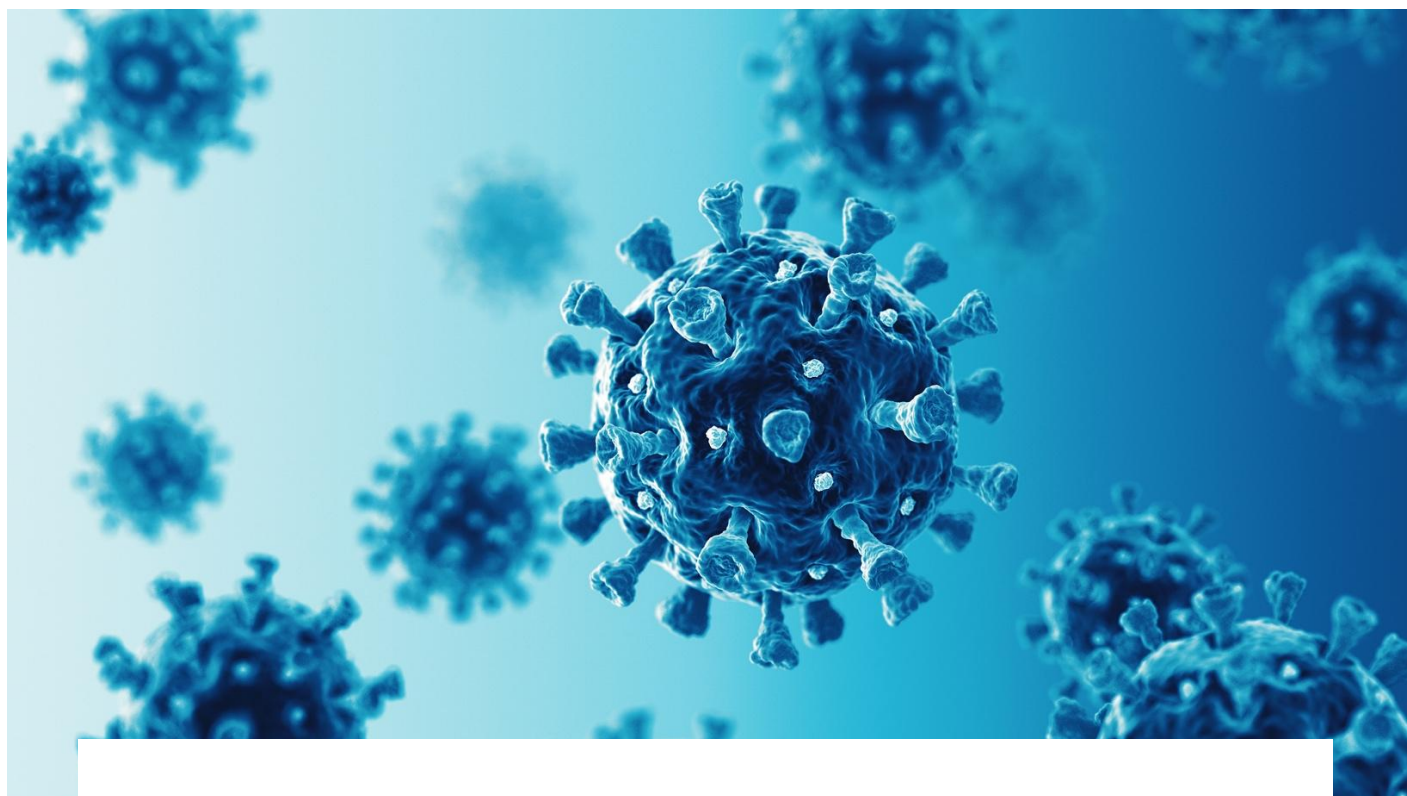




C19 RESPONSE MECHANISM GRANT OF THE GLOBAL FUND

*A move towards health system strengthening for
pandemic preparedness*

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ACRONYMS

ADRs — Adverse Drug Reactions
ANM — Auxiliary Nurse and Midwife
ART — Anti-Retroviral Therapy
ASHA — Accredited Social Health Activist
BCG — Bacillus Calmette–Guérin
BDQ — Bedaquiline
CDHO — Chief District Health Officer
CDMO — Chief District Medical Officer
CHO — Community Health Officer
CoC — Continuum of TB Care
CTD — Central TB Division
DBT — Direct Benefit Transfer
DR-TB — Drug-Resistant Tuberculosis
DTC — District TB Centre
DTO — District TB Officer
EPTB — Extrapulmonary Tuberculosis
FNAC — Fine Needle Aspiration Cytology
ICT — Information and Communication Technology
IEC — Information, Education and Communication
IT — Information Technology
LT — Laboratory Technician
M&E — Monitoring and Evaluation
MDR/RR-TB — Multidrug-Resistant / Rifampicin-Resistant Tuberculosis
MO — Medical Officer
MoHFW — Ministry of Health and Family Welfare
MoU — Memorandum of Understanding
NAAT — Nucleic Acid Amplification Test
NGOs — Non-Governmental Organisations
NPY — Ni-Kshay Poshan Yojana
OOP — Out-of-Pocket Expenditure
OPD — OutPwTB Department
PM-ABHIM — Pradhan Mantri Ayushman Bharat Health Infrastructure Mission
PMDT — Programmatic Management of Drug-Resistant Tuberculosis
PMTBMBA — Pradhan Mantri TB Mukht Bharat Abhiyaan
PMTPT — Programmatic Management of TB Preventive Treatment
PPSA — PwTB Provider Support Agency
PwTB — Person with Tuberculosis
SOPs — Standard Operating Procedures
STC — State TB Cell
STLS — Senior TB Laboratory Supervisor
STO — State Tuberculosis Officer
STS — Senior TB Treatment Supervisor
TAT — Turnaround Time
TB — Tuberculosis
The Union — International Union Against Tuberculosis and Lung Disease

Executive Summary

The C19 Response Mechanism (C19RM) for TB Care in India was conceptualised during an unprecedented public health emergency. The COVID-19 pandemic disrupted tuberculosis services across the country in ways not witnessed in decades. Movement restrictions, fear of infection, diversion of health staff to COVID-19 duties, and repurposing of diagnostic infrastructure collectively interrupted the continuity of TB care.

India, which carried nearly 27% of the global TB burden, could not afford sustained disruption. In 2022 alone, an estimated 2.8 million TB cases occurred in India out of 10.6 million globally (Source: National TB Elimination Programme, MoHFW; Global TB estimates – <https://dghs.mohfw.gov.in/national-tuberculosis-elimination-programme.php>).

It was within this context that The International Union Against Tuberculosis and Lung Disease (The Union), supported by The Global Fund to Fight AIDS, Tuberculosis and Malaria, designed and implemented the 3-D TB Care Model under the C19RM grant (Source: <https://theunion.org/our-work/tuberculosis/covid-19-response-mechanism>).

The model introduced three operational pillars:

- Doorstep Sputum Collection and Transportation (SCT)
- Doorstep Drug Delivery (DD)
- Tele-Consultation (TC)

All three were supported by a structured digital backbone - the Patient Support Portal (PSP) - designed to ensure traceability, accountability, and real-time monitoring.

Originally conceived as an emergency preparedness response to protect TB services during lockdown conditions, the programme evolved as the public health landscape changed. By the time field implementation began in mid-2023, India had largely moved beyond lockdowns and routine TB services had resumed (Source: Inception Report of the 3-D TB Care Model, April 2022–March 2025, The Union).

This shift required strategic recalibration. The 3-D TB Care Model transitioned from a pandemic-continuity mechanism to a system-strengthening and service-extension intervention - particularly focusing on:

- Government-notified PwTB in hard-to-reach geographies requiring continuity reinforcement
- PwTB notified from private sector
- PwTB at risk of treatment interruption

Over the course of implementation across six states and twenty-two districts, the model demonstrated that structured doorstep TB services were operationally feasible when embedded within the National TB Elimination Programme (NTEP) architecture.

This documentation presents a grounded assessment of how the 3-D TB Care Model was designed, how it was implemented across six states and 22 districts, what worked, what did not, and ultimately whether the implementation system functions as intended.

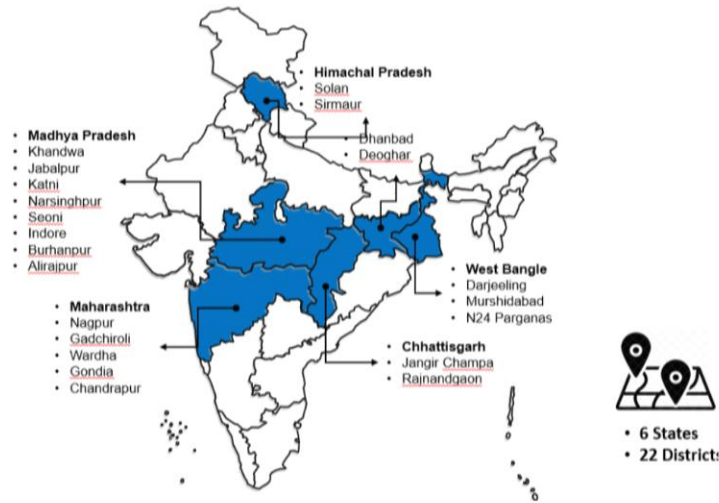
Geographic Coverage and Target Population

Although initially conceptualised for seven states and sixteen districts, the project was revised - as per states' request and after seeking necessary permission from the Central TB Division (CTD) and the donor - to six states and twenty-two districts (Source: Inception Report of the 3-D TB Care Model, Annexure 2) depicted in table 1 below:

S. Nb.	States and Union Territories	Number of Districts	Total Population (in Lakh)
1	Chhattisgarh	2	21.5 (2.15 million)
2	Himachal Pradesh	2	13.5 (1.35 million)
3	Jharkhand	2	49.7 (4.97 million)
4	Madhya Pradesh	8	124.1 (12.41 million)
5	Maharashtra	5	106.1 (10.61 million)
6	West Bengal	3	106.9 (10.69 million)
TOTAL		22	421.8 (42.18 million)

Table1: Geographical coverage

Geographical Coverage C19-RM



Nearly **42.18 million**
population covered

>259817

beneficiaries
reached

Stakeholders interviewed for the purpose of this documentation included:

- Project Management Unit (PMU) functionaries at The Union, New Delhi
- Outreach Workers (ORWs)
- Nodal Coordinators (NCs)
- Telecallers (TCs), and
- Beneficiaries, including PwTB and their families (from district Wardha, Maharashtra)

Purpose and Scope of the Documentation

The purpose of this documentation is to examine the implementation architecture of the C19RM 3-D TB Care Model and to assess its operational effectiveness, especially in the context of pandemic situations. It goes beyond a simple performance review. Instead, it analyses the full implementation cycle: organisational hierarchy, digital systems, monitoring structures, state-level coordination, stakeholder experience, and trajectory over time.

The documentation draws upon multiple official sources, including:

- The C19RM Proposed Document Framework
- The Monitoring & Evaluation Plan (January 2025)
- The Inception Report of the 3-D TB Care Model (April 2022–March 2025)
- Standard Operating Procedure (SoP) for digital Platform, and
- Stakeholder testimony

Institutional information about The Union's mandate and global TB response approach has also been drawn from its official website (<https://theunion.org/>), which highlights its century-long role in advancing TB control, operational research, and health system strengthening.

What Worked

The scale and outcomes of the C19 RM-supported 3-D TB Care Model underscore both its reach and operational effectiveness. Covering a population of nearly 26.1 million, the programme reached over 259,817 beneficiaries through a coordinated network of 236 private physicians, 43 private laboratories, and 265 Outreach Workers (ORWs).

Digital integration further strengthened this ecosystem, with 3,050 PwTBs and all 265 ORWs actively using the application to enable real-time tracking and service delivery. In practice, this translated into 142,364 sputum samples collected, 89,336 drug deliveries completed, and 26,083 teleconsultations conducted - ensuring continuity of care beyond facility-based models.

Diagnostic access was significantly expanded, with 44,190 chest X-rays, 688 ultrasonography services, 92 FNAC procedures, and 9,944 blood tests provided free of cost. Together, these figures demonstrate that the model not only achieved scale but delivered integrated, end-to-end TB care with measurable impact, reinforcing its effectiveness as a responsive and system-aligned intervention.

The model demonstrated that doorstep TB services were operationally feasible at scale when supported by structured governance.

The Monitoring & Evaluation architecture proved particularly strong. Multi-layer validation, including 10% field verification and telephonic cross-checking before payment processing, enhanced data credibility (Source: Monitoring & Evaluation Plan, January 2025).

Alignment with NTEP recording and reporting structures ensured that no parallel system was created and that programme outcomes fed into national databases through NIKSHAY.

Most importantly, once direct institutional leadership was established, particularly following the transition to Union-led implementation in November 2024. Service delivery performance improved significantly, especially in drug delivery and sputum collection (Source: Inception Report of the 3-D TB Care Model, April 2022-March 2025).

Opportunities for Streamlining Project Impact

The implementation journey surfaced important areas for adaptive refinement:

- The programme recalibrated from lockdown preparedness to complementary system strengthening as national conditions evolved (Source: Inception Report, The Union).
- Vendor-led implementation underscored the importance of deeper institutional convergence with district TB structures (Source: Ibid.).

- Digital platform stabilisation required iterative development, piloting, and field-informed modification (Source: Updated Indexed 3-D Care TOG_06.09.23_Final).
- Administrative approvals at state and district levels required time but ensured contextual alignment with government systems.

During the transition phase (December 2024–March 2025), tele-consultations were temporarily recorded offline while platform updates were underway, demonstrating that technology needed to remain adaptable to field realities (Source: Inception Report, The Union).

These were not structural weaknesses but phases of institutional learning within a complex public health ecosystem.

Conclusion: Does the Implementation System Work?

The implementation system functioned effectively when three conditions were consistently upheld:

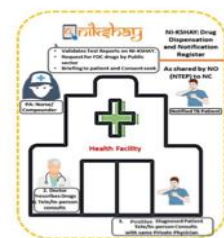
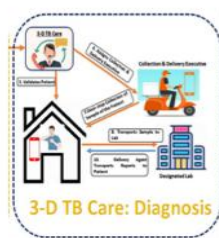
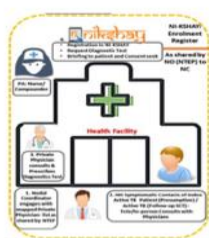
1. Strong institutional ownership and leadership
2. Real-time monitoring and verification discipline
3. Active convergence with NTEP structures

The experience reinforced a central lesson: technology alone did not drive impact. Clear roles, defined accountability, structured SOPs, and collaborative engagement with public health authorities determined outcomes.

The 3-D TB Care Model demonstrated that doorstep TB services, when embedded within government architecture and supported by disciplined oversight, could strengthen continuity of care during emergencies and supplement routine services thereafter.

Figure 1: Glimpse of doorstep delivery services

Snapshot of Doorstep delivery services



142364 sputum samples collected
89336 drug deliveries completed
26083 teleconsultations conducted
44190 free Chest X-rays done
688 free Ultrasonography services given
92 free FNAC procedures done
9944 free Blood tests examined

43 Private Labs engaged
265 Outreach Workers (ORWs) engaged
236 Private Physicians onboarded
3,050 patients used the digital app
265 ORWs used the digital app

The overarching lesson is encouraging: supported by strong leadership, constructive engagement with public systems, and a willingness to adapt in real time, the 3-D TB Care approach was able to translate vision into measurable results and sustained impact.

Equally, the process of documenting this experience reflected the same spirit of coordination and shared purpose that underpinned the programme's success. Leadership and support from the National Tuberculosis Elimination Programme (NTEP) at national, state, and district levels ensured that both implementation and documentation remained grounded in programmatic realities. The Union teams across these levels played a pivotal role in enabling field access, facilitating visits, and coordinating interactions that brought diverse perspectives into this narrative. Their efforts made it possible to engage meaningfully with Outreach Workers (ORWs), Treatment Coordinators (TCs), Nodal Coordinators (NCs), and other frontline functionaries, whose insights form the backbone of this document through added depth. At the same time, donor support and the commitment of project staff and field teams ensured that the process remained rigorous and comprehensive. The openness and time shared by all those interviewed transformed this documentation into a collective effort - mirroring the collaborative ecosystem that made the C19 RM project approach both effective in practice and credible in its representation.

