiting for procedure or immediately after the procedure. Cough etiquette must be enforced.

- Healthcare workers in the bronchoscopy room should use respiratory protection using N95 particulate respirators. Simple surgical face masks may be insufficient to ensure protection against infective aerosol. Healthcare workers must be given time and training to adjust to these infection control measures. Disposable N95 respirator masks may be an economically suitable option; these may be reused by the same person till they lose fit or get soiled. The mask selected should be well-fitting. A seal check must be conducted each time the respirator is donned. The respirator should be continuously used both during the bronchoscopy procedure as well as during specimen handling. Manufacturer recommendations must be strictly adhered to for all aspects of respirator use.

TB laboratories

Designated Microscopy Centres:

Direct sputum microscopy is a relatively low-risk activity as long as safe work practices are implemented properly. The following work practices are recommended to ensure that microscopy laboratory technicians are not exposed to aerosols from sputum specimens.

1. *Sputum collection:* Sputum must be collected in a well ventilated area with direct sunlight. It should not be collected in laboratories, toilets, waiting rooms, reception rooms, or any other enclosed space.
2. *Smear preparation:* Smears should be prepared in a well ventilated environment, near an open flame.
3. *Work bench:* Work Benches should be cleaned daily with 70% Alcohol.
4. *Sputum container/applicator sticks/slides:* sputum containers, applicator sticks and slides should be disinfected with 5% Phenol overnight before discarding. They may be discarded in deep burial pits or may be tagged for appropriate disposal via the hospital biomedical waste management system.

5. *Sputum pots in the inpatient wards*: These may be disinfected with 5% Phenol for one hour, and then emptied into the routine drain.

TB Bacteriology laboratory activities that may generate aerosols

1. Preparing specimens for centrifugation and AFB culture
2. Centrifugation of specimens
3. Inoculating cultures from specimen sediment
4. Handling unopened primary- isolation plates or tubes
5. Staining smear of material from culture
6. Manipulating cultures (suspension preparation, vortex, and transferring) of *M. tuberculosis* complex on solid medium
7. Transferring large volumes of cultures or suspensions of bacilli
8. Disposing of cultures of *M. tuberculosis* complex
9. Inactivation of specimens for isolation of DNA and other macromolecules on *M. tuberculosis* complex species
10. Shipping cultures or specimens of *M. tuberculosis* complex

Summary of recommended administrative and bio-safe practices for TB bacteriology laboratories

Activity	Administrative controls	Bio-safe practice and procedure
Preparing specimens for centrifugation and AFB Culture	Train personnel in safety procedures	Conduct all work in the BSC on a tissue-wad moistened with a tuberculocidal agent; use aerosol-containing safety cups for centrifugation
Centrifugation of specimens with live TB bacteria	Bio-safe centrifuge & biocontainment devices	Use aerosol containing safety cups for centrifugation; open only in the BSC.
Inoculating cultures from specimens	Use BSC and follow biosafety practices and procedures	Follow aseptic techniques; autoclave all wastes from the BSC
Handling unopened primary-isolation culture bottles/Mccartney bottles	Treat all cultures as potentially infectious	Carry all the materials in trays and in designated racks; and not individually in hands. Label the racks and trays.
Staining smear of material from culture	Bio-safety cabinet class II	Prepare slides in a BSC. Before removal from BSC, heat-fix to kill tubercle bacilli. Do not carry individual slides in hands, carry as a whole on a slide-carrying tray
cultures of <i>M. tuberculosis</i> complex species on solid medium	tuberculosis complex; and screw-caps tightened. Bio-safety cabinets Class II B.	and after use, in the flame.
Transferring suspensions of bacilli	Ensure BSC is certified annually using calibrated instruments by qualified person; maintain directional air flow and room air changes; Adhere to spill protocol for management of accidents.	Vortex and sonicate suspensions in BSC in closed tubes that are opened only in BSC. Use aerosol-containing centrifuge cups and open only in BSC. Manage waste safely.
Disposing of cultures of <i>M. tuberculosis</i> complex	Identify material with proper disposal labels and autoclave prior to disposal.	Discard liquid waste into a tuberculocidal 5% phenolic disinfectants solution; transfer to autoclave carefully for sterilization.
Shipping cultures or specimens of <i>M. tuberculosis</i> complex	Provide approved and safe shipping containers	Ship in triple – packaged container. Follow SOP and regulations for transport of diagnostic specimens and infectious substances.

Summary of environmental controls recommended for TB bacteriology laboratories

The laboratory meets at minimum complete WHO Biosafety laboratory level 2 standards, in accordance with the RNTCP laboratory committee recommendations for culture and DST laboratories.

- Laboratory is either placed at the blind-end of building and/ physically Isolated from the common lab/hospital environments
- Access to the culture and DST rooms is through an anteroom. The entry to lab is restricted to trained laboratory personnel.
- The containment room where culture and DST is carried out is sealable in case of spill and aerosolization for decontamination.
- Biological safety cabinets (BSC) class II, with 100% exhaust (i.e. ducted outside) is provided and used.
- Bio-safety cabinets ducted to outside, while switched ON, would maintain an inward air flow into the culture and DST facilities
- Bio-safe centrifuges, with aerosol-seal buckets is provided and used.
- Hand-wash sink is provided in the culture & DST room with effective disinfectant
- Autoclave (steam sterilization facility) is provided within the laboratory facility

Personal Protection measures for TB bacteriology laboratory staff

Following protection measures to be followed in the lab by lab staff

(a) For sputum collection & smear microscopy:

- a. Proper cough hygiene needs to be explained to the patients
- b. Collection should be in an open area, or in a properly designed and maintained indoor sputum collection booth.
- c. LT would maintain at least one arm length distance and upwind when a patient is Collecting a sputum sample.

d. Wear lab coats while performing the lab work.

(b) For culture and DST activities:

a. All personnel working in culture laboratory need to wear separate clothing, not the common lab coat. Separate closed-toe foot-wear to be used at all times. Chappals or sandals are not appropriate.

b. All personnel are to wear an N95 particulate respirator while performing DST, or manipulating cultures for any reason.

c. Decontaminate lab coat before laundering or disposal.

d. In case of accidents and spillages, lab personnel should strictly adhere to the procedure given below:

e. Personal Protective equipment (PPE) should be worn in the following order

i) Disposable gloves, ii) Coats/suits/overalls, iii) Respirator/mask

f. PPE should be removed in the following order before leaving the laboratory

i) Respirator/mask, ii) Coats/suits/overalls, iii) Disposable gloves

3. Establish a robust TB active surveillance system

Surveillance is the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation and evaluation of public health practice (WHO). **Surveillance of Tuberculosis** is systematic identification of people with suspected active TB, in a predetermined target group, using tests, examinations or procedures that can be applied rapidly (WHO).

Active case finding is looking systematically for cases of active tuberculosis and latent TB infection in groups known, or thought to be, at higher risk of tuberculosis, rather than waiting for people to develop symptoms/signs of active disease and present themselves for medical attention (which would be passive case finding).

Surveillance is one of the fundamental public health activities necessary for the control and elimination of TB. A robust surveillance system should include individual risk-

based surveillance for early diagnosis of TB, Case based surveillance of TB disease, Surveillance for prevalence of TB disease and LTBI and addressing TB among guest workers.

Vulnerable groups or target groups for TB surveillance include Trans-genders, migrant workers/populations, IV drug abusers, prisoners etc.

Active surveillance of TB in migrant population of Puducherry

Migrant populations are those populations which move either across an international border, within a country or within a state. In Puducherry, major migration of people is mostly due to labour as internal migration (a movement of people from one area of a country to another area of the same country for the purpose or establishing a new residence either permanent or temporary, for the purpose of employment).

As an essential component to achieve “TB – Free World”, the “WHO STOP TB” strategy calls various governmental and non-governmental organizations to protect poor and vulnerable subgroups in TB infection and its related conditions. So we at Puducherry also want to concentrate on migrant population which is one of the major vulnerable or target group existing in Puducherry state.

Active case finding in the migrants are considered important as they are high risk population of developing TB in the community. They are also acts as a bridge population along with truckers. The transmission of TB among this population is due cause of many factors like over-crowded living condition, poor nutritional status, low education status, poverty, stigma, discriminatory practices, urbanization, indoor air pollution, insecure working arrangements and police harassment impact their health-seeking behaviour and access to health care leads to morbidity and mortality among migrants.

Also there are barriers like lack of knowledge regarding availability of health services; interrupted continuum of care, attitudes of the health care workers, language and cultural barriers in the health care provision which hinder the early diagnosis and treatment of

TB. Active case finding based TB surveillance helps in overcoming these barriers among the migrants and enable early case detection and treatment of TB and also in TB screening of children of TB contacts, identifying latent TB infections and improving the quality of care to these population in need.