1. INTRODUCTION & PROGRAMME CONTEXT

1.1 TB Care Delivery Challenges During COVID-19

The COVID-19 pandemic, caused by SARS-CoV-2, significantly disrupted global health systems. In India, attention and resources shifted rapidly toward controlling COVID-19 (Source: <https://www.sciencedirect.com/science/article/pii/S0019570721002262>). While necessary, this redirection impacted on-going public health priorities, including tuberculosis (Source: WHO Global TB Report 2021 – <https://www.who.int/publications/digital/global-tuberculosis-report-2021/featured-topics/covid-19-tb-india>).

Overlapping Symptoms and Delayed Care

Both COVID-19 and pulmonary TB caused cough, fever, and difficulty breathing. During 2020, many individuals with TB symptoms assumed they had COVID-19 and delayed visiting clinics for TB testing. Fear of quarantine and stigma discouraged early care-seeking, particularly among economically vulnerable populations.

Lockdowns Interrupted TB Services

To contain COVID-19, India imposed nationwide lockdowns in 2020. Routine TB services—including diagnosis, sputum testing, follow-up, and drug refills were disrupted because:

- Many TB clinics and OPDs were closed or repurposed for COVID care.
- Laboratories prioritised COVID-19 samples over sputum testing.
- Community health workers were unable to conduct field follow-up.
- Private-sector access was severely limited (Source: <https://indianexpress.com/article/india/coronavirus-covid-19-private-hospitals-6385631/>).
- Anti-TB drug supply chains experienced interruptions (Source: Migliori GB et al., Emerging Infectious Diseases, 2020;26:2709).
- Overburdened health staff deprioritized other health diseases, including TB

For PwTB already on treatment, these interruptions increased risks of relapse, treatment failure, and drug resistance.

Major Decline in TB Case Notification

WHO reported that global TB notifications declined from 7.1 million in 2019 to 5.8 million in 2020 - an

18% reduction, with India accounting for a substantial share of the decline (Source: WHO Global TB Report 2025 – <https://www.who.int/teams/global-programme-on-tuberculosis-and-lung-health/tb-reports/global-tuberculosis-report-2025>).

Separate analyses indicated that notifications in high-burden countries, including India, fell by approximately 25–30% in the first half of 2020 compared to 2019 (Source: Dey A et al., 2021, Preprint).

Indian studies reported a similar 26% fall in TB case notifications during the pandemic period (Source: Cureus Review Article, 2024 – https://assets.cureus.com/uploads/review_article/pdf/160984/20240724-319105-dor88r.pdf).

The reduction reflected detection gaps rather than reduced incidence. Undiagnosed individuals continued to transmit infection within communities.

Socioeconomic Impact: Stigma, Poverty and Fear

Daily wage earners and economically vulnerable populations were disproportionately affected. Isolation meant wage loss. Social stigma around coughing intensified. The combined effects of poverty, restricted mobility, and fear created conditions in which TB services became harder to access.

This context underscored the need not only for restoration but also for resilience planning.

People struggling financially were hit hardest. Stigma around coughing discouraged people from testing for either disease. Many who could not work also feared isolation would mean losing wages and livelihoods, further compounded by social ostracization.

The Second Wave and Continued Challenges

During India's second COVID-19 wave (2021 onwards), the government generally avoided nationwide lockdowns as strict as in 2020. This made it somewhat easier for PwTB to access health services. However, the health system continued to be strained by COVID-19 cases which also significantly disrupted TB detection, diagnosis, treatment, and follow-up care - slowing progress against a disease that was already a major health burden. Fewer diagnoses in 2020 likely meant

many people went untreated, and modelling suggests this could lead to increased TB cases and deaths in coming years.

1.2 Rationale for the C19 Response Mechanism

The 3-D TB Care Model under the C19RM grant was conceptualised during the height of the pandemic to ensure continuity of TB services during potential future waves and similar pandemic scenarios.

The initial design focused on:

- Tele-consultation (TC)
- Sputum Collection and Transportation (SCT)
- Drug Delivery (DD)
- Digital tracking through mobile applications
- Develop a pool of private doctors and health facilities to provide teleconsultation and testing services at a negotiated cost
- Engage the community by identifying outreach workers from the same geography to ensure continuity of services at doorstep

The goal was to demonstrate a decentralised, digitally tracked, doorstep TB service model aligned with NTEP guidelines.

However, by June 2022 - when implementation funding was received - India had largely moved beyond lockdowns and TB services had resumed at health facilities (Source: Inception Report of the 3-D TB Care Model, April 2022 - March 2025).

Rather than duplicate public-sector services, consultations with the Central TB Division led to a strategic shift:

- Focus on private notified PwTB
- Strengthen follow-up and continuity
- Serve hard-to-reach geographies with notified PwTB in public sector
- Increase roll of private practitioners in teleconsultations

Thus, the rationale evolved from emergency preparedness to system strengthening and service access expansion. While the 3-D TB Care Model was conceived during the COVID-19 emergency, its relevance extends beyond that immediate crisis. The disruption of routine TB services during lockdowns exposed structural vulnerabilities in facility-dependent care delivery. By proposing decentralised consultation, doorstep logistics, and digital monitoring, the intervention tested whether

service continuity could be maintained even under restricted mobility conditions. In doing so, it laid the groundwork for a more resilient service model capable of responding to future disruptions.

1.3 Objectives of the Documentation Assignment

This documentation assignment was designed to systematically capture, analyse, and present the institutional learning emerging from the implementation of the 3-D TB Care Model under the C19RM grant implemented by The Union.

The objective was not merely to report outputs, but to examine the implementation architecture, operational processes, performance trends, adaptive course corrections, and systemic convergence with the National TB Elimination Programme (NTEP).

The documentation therefore served three functions simultaneously:

- Institutional memory
- Operational reflection
- Policy-relevant learning

The specific objectives were as follows:

1.3.1 Document the Design and Evolution of the 3-D TB Care Model

The assignment sought to:

- Capture the original conceptualisation of the C19RM-supported 3-D TB Care Model, including its pandemic preparedness rationale (Source: C19RM Proposed Document Framework; Inception Report, April 2022-March 2025).
- Document subsequent adaptations, including revisions in geographic coverage, shift in PwTB focus, and transition from vendor-led implementation (Infinite Health Solutions Pvt. Ltd.) to direct implementation by The Union.
- Analyse alignment between approved grant design and on-ground execution across different implementation phases.

This objective was critical in establishing whether the programme evolved strategically or drifted operationally. The documentation found that adaptation occurred through structured consultation with CTD and state authorities rather than through unplanned deviation.

1.3.2 Assess Implementation Processes Across States and Districts

The documentation examined how the model was operationalised across six states and twenty-two districts (Source: Inception Report, Annexure 2).

It aimed to:

- Record the phased rollout across states and districts.
- Examine preparatory, implementation, transition, and consolidation phases.
- Capture human resource structures at district and state levels.
- Analyse coordination mechanisms between The Union, District TB Centres (DTCs), State TB Cells (STCs), and private stakeholders.
- Review how Standard Operating Procedures (SOPs), digital tools, dashboards, and monitoring systems were implemented in practice (Source: SOP for Digital Platform; Updated Indexed 3-D Care TOG_06.09.23_Final).

This objective ensured that the documentation moved beyond performance metrics to examine structural coherence.

1.3.3 Evaluate Service Delivery Outcomes and Performance Trends

Using available performance data, the documentation analysed trends across:

- Tele-consultation (TC)
- Sputum Collection and Transportation (SCT)
- Drug Delivery (DD)

It compared:

- Agency-led implementation performance
- Post-transition performance under direct Union implementation (post-November 2024) (Source: Monthly Performance Reports; Inception Report, April 2022 - March 2025)

The objective was to:

- Identify inflection points in service delivery
- Examine drivers of improvement
- Assess utilisation and stabilisation of the digital platform

This analysis helped determine whether performance variation was structural, contextual, or managerial.

1.3.4 Capture Stakeholder Perspectives

The assignment gathered qualitative insights from:

- PwTB and their contacts
- Tele-callers (TCs)
- Nodal Coordinators (NCs)

- Outreach Workers (ORWs)
- District TB Officers (DTOs)
- State TB Officers (STOs)
- Private Practitioners

These perspectives helped:

- Understand PwTB acceptability of doorstep services
- Assess operational feasibility from field staff
- Evaluate coordination between public and private sectors
- Review usability and reliability of digital systems
- Examine sustainability and scalability perceptions

Stakeholder experience added contextual nuance to quantitative findings and strengthened validation through triangulation.

1.3.5 To Identify Systemic Enablers and Opportunities for Strengthening

The documentation analysed operational and structural factors influencing implementation, including:

- Procurement timelines
- Digital development cycles
- Data upload constraints
- Private sector engagement variability
- Administrative approval processes
- HR transition from vendor-led to Union-led implementation

Rather than framing these as “challenges,” the analysis interpreted them as opportunities for institutional strengthening and adaptive governance. Corrective measures taken during transition phases were documented to assess institutional responsiveness.

1.3.6 To Generate Lessons for Future Preparedness and Scale

Finally, the documentation aimed to extract forward-looking insights by:

- Identifying operational elements that enhanced continuity of care
- Assessing relevance of the model in pandemic or emergency settings
- Evaluating integration potential within routine NTEP services
- Providing structured recommendations for sustainability beyond the grant period

The documentation therefore positioned the 3-D TB Care Model not only as a crisis intervention but as a potential supplementary service delivery layer within India’s TB control architecture.

1.4 Methodology

This documentation adopted a mixed-methods approach combining document review, quantitative performance analysis, qualitative stakeholder consultations, and field-based observation in district Wardha in the state of Maharashtra.

The intent was not merely to describe activities but to generate a structured institutional learning narrative grounded in triangulated evidence.

The methodology was designed to ensure:

- Traceability of findings
- Cross-verification of performance claims
- Balanced representation of stakeholder perspectives
- Alignment between documentary evidence and field realities

1.4.1 Desk Review

A comprehensive desk review was undertaken of all key programme documents, including:

- Consultant Agreement and Scope of Work
- C19RM Proposed Document Framework
- Inception Report and Annexures (April 2022 - March 2025)
- Standard Operating Procedures (SOPs) for the digital platform
- Monitoring & Evaluation Plan (January 2025)
- Updated Indexed 3-D Care TOG_06.09.23_Final
- Monthly and phase-wise performance reports
- HR structure documentation
- Communication records related to transition and state approvals

The desk review served several purposes:

- Mapping approved grant design against actual implementation
- Establishing a chronological timeline of major milestones (grant approval, vendor onboarding, digital rollout, transition to Union-led implementation)
- Identifying structured adaptations undertaken during implementation
- Reviewing formal reporting mechanisms to CTD and The Global Fund

This review ensured that the documentation remained anchored in approved programme architecture rather than retrospective interpretation.

1.4.2 Quantitative Data Analysis

Secondary analysis of programme data was undertaken using:

- Monthly service delivery data (Tele-consultation, Drug Delivery, Sputum Collection & Transportation)
- District-wise target versus achievement reports
- Pre- and post-transition performance comparisons
- Dashboard utilisation metrics
- Tele-consultation completion rates
- 10% field verification records

The analysis examined:

- Trends across implementation phases
- Inflection points in performance
- District-level variation
- Impact of HR restructuring and digital stabilisation

Particular attention was given to the period following November 2024, when direct implementation by The Union commenced (Source: Inception Report, April 2022 - March 2025).

Simple descriptive statistics and comparative trend analysis were used to interpret performance shifts. The purpose was clarity and transparency rather than statistical complexity.

1.4.3 Qualitative Stakeholder Interviews

Semi-structured interviews were conducted using structured questionnaires developed for each stakeholder category.

1.4.3.a Sampling Approach

A purposive sampling approach was adopted to ensure representation from:

- High-performing districts
- Districts requiring performance strengthening
- Different geographic contexts
- Both early-phase and later-phase implementation districts

This ensured balanced representation across states and operational contexts.

1.4.3.b Stakeholder Categories

Interviews were conducted with:

- PwTB receiving doorstep services
- Tele-callers managing follow-up
- District Nodal Coordinators
- Outreach Workers
- Private Practitioners

This multi-level perspective helped assess:

- Acceptability of doorstep services
- Digital platform usability
- Convergence with NTEP structures
- Perceived operational value addition
- Sustainability considerations

1.4.3.c Areas of Inquiry

Interviews explored:

- Clarity of roles and responsibilities
- Ease of digital platform use
- Coordination and escalation mechanisms
- Adherence support mechanisms
- Perceived operational refinements
- Institutional alignment with government systems
- Opportunities for long-term integration

All interviews were documented through detailed field notes. Where quotations were used, they were anonymised unless formal attribution had been authorised.

1.4.4 Field Visits and Direct Observation

Where feasible, field visits were conducted in selected districts to:

- Observe sputum collection and drug delivery processes
- Review digital dashboards in real time
- Interact with District TB Centres (DTCs)
- Validate service delivery claims through physical registers
- Understand ground-level coordination between ORWs and NTEP staff

Field observation strengthened triangulation and prevented over-reliance on dashboard-reported data.

1.4.5 Data Triangulation

Findings were triangulated across three sources:

- Documentary evidence
- Performance data
- Stakeholder narratives

For example:

- Low tele-consultation performance was cross-checked with district-level explanations.
- Improvement trends were correlated with HR restructuring and physician onboarding.
- Digital challenges were validated through both tele-caller and ORW interviews.

Triangulation reduced reporting bias and strengthened interpretive validity.

1.4.6 Ethical Considerations

The documentation adhered to the following ethical safeguards:

- Informed consent was obtained from all interviewees.
- PwTB confidentiality was strictly maintained.
- No personally identifiable information was published.
- Findings were presented objectively and without attribution unless formally authorised.

The documentation process functioned as an institutional learning exercise rather than an audit investigation. The intent was constructive reflection and system strengthening.

This documentation assignment is designed not merely as a reporting exercise, but as a structured institutional learning process. By integrating performance analytics, stakeholder experience, and systemic analysis, the study will generate actionable insights for strengthening doorstep TB service delivery, improving digital integration, and informing future emergency preparedness models under NTEP and Global Fund-supported programmes.

2. PROGRAMME DESIGN

2.1 Intended Design of the C19 Response Mechanism

When COVID-19 disrupted mobility and facility-based care across India, the continuity of tuberculosis services became uncertain. Millions of PwTBs were either unable or hesitant to visit health facilities for diagnosis, follow-up consultations, or drug refills. The C19RM intervention was therefore designed as an alternative service delivery layer that could preserve continuity of care under restrictive conditions.

The design did not aim to replace the National TB Elimination Programme (NTEP). Rather, it sought to complement it by decentralising specific functions while maintaining alignment with national protocols.

The model drew upon existing NTEP structures - standardised diagnosis, weight-based treatment regimens, laboratory networks, and NIKSHAY-based notification - while introducing three operational pillars supported by digital monitoring.

These pillars formed the basis of what became known as the 3-D TB Care Model:

- Doorstep Sputum Collection and Transportation (SCT)
- Doorstep Drug Delivery (DD)
- Tele-Consultation (TC)

The design of the model was not only a response to the immediate pandemic situation. It was also an effort to build a more resilient way of delivering services. By including verification processes, clear escalation steps, and digital task tracking from the beginning, the project ensured that continuity was not handled as an ad hoc emergency response. Instead, these were structured systems that could be used again in future crisis without needing to be redesigned from scratch.

The digital backbone for these services was the PwTB Support Portal (PSP), supported by mobile applications used by Outreach Workers (ORWs), Tele-callers (TCs), and physicians (Source: SOP for Digital Platform; Updated Indexed 3-D Care TOG_06.09.23_Final).

The intent was to embed a digitally tracked, crisis-resilient delivery mechanism within the broader NTEP architecture.

For example, under routine NTEP conditions, a PwTB suspected of TB would:

1. Visit a Designated Microscopy Centre (DMC)
2. Provide sputum samples
3. Return for results
4. Visit again for treatment initiation

Under the 3-D TB Care Model, the workflow was modified: insert flow diagram

- The ORW collected sputum samples at the PwTB's home.
- Samples were transported to accredited laboratories following NTEP protocols.
- Results were uploaded onto the digital platform.
- Doctors reviewed reports remotely and initiated tele-consultation.

The model thus shifted the locus of service delivery from facility to household, while maintaining diagnostic and treatment standards.

2.2 Organisational Hierarchy and Roles

To understand how the model functioned operationally, it was necessary to situate it within India's established TB control architecture.