Steps to eliminate TB among the migrants:

1. After discussing with PHC medical officer, ANM, Anganwadi workers etc. the population distribution details of the PHC service area will be obtained.
2. **Tentative micro plan** will be made and discussed with concerned STF members and will be presented before STO, Puducherry
3. **Geo-location-based mapping of the migrants and other vulnerable population** will be done to find the risk groups of the population to be focused.
4. **Public health education and intensified health promotion campaign** for the migrants and vulnerable populations will be made to empower the community and ensure community participation by raising awareness and sense of ownership.
5. After screening from verbal symptoms, sputum collection will be made after examining the presumptive cases. **Active case detection** will be done by means of program recommended quality assured bacteriological diagnostic methods and chest X-ray assessment. In Puducherry we have planned to **use CBNAAT as bacteriological diagnostic method.**
6. **Referral mechanisms** will be enhanced and timely follow up examinations will be done.
7. **TB surveillance system** needs to include various specific study variables on migrant vulnerable population.
8. Monitoring of the burden of TB and the treatment outcomes will be done periodically among the migrant and vulnerable population by the concerned agencies.

9. **Mobile health services** associated with intensified active screening camps for TB and its co-morbid conditions will attract more people for screening and bridge the health care access gaps in these populations.
10. **TB case notification** will be strengthened by active involvement of private and government medical colleges as well as private health care providers by involving them in the planning process and giving adequate training in using NIKSHAY portal and periodical follow ups on their usage.
11. **Contact tracing** of HIV-TB co-infection among the migrants and the mobile population will be strengthened in association with ART centres and NACO and utilizing services and collaborations from NGOs working with vulnerable populations. The traced contacts will be promoted to undergo TB and HIV screening tests.
12. Involvement of community-based organizations like NGOs, Voluntary organisation for migrants from the community itself
13. **Control of air borne infection** among populations with overcrowded housing conditions (like slum dwellers, migrant workers, etc.) with improvement in housing infrastructure of these populations by incorporating various schemes and assistance government and other welfare organizations and also by empowering the vulnerable populations with health education and information on various welfare schemes.
14. **Vaccination** of the children of migrant populations with BCG and providing **Isoniazid Preventive Therapy (IPT)** for children living with TB contacts will be made mandatory.

Elimination of TB in marginalized minorities, Transgender people and commercial sex-workers

Trans-genders and sex-workers are examples of marginalized populations that need to be incorporated into the public health priorities for TB. Communities, Rights and Gender

(CRG) Tools were developed by the Stop TB Partnership in consultation with various partner and donor organizations. TB and HIV among these sub-groups will be diagnosed early and treated almost entirely in the context of HIV-TB co-infection, as per ART guidelines.

Given that these groups face barriers in accessing health care in comparison to general population, tedious and well planned efforts need to be taken to ensure the timely detection and treatment of TB, HIV and other sexually transmitted diseases among them. But while doing this all efforts will be taken to respect their right to dignity, privacy and desired levels of anonymity.

Our response to TB elimination would be based on gender equality; focus on key and priority populations; human rights protection and empowerment of vulnerable and target populations. An increased focus on these aspects has the potential to not just increase case detection and improve treatment outcomes but also to improve the overall quality of care available to those affected by TB.

Steps to eliminate TB among the marginalized minorities

1. RNTCP – NACO collaboration
2. Enlisting the subgroup of population from AIDS control society Pondicherry.
3. **Community Empowerment** - Collaboration with Community based organizations, NGOs, Other Voluntary organizations, Link workers (like with Sahodharan organization), Conducting plenty of awareness programs, campaigns to break stigma on TB and HIV and addressing other relevant sensitive issues.
4. **Develop a patient-centric, gender equality-based TB care approach.**
5. **Mobile camps** – conducting intensified Active screening camps (for both HIV and TB) along with facilities for general health check-up and care.
6. **Make available safe virtual or physical spaces** (for example telephone hotlines, or drop-in centers) for subgroups in these populations for anonymous support, feedback and access.

7. Contact tracing

- 8. Sensitizing the community** – Creating an Enabling Environment for early screening, diagnosis and treatment.

4. Complete treatment of all forms of TB including drug resistant TB

Principle of complete treatment is not completing treatment anyway. It is prompt initiation of treatment with the right regime, regular intake of all doses, prevent or manage factors adversely affecting a good treatment outcome like adverse reactions to drugs (ADR), co morbidities, social inclusion issues, substance abuse, smoking and unfavorable occupations so that the patient becomes healthy by all means. It is important in preventing long term morbidity due to TB sequelae. It is also important in achieving a goal of zero TB death.

Strategy for complete treatment includes,

- a. Prompt initiation of treatment of TB including drug resistant TB
- b. Patient support through treatment support groups
- c. Monitoring and promotion of adherence through ICT
- d. Early detection and management of ADR
- e. Institutional management of seriously ill patients
- f. Management of co morbidities

a. Prompt initiation of treatment of TB including DRTB

All TB patients should be initiated on a first-line regime at the earliest, within seven days of diagnosis. Since we have implemented universal DST, based on the results any change in the regimen will be implemented as per the guidelines. All medical colleges should also have

TB/DRTB wards and a panel of specialists trained in management of drug resistant TB. The DRTB centre is having an indoor facility to admit 4 female patients and 8 male patients at a time. Similarly, seriously ill drug sensitive patients also may need hospitalization for which we are having separate ward in Govt. Hospital for Chest diseases.

b. Patient support through treatment support groups

A treatment support group [TSG] is a non-statutory body of socially responsible citizens and volunteers to provide social support to each needy TB patient safeguarding his dignity and confidentiality by ensuring access to information, free and quality services and social welfare programs, empowering the patient for making decision to complete the treatment successfully. The group is usually chaired by the president of Gram Panchayat or a local opinion leader. Members of the group are the Medical Officer [MO], STS, LHV, community DOT provider, experienced informal counselors, community based or faith based organization [FBO] members, local philanthropists and other community volunteers. TSG links the patient to social welfare schemes, nutritional support project, DBT Schemes, Alcohol de-addiction or local benevolence. For example: A patient tends to interrupt treatment would be counseled by the counselor member. Emotional and spiritual support would be provided by the FBO member. This intervention is expected to minimize loss to follow up in the state.

c. Monitoring and promotion of adherence through ICT and other means.

Real time information about administration of each dose is important to health system to promote adherence for a relapse free cure. ICT can play a big role in ensuring adherence to treatment by bidirectional flow of information controlled by a call centre. One such initiative available in the program is “99 DOTS” where each patient is registered in the web system of 99 DOTS, doses taken by the patient is documented through a call by the patient to the random toll free number in the blister pack of each dose, the call is acknowledged, the

absence of call is treated as doses not taken and the health system is alerted for retrieval. It is already being implemented to support PLHIV with TB. It can make a positive impact on the treatment adherence of patient and responsiveness of health system.

d. Early detection and management of ADR

Adverse reactions to drugs play major role in interruptions in treatment, increase in morbidity and catastrophic expenditure. To prevent, detect and manage ADRs, especially in the context of daily regime, the following may be considered.

1. Treatment initiation by a medical officer after interrogating thoroughly for conditions that may predispose to or complicate ADRs. In situations where such conditions exist, laboratory investigations need to be done to guide treatment.
2. Monthly clinical review by Medical Officers of the PHI or the treating clinician. In presence of a predisposing condition, this monitoring should be at least once in two weeks.
3. Basic tests to rule out impaired liver and renal function should be done at two monthly intervals.
4. All ADRs should be reported through the health facility / Medical Colleges / state Pharmacovigilance Units.

e. Institutional management of seriously ill patients

It is important to manage seriously ill TB and DRTB patients in tertiary care institutions where there are facilities for such management. All medical college hospitals and general hospitals should have TB/DRTB wards with at least 3-4 beds to manage seriously ill TB patients.

f. Management of co morbidities

Non-communicable diseases like diabetes, chronic respiratory diseases, cardiovascular diseases, and cancers significantly lower the favorable outcomes of TB treatment. With

prompt linkages among respective disease control programs, patients could be ensured of cure and better quality of life.

g. Screening for diagnosis and treatment of latent TB infection

Strategy of community based screening for diagnosis and treating LTBI would be the most resource intensive. Additionally, it throws queries of acceptance, civic rights, compliance and methodology.

Diagnosis of LTBI: It requires administration of an invasive test (Tuberculin Skin Test or Interferon Gamma Release Assay) for complete population. TST is cheaper, but less accurate. IGRA is very costly, though accurate. In a resource limited setting, expenditure should be justified with expected yield and decision to treat. Diagnosing LTBI, if not complemented with decision to treat, results in fear of ill health. Hence what would be recommended is testing close contacts. Screening general population may be considered at a later stage after marked reduction in incidence rates and future guidelines from CTD will be followed in this regard.