2.2.1 National and Central Oversight

At the apex of TB control in India was the Central TB Division (CTD) under the Ministry of Health and Family Welfare (MoHFW). CTD was responsible for:

- National TB strategy
- Treatment protocols
- Laboratory standards
- Monitoring and reporting frameworks

The NTEP functioned through a four-tier structure:

1. Central
2. State
3. District
4. Sub-district (TB Unit)

Under the C19RM grant, The Union functioned as the Principal Recipient (PR). Through its Project Management Unit (PMU), The Union was responsible for:

- Strategic planning and target setting
- Oversight of digital systems
- Consolidation and validation of district-level data

- Reporting to CTD and The Global Fund
- Structured review and corrective action planning

A digital partner - Infinite Health Solutions Pvt. Ltd. - initially developed and maintained the PwTB Support Portal and associated applications before the transition to Union-led implementation (Source: Inception Report, April 2022-March 2025).

2.2.2 State Level – Coordination and Supervision

State TB Cells (STCs) provided the bridge between national strategy and district implementation.

At this level, responsibilities included:

- Administrative approvals
- Alignment with state NTEP priorities
- Training facilitation
- Review participation
- Problem-solving resolution

If dashboard data indicated low sputum collection in a district, state-level review meetings were convened to identify corrective measures.

The state layer ensured that the intervention remained embedded within government priorities rather than functioning independently.

2.2.3 District Level – Programme Engine

The district formed the core unit of implementation.

Within NTEP, the District TB Officer (DTO) oversaw:

- Case notification
- Treatment supervision
- Drug stock management
- Monitoring outcomes

Under the C19RM 3-D TB Care Model, additional structured roles were introduced to extend service reach.

1. Nodal Coordinator (NC)

The NC functioned as the district-level operational anchor.

Responsibilities included:

- Uploading Notification Register (NR) data into PSP
- Onboarding doctors and ORWs
- Monitoring dashboard indicators
- Assigning and tracking service tasks
- Conducting 10% field verification
- Submitting validated monthly reports
- Convening district review meetings

The NC interfaced directly with the District TB Centre (DTC). Importantly, the programme did not generate independent PwTB lists. It extended services based on government notification data through NIKSHAY.

Says Siddanth Tiwari, NC Indore (MP):

“Our starting point was always the DTC data. We did not create parallel records. We extended services based on government notifications.”

This alignment reduced duplication and strengthened institutional legitimacy.

As an example, if mass drug delivery in a particular block remained pending due to scheduling delays, the NC saw to this instantly on the “Pending Delivery” dashboard and could rearrange resources to ensure timely action.

2. Tele-Caller (TC)

The Tele-caller acted as the structured communication bridge between PwTB and programme.

Responsibilities included:

- Reconfirming demographic details
- Obtaining consent from PwTB for home visit
- Scheduling tele-consultations
- Coordinating sample collection
- Arranging drug delivery
- Conducting adherence follow-up
- Screening for Adverse Drug Reactions (ADRs)

Tele-calling replaced passive follow-up with proactive engagement.

3. Outreach Worker / Collection & Delivery Executive (CDE)

The ORW operationalised last-mile service delivery.

Responsibilities included:

- Doorstep sputum collection
- Triple-layer packaging as per NTEP infection control norms
- Transport to designated laboratories within 24–48 hours
- Doorstep drug delivery
- Refill verification
- Geo-tagged mobile updates

All activities were timestamped and synchronised to the PSP.

4. Private Physicians

Private physicians onboarded onto the digital system provided:

- Tele-consultations
- Clinical review of laboratory reports
- Treatment initiation or modification
- ADR management guidance
- Referral for physical consultation where necessary

Clinical authority remained aligned with NTEP treatment protocols.

2.3 Standard Operating Procedures (SOPs) and Workflows

The 3-D TB Care Model operated through structured SOPs designed to ensure clarity of process, role demarcation, and data integrity (Source: SOP for Digital Platform; Updated Indexed 3-D Care TOG_06.09.23_Final).

A. Screening and Diagnosis Workflow

Under NTEP guidelines, individuals presenting with cough of two weeks or more, fever, weight loss, or other TB symptoms were evaluated using sputum examination and rapid molecular tests.

C19RM operationalised this through the following structured pathway:

1. Tele-caller contacted the PwTB following NIKSHAY notification (Source: NIKSHAY platform description - CTD, MoHFW).
2. Address and consent were confirmed.
3. ORW collected sputum samples at home.
4. Samples were transported to accredited laboratories within 24–48 hours.
5. Sputum collection and transport kit was provided by the District TB Officer
6. Reports were scanned and uploaded to PSP.
7. If required, physical report delivery was ensured.

Quality checks, geo-tagging, and packaging standards ensured traceability.

B. Treatment Initiation and Adherence Workflow

Once diagnosis was confirmed:

- Doctor reviewed report digitally.
- Treatment was initiated as per NTEP weight-based FDC guidelines.
- Tele-consultation was scheduled within 7 days.
- Drug delivery task was generated.

Under NTEP, PwTBs typically collected monthly refills from facilities. Under C19RM, drugs were delivered to the PwTB's doorstep while maintaining NTEP stock protocols.

Adherence reminders were digitally triggered.

C. Tele-Consultation and ADR Monitoring

Tele-consultations were scheduled at structured intervals:

- Within 7 days of treatment initiation
- At two months
- On completion of treatment

During these consultations, ADRs such as nausea, rashes, and joint pain were screened. If severe, referral to physical facility was arranged. Interestingly, the PwTB application developed by The Union included an SOS feature that enabled PwTBs undergoing tuberculosis treatment to quickly reconnect with their physician in the event of an adverse reaction or medical concern. This functionality ensured timely clinical consultation and strengthened PwTB safety during the course of treatment.

This maintained pharmaco-vigilance standards within a remote model.

D. Data and Digital Workflow

The PSP provided role-specific dashboards showing:

- Uploaded PwTB data
- Services booked
- Services completed
- Pending tasks
- Overdue tasks

The system enabled:

- Real-time tracking
- Geo-tag verification
- Timestamp validation
- Centralised supervision

Integration with NTEP ensured reporting alignment with NIKSHAY.

2.4 Assumptions Underlying the Implementation Model

The design stage, several operational assumptions were made. Over time, these were tested in real-world conditions.

1. PwTB Would Prefer Doorstep Services

It was assumed that PwTB would find home-based services more acceptable during restricted mobility. Field experience confirmed high acceptability, particularly among elderly and mobility-constrained PwTB.

2. Human Resources Could Adapt to Digital Tools

The model assumed ORWs, NCs, and TCs would adapt to Android-based applications and dashboards. Initial training needs were higher than anticipated, but digital literacy improved progressively.

3. Connectivity and Laboratory Networks Would Function Reliably

The design assumed intermittent internet availability for data syncing and laboratory reporting within 48 hours. In some districts, laboratory turnaround times required strengthening, creating opportunities for tighter coordination with STLS and district labs.

4. Integration with NTEP Would Be Smooth

The programme assumed alignment with NIKSHAY, drug stock availability, and district reporting systems. In practice, convergence required structured negotiation and role clarity (as elaborated further in Chapter 3).

5. Monitoring Would Improve Outcomes

The model assumed real-time monitoring would reduce missed tasks. Dashboard-driven supervision and 10% field verification demonstrated that structured oversight improved compliance and performance discipline.

6. Reaching Tribal Communities and Hard-to-Reach Areas

The model assumes that tribal and remote areas can be effectively covered within the existing system, without creating a separate delivery structure.

This is based on a few key assumptions:

- Services can be taken closer to PwTB

The model assumes that doorstep or near-home services will reduce access barriers. In remote areas, this means outreach workers can handle sample collection, follow-ups, and drug delivery, so PwTB do not need to travel long distances.

- Existing frontline workers can manage the outreach

It assumes that current field staff (like outreach workers and community health workers) can adapt to local conditions and take on additional responsibilities. No separate workforce is planned specifically for tribal areas.

- Connectivity and logistics will function adequately

The model assumes that digital systems, lab networks, and supply chains will work reliably, even in difficult locations.

- Integration with the government system will ensure reach

By working within the existing NTEP structure, the model expects to reach remote populations through established district and sub-district systems.

- Monitoring systems will help track PwTB everywhere

It assumes that digital tracking and monitoring tools will work across all geographies, helping identify gaps and ensure follow-up.

Overall, the model does not design a separate approach for tribal or hard-to-reach areas. Instead, it assumes that stronger coordination, better outreach, and use of existing systems will be enough to ensure coverage in these regions. Comparison: Routine NTEP vs C19RM (3-D TB Care Model)

Programme Component	Routine NTEP	C19RM – 3-D TB Care Workflow
PwTB Identification	PwTB visits PHI/DMC; notification entered in NIKSHAY	Indexed PwTB list received from DTC/NIKSHAY; uploaded to PSP
Initial Contact	In-person counselling	Tele-caller outreach and consent
Sample Collection	Chest symptomatic/ PwTB visits DMC	ORW collects at home
Sample Transport	Internal lab routing	ORW transports within 24–48 hrs
Lab Reporting	Chest symptomatic/ PwTB returns for report	Uploaded digitally; physical delivery if needed
Consultation	In-person MO consultation	Tele-consultation; physical referral if needed
Drug Refill	Monthly facility visit/ ASHA delivers	Doorstep delivery
Adherence Monitoring	Treatment supporter supervision	Tele-follow-up + ORW refill verification
ADR Monitoring	Reported during clinic visit	Screened during tele-consult
Data Recording	Paper + NIKSHAY	Real-time PSP dashboard
Supervision	Periodic review meetings	Daily dashboard + structured review
Crisis Resilience	Vulnerable to mobility restrictions	Designed for restricted mobility

Under routine NTEP:

- The health facility functioned as the centre of gravity.
- Monitoring was periodic.

Under C19RM:

- The PwTB's home became the service delivery centre.
- Monitoring was real-time and task-based.
- Accountability was reinforced through geo-tagging and timestamps.

The model extended the NTEP foundation by adding a digitally tracked, doorstep-oriented layer.

3. FROM DESIGN TO DELIVERY: IMPLEMENTATION ARCHITECTURE

The implementation architecture of the 3-D TB Care Model under the C19RM grant was deliberately structured to ensure clarity of roles, defined information pathways, and institutionalised coordination between The Union, public TB systems, and private-sector actors.

As discussed in Chapter 2, the programme was not conceived as a parallel system. Rather, it functioned as a digitally enabled service delivery and monitoring layer embedded within the National TB Elimination Programme (NTEP) framework. Understanding this architecture required situating The Union's operational structure within the government TB control hierarchy and examining how these layers interacted in practice.

Three core elements defined the architecture:

1. Roles and responsibilities across levels
2. Information flow and escalation pathways
3. Coordination mechanisms between The Union, public actors, and private stakeholders

The experience of Darjeeling district - presented during the Biannual Review Meeting (25-26 November 2025) - provided a practical illustration of how this architecture functioned operationally (Source: DJL_Biannual RM Delhi 25th Nov. 2025, Deepak Kumar, NC Darjeeling).

3.1 Roles and Responsibilities of Each Stakeholder Across Levels

A. Principal Recipient (PR) Level - Project Management Unit (PMU), The Union

At the national level, The Union, as Principal Recipient, operated through a dedicated Project Management Unit (PMU).

The PMU was responsible for:

- Strategic planning and target setting
- Development of monitoring indicators
- Oversight of digital systems (PSP and mobile applications)
- Consolidation and validation of district-level data
- Reporting to CTD, ICCM, and The Global Fund
- Periodic review and corrective planning

As described in Chapter 2, real-time dashboards enabled structured supervisory oversight. Performance deviations were identified through quarterly trend analysis and addressed through targeted action plans.

Similarly, Supervisory visits continued to play an important role, but their function became more targeted and evidence-based. Instead of routine or uniform visits, real-time dashboards and quarterly data analysis were used to identify gaps or underperformance.

Based on this:

- Supervisory visits were prioritised for specific locations or issues
- Field visits focused on problem-solving rather than general review
- Supervisors used data to validate performance and support corrective actions

In essence, supervisory visits shifted from routine monitoring to data-driven, need-based interventions. This central oversight ensured that decentralised service delivery remained accountable.

B. State Level – Coordination and Convergence

At the state level, coordination occurred through the State TB Cell (STC) and State Tuberculosis Officer (STO).

State-level responsibilities included:

- Alignment of district action plans with state NTEP priorities
- Facilitation of administrative approvals
- Resolution of escalations requiring state intervention
- Participation in review meetings

The state layer functioned as a convergence mechanism. It ensured that the 3-D TB Care Model remained institutionally aligned with government systems rather than operating independently.

CASE STUDY

From Hesitation to Integration: Structured Engagement with NTEP

The integration of the 3-D TB Care Model into district-level NTEP structures was arrived at after mutual discussions between The Union and the NTEP leadership. In districts such as Seoni and Narsinghpur (Madhya Pradesh), the introduction of the C19RM intervention prompted legitimate questions from district TB authorities like why was an additional service layer required, would this create duplication, would ASHAs be sidelined, etc.

Phase 1: Initial Hesitation

At the outset, the project proposal suggested working with both public and private TB PwTBs.

District officials clarified that:

- Private PwTBs were already supported under existing PPM (Public-Private Mix) structures.
- Government-notified PwTBs required continuity reinforcement.

This prompted a definitional clarification:

- A *private PwTB* was registered in NIKSHAY under a private practitioner's ID.
- A *government PwTB* was registered through a public facility.

District authorities recommended that the project focus exclusively on government-notified PwTBs.

Phase 2: Clarifying Value Addition

After agreeing to focus on government-notified PwTBs, the district asked a critical question:

What additional value would this intervention provide? The project clarified: it would not create parallel service delivery, it would not issue drugs independently, it would not alter treatment protocols, etc.

Instead, it would strengthen continuity where operational gaps existed, like PwTBs who received drugs but became non-responsive, strengthening follow-up after notification, etc.

As discussed in Chapter 2 (Assumption 4: Integration with NTEP), the model was based on structured convergence rather than substitution.

Phase 3: Protecting Government Roles

Another concern raised by district officials was the protection of ASHA roles. The district NTEP leadership sought assurance that ORWs would not replace ASHAs. The project clarified that ORWs would operate in coordination with STS and TU, would not interfere with ASHA incentive structures, etc.

This assurance was critical in reducing perceived turf overlap (incidentally, this theme of role clarity and protection re-emerges later in Chapter 7 (Stakeholder Experience).

Phase 4: Data Integrity Assurance

A NTEP concern was data duplication. NTEP officials asked if PSP create separate PwTB records, or how would it work with the existing system based on NIKSHAY. The project response was structural: all data would originate from ER/NR registers in NIKSHAY, upload format would strictly mirror government records (Source: Updated Indexed 3-D Care TOG_06.09.23_Final), or no PwTB would be enrolled independently of NTEP notification. As described in Chapter 3 (Information Flow – Step 1), PSP activation occurred only after verified DTC upload.

This principle became foundational to institutional acceptance.

Phase 5: Operational Demonstration

Once initial PwTBs were onboarded district NTEP officials observed no duplication in reporting, improved adherence follow-up, etc. which reinforced the practical value of the intervention.

Phase 6: Institutional Ownership

Over time, the tone shifted from oversight to collaboration. In Seoni and Narsinghpur, NCs reported that DTOs began viewing the digital dashboard during reviews.

This case demonstrated several institutional principles:

1. Integration was secured by aligning with NTEP structures before expanding services.
2. Restricting work to government-notified PwTBs reduced duplication and systemic sensitivity.
3. Strict upload alignment with NIKSHAY prevented perception of parallel systems.

This liasoning & convergence was as important as service delivery itself.

C. District Level: The Operational Core

The district formed the primary operational unit.

Each district typically included:

- One Nodal Coordinator (NC)
- One Tele-caller (TC)
- One or more Outreach Workers (ORWs)
- Engaged private practitioners/physicians
- Engaged diagnostic facilities

For example, in Darjeeling district (WB), implementation was carried out by:

- 1 NC
- 1 TC
- 1 ORW
- 2 active private physicians
- 3 active private diagnostic facilities

This lean structure demonstrated that operational clarity often outweighed numerical scale.

The district structure worked in tandem with NTEP leadership, strengthening - rather than replacing -existing systems. The project supplemented this system by appointing its own set of functionaries who worked in tandem with and under the supervision & guidelines of the NTEP district level leadership to enhance service delivery and outcomes.

This included the following:

- Nodal Coordinator (NC)

The NC functioned as the district-level lead, responsible for data integration, coordination, and monitoring.

The NC was responsible for:

- Uploading Notification Register data into PSP
- Onboarding doctors and ORWs
- Monitoring dashboard indicators
- Assigning service tasks
- Conducting at least 10% field verification

- Submitting validated monthly reports
- Convening review meetings

As Rakesh Paliwal (NC, Gadchiroli, Maharashtra) observed: “The district was the key management unit for primary healthcare services. The Chief District Health Officer (CDHO) or Chief District Medical Officer (CDMO) oversaw public health activities, including TB control.”

Within this framework, the District TB Centre (DTC) served as the nodal TB unit. The Union’s district structure operated in coordination - not substitution - with the DTC.

Crucially, as noted in Chapter 2 (Data Workflow), the PSP activated only after verified DTC data was uploaded.

Jai Pratap Prasad (NC, Seoni & Narsinghpur) explained: “Our starting point was always the DTC data. We did not generate parallel records.”

This design decision was central to institutional legitimacy.

- Tele-caller (TC)

The Tele-caller managed PwTB communication and continuity.

Responsibilities included:

- Reconfirming PwTB details
- Obtaining consent from PwTB for home visit
- Scheduling tele-consultations
- Coordinating sample collection
- Monitoring adherence
- Screening ADRs

In Darjeeling district, for example, tele-consultation performance improved significantly after onboarding an additional physician in October 2025, resulting in more than 200 tele-consultations in a single month (Source: DJL_Biannual RM Delhi, 25–26 Nov. 2025).

This improvement illustrated how human resource strengthening influenced performance - an example revisited in Chapter 6 (Monitoring and Accountability).

- Outreach Worker (ORW)

The ORW operationalized doorstep services.

TB treatment - particularly for DR-TB - required strict adherence. ORWs did more than deliver medicines. They:

- Explained regimen logic
- Prepared PwTBs for possible side effects
- Reinforced importance of completing treatment
- Coordinated with Senior Treatment Supervisors (STS) and Senior TB Laboratory Supervisors (STLS) at TU level
- Were responsible for sputum collection and transport
- Were responsible for medicine delivery
- Ensured adherence counselling

As described in Chapter 2 (Treatment Workflow), adherence monitoring was digitally reinforced, but it was the ORW's engagement that humanised the process.

TB Champions further strengthened counselling by sharing lived experiences.

Thus, the ORW role extended beyond logistics to behavioural reinforcement.

D. Sub-District Level (TB Unit – TU)

The TB Unit (TU) served as the sub-district operational layer under NTEP.

It included:

- Medical Officer - TB Control (MO-TC)
- Senior TB Treatment Supervisor (STS)
- Senior TB Laboratory Supervisor (STLS)

Coordination between The Union and TU occurred through:

- Sample transport alignment
- Treatment initiation confirmation
- Follow-up scheduling
- Community-level screening

This ensured that doorstep services remained clinically anchored within NTEP systems.

Together, this combination of medical guidance and peer support helped PwTB manage both the physical and psychological challenges of treatment. The approach moved beyond drug delivery to building confidence, resilience, and informed self-care among PwTB.

The Darjeeling field experience demonstrates how ORWs adapted service delivery in high-burden settings such as institutional care facilities, reducing the need for PwTB travel.¹

3.2 Information Flow, Escalation Pathways and Service Sequencing

As described in Chapter 2 (Data and Digital Workflow), digital integration was central to monitoring discipline. As such, the implementation architecture was supported by a structured information flow anchored in the digital platform (PSP). This flow was directly linked to the service pathway, guiding PwTBs from notification to treatment outcome.

○ Information Flow

Stage	Actor	Key Action	Output
Step 1	System (NIKSHAY + DTC)	PwTB data generated and recorded	Source data available
Step 2	Nodal Coordinator (NC)	Collects and verifies DTC records	Verified dataset
Step 3	NC / PSP	Uploads data into PSP	Data live on dashboard
Step 4	Tele-caller	Confirms details, obtains consent, schedules services	PwTB engagement initiated
Step 5	ORW	Conducts sputum collection, transport, drug delivery	Services delivered
Step 6	ORW / System	Updates mobile application	Real-time tracking
Step 7	Dashboard	Displays status	Booked / Completed / Pending

Information Flow and Service Activation

- PwTB data originated from NIKSHAY and DTC registers
- NC verified and uploaded records into PSP
- Data became visible on dashboards
- Tele-caller initiated engagement and consent
- ORW delivered services (diagnostics, medicines)
- Mobile applications captured real-time updates

¹ DJL_Biannual RM Delhi 25th Nov. 2025, Deepak Kumar, NC Darjeeling.

- Dashboards reflected status (booked/completed/pending)

As observed by NCs, this system provided visibility across the entire service cycle, significantly shortening feedback loops.

Neha (NC, Alirajpur, MP) observed:

“The dashboard showed us the entire service cycle - from upload to delivery.”

This real-time visibility shortened feedback loops.

○ Escalation Pathways

Clear escalation mechanisms ensured responsiveness:

These pathways reduced ambiguity and strengthened accountability.

- Operational Escalation
 - Issues such as laboratory delays were first addressed at district level.
 - If unresolved, they were escalated to State TB Cell.
- Administrative Escalation
 - Payment concerns for private providers were escalated to PMU and, where required, coordinated with state authorities.

Rajkumar (NC, Janjgir Champa, Chattisgarh) stated: “Clear escalation channels reduced uncertainty.”

- Performance Escalation
 - Quarterly underperformance triggered review discussions.
 - In Darjeeling, onboarding an additional physician strengthened tele-consultation rates (Source: DJL_Biannual RM Delhi, 2025).
 - This illustrates the monitoring discipline described earlier in Chapter 2 (Assumption 5: Monitoring Improves Outcomes).

3.3 Coordination Mechanism(S): The Union, Public and Private Actors

Implementation relied on structured coordination across three domains:

1. Programmatic alignment
2. Operational collaboration

3. Community engagement

Alignment with Public TB Systems

Coordination mechanisms included:

- Data alignment through NIKSHAY
- Joint review meetings with DTO/DPC and PPM coordinators
- Private physician onboarding in consultation with district structures
- 10% field verification before payment processing

This institutionalised accountability.

Illustrative Case: Access Through Coordinated Outreach

A case from Darjeeling illustrates how the structured pathway improves access and continuity. At Jesus Ashram, residents previously had to travel to a medical college for sputum testing. Travel was physically demanding and logistically difficult. Under the 3-D TB Care model, the ORW team began collecting sputum samples directly from the Ashram's quarantine area and transporting them for CBNAAT, first-line and second-line testing, and culture investigations. This adjustment did not alter clinical protocols; it removed logistical barriers. Early identification of TB-positive cases improved, and PwTBs were initiated on treatment without requiring long-distance travel.

As described during the district review:

"By shifting collection to the institution, we reduced PwTB burden and ensured timely diagnosis."
- District Implementation Team, Darjeeling

This case demonstrates that structured coordination within defined protocols can significantly improve service accessibility without altering programme guidelines.

Illustrative Case: Protecting the Role of ASHAs*

District officials expressed concern that doorstep delivery by project staff might weaken ASHA involvement. Since ASHAs are responsible for ensuring treatment adherence, any bypassing of their role could undermine accountability.

The project addressed this directly. Instead of replacing ASHAs, ORWs would coordinate with them:

- Medicines would be delivered in the presence of the ASHA.
- The ASHA would remain central in counselling and adherence monitoring.
- The ORW's role would be logistical and supportive.

This approach preserved the integrity of the government workforce while strengthening service delivery. It reassured DTOs that the project was complementary, not competitive.

**Based on interviews with Jai Pratap, NC, Seoni & Narsinghpur (MP); Shivank Asati, NC, Katni (MP); and Raj Kumar, NC, Chattisgarh.*

In Darjeeling, door-to-door screening was conducted in collaboration with STS where ASHA coverage was limited (Source: DJL_Biannual RM Delhi, 2025). This reflected adaptive field-level coordination rather than duplication.

Similarly, the onboarding of Dr. Utpal Kumar Ghosh in Darjeeling district in October 2025 contributed significantly to tele-consultation expansion (largely due to his constant, increased availability because of a smaller practice and commitment to attending to significantly larger number of tele-consultations), demonstrating how structured engagement directly influences service volume. In another example from Darjeeling, coordination with the PPM Coordinator and District TB Officer supported laboratory reporting consolidation and strengthened case tracking.

The implementation architecture of the 3-D TB Care Model was built on structured integration with the government TB control framework.

- The STO and STC provided state-level programme oversight.
- The DTO and DTC anchored district-level TB management.
- The TU and PHI ensured operational delivery of diagnosis and treatment.
- The Union's NC, Tele-caller, and ORW extended service reach and ensured digital tracking.
- The PSP provided real-time visibility across levels.

This coordinated architecture ensured that doorstep services are delivered within the boundaries of national policy, while improving timeliness, supervision, and accountability.

This integration process also had implications for future emergency preparedness. A crisis-response mechanism that operates outside government systems cannot be sustained during prolonged disruptions. By aligning with NTEP structures, the intervention ensured that any future activation of similar continuity mechanisms would operate within established authority, rather than alongside it. This institutional embedding strengthened long-term system resilience.

As Rajkumar, NC Janjgir Champa (Chhattisgarh) summarised: "When government data and PSP tracking move together, service delivery becomes structured and measurable."

3.4 End-to-End Service Delivery Pathway

The 3-D TB Care Model under the C19RM grant was designed as a structured, sequential service pathway. It began with PwTB identification within the government system and concluded with treatment completion and outcome documentation.

As outlined in Chapter 2 (Programme Design), the model did not function as an episodic intervention. It operated as a monitored continuum aligned with NTEP guidelines for diagnosis, treatment initiation, follow-up, and reporting. As elaborated earlier, the strength of this pathway depended on defined roles, digital traceability, and institutional convergence.

Reconstructing the PwTB pathway from notification to outcome demonstrated that continuity could be preserved even if facility access became intermittent. The structured sequencing of tele-consultation, doorstep delivery, and follow-up verification created a decentralised care loop that did not depend solely on physical facility visits. This pathway design offers a replicable template for maintaining TB care during future mobility restrictions or public health emergencies.

This section reconstructs the PwTB journey from notification to outcome.

3.4.1 PwTB onboarding and engagement

The service pathway began within the NTEP system.

PwTB data originated from:

- Enrolment Registers (ER) & Notification Registers (NR) in the government NIKSHAY portal (Source: NIKSHAY platform – CTD, MoHFW; Inception Report, April 2022–March 2025).

As described earlier (Information Flow - Step 1), the Nodal Coordinator collected verified records from the District TB Centre (DTC) based on the Enrolment & Notification Registers.

Data Upload and Indexing

The Standard Operating Procedure prescribed a structured upload format with strict column alignment to ensure that uploaded data mirrored government records (Source: Updated Indexed 3-D Care TOG_06.09.23_Final).

The upload process ensured:

- No duplication
- No parallel PwTB lists
- Alignment with official notification

Once uploaded, the PwTB record became active in the PwTB Support Portal (PSP).

Indexing followed upload. PwTBs were mapped to:

- District
- Linked laboratory
- Assigned physician
- ORW service area

This indexing created a traceable service chain.

The PSP became operational only after verified DTC data was uploaded, reinforcing institutional convergence.

Telephonic Engagement and Consent

PwTB onboarding formally began when the Tele-caller contacted the PwTB.

The call followed a structured script and included:

- Reconfirmation of demographic details
- Explanation of the 3-D TB Care Model
- Clarification that services were aligned with NTEP
- Explicit consent for:
 - Tele-consultation
 - Sputum collection
 - Drug delivery
 - Report sharing

This structured approach ensured uniformity across districts.

Onboarding therefore functioned at two levels:

- Administrative (eligibility and data integrity)
- Relational (trust and acceptability)

3.4.2 Tele-calling and follow-up mechanisms

Tele-calling was embedded throughout the treatment cycle. It was not limited to appointment scheduling.

The Treatment Operational Guidelines (TOG) allowed flexible consultation pathways:

- Tele-only consultation
- Tele shifting to physical consultation

- Physical shifting to tele consultation
- Physical-only consultation where clinically required

(Source: Updated Indexed 3-D Care TOG_06.09.23_Final)

This flexibility ensured that clinical standards were maintained while leveraging digital convenience.

Structured Call Sequence

The SOP prescribed defined telephonic checkpoints:

- Pre-sample collection confirmation
- Post-sample collection follow-up
- Report availability notification
- Pre-drug delivery call
- Post-drug delivery adherence check
- ADR screening calls
- Scheduled milestone tele-consultations

Routine tele-consultations were recommended:

- Within 7 days of treatment initiation
- At two months
- Prior to outcome assignment

(Source: Updated Indexed 3-D Care TOG_06.09.23_Final)

These checkpoints mirrored NTEP's clinical monitoring structure while reducing facility dependency.

As discussed in Chapter 2 (Assumption: Monitoring Improves Outcomes), this proactive follow-up reduced passive attrition.

Jai Pratap (NC, Seoni & Narsinghpur, MP) noted:

"We were not waiting for PwTBs to report problems. We were proactively checking. Tele-calling thus became the connective tissue linking diagnosis, adherence, and outcome. The structured call sequence reduced gaps. We were not waiting for PwTBs to report problems; we are proactively checking."

Tele-calling thus functioned as the connective thread that linked diagnosis, treatment initiation, adherence, and outcome.

3.4.3 ORWs and Sample collection and diagnostics

Following consent and tele-screening, ORWs scheduled doorstep sputum collection.

As outlined in Chapter 2 (Screening and Diagnosis Workflow), the process included:

- Collection of spot and early-morning samples
- Triple-layer packaging as per infection control standards
- Transport to designated laboratories within 24 - 48 hours

All collections were geo-tagged and time-stamped through the mobile application.

Laboratory Processing and Reporting

Laboratories conducted:

- Smear microscopy
- CBNAAT
- First-line and second-line DST as required

Reports were:

- Uploaded to PSP
- Physically delivered to PwTBs where digital access was limited

In certain districts, turnaround time for advanced diagnostics required strengthening. This became an opportunity for tighter coordination between ORWs, STLS, and district laboratories - an area further analysed in Chapter 6 (Monitoring and Feedback Loops).² The M&E framework integrates laboratory tracking and validation to ensure accountability.³

3.4.4 Drug accessibility and delivery

Upon availability of reports:

- Tele-consultation was scheduled
- Physician reviewed diagnostic findings
- Treatment regimen was initiated as per NTEP guidelines

² Ibid.

³ The Union_C19RM M&E plan _Jan'25

Doctors monitored:

- Drug-resistant regimens where applicable
- Adverse Drug Reactions/change in treatment regimens, etc.

Tele-consultation did not eliminate physical referral. Where severe ADRs or clinical complications were identified, PwTBs were referred to facilities. Thus, clinical authority remained grounded in NTEP standards while utilising digital convenience. Drugs prescribed outside government protocols were not covered under the model, ensuring consistency with NTEP policy.⁴

Shivank Asati (NC, Katni, MP) observed:

“Delivery is also a verification point. We confirm adherence at each refill, not just distribution.”

Medicine access under this model therefore integrates logistics with monitoring.

3.4.5 Follow-up, adherence, and closure

After prescription:

- Drug delivery task was generated in PSP
- ORW coordinated collection from district store
- Drugs were delivered at PwTB's home
- Refill verification was documented via mobile app

Unlike routine facility-based monthly refill collection, doorstep delivery reduced:

- Travel burden
- Wage loss
- Missed refills

However, adherence reinforcement extended beyond delivery.

ORWs:

- Explained regimen importance
- Prepared PwTBs for possible side effects
- Reinforced completion necessity

⁴ Ibid.

This integration of logistical delivery and behavioural reinforcement strengthened treatment continuity.

3.4.6 Follow-Up, Outcome Monitoring, and Closure

Follow-up sputum examinations were scheduled at:

- 2 months
- End of treatment

Tele-caller coordinated scheduling. ORW collected follow-up samples where required.

Treatment outcomes were documented in alignment with NTEP categories:

- Cured
- Treatment completed
- Failure
- Lost to follow-up

Data synchronisation ensured that PSP status aligned with NIKSHAY reporting.

As described earlier (Data Flow), this closed the digital service loop.

The end-to-end service delivery process under the 3-D TB Care Model is sequential, structured, and digitally monitored. It begins with government-notified PwTB data, proceeds through consented engagement, tele-consultation, doorstep diagnostics, medicine delivery, and adherence monitoring, and concludes with validated outcome assignment.