Treatment of LTBI: All LTBI may not progress to active TB. Life time risk to develop active disease among HIV positive individuals is 60-80%. It justifies treatment of LTBI among them, which policy has been incorporated into RNTCP, as prophylactic isoniazid therapy for all HIV positive individuals irrespective of LTBI test positivity. Hence LTBI testing would not be recommended for HIV positives, as it does not influence decision to treat. However, similar risk is not accurately estimated among the infected that have diabetes, renal disease, malnourished etc. Since the objective is to prevent active breakdown and onward transmission, treating LTBI may be considered among these populations. Treatment will be 'offered' to these individuals, they will be encouraged to opt for treatment and monitored for adherence and completion of a course of treatment. However, people who do not opt for treatment may be closely followed up for symptoms of active tuberculosis, at

the onset of which a CBNAAT must be done on the appropriate sample and if found positive, or clinically diagnosed having active TB, must be treated with full course of anti TB treatment.

Treatment options recommended by WHO for LTBI include:

1. 6-month Isoniazid or
2. 9-month Isoniazid, or
3. 3-month regimen of weekly rifapentine plus Isoniazid
4. 3–4 months Isoniazid plus Rifampicin
5. 3–4 months Rifampicin alone

Among these options, 3-month regimen of weekly rifapentine plus Isoniazid is operationally feasible in view of ease of administration, and monitoring for adherence or will be managed as per the guidelines from CTD.

5. Universal access to drug susceptibility testing

Currently drug susceptibility testing is available in the form of upfront CB-NAAT for Rifampicin resistance in EPTB, Paediatric TB, TB-HIV and sputum negative TB cases. CB-NAAT and LPA facility from the Intermediate Reference Laboratory (IRL) is being utilized. Further, testing of new TB patients who remain sputum positive during follow-up sputum examination and further drug resistance testing for first line drugs and second line drugs with liquid and solid culture media will also be performed at the IRL as per the RNTCP guidelines. CB-NAAT testing will also be used for active case finding. Tru-NAAT technology will also be used to facilitate the drug susceptibility testing at high burden DMCs. Subsequently, drug susceptibility testing facility will be made available universally to all TB patients.

6. Screening for co-morbidities, including HIV, and their management:

The co-morbidities commonly associated with TB are diabetes, HIV/ AIDS, malnutrition, COPD, smoking, alcoholism etc. Screening for these co-morbidities shall be attempted at every visit to the health care facility.

Screening for Diabetes and Tuberculosis:

All TB patients who have been diagnosed and registered under RNTCP will be referred for screening for diabetes. Referral of TB patients for screening of diabetes and its recording and reporting will be done at the PHI where TB treatment is initiated. Screening for diabetes will follow the guidelines stipulated by NPCDCS. Screening TB patients for diabetes would be conducted as early as possible after diagnosis of TB, but can be done at any time during the course of TB treatment. TB patients will initially be screened with a Random Blood Sugar (RBS) test using a glucometer. The Auxiliary Nurse Midwife (ANM)/ laboratory technician/ staff nurse of the PHI will screen patients for diabetes using a glucometer available at all PHIs. If the RBS is less than 140 mg/dL, this is a normal result and no further tests need be carried out. If the RBS is ≥ 140 mg/dL, this might indicate an abnormal glucose state and there is a possibility of diabetes. The patient will be referred to the nearest NCD clinic for Fasting Blood Glucose (FBG) test with NCD clinic referral slip. FBS value ≥ 126 mg/dL indicates diabetes. TB patients with diabetes or with a RBS ≥ 140 mg/dL will be referred to the NCD clinic for definite diagnosis and management.

All presumptive TB cases aged more than 30 years attending the DMC will be screened for diabetes as per NPCDCS.

All patients, including diabetics registered at the NCD clinic will be screened for the four symptoms complex. Screening is expected to be carried out every time the patient visits the NCD clinic. Patients will be asked whether they are on TB treatment, and if not, they would be screened for four symptoms complex:

- Current Cough,
- Current Fever,
- Experiencing of significant weight loss and
- Night sweat

Medical Officer-in-charge of NCD clinic will ensure regular screening of patients attending the NCD clinic. Staff Nurse and Counselor attending to the NCD patient will enquire about the TB symptom complex and refer the patient. The staff nurse and counselor would be trained by the Medical Officer-Incharge to screen the TB symptom complex. After screening, patients with one or more symptoms of TB symptom complex will be referred to the co-located DMC in the PHI for diagnosis of TB.