Each stage was recorded, time-stamped, and visible within the PSP system as well as on the phone apps of the NC, PwTB and the ORW.⁵

The model did not alter clinical standards; it strengthened operational execution and monitoring.

The project's learnings from states like West Bengal & Madhya Pradesh, for example, demonstrated that when logistical barriers are addressed within a structured framework, PwTB access improved without compromising programme integrity.⁶

⁵ Updated Indexed_3-D Care TOG_06 .09. 23_ Final

⁶ DJL_Biannual RM Delhi 25th Nov. 2025, Deepak Kumar, NC Darjeeling.

4. USE OF TECHNOLOGY AND DIGITAL PLATFORMS

Case Study

Building and Running the PwTB Support Portal (PSP)

The PSP was designed to operationalise the three pillars of the 3-D TB Care Model:

- Tele-consultation
- Sputum Collection & Transportation
- Drug Delivery

(Source: SOP for Digital Platform; Updated Indexed 3-D Care TOG_06.09.23_Final)

The objective was to create a single, role-based dashboard that would:

- Track PwTB status
- Allocate tasks
- Monitor completion
- Trigger alerts for pending services
- Enable supervisory oversight

Unlike NIKSHAY - which functioned primarily as a notification and surveillance platform - the PSP functioned as a task management and workflow system layered onto government data. This distinction was central to institutional acceptance (see Chapter 3: Data Integrity Assurance).

The 3-D TB Care Model relied on technology not as a standalone innovation, but as an enabling layer supporting structured service delivery.

As described in Chapter 2 (Programme Design), the digital backbone was the PwTB Support Portal (PSP), supported by mobile applications for:

- Nodal Coordinators (NCs)
- Tele-callers (TCs)
- Outreach Workers (ORWs)
- Physicians

Technology did not replace clinical or field processes. It made them traceable, accountable, and monitor-able in real time.

The digital system became particularly important in reinforcing integration with NTEP, as discussed in Chapter 3 (Information Flow and Data Integrity).

4.1 Intended Role of Technology In SOP Enforcement

The digital architecture of the 3-D TB Care model consisted of:

- A web-based PwTB Support Portal (PSP);

- Three mobile applications - for PwTBs, physicians, and Collection & Delivery Executives (CDEs/ORWs);
- Integrated tele-consultation functionality;
- A dashboard-enabled monitoring system

The stated objective of the digital system was to enable doorstep delivery of tele-consultation, sample collection, drug delivery, refill, tele-counselling, and ADR monitoring through a structured and trackable pathway

The SOP clearly assigned defined digital responsibilities to each cadre - Nodal Coordinator (NC), Tele-caller (TC), Outreach Worker (ORW/CDE), and Doctor.

Every service action - whether uploading a notification register, booking a tele-consultation, collecting a sputum sample, or delivering drugs - must be recorded within the portal or the relevant mobile app.

The portal enforced procedural discipline in several ways:⁷

- Data cannot go live until verified and activated by the NC.
- Doctors and ORWs must be assigned state and district before they become visible for task allocation
- Tele-consultations move through structured states: pending, confirmed, completed, or cancelled.
- Drug delivery status must be updated before refill tracking is enabled

The system was therefore not merely recording events; it structures them.

Siddhant Tiwari (NC, Indore, MP) described this role succinctly:

“The portal ensures that no activity remains informal. If it is not updated in the system, it is considered incomplete.”

Automated alerts, algorithm-based follow-ups, and task assignments reduced dependency on memory or manual registers. In this sense, technology acted as an internal compliance mechanism for SOP adherence.

The platform was developed to address three operational needs:

⁷ SOP for digital platform

1. Real-time visibility of service delivery
2. Traceability of field-level activities
3. Structured coordination between digital and physical tasks

During pandemic conditions, mobility restrictions limited in-person supervision. The PSP was therefore designed to:

- Allow daily monitoring without physical review meetings
- Reduce dependency on paper-based reporting
- Shorten feedback loops

As described in Chapter 4 (End-to-End Service Delivery), the entire PwTB pathway - from onboarding to outcome - was digitised through PSP tracking.

4.2 Technical Architecture

The PSP functioned as a web-based dashboard with mobile application integration.

Each user role had:

- Defined login credentials
- Role-specific visibility
- Task-specific permissions

The system architecture included:

- Central database server
- Role-based access control
- Geo-tagging capability
- Timestamp recording
- Automated task generation
- Dashboard analytics

Mobile applications enabled ORWs and TCs to update service status in the field.

The architecture was designed to support:

- Daily district-level supervision
- Quarterly performance review at PMU level
- Validation prior to payment processing

As noted in Chapter 3 (Escalation Pathways), digital logs supported administrative and operational escalation.

4.3 How the System Worked: Step-by-Step

The system followed a structured workflow aligned with the PwTB journey described in Chapter 3.

Step 1: Data Upload

The Nodal Coordinator uploaded verified Notification Register (NR) data into the PSP (Source: Updated Indexed 3-D Care TOG_06.09.23_Final).

Strict file format alignment ensured consistency with DTC records.

The system became active only after upload validation - reinforcing the data discipline described in Chapter 3.

Step 2: Tele-Calling and Appointment Scheduling

The Tele-caller accessed PwTB details via dashboard.

The system allowed:

- Call logging
- Consent documentation
- Appointment scheduling
- Tele-consult booking

Pending calls appeared in “Action Required” sections.

This prevented passive attrition, reinforcing the proactive follow-up described in Chapter 4.

Step 3: Tele-Consultation and Prescription

Doctors accessed PwTB records via a secure interface.

They:

- Reviewed uploaded laboratory reports
- Entered prescription details
- Recorded consultation notes
- Flagged ADR concerns

If a physical referral was required, it was recorded in the system.

Tele-consultation data fed into monthly performance review (see Chapter 5: Performance Monitoring).

Step 4: Sample Collection Workflow

When sputum collection was scheduled:

- Task appeared in ORW dashboard
- Geo-tagging was activated
- Timestamp was recorded upon completion

Laboratory receipt and reporting were updated through PSP.

This ensured traceability from household to lab.

Step 5: Drug Delivery

Drug delivery tasks were digitally generated after prescription.

ORWs updated:

- Delivery confirmation
- Refill status
- Adherence observation

This reinforced the adherence cycle described in Chapter 4.

Step 6: Special Cases – Family Screening

The system allowed task creation for household contact screening.

This enabled structured follow-up beyond index PwTB.

This functionality later informed discussions in Chapter 8 (Implementation Trajectory and Expansion Opportunities).

4.4. Quality Monitoring and Cross-District Support

The PSP dashboard allowed PMU to view:

- District-level target vs achievement
- Pending task volume
- Tele-consultation gaps
- Delivery delays

Districts demonstrating underperformance were flagged for review. As described in Chapter 3 (Performance Escalation), onboarding additional physicians in Darjeeling was triggered by dashboard review.

Thus, technology informed managerial decisions.

4.5 PwTB App and Digital Inclusion

A PwTB-facing mobile application was introduced to allow:

- Report viewing
- Appointment reminders
- Direct communication

However, digital inclusion varied across districts.

In areas with limited smartphone penetration, physical communication remained essential.

This experience reinforced an important lesson:

Technology supported service delivery, but did not substitute human engagement.

This theme is further elaborated in Chapter 7 (Stakeholder Experience).

4.6 Early Challenges and Adaptation

Challenge 1: Technology Resistance

The digital system required iterative refinement.

Four main strengthening areas emerged during early phases:

Figure 2: Field visit



Geotagged picture of Siddhanth Tiwari, NC, Indore, visiting a handicapped PwTB after drug ..

Opportunity 1: Technology Familiarisation

- Initial resistance among field staff reflected limited exposure to dashboard-based reporting.
- Structured training sessions and on-the-job support improved confidence.
- Over time, digital literacy strengthened significantly.

Opportunity 2: Connectivity Constraints

- In rural districts, intermittent internet connectivity affected real-time synchronisation.
- Offline data entry with delayed sync functionality was reinforced.
- This flexibility preserved service continuity.

Opportunity 3: Device Compatibility

- Variation in Android versions required app optimisation.
- Updates were rolled out progressively.

Opportunity 4: Data Format Variation

- Notification Register formatting differed across districts.
- Standardisation templates were introduced to reduce upload errors.
- This strengthened data hygiene.

4.7 Lessons from Digital Implementation

1. Technology functioned best when embedded in clear SOPs (see Chapter 2).
2. Data integrity determined institutional credibility (see Chapter 3).
3. Human reinforcement remained central to adherence (see Chapter 3).
4. Dashboards improved managerial oversight (see Chapter 5).

Technology amplified governance discipline; it did not replace it.

4.8 Significance of Digital Layer

The PSP:

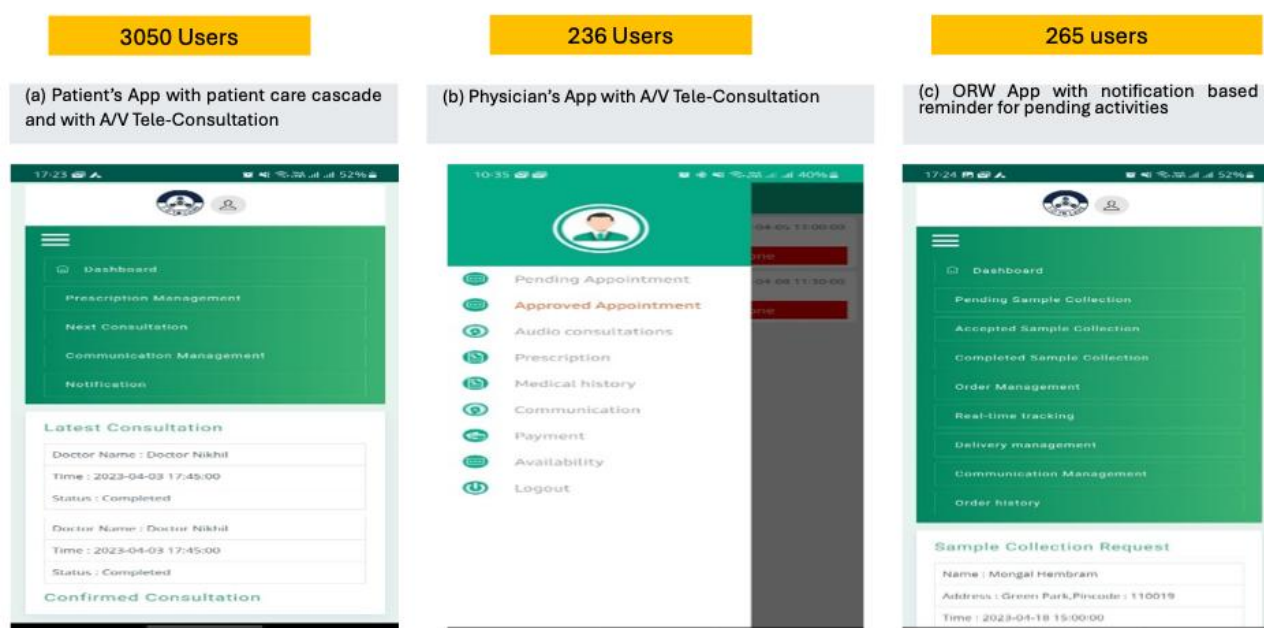
- Reduced reporting lag
- Enabled task-based monitoring
- Strengthened verification
- Improved performance transparency
- Facilitated structured escalation

However, the most important lesson was this:

The digital system succeeded because it was aligned with government structures, not because it operated independently.

It also did more than just record activities. It also helped the programme stay prepared. Real-time dashboards, location tracking, and alert messages made it possible to quickly identify gaps in service delivery. In situations like a future pandemic, when supervisors may not be able to travel easily, this kind of digital visibility can help managers stay informed and respond quickly.

Figure 3 : Glimpse of the Mobile Applications



The patient portal system served as a monitoring tool for recording the activities being done at ground level as far as sputum transportation and drug delivery is concerned as this is not captured in Ni-kshay. Teleconsultations was another activity which was incentive based , thus required a recording toll for reporting for which the PSP portal was used. Ni-kshay has no mechanism of recording teleconsultations provided to PwTB. As a recording tool PSP and mobile applications did not serve as a parallel system as Ni-kshay does not record no. of drug deliveries done, no. of sputum samples transported and number of teleconsultations done.

5. MONITORING, ACCOUNTABILITY & FEEDBACK LOOPS

The 3-D TB Care Model did not rely solely on service delivery. It relied on structured monitoring discipline.

As described in Chapter 2 (Assumption: Monitoring Improves Outcomes), the programme assumed that real-time visibility and defined accountability would reduce missed tasks and treatment interruptions. Chapter 5 demonstrated how the PwTB Support Portal (PSP) enabled digital tracking. This chapter examines how that tracking translated into corrective governance action.

Monitoring operated at five interlinked levels:

1. PMU-level oversight
2. District-level operational planning
3. Tele-caller level micro-monitoring
4. ORW-level field verification
5. Cross-level triangulation

Case Study

Re-Engaging a Lost-to-Follow-Up PwTB — The Case of Sudama Mahto

In Darjeeling, Sudama Mahto, a 25-year-old resident of Santoshi Nagar, had previously been registered under NIKSHAY ID 64104715 but had become Lost to Follow-Up (LTFU). Over time, his health deteriorated. He was experiencing persistent cough, fever, and noticeable weight loss - clear warning signs that required urgent medical attention. However, due to his weakened condition and limited access to transport, he was unable to visit a health facility.

The case came to light during a routine service delivery visit, when his relative, Nisha Mahto, informed the 3-D TB Care team about his worsening health and inability to seek care. Recognising the seriousness of the situation, the team acted immediately.

Outreach Worker (ORW) Subhadeep Mallick visited Sudama's home without delay. Understanding the risk of further disease progression and possible transmission, he prioritised sputum collection. On 27 September 2025, he successfully collected Sudama's sputum sample (Enrolment No. 193269140). Despite the ongoing Durga Puja holidays - when many services operate with limited staff - the sample was safely stored at the District TB Centre (DTC) to ensure it remained viable for testing.

The ORW's intervention addressed several challenges at once:

- A critically ill PwTB who had disengaged from treatment;
- Lack of mobility and access to healthcare facilities;
- Risk of further delay due to festival-related service disruptions;
- Potential spread of infection within the household and community.

Through proactive follow-up and coordination with the DTC, Sudama was successfully re-enrolled into care. This marked a critical turning point. Instead of remaining untreated and at risk of severe complications, he was given a structured pathway back into the treatment system. This case illustrates the importance of active field presence and responsive follow-up mechanisms. Lost-to-follow-up PwTBs often remain outside formal health systems unless someone identifies and re-engages them. In Sudama's case, timely information from a family member, rapid field action by the ORW, and coordinated handling at the district level ensured that a vulnerable PwTB received a second chance at treatment and recovery.

The dashboard alerts helped the team identify PwTBs who were slipping out of contact and bring them back into care. This showed that digital monitoring can protect treatment continuity, especially during disruptions such as a pandemic. When regular follow-up systems are strained, timely alerts make it possible to act quickly and prevent treatment from being interrupted.

5.1 PMU-Level Oversight: Pattern Recognition and Corrective Action

At the national level, the Project Management Unit (PMU) reviewed:

- Monthly service delivery trends
- District-wise target vs achievement
- Tele-consultation completion rates
- Drug delivery gaps
- Sample collection turnaround

Quarterly reviews identified inflection points and structural patterns.

For example:

Example 1: Low Tele-Consultation Volumes

Certain districts showed persistent tele-consultation gaps.

Dashboard data revealed:

- Limited physician availability
- Scheduling bottlenecks

Corrective action included:

- Onboarding additional physicians
- Reorganising tele-consult time slots

As described earlier in Chapter 3 (Darjeeling Case), onboarding an additional physician in October 2025 significantly improved tele-consultation volumes.

Monitoring thus informed managerial restructuring.

Example 2: Repeated Tele-Consult Validation

In a few instances, repeated tele-consult entries were observed.

Instead of punitive action, the issue was treated as a data discipline opportunity.

Structured validation checks were introduced prior to performance reporting and payment processing.

This reinforced accountability without eroding trust.

5.2 Nodal Coordinator Level: Operational Planning

At the district level, the Nodal Coordinator (NC) translated dashboard data into micro-planning.

Example 3: Filtering Notification Register Data

Before activating PwTBs in PSP, NCs filtered NR data to:

- Remove already transferred cases
- Exclude completed treatments
- Verify active status

This prevented artificial inflation of pending tasks.