Screening for HIV & Tuberculosis:

Bidirectional screening among TB cases for HIV and TB among PLHIV will be strengthened. Routine HIV counselling and voluntary testing will be offered to all TB patients. This referral would be done as soon as possible after diagnosis, and results would be communicated back to the referring provider in order to provide better patient management. All TB patients with a history of any HIV risk factors, with a history of present or past STI, or any clinical signs/symptoms concerning for other HIV-related opportunistic infections should be offered HIV counselling and voluntary testing.

Health care provider will initiate testing for HIV among the presumptive TB patients to increase the uptake of HIV testing and early detection. All presumptive TB patients will be

offered and referred for HIV testing at the DMC. All DMCs have co-located ICTCs which makes it easier for referral.

All ICTC clients would be screened by the ICTC Counsellors for the four-symptoms complex for the presence of the symptoms of TB disease (at pre, post, and follow-up counselling). All clients who have symptoms or signs of TB disease, irrespective of their HIV status, would be referred to the nearest facility providing RNTCP diagnostic and treatment services. After screening, patients with one or more symptoms of TB symptom complex will be referred to the co-located DMC in the PHI for diagnosis of TB. All patients coming to ART centres should be screened for opportunistic infections, particularly TB.

Screening for malnutrition and Tuberculosis:

Studies on nutritional status of TB patients in India have shown high levels of moderate to severe undernutrition in both women and men. According to programme data, the median weights in men and women are 43 kg and 38 kg, respectively. In Puducherry also Body Mass Index (BMI) below normal ($BMI < 18.5 \text{ kg/m}^2$) was found in 11.2% of women and 10.2% of men. Undernutrition is a serious co-morbidity in patients with active TB in India, and increases the risk of severe disease, death, drug toxicity, drug malabsorption and relapse after cure. In the absence of nutritional support, undernourished patients with TB do get enmeshed in a vicious cycle of worsening disease and undernutrition, which can be detrimental and even fatal. Food insecurity in household contacts of TB patients in India increases their risk of developing active TB. This has serious implications, especially for contacts of patients with multidrug-resistant TB.

Nutritional status will be assessed based on history and examination, including anthropometric measurements of body weight and height. Nutritional status should be classified using body mass index (BMI) (for adults), BMI for age charts (for children aged 6–

18 years), or WHO growth charts (for children under 5 years). In pregnant women, those with oedema or those unable to stand, the mid-upper arm circumference should be used to classify nutritional status. Anemia is common in TB patients and contributes to morbidity and poor functional status. Hemoglobin estimation should be performed at baseline in patients with active TB. Nutritional counselling should be offered to all patients with active TB. The emphasis in counselling should be on consumption of a healthy balanced diet to achieve the desired energy and protein intake with three meals and three snacks, clarifying misconceptions and practices to be avoided such as consumption of tonics or expensive food supplements and promoting food hygiene and healthy cooking practices. Short-term inpatient treatment of patients based on BMI, presence of oedema, performance status, disease status and comorbidities to prevent a serious outcome like TB mortality will be provided at nearest tertiary care institutions.

Screening for tobacco use and tuberculosis:

Every patient who gets registered as a TB case will be enquired about status of tobacco use which will be recorded in the revised TB treatment card. Each patient will be offered 'Brief Advice' on how to quit tobacco use based on 5 As and 5 Rs model. Each patient will be provided with 'Brief Advice' at least twice a week and check on his/her quitting status. Each patient will be observed for showing signs of quitting tobacco use after completion of intensive phase. If not, encourage him/her to avail cessation services at the TCC or National Tobacco Quit line. Meanwhile, ensure that the Treatment Supporter (DOTS Provider) will continue to provide 'Brief Advice' and record the final status of quitting at the completion of TB treatment.

All tobacco users registered at the District Tobacco Cessation Centre (TCC), National Tobacco Quitline/mCessation will be screened for four symptoms complex of active TB and will be referred for further confirmation and management.

All TB patients will be counselled about the importance of cessation of alcohol intake for better treatment outcomes at the initiation of treatment. Chronic respiratory diseases will be managed with a patient centered approach in the primary care setting. Other co-morbidities like renal diseases, hepatic disorders will be referred to tertiary care institutions for further management.