As discussed in Chapter 3 (Data Integrity), upload discipline was foundational to credibility.

Example 4: Uneven TU Workload

Dashboard review revealed that certain TB Units (TUs) had disproportionately high pending tasks.

Instead of treating this as underperformance, NCs reorganised:

- ORW route mapping
- Task clustering
- Visit sequencing

This operational redistribution improved efficiency.

Example 5: Route Mapping After Laboratory Burden Increase

In districts where laboratory reporting volumes increased, ORWs restructured transport routes to reduce turnaround delays.

This adaptive refinement reinforced the SCT workflow described in Chapter 3.

5.3 Tele-Caller Level: Micro-Level Decision Support

Tele-callers used dashboard alerts to:

- Identify overdue follow-up

- Screen ADR concerns
- Reschedule missed consultations

Example 6: Call Outcome Tracking

The system categorised call outcomes:

- Connected
- Switched off
- Invalid number
- Reschedule requested

Repeated “invalid number” entries triggered escalation to ORW for physical verification.

This reduced reliance on single-mode communication.

Example 7: SOS Alerts in Indore

In one district, ADR-related symptoms were flagged during tele-call screening.

Instead of waiting for scheduled review, immediate tele-consult was arranged.

The PwTB was referred to facility-level care.

This case reinforced the safety net embedded within digital monitoring.

5.4 ORW-Level: Real-Time Evidence from the Field

ORWs functioned as the physical validation layer of the monitoring architecture.

While the PSP provided digital visibility (Chapter 4), and dashboards enabled supervisory oversight (Section 4.1), it was the ORW who translated digital entries into field action.

The following interconnected case lets illustrate how monitoring discipline moved from detection to institutional confidence.

Case let 1

When Digital Confirmation Was Questioned: The Delivery Dispute

In one district, a PwTB reported during telephonic verification that medicines had not been received, despite the ORW having marked the delivery as “completed” in the PSP.

This created a potential integrity concern.

Instead of immediate attribution of fault, the case was treated as a validation exercise.

The NC reviewed:

- Geo-tag location data
- Timestamp of delivery entry
- Route mapping for that day

The ORW was asked to revisit the household.

Field re-verification revealed that:

- Medicines had been delivered to a family member.
- The PwTB was temporarily away for work.
- Internal family communication had been incomplete.

The system entry was therefore accurate, but PwTB-level confirmation had been unclear.

The incident led to two refinements:

1. ORWs began explicitly confirming receipt with the intended PwTB wherever possible.
2. Tele-call verification scripts were strengthened to probe intra-household receipt.

This episode demonstrated that digital traceability required field-sensitive interpretation.

It also reinforced that verification was corrective - not punitive.

Case let 2

From Dispute to Protocol Strengthening

The delivery dispute did not remain an isolated episode.

During monthly review, the case was discussed across districts as a learning opportunity.

As a result:

- A checklist for drug handover confirmation was standardised.
- ORWs began recording whether the PwTB or family member received medicines.
- Tele-callers cross-verified recipient identity before marking delivery fully validated.

This created a loop between field experience and SOP refinement.

The system matured through feedback.

Case let 3

Preventing Attrition: The Re-Engagement of Sudama Mahto

Shortly after the delivery dispute episode, another dashboard alert emerged - this time concerning a PwTB (Sudama Mahto) who had missed tele-consultation and drug refill.

Unlike the previous case, this was not a data discrepancy. It was a potential treatment interruption.

The dashboard flagged:

- Overdue refill
- No ORW visit recorded
- Missed tele-consult

Instead of waiting for monthly review, the NC escalated immediately.

The ORW conducted a field visit and discovered that:

- The PwTB had migrated temporarily for work.
- Contact information required updating.

Through coordination with TU staff, contact was re-established.

Tele-consultation was rescheduled, and drug refill continuity was restored.

The PwTB was re-engaged before being categorised as lost-to-follow-up.

This case reinforced a key principle:

Monitoring functioned preventively, not retrospectively.

Case let 4

When Monitoring Protected Financial Integrity

The layered verification system extended beyond service correction into financial governance.

Before processing payments to private physicians or diagnostic facilities, three levels of validation were applied:

- PSP dashboard verification
- 10% telephonic cross-check (Source: Monitoring & Evaluation Plan, January 2025)
- Escalation review where discrepancies appeared

In one district, minor inconsistencies between reported tele-consultations and dashboard timestamps were observed.

Instead of rejecting claims outright:

- Call logs were reviewed.
- Consultation duration was verified.
- Clarifications were sought from the physician.

This approach maintained financial discipline without undermining professional relationships.

Monitoring thus protected both programme credibility and stakeholder trust.

5.5 Cross-Level Data Triangulation

These case lets illustrate how triangulation operated in practice.

The monitoring architecture relied on three concurrent validation streams:

1. PSP digital entries
2. 10% mandatory field verification
3. Telephonic confirmation prior to payment

(Source: Monitoring & Evaluation Plan, January 2025)

Triangulation ensured that:

- Dashboard data reflected field reality.
- Performance reporting remained credible.
- Financial disbursement was evidence-backed.

The delivery dispute (Caselet 1) demonstrated digital-to-field validation.

The Sudama Mahto case (Caselet 3) demonstrated dashboard-to-field escalation.

The physician verification case (Caselet 4) demonstrated digital-to-financial reconciliation.

Monitoring thus operated as a layered integrity system.

5.6 Performance Monitoring and Incentive Alignment

Financial incentives were tied to verified service delivery.

This linkage ensured that:

- Tele-consultation entries were authentic.
- Diagnostic claims were traceable.
- Drug delivery logs were verifiable.

Monitoring therefore extended beyond programme reporting into fiscal accountability.

However, verification discipline was applied constructively.

Rather than penalising inconsistencies, the system:

- Identified clarification opportunities
- Strengthened documentation habits
- Reinforced role clarity

This strengthened professional accountability without creating adversarial dynamics.

5.7 Data as a Tool for Relationship Management

Monitoring also strengthened institutional relationships.

In districts such as Darjeeling:

- DTOs began reviewing dashboard summaries during review meetings.
- Discussions shifted from anecdotal impressions to data-based dialogue.

As described in Chapter 3 (Integration Case), institutional confidence increased when transparency was visible.

Data became a shared reference point.

Trust deepened not because disputes disappeared, but because discrepancies were openly examined and resolved.

5.8 From Reporting to Real-Time Management

The cumulative effect of these monitoring layers was structural.

The programme shifted from:

Retrospective reporting to Real-time management.

Dashboards enabled:

- Immediate corrective action
- Resource redistribution (as seen in Darjeeling physician onboarding)
- Rapid escalation
- Structured review meetings
- The lost-to-follow-up alert prevented attrition.
- Financial verification strengthened fiscal integrity.
- Dashboard review strengthened district convergence.

Together, these episodes demonstrated managerial agility.

- This reinforced the design assumption articulated in Chapter 2
- Monitoring discipline improved outcomes when actively used.

Conclusion

The monitoring architecture of the 3-D TB Care Model demonstrated that:

- Digital traceability strengthened accountability.
- Field verification preserved credibility.
- Escalation channels reduced ambiguity.
- Proactive review prevented attrition.
- Financial governance reinforced programme legitimacy.

Monitoring did not function as compliance reporting. It functioned as a management instrument.

As subsequent chapters will demonstrate:

- Chapter 6 examines how stakeholders experienced this monitoring discipline.
- Chapter 8 analyses how monitoring shaped implementation trajectory.
- Chapter 10 distils these mechanisms into institutional learning.

Ultimately, sustainability depended less on the existence of dashboards and more on the disciplined, transparent, and relational use of data.

6. STAKEHOLDER EXPERIENCE AND INCENTIVES

The success of the 3-D TB Care Model depended not only on system design and digital infrastructure, but on how stakeholders experienced and responded to the intervention.

This chapter examines how these elements were perceived at the human level.

Stakeholder experience shaped implementation stability, institutional trust, and long-term sustainability.

6.1 Experience sharing by PwTB on Quality of Care

For many PwTB, particularly in rural and mobility-constrained settings, doorstep services reduced barriers that extended beyond physical travel.

PwTB reported that:

- Travel costs were avoided.
- Wage loss due to clinic visits was reduced.
- Waiting time at facilities was eliminated.
- Stigma associated with repeated facility visits was minimised.

This echoed the pandemic-related mobility concerns discussed in Chapter 1.

Even after lockdown conditions eased, the convenience of doorstep services retained relevance.

In districts where transport was limited or terrain difficult (e.g., hilly regions such as Darjeeling), doorstep services functioned as access equalisation rather than emergency substitution.

Case Study 1

Shubhangi: Field Commitment Beyond the Checklist

Shubhangi, an Outreach Worker in Wardha district of Maharashtra, described her role as extending beyond task completion.

While the dashboard recorded:

- Sample collection

- Drug delivery
- Geo-tag confirmation

Her field experience involved:

- Addressing PwTB fears about side effects
- Negotiating family resistance
- Explaining the importance of completing treatment

As described in Chapter 4 (Drug Delivery and Adherence Reinforcement), ORWs frequently functioned as behavioural anchors, not just logistics agents.

Shubhangi's experience illustrated that technology recorded action - but commitment sustained adherence.

The above example explains why the project Tele-callers not only scheduled appointments but also:

- Explained the nature of sputum collection;
- Clarified laboratory processes;
- Reinforced the importance of adherence;
- Addressed concerns about side effects;
- Followed up if reports were not viewed within defined timelines

Shivank Asati (NC, Katni, MP) noted:

“Many PwTB initially hesitated to discuss symptoms. Over repeated calls, they opened up. That continuity improved adherence.”

The availability of physicians for tele-consultation without long waiting periods was also valued. PwTB reported appreciation for doctors who responded even outside conventional working hours when urgent clarification was needed.

Says Avinash, Telecaller, Wardha district (Maharashtra):

“When doctors received late calls and addressed PwTB queries, it significantly improved PwTB confidence in treatment.”

Quality of care, therefore, extended beyond clinical correctness. It included responsiveness, empathy, and continuity.

Timeliness and Predictability

The system's digital tracking ensured time-bound actions - report uploads within 48 hours of sample collection and follow-up if reports were not viewed. PwTB reported that predictable timelines reduced anxiety.

Doorstep drug delivery and refill reminders ensured that medicine intake was not interrupted due to logistical barriers. For many, this reduced the fear of missing doses or facing travel-related obstacles.

Overall, beneficiaries' feedback across districts reflected high acceptance, particularly where counselling quality and confidentiality safeguards were consistently applied.

6.2 Counselling and Emotional Continuity

TB treatment, particularly for drug-resistant cases, required prolonged medication regimens.

PwTBs frequently reported:

- Fatigue
- Fear of side effects
- Social isolation
- Economic stress

Tele-callers and ORWs became continuity figures.

As described in Chapter 6 (Micro-Level Monitoring), structured follow-up reduced attrition. From the PwTB perspective, this translated into feeling “monitored” but also “supported.”

Case Study

Avinash: Counselling as Continuity of Care

Avinash, a Tele-caller, described how structured call sequences built familiarity. Instead of one-time contact, PwTB received:

- Pre-sample reminders
- Post-sample follow-ups
- ADR screening calls
- Refill reminders

Over time, PwTB recognised his voice and proactively reported symptoms.

This illustrated the humanisation of digital monitoring.

The structured tele-calling architecture described in Chapter 3 thus functioned not merely as a scheduling tool, but as emotional continuity.

6.3 Timeliness and Predictability

Stakeholders across districts observed that predictability strengthened trust.

PwTBs knew:

- When the ORW would visit
- When tele-consult would occur
- When drug refill would arrive

This reduced uncertainty.

At the district level, NCs reported that predictable workflows reduced crisis-driven management.

As described in Chapter 4 (From Reporting to Management), structured dashboards shifted implementation from reactive to anticipatory.

6.4 Structured Workflows and Role Clarity

One of the most consistent stakeholder observations was clarity of responsibility. Tele-callers knew their scheduling responsibilities. ORWs knew their field execution roles. NCs understood escalation channels.

This clarity was particularly important during the transition from vendor-led to Union-led implementation (as referenced in Chapter 3 and Chapter to follow). Role clarity reduced friction.

6.5 Workload and Field Realities

While the system was structured, field realities varied.

In low-volume TUs:

- ORWs reported irregular task distribution.

In high-volume districts:

- Task clustering required route optimisation (as discussed in Chapter 6: Route Mapping).

Workload variation required adaptive micro-planning. Digital dashboards enabled such redistribution.

6.6 Motivation and Institutional Support :

Figure 4 : Rewards & Recognition



Mohit Kumar, NC, Sirmaur, receiving the "Best Project Team" award.



Outstanding Monitoring Reward given to Shankar Pramanik, NC Dhanbad.



Deepak, NC, Darjeeling, receiving the "Best Innovation Award".

Motivation among field staff, as evidenced from meetings with field staff like Avinash Raut (TC) and Shubhangi (ORW), Wardha (Maharashtra); Mohit, (NC, Sirmaur, Himachal Pradesh), Deepak (NC, Darjeeling, West Bengal); Raj Kumar (NC, Janjgir Champa, Chattisgarh); Shankar Pramanik (NC, Jharkhand); Neha (NC, Alirajpur, MP); and Siddhanth Tiwari (NC, Indore, Madhya Pradesh), was influenced by:

- Clear supervision
- Structured review meetings
- Recognition during performance discussions
- Transparent payment processes

Private physicians reported that digital documentation improved prescription tracking and reduced administrative ambiguity.

However, engagement was strongest where:

- Payment cycles were predictable
- Dashboard data was regularly reviewed

- Escalations were resolved promptly

This reinforces a key insight from Chapter 6: monitoring discipline strengthened motivation when paired with responsiveness.

6.7 Monitoring, Documentation, and Reduced Administrative Burden

Tele-callers and NCs noted that digital dashboards reduced dependence on manual registers.

Instead of compiling monthly summaries retrospectively, data was available in real time.

This reduced administrative burden and improved reporting accuracy.

However, digital familiarity required initial investment in training (as described in Chapter 5: Technology Familiarisation).

Case Study

Doctor Engagement and Workflow Discipline

In Darjeeling, tele-consultation volumes improved significantly after onboarding an additional physician (Chapter 3).

Doctors like Dr. Utpal Kumar Ghosh (Darjeeling district) reported that:

- Structured tele-consult slots improved efficiency.
- Digital prescription entry reduced documentation lag.
- PSP visibility clarified pending consultations.

This demonstrated how digital systems, when embedded within predictable workflows, strengthened physician engagement.

6.8 Acceptability Across Stakeholder Categories

People with TB

High acceptability was reported for doorstep services, especially among elderly and economically vulnerable groups. The C19 RM-supported 3-D TB Care Model demonstrated high acceptability among PwTB primarily because it directly addressed the practical, behavioural, and systemic barriers that typically disrupt treatment continuity. At the most immediate level, doorstep service delivery significantly reduced the need for repeated facility visits - minimising travel time, out-of-

pocket expenditure, and wage loss, which are critical concerns for many PwTB. This made the care process less disruptive to daily life and more feasible to sustain over long treatment durations.

Equally important was the role of structured tele-calling and regular follow-up, which created a sense of continuous engagement rather than episodic interaction. PwTB were not left to navigate the treatment journey independently; instead, they experienced proactive communication, timely reminders, and early identification of issues such as adverse drug reactions. This built trust in the system and reduced uncertainty during treatment.

The involvement of ORWs further strengthened acceptability by bringing a human interface into what could otherwise have been a purely digital system. ORWs provided counselling, explained treatment regimens in simple terms, and helped PwTB anticipate and manage side effects. This personalised support improved understanding and adherence, while also addressing fear and stigma associated with TB.

Importantly, the model maintained alignment with NTEP protocols, ensuring that PwTB did not perceive it as an unfamiliar or parallel system. Services were seen as an extension of existing government care rather than a replacement, which enhanced credibility and acceptance. The inclusion of tele-consultation with qualified physicians also reassured PwTB about the clinical validity of the care they were receiving.

Taken together, the combination of convenience, continuous engagement, personalised support, and institutional legitimacy contributed to high acceptability of the C19 RM intervention among PwTB. The model did not require PwTB to adapt to a new system; rather, it adapted service delivery around their needs, making adherence more practical and sustainable

Frontline Workers

ORWs valued:

- Clear task allocation
- Reduced ambiguity
- Structured supervision

However, connectivity constraints required flexibility (Chapter 4).