7. Addressing vulnerability to TB:

Current national policy on diagnosis of TB disease has moved up from passive diagnosis in self-reporting TB symptomatic cases to active case finding in health facilities and intensified case finding in high risk institutional settings and finally to active case finding in high risk community settings with priority diagnostic care to clinically and socially vulnerable individuals. A vulnerable group is any group of people in which the prevalence or incidence of TB is significantly higher than in the general population. The recommended vulnerable groups to be considered for active case finding may be classified as follows:

Clinical	Social	Geographical
Clients attending HIV Care Settings	Prisoners	Urban Slums
Substance abuse including smokers	Occupations with risk of developing TB	Hard to reach areas
Co-morbidities like Diabetes Mellitus, Malignancies, patients on dialysis & on long-term immunosuppressant therapy	People in Congregated Settings night shelters, De-addiction centres, Old age homes	Indigenous & tribal populations
Health Care Workers within the state and working outside the state	Migrant labourers	

Household & Workplace Contacts		
Patients with Past History of TB		
Malnourished		
Antenatal mothers attending antenatal clinics/MCH clinics		

The MO-PHI will be responsible for mapping the service area of the PHIs for identifying the vulnerable populations mentioned above. Periodic screening of the vulnerable population would be done by the ANM and will be supported by the Medical colleges in the vicinity. The department of Community Medicine of the Medical Colleges, both government and private institutions, in the region will carry out active case finding activities in their respective RHTC and UHTC service areas. A structured screening questionnaire for assessing symptoms will be used. Those identified with symptoms will be subjected to sputum examination with CB-NAAT. The mobile CB-NAAT van from RNTCP program will be used for this purpose. X ray facilities will be utilized wherever available.

8. Establishment of cross-border collaboration with private hospitals in Pondicherry and Tamil Nadu

The Union Territory (UT) of Puducherry lies in the southern part of the Indian Peninsula. It consists of four small unconnected districts namely Puducherry, Karaikal, Mahe and Yanam that fall in three different states of India which makes Puducherry UT geographically unique for provision of services related to Tuberculosis elimination. The areas of Puducherry district and Karaikal district are bound by the state of Tamil Nadu, while Yanam district and Mahe district are enclosed by the states of Andhra Pradesh and Kerala respectively. Hence for the achievement of elimination of Tuberculosis from UT, cross collaboration with District TB Elimination task force of neighbouring state becomes vital.

Puducherry UT as a whole has already established complete geographic coverage of RNTCP services by effective cross border collaboration with private medical colleges situated at the borders and also with the neighbouring districts of other states. As a result of these TB notification from private sector has increased substantially. The same will be continued for achieving TB elimination by 2025.

Puducherry District

Puducherry is sharing border with Cuddalore district to the South, Villupuram district to the West and the other borders (North and East) surrounded by the Bay of Bengal. In its western border is located two private medical colleges namely Sri Manakula Vinayagar Medical College (SMVMCH) and Sri Venkateshwaraa Medical College Hospital and Research Centre (SVMCHRC). They provide comprehensive service to the people residing around the borders of UT and Tamil Nadu (Villupuram district). The southern border has two more private medical colleges namely Mahatma Gandhi Medical College and Research Institute (MGMCRI) and Arupadai Veedu Medical College (AVMC). Apart from the people of UT, they are providing RNTCP related services to Cuddalore district of Tamil Nadu. In its eastern border are located Pondicherry Institute of Medical Science (PIMS) and Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER). The Govt. medical college, IGMCRI (Indira Gandhi Medical college and Research Institute) and Sri Lakshmi Narayana Medical college caters services to people of all region.

Other Districts

Karaikal is bounded on the North and South by Nagapattinam district of Tamil Nadu state, on the west by Tiruvarur district (also belonging to Tamil Nadu), and on the East by the Bay of Bengal. At Karaikal district, there exist collaboration with Vinayaka Mission's Medical College (VMMC) and border district TB centres of adjoining districts of Tamil Nadu

for ensuring complete TB notification, early diagnosis and free of cost TB services to citizens of the residents. It should also address confidentiality, treatment adherence, disease surveillance, LTBI detection and management and long term follow up. Similarly at Mahe district, there is collaboration with border districts like of Kannur district and Kozhikode district of Kerala. At Yanam district similar arrangements have been made with the adjoining East Godavari district of Andhra Pradesh for complete coverage of residents.

Patients attending the private medical college hospitals situated at the borders of UT have been systematically screened for symptoms of TB by the respective service provider. The beneficiaries of the services are people residing in UT and adjoining districts of Tamil Nadu. Every college has well-functioning Designated Microscopy Centres which are monitored regularly by the program staff and STF core committee members of the respective college and the same will be carried out in future also. The Intermediate Reference Laboratory situated at Puducherry district will be utilized for availing the appropriate diagnostic services. After diagnosis the patients are referred to the DOTS provider for ensuring adequate and appropriate management.

Strategies to improve better implementation of RNTCP activities towards TB elimination

1. The strategy to improve and enhance yield of TB patients screened at private medical colleges situated at the borders of Puducherry district is proper utilization of Ayushman Bharath initiative by government of India. Recently Puducherry State Health Mission has been actively involved in establishing Health and Wellness Centre as per the guidelines of Ayushman Bharath initiative. MoU will be shortly signed with all private medical colleges to adopt at least 10 HWC. This platform can be used to mobilise chest symptomatic to nearby medical colleges for systematic screening, diagnosis, treatment and follow up. The ASHA workers can be trained to identify

people with symptoms suggestive of TB and they can be used to escort these patients for further work up at the PHI. Increased coverage can be achieved by focusing on clinically, socially and occupationally vulnerable populations. Program will support medical colleges to build the capacity of provision of TB care.

2. Utilisation of the neighbouring district DMCs for diagnosis and treatment.
3. In areas where sputum testing centres are not available, the sputum samples can also be transferred to nearby DMC through vehicles and postal /courier services specially arranged for this purpose by the program. These arrangements prevent the loss of TB cases in the cascade of care with support systems thereby ensure elimination of TB as per the plan.
4. STS and STLS can be asked to attend the monthly review meeting of the TU of adjoining district for clarifying the missed cases that never turn up after referral to their corresponding districts.
5. Community Medicine department of each medical college can be encouraged, trained and supported to carry out ACF and ICF activity at their respective field practice area, which is a key strategy to identify the missing cases in the community an important step towards elimination.
6. RNTCP STF Core Committee to conduct frequent meetings to enhance case finding at all those departments that deals with TB patients and to facilitate inter-departmental coordination for implementation of DOTS strategy.
7. The RNTCP can facilitate the conduct of operational research relevant to program activities of medical colleges situated at the borders by capacity building activities in research methodology and proposal writing and by providing funds.
8. Improving the capacity building for surveillance, diagnosis and treatment of MDR-TB at medical colleges by the program.

9. Increasing the participation of the medical college faculty in Television/Radio / Newspapers to disseminate information related to RNTCP.
10. Modifications to be made in the infrastructure and services of existing medical colleges for carrying out air-borne infection control measures.

9. Plan for targeted testing and treatment of LTBI

Diagnosis and treatment of latent TB infection will help to reduce the reservoir of infection that eventually may drastically reduce incidence of TB disease.

Accelerating impact for elimination needs to carry this intervention at the community level. Running a community-based screening program requires set criteria for probability. Thus, all the vulnerable individuals in the low case settings, who are mapped and targeted for active surveillance, may be tested for LTBI. Strategy of community-based screening for diagnosis and treating LTBI would be the most resource intensive. Additionally, it throws queries of acceptance, civic rights, compliance and methodology. Hence what would be recommended is testing close contacts and vulnerable population. Since the objective is to prevent active breakdown and onward transmission, treating LTBI may be considered among these populations. Treatment will be 'offered' to those individuals, they will be encouraged to opt for treatment and monitored for adherence and completion of a course of treatment.

Conclusion:

Puducherry UT is confident of achieving a reduction of more than 80% in TB incidence as compared to 2015 incidence rate before 2025. The expected timelines are as follows:-

Year	Percent of reduction in incidence compared to 2015 rates (2015 rates-Best-185; Low:96; High-302)
2020-2021	20% (brass medal)
2021-2022	40% (silver medal)
2022-2024*	60% (gold medal)
2024- 2025*	≥80% (TB elimination certificate)

- * 1. Subject to rolling out of Latent TB Infection (LTBI) management guidelines by CTD for children 6 to 18 years and adults more than 18 years.
- 2. Improvement in socio-economic conditions, nutrition status and control of risk factors such as smoking, diabetes, substance abuse like alcohol, etc.
- 3. The support of all stake holders are key determinants in making Puducherry “TB Free” in the proposed timelines.

The proposed timelines are in line with India’s set target of achieving TB elimination by 2025. However, Puducherry UT is determined to achieve the targets much earlier than indicated.