ORWs reported that PwTB were comfortable with doorstep services and tele-consultation even during normal times. This suggests that these approaches would be even more useful during a crisis. When people are already familiar with such systems, it becomes easier to use them quickly

during future disruptions. Preparedness depends not only on having the right systems in place, but also on people trusting and understanding how they work.

Private Practitioners

Engagement varied across districts.

Where district authorities were actively involved (Chapter 3: Integration Case), private participation was stronger.

Institutional Reflection

Stakeholder experience revealed a consistent theme:

Technology alone did not drive acceptability.

Acceptability emerged from:

- Predictability
- Human engagement
- Clarity of roles
- Transparent supervision
- Institutional alignment

As the next chapter will explore, variation across states influenced how these experiences differed geographically.

7. STATE-LEVEL VARIATION AND ITS CONTEXT

The 3-D TB Care Model was implemented across six states and twenty-two districts. While its core architecture remained standardised (as described in Chapter 2), implementation unfolded differently across geographies. These differences did not signal inconsistency in design. Rather, they reflected the realities of public health administration across diverse institutional and geographic settings.

State-level variation emerged through administrative processes, public-private interface strength, digital familiarity, terrain conditions, and governance culture. These contextual elements shaped the pace and pattern of stabilisation but did not alter the model's structural integrity.

7.1 Administrative and System Readiness

Administrative onboarding did not occur uniformly across states. In some contexts, State TB Cells facilitated rapid orientation and district-level engagement. In others, clarification meetings extended over multiple rounds before operational approval was granted.

As discussed in Chapter 3 (From Hesitation to Integration), early scrutiny strengthened convergence. Where state and district authorities examined scope carefully - particularly around PwTB selection and data alignment - long-term stabilisation proved smoother. The negotiation phase functioned as a structural alignment exercise rather than a delay.

Administrative pacing therefore influenced rollout speed but ultimately strengthened institutional ownership.

Case Study

Differentiated TB

The TB Differentiate initiative required structured severity assessment and counselling at the Community Health Centre (CHC) level. Officials worried that if medicines were delivered directly to homes, PwTBs might not visit CHCs for necessary assessments.

The project clarified sequencing:

- First-month medicines would continue to be issued at CHC.
- Public Health Action (blood sugar testing, HIV testing, Aadhaar verification for DBT) would remain intact.
- Doorstep delivery would begin from the second month onward.
- ORWs would collect medicines from CHC under STS supervision.

This alignment ensured that TB Differentiate objectives were preserved while extending follow-up support into the community.

Let's take another exemplar:

Building Verification Systems to Strengthen Trust

A common concern raised by officials was accountability: If a PwTB denies receiving medicines and an ORW claims delivery, how can this be verified?

To address this, the project instituted a documentation protocol:

- Geotagged photos at CHC during medicine pickup.
- Photographic evidence at PwTB residence or village markers during delivery.
- Details shared in a joint WhatsApp group with NIKSHAY ID references.

This applied equally to sputum collection and transport. The result was a transparent, verifiable trail that strengthened confidence in reported data.

In districts where District TB Officers (DTOs) and PPM Coordinators were actively involved, onboarding of private doctors and laboratories was smoother and faster. The data upload process worked well when notification registers were clean and regularly updated. In districts where records were incomplete or inconsistent, activation of the PSP took more time.

The model's dependence on verified government-origin data meant that alignment with DTC processes was essential. States with stronger data management practices experienced fewer upload rejections and less duplication filtering.

7.2 Urban–Rural and Public–Private Interface

Variation in the strength of Public-Private Mix (PPM) ecosystems influenced operational dynamics.

In urban districts with established private networks, physician onboarding and diagnostic partnerships progressed quickly. Tele-consultation volumes stabilised earlier in these contexts. In

more rural districts, where government-notified PwTB formed the primary base, private-sector engagement was more limited.

These ecosystem differences affected early performance patterns, particularly in tele-consultation uptake, as noted in Chapter 5 (Performance Monitoring). However, once physician availability was strengthened - such as in the Darjeeling example discussed in Chapters 3 and 6 - performance improved regardless of baseline context.

Variation reflected ecosystem starting points rather than design limitation.

7.3 Context-Specific Adaptations/Innovations

Digital adoption varied across districts. In areas with stronger digital penetration and familiarity, the PwTB Support Portal (PSP) stabilised quickly. Tele-call scheduling, task updates, and dashboard review became routine early in implementation.

In districts with intermittent connectivity or limited smartphone familiarity, synchronisation delays occurred. As discussed in Chapter 5, offline entry mechanisms and structured training sessions strengthened digital confidence over time.

Importantly, digital maturity did not emerge automatically. It developed through iterative refinement, hands-on training, and supervisory reinforcement. By the consolidation phase, digital literacy had improved significantly across states.

This reinforced a key lesson: technology functioned effectively only when embedded within sustained human support.

7.4 Geographic and Terrain Constraints

Geography influenced operational logistics in visible ways.

In hilly regions such as Darjeeling, ORWs navigated longer travel times and weather-related variability. Route planning required careful sequencing to ensure timely sample transport and drug delivery. Yet in precisely such contexts, doorstep services reduced PwTB burden most significantly, particularly for elderly and mobility-constrained individuals (as reflected in Chapter 6).

In tribal and dispersed rural districts, household dispersion increased travel time and follow-up complexity. Phone connectivity limitations required repeated call attempts and greater reliance on physical verification. These realities reinforced the importance of maintaining both digital and field-based engagement layers.

Terrain variation did not alter the service model. It required adaptive micro-planning.

7.5 Governance Culture and Review Discipline

District-level governance culture shaped implementation rhythm.

In districts where District TB Officers actively engaged with dashboard reviews, performance discussions became data-driven. Escalations were resolved more quickly, and physician onboarding moved faster. As illustrated in Chapter 5 (Data as Relationship Management), transparency strengthened convergence.

In districts where review meetings were not held regularly, Nodal Coordinators took on a more active coordination role. Although resolving issues sometimes required additional follow-up and coordination, the overall alignment of the system remained intact.

Working across different states tested how strong and adaptable the model was. It was implemented in hilly areas, tribal districts, places with poor internet connectivity, and urban centres. The fact that it stabilised in such varied settings shows that its core design can handle different geographic and administrative conditions. This is important if similar systems need to be used during a future pandemic.

7.6 Interpreting Performance Variation

Service delivery trends did not evolve uniformly across states. Some districts demonstrated early strength in tele-consultation but required later reinforcement in sputum collection. Others showed consistent drug delivery but needed to strengthen physician availability.

Dashboard-based monitoring (Chapter 5) allowed these variations to be interpreted diagnostically rather than normatively. Underperformance triggered corrective planning rather than retrospective criticism.

This adaptive management approach ensured that contextual variation strengthened learning rather than fragmenting execution.

7.7 Structural Consistency Amidst Contextual Flexibility

Despite variation, three structural anchors remained constant across states:

- PwTB data originated exclusively from NTEP records.
- The PSP functioned as the digital monitoring backbone.

- Escalation pathways were clearly defined and consistently applied.

This ensured that contextual flexibility did not compromise systemic coherence.

The Darjeeling example - referenced in Chapters 3 and 5 - illustrated how physician onboarding, dashboard review, and terrain-sensitive planning operated within a stable architectural framework.

Conclusion

State-level variation did not weaken the 3-D TB Care Model. It demonstrated that structured architecture could accommodate contextual realities without losing coherence.

Administrative pacing influenced rollout tempo. Ecosystem strength influenced early performance. Digital familiarity influenced stabilisation speed. Terrain influenced route planning. Governance culture influenced escalation rhythm.

Yet across contexts, the core model remained intact.

The strength of the intervention lay not in uniform execution, but in structured adaptability.

8. IMPLEMENTATION TRAJECTORY

The implementation of the 3-D TB Care Model did not unfold as a static intervention. It evolved through identifiable phases - each shaped by contextual realities, institutional negotiation, digital stabilisation, and governance refinement.

As earlier chapters have shown, the model was conceptually robust (Chapter 2), institutionally negotiated (Chapter 3), operationally structured (Chapter 4), digitally enabled (Chapter 5), and disciplined through monitoring (Chapter 6). However, its eventual stabilisation depended on how these elements matured over time.

This chapter traces that evolution.

8.1 The Early Phase: Designed for a Crisis

The C19RM grant was conceived during pandemic uncertainty (Chapter 1). At that time, the core concern was continuity of TB services under lockdown conditions.

The model was therefore designed as a crisis-resilient mechanism:

- Tele-consultation to reduce facility visits
- Doorstep drug delivery to prevent treatment interruption
- Sputum collection at home to maintain detection

The emphasis was on preparedness.

However, by the time implementation funding was operationalised, India had largely moved beyond severe mobility restrictions. TB services had resumed at facilities.

This required a strategic pivot.

As described in Chapter 3 (From Hesitation to Integration), district authorities asked a fundamental question:

If routine services had resumed, what was the value addition?

The programme transitioned from emergency continuity to continuity reinforcement.

This marked the beginning of the next phase.

8.2 Building Acceptance Within the System

The early months of implementation were characterised less by service expansion and more by institutional positioning.

The case study from Seoni and Narsinghpur (Chapter 3) illustrates this phase clearly. Initial hesitation around duplication, ASHA displacement, and parallel systems required structured clarification.

The decision to focus exclusively on government-notified PwTBs was not merely operational - it was strategic. It aligned the programme with NTEP authority and reduced political sensitivity.

Similarly, strict data origin discipline - uploading only verified DTC records into PSP - became foundational (Chapters 3 and 4).

This phase did not produce immediate high service volumes. It produced legitimacy.

Integration came before scale.

8.3 Strengthening the Digital System

Once institutional alignment stabilised, operational dynamics began to mature.

Digital refinement became central.

As described in Chapter 5, early phases required:

- Standardising upload formats
- Managing connectivity limitations
- Strengthening field-level digital training
- Improving device compatibility

These were not technical failures. They were familiarisation processes.

The delivery dispute case (Chapter 6, Case let 1) illustrates this maturation. What began as a discrepancy evolved into improved SOPs and stronger verification protocols.

Similarly, the Sudama Mahto re-engagement case (Chapter 6) demonstrated how dashboard alerts began functioning preventively rather than retrospectively.

Monitoring shifted from documentation to decision-making.

8.4 Performance Turning Points

The most visible inflection occurred during and after the transition from vendor-led to Union-led implementation (November 2024 onward).

Earlier phases relied on external technical partners for digital management and certain coordination functions. While structurally aligned, deeper integration required stronger institutional ownership.

The transition to Union-led implementation represented consolidation.

Following transition:

- Dashboard reviews became more regular.
- Escalation channels shortened.
- Corrective action was implemented faster.

The Darjeeling example (Chapters 3 and 5) illustrates this clearly. Tele-consultation volumes strengthened significantly after onboarding an additional physician - a decision triggered by dashboard review.

Similarly, route reorganisation by ORWs improved turnaround times in geographically challenging districts.

The turning point was managerial rather than structural.

8.5 What the Transition Changed

Transitions often destabilise programmes. In this case, the transition strengthened managerial coherence.

Three factors explain this:

First, data discipline had matured (Chapter 5). Verification systems were already functioning well.

Second, stakeholder roles had stabilised (Chapter 6). ORWs, TCs, and NCs understood workflows clearly.

Third, integration with NTEP had already been negotiated and embedded (Chapter 3).

The transition therefore strengthened alignment rather than disrupting it.

8.6 Looking at the Phases Together

Seen together, the trajectory followed a clear pattern:

- The first phase prioritised preparedness.
- The second phase prioritised legitimacy.
- The third phase prioritised digital maturity.
- The fourth phase prioritised managerial agility.

Performance trends must be interpreted in this sequence.

Early lower volumes reflected institutional embedding. Later strengthening reflected consolidated management.

As discussed in Chapter 7, variation across states influenced pace but not direction.

8.7 Lessons from the Journey

The case studies across earlier chapters reinforce this trajectory:

- Seoni & Narsinghpur (Chapter 3): Negotiated integration built trust.
- Delivery Dispute (Chapter 4): Verification strengthened data discipline.
- Sudama Mahto (Chapter 5): Monitoring prevented attrition.
- Darjeeling (Chapters 3 & 6): Physician onboarding improved performance.
- Shubhangi & Avinash (Chapter 7): Human engagement sustained system design.

Together, these illustrate a system evolving through practice.

8.8 From Project to Routine Mechanism

By the consolidation phase, the 3-D TB Care Model no longer functioned merely as a project.

It functioned as a routine mechanism:

- Data flowed predictably from NTEP to PSP.
- Tele-calling followed structured cycles.
- ORWs executed geo-tagged tasks consistently.

- Monitoring triggered corrective action.
- Financial verification reinforced accountability.

The programme had moved from intervention mode to operational rhythm.

Conclusion

The implementation journey showed that sustainability did not happen automatically. It developed step by step.

The programme first had to build acceptance within the system before it could expand. It had to ensure clean and reliable data before linking performance to payments. Monitoring systems had to stabilise before expecting higher results. Field teams had to become comfortable with the process before the digital system could function smoothly.

The shift from vendor-led to Union-led implementation did not disrupt the programme. Instead, it brought stronger alignment, clearer oversight, and more consistent management.

The programme remained stable during the transition from vendor-led to Union-led implementation, which is important for preparedness. A system that continues to function smoothly during administrative change is more likely to remain stable during a crisis. The ability to manage transition without disruption shows that the system is structurally strong and resilient.

Across Chapters 2 through 8, one message remained clear:

Long-term sustainability depended not just on introducing a new idea, but on carefully integrating it into the existing public health system.

9. DOES THE SYSTEM ACTUALLY WORK?

After design, negotiation, digital development, field deployment, monitoring refinement, and managerial transition, the central question remained:

Did the system actually work?

This question must be answered not only in terms of service delivery numbers, but in terms of institutional behaviour, corrective capacity, and sustainability.

After design (Chapter 2), negotiation (Chapter 3), digital deployment (Chapter 4), monitoring discipline (Chapter 5), stakeholder adaptation (Chapter 6), contextual variation (Chapter 7), and managerial consolidation (Chapter 8), the central question remained:

9.1 Integration Without Disruption

The system worked first because it integrated without fragmenting NTEP.

As described in Chapter 3 (From Hesitation to Integration), PwTB data originated exclusively from NIKSHAY and DTC registers. Drug stocks remained within government supply chains. Treatment protocols were not altered.

This structural discipline ensured that the system strengthened public health architecture rather than duplicating it.

Sustainability began with integration.

9.2 When the System Was Tested: The Delivery Dispute

A useful way to assess whether a system works is to observe how it responds under stress.

In one district, a PwTB reported during telephonic verification that medicines had not been received, despite the ORW having marked the delivery as completed in the PSP.

This created a potential integrity concern.

The response demonstrated whether the system functioned beyond documentation.

The NC reviewed:

- Geo-tag location data
- Timestamp entries
- Route mapping records

The ORW revisited the household.

It was discovered that:

- Medicines had been handed to a family member.
- The PwTB had temporarily migrated.
- Communication within the household had caused confusion.

The dashboard entry was correct, but verification exposed a communication gap.

The outcome was not blame. It was refinement.

Protocols were strengthened:

- ORWs began confirming receipt explicitly with the intended PwTB wherever possible.
- Tele-call scripts were modified to confirm recipient identity.

This case demonstrated three important things:

1. Digital traceability protected the ORW from wrongful attribution.
2. Field re-verification resolved ambiguity transparently.
3. The system improved because of the discrepancy.

A system that corrects itself is working.

From a sustainability perspective, this episode showed that verification discipline protected financial integrity (as discussed in Chapter 6) and strengthened trust among stakeholders.

Without that discipline, long-term continuation would be vulnerable to doubt.

9.3 When System Prevented Failure: The Re-Engagement of Sudama Mahto

The second test was more consequential.

Dashboard alerts flagged a PwTB - Sudama Mahto - who had:

- Missed tele-consultation
- Not received a scheduled refill
- Not been contacted successfully

Instead of waiting for monthly review, escalation occurred immediately.

The ORW conducted a field visit and identified that:

- The PwTB had temporarily migrated for work.
- Contact details required updating.

Through coordination with TU-level staff, contact was restored. Treatment continuity resumed before formal categorisation as “lost-to-follow-up.”

This case is critical.

It demonstrates that the monitoring system did not merely record attrition - it prevented it.

This distinction defines whether a system is functional.

From a sustainability standpoint, this is equally important. If such preventive alerting were absorbed into routine NTEP digital practice, the impact would extend beyond the grant period.

The case illustrates that the value of the model lies less in doorstep delivery alone and more in structured early-warning mechanisms.

9.4 Did Monitoring Translate Into Action?

These two cases together answer that question.

The delivery dispute refined verification protocols.

The Sudama Mahto case prevented treatment interruption.

In Darjeeling (Chapters 3 and 6), dashboard review triggered physician onboarding, improving tele-consultation volumes.

Monitoring did not remain on the screen. It moved into the field.

A system that translates data into action is functioning.

9.5 Did It Build Institutional Confidence?

The delivery dispute could have damaged credibility. Instead, it strengthened it because the system resolved it transparently.

The Sudama Mahto case demonstrated responsiveness.

As described in Chapter 6 (Data as Relationship Management), DTOs in districts such as Darjeeling began engaging more actively with dashboards because data proved reliable.

Institutional confidence is a precondition for sustainability.

The system worked not only because services were delivered, but because trust deepened.

9.6 Did It Survive Transition?

The transition from vendor-led to Union-led implementation (Chapter 9) did not dismantle the monitoring architecture.

It strengthened it.

Because:

- Data discipline was already embedded.
- Escalation pathways were functioning.
- Stakeholder roles were clear.

The system did not reset. It consolidated.

A system that survives transition demonstrates structural resilience.

9.7 What “Working” Really Means

If “working” means removing every error or discrepancy, then no public health system would qualify. But if “working” means integrating into existing systems without creating duplication, identifying and correcting problems when they arise, preventing treatment interruptions, using monitoring data to guide action, building institutional confidence, and remaining stable during transition, then the system did work.

The delivery dispute showed that the system could correct itself with integrity. The Sudama Mahto case showed that it could detect risk early and prevent treatment interruption. The

improvement seen in Darjeeling showed that monitoring could lead to timely managerial action. Taken together, these examples demonstrate that the system functioned effectively at multiple levels.

Taken together, the delivery dispute resolution, the preventive re-engagement of a PwTB, and the improvement in performance show that the system remained steady under pressure. It was able to fix problems, identify risks early, and make timely management decisions. These are the same strengths required of public health systems during a pandemic. The intervention therefore did more than deliver services - it showed that the system could function effectively even during disruption.

9.8 Sustainability

Sustainability depended on institutional integration, financing, and human resource continuity.

Institutional Integration

The model was aligned with NTEP:

- PwTB data originates from NIKSHAY;
- Treatment definitions follow NTEP;
- Physician continuity is maintained;
- Reporting complements government systems

This alignment reduced the risk of parallel systems and supported potential integration into routine government TB programme structures.

Financial Sustainability

Long-term sustainability required:

- Continued funding for NC, TC, ORW positions;
- Maintenance of digital infrastructure;
- Ongoing incentive disbursement;
- Transport support for SCT.

Experience from other TB outreach programmes suggests sustainability improves when states adopt core functions into health budgets or integrate them into existing cadres.

Human Resource Stability

Staff retention and continued training were critical. The system relied on digital literacy and disciplined workflows. Institutional memory - through dashboards, audit logs, and SOPs - supported continuity

The model is structurally sustainable because it aligns with national systems. Financial and administrative commitment at state levels will determine long-term continuity.

Does the system work?

Yes - especially when implemented as designed.

As demonstrated across Chapter 3 (Implementation Architecture and End-to-End Service Delivery), the model functioned effectively because it addressed critical operational gaps within the TB care continuum. It reduced diagnostic delays through doorstep sample collection (see Section 3.4: Service Delivery Pathway), maintained treatment continuity through structured refill tracking and follow-up mechanisms, and enabled early gap detection through real-time digital dashboards (see Section 3.2: Information Flow and Monitoring).

At the patient level, trust was strengthened through regular counselling, proactive tele-calling, and confidentiality in service delivery - elements embedded within the roles of Tele-callers and ORWs (see Section 3.1: District-Level Roles). At the system level, accountability was reinforced through time-stamped and geo-tagged service tracking, ensuring that each stage of the PwTB journey remained visible and verifiable.

Importantly, as emphasised in Chapter 3.3 (Coordination Mechanisms), the model did not function as a substitute for NTEP; it strengthened the delivery layer around it by aligning with existing institutional structures, data systems, and programme protocols.

In measured terms, the 3-D TB Care Model provided an operationally sound, adaptable, and evidence-aligned mechanism for strengthening PwTB-centred TB care. Its effectiveness, however, depended not on technology alone but on sustained institutional commitment and disciplined implementation.

The project also created durable system assets that can be leveraged beyond the immediate intervention. As discussed in Chapter 11.8 (Pool of Private Providers and Outreach Workers), a network of 236 private practitioners was established, which can be sustained under NTEP's PPM schemes to support teleconsultations in future emergency scenarios. Similarly, 43 private

laboratories were engaged to provide diagnostic services - including chest X-rays and blood tests - at negotiated rates, offering a ready resource for district TB officers to draw upon when required.

In addition, the programme developed a trained pool of community-based workers, including ORWs, who can be mobilised for doorstep service delivery in line with programme needs. Together, these assets demonstrate that beyond immediate outputs, the model has contributed to strengthening system readiness, offering a scalable and adaptable framework for future public health responses.

10. Challenges and Key Learnings

The 3-D TB Care Model began as a crisis response. It evolved into a structured reinforcement mechanism embedded within the National TB Elimination Programme (NTEP). Across Chapters 1 through 10, the journey revealed lessons that extend beyond the C19RM context.

This chapter distils those lessons.

PART A: STRATEGIC TAKEAWAYS

1. Integration Must Precede Expansion

The programme stabilised only after it aligned fully with NTEP systems (Chapter 3). By using government-notified PwTB data and retaining public drug supply chains, it avoided duplication and built institutional trust.

Scale without alignment would likely have fragmented implementation.

2. Data Discipline Determines Credibility

Strict upload protocols, geo-tagging, timestamping, and 10% verification (Chapters 4 and 5) ensured that reported performance reflected field reality.

The delivery dispute case (Chapter 10) demonstrated that digital traceability protected both staff and system integrity.

Without data discipline, monitoring loses legitimacy.

3. Monitoring Must Trigger Action

Dashboards alone do not improve performance.

The Sudama Mahto case (Chapter 10) showed that early alerts prevented treatment interruption. The Darjeeling example (Chapters 3 and 5) demonstrated how physician onboarding followed dashboard review.

Monitoring worked because it led to corrective action.

4. Human Engagement Sustains Digital Systems

Technology enabled visibility (Chapter 5), but ORWs and Tele-callers sustained adherence (Chapter 7).

The system functioned because human roles were clear, supported, and responsive.

Digital systems amplified discipline; they did not replace relationships.

5. Transition Is a Test of System Strength

The shift from vendor-led to Union-led implementation (Chapter 9) strengthened oversight rather than disrupting it.

Because integration, monitoring, and role clarity had already stabilised, transition consolidated rather than fragmented the system.

Resilience during transition is a marker of structural strength.

6. Sustainability Is Behavioural, Not Just Financial

The model's durability lies less in preserving its exact operational form and more in retaining its core behaviours:

- Early-warning alerting
- Verification discipline
- Escalation clarity
- Structured review culture

If these behaviours endure within routine TB governance, the intervention's impact will outlast the grant.

PART B: POLICY-FORWARD REFLECTIONS AND RECOMMENDATIONS

10.1 Embedding Early-Warning Systems into Routine NTEP

The preventive value of dashboard alerts, illustrated through the Sudama Mahto case (Chapters 6 and 10), demonstrates the importance of early-warning mechanisms.

Recommendation:

Integrate automated overdue alerts, refill gaps, and follow-up reminders into NIKSHAY dashboards at state and district levels.

This would preserve preventive monitoring without requiring a parallel system.

10.2 Institutionalising Verification Mechanisms

The layered verification system (PSP entry + field validation + telephonic cross-check) protected programme integrity (Chapter 6).

Recommendation:

Adopt structured random verification within routine TB monitoring to strengthen accountability, especially where performance-linked incentives exist.

Verification should remain corrective and improvement-oriented rather than punitive.

10.3 Targeted Use of Doorstep Services

State-level variation (Chapter 8) demonstrated that universal overlay may not be necessary everywhere.

Recommendation:

Deploy doorstep sputum collection and drug delivery strategically in:

- Hard-to-reach districts
- Areas with high migration
- Urban informal settlements
- Districts with high loss-to-follow-up

Targeted reinforcement enhances cost-effectiveness and sustainability.

10.4 Strengthening District-Level Review Culture

In districts where DTOs actively engaged with dashboards (Chapter 6), performance stabilised faster.

Recommendation:

Formalise structured dashboard review within monthly district TB review meetings. Encourage data-led discussion rather than anecdotal reporting.

This behavioural shift may be one of the most sustainable legacies of the model.

10.5 Aligning Financial Incentives with Verified Outputs

The linkage between service verification and payment (Chapters 6 and 10) reinforced discipline.

Recommendation:

Link payments to verified outputs only where strong verification systems are in place. Incentives should not be expanded unless proper checks and safeguards are available.

Financial governance must remain tied to traceable outputs.

10.6 Strengthening Role Clarity

The clarity of NC, TC, and ORW responsibilities (Chapters 3 and 7) reduced ambiguity and improved coordination.

Recommendation:

In future TB system strengthening initiatives, define task allocation explicitly and document escalation pathways clearly before scale-up.

In implementation contexts such as the C19RM-supported 3-D TB Care Model, ambiguity can manifest in multiple ways - unclear ownership between programme staff and NTEP functionaries, uncertainty around data sources and reporting pathways, or confusion over how new roles (such as ORWs) align with existing ones (such as ASHAs and STS). Each of these slows the transition from design to routine operations.

Operationally, without clearly assigned responsibility, performance cannot be measured or corrected. Without defined processes, coordination becomes reactive rather than structured. And without clarity of intent - particularly in government-facing programmes - stakeholders may perceive duplication or encroachment, leading to resistance.

The early phases of implementation in districts such as Seoni and Narsinghpur illustrate this dynamic. Initial questions around scope, duplication, and role overlap required deliberate clarification before the system could stabilise. Once these ambiguities were resolved - through alignment with NTEP data, restriction to government-notified PwTBs, and clear positioning of ORWs as complementary - the system transitioned more smoothly into routine functioning.

The lesson is clear: stabilisation is not achieved through scale alone, but through clarity. When roles are defined, data flows are standardised, and institutional boundaries are respected, implementation

moves from negotiation to execution - allowing the system to operate with consistency, predictability, and confidence.

10.7 Planning for Transition from the Beginning

The vendor-to-Union transition (Chapter 9) succeeded because monitoring and integration were already embedded.

Recommendation:

All future large-scale interventions should include transition planning from the outset, including documentation of workflows, dashboards, and issue-resolution channels.

10.8 Role of Private Sector and Community Engagement

As discussed earlier in Chapter 3 (Coordination Mechanisms: The Union, Public and Private Actors), the C19RM-supported 3-D TB Care Model relied on structured engagement with both private providers and community-level actors to strengthen service delivery within the NTEP framework. This convergence was not incidental—it was integral to how the model translated architecture into outcomes.

The private sector played a critical role in augmenting diagnostic and clinical capacity across the service pathway (see Chapter 3.4: End-to-End Service Delivery Pathway). The engagement of 43 private laboratories enabled timely access to investigations such as chest X-rays, blood tests, FNAC, and ultrasonography, addressing capacity and access gaps in public systems. Similarly, the onboarding of private physicians strengthened tele-consultation availability, contributing to over 26,000 consultations and improving responsiveness in treatment initiation and follow-up. As noted in Chapter 3 (District-Level Operations and Case Examples), targeted onboarding—such as in Darjeeling—demonstrated how structured private sector engagement directly influenced service volume and continuity.

At the community level, Outreach Workers (ORWs) formed the backbone of last-mile service delivery (see Chapter 3.1: District-Level Roles and Responsibilities and Chapter 3.4: Service Delivery Pathway). Their role extended beyond logistics to include counselling, adherence reinforcement, and coordination with TU-level staff such as STS and STLS. As highlighted in Chapter 3 (Community Coordination Examples), ORWs worked in alignment with ASHAs and district TB teams, ensuring that doorstep services complemented existing public health mechanisms rather than creating parallel structures.

The combined effect of these efforts is reflected in programme outputs: over 142,000 sputum samples collected, 9,300+ drug deliveries completed, and more than 44,000 diagnostic services delivered. These outcomes reinforce the central argument made in Chapter 2 (Programme Design Assumptions)—that integration with existing systems, rather than substitution, is key to scale and sustainability.

Together, private sector participation and community engagement strengthened both access and accountability within the care continuum. The experience demonstrates that when embedded within public systems and supported by clear coordination mechanisms, these partnerships can significantly enhance the reach, responsiveness, and effectiveness of TB care delivery.

Conclusion

The 3-D TB Care Model showed that innovation by itself does not strengthen public health systems. What truly makes a difference is how well new ideas are integrated into existing structures, how consistently processes are followed, how carefully services are verified, and how actively people remain engaged.

The model worked not because it introduced something entirely new, but because it reinforced existing systems with greater clarity, transparency, and responsiveness. Its long-term value will depend on whether these practices continue - whether early-warning alerts remain in use, verification remains routine, dashboard reviews continue to guide decisions, and clear and effective issue-resolution pathways continue to remain in place.

Preparedness for Future Disruptions

Although the 3-D TB Care Model was conceptualised in response to pandemic-related service disruption (Chapter 1), its relevance extended beyond COVID-19. The project demonstrated that TB service continuity can be maintained even when mobility is restricted, facility access is uneven, or administrative functioning is disrupted.

Through structured tele-consultation, doorstep service delivery, digital task tracking, and verification discipline, the model created a decentralised continuity mechanism that could function during periods of uncertainty. The ability to monitor PwTBs remotely, trigger early-warning alerts, and escalate quickly across administrative levels strengthens system resilience.

The outcomes documented across Chapters 4 through 10 - including preventive re-engagement of PwTBs, digital traceability, and stable performance during managerial transition - validate that the system can operate under stress without fragmentation.

In this sense, the project did not merely deliver TB services during a crisis. It strengthened the government system's preparedness for future disruptions, whether caused by pandemics, climate events, migration shocks, or other public health emergencies.

11. WAY FORWARD

The 3-D TB Care Model has formally concluded under the C19RM grant. But the systems it tested, refined, and stabilised raise an important question:

What should happen next?

Across Chapters 1 through 11, one theme remained consistent: The intervention worked not because it introduced a parallel structure, but because it strengthened existing systems through disciplined integration.

The way forward, therefore, does not lie in replicating the project unchanged. It lies in preserving and adapting the principles that proved effective.

11.1 What Can Be Retained

Three elements demonstrated clear value across districts and phases:

1. Early-Warning Monitoring

The Sudama Mahto case (Chapters 6 and 10) showed that dashboard alerts prevented loss-to-follow-up.

This preventive function is perhaps the strongest contribution of the model.

Even if doorstep services are scaled back, automated alerts for:

- Missed refills
- Missed tele-consults
- Overdue follow-ups

should be embedded within routine TB dashboards.

Preventing a problem is easier and more effective than fixing it later.

2. Verification Discipline

The delivery dispute case (Chapters 6 and 10) demonstrated that layered verification:

- Protected staff

- Preserved financial integrity
- Strengthened institutional trust

Randomised field verification and telephonic cross-checks should remain part of any performance-linked system.

Accountability lasts only when checking and verification become a regular part of the system.

3. Structured Escalation Pathways

Across multiple case studies (Darjeeling physician onboarding, route reorganisation, lost-to-follow-up re-engagement), the presence of defined escalation channels shortened corrective cycles.

Future system strengthening efforts should clearly define escalation processes at the design stage, rather than waiting to set them up after problems arise.

11.2 What Can Be Adapted

Not every element requires permanent universal continuation.

Doorstep services, for example, demonstrated highest value in:

- Hard-to-reach geographies
- High-migration districts
- Elderly or mobility-constrained populations
- Urban informal settlements

A future iteration may benefit from targeted deployment rather than universal overlay.

11.3 Strengthening Digital Integration

The PwTB Support Portal (PSP) proved that task-based dashboards improve managerial responsiveness (Chapter 5).

However, sustainability may not require maintaining PSP as a standalone platform.

Instead, its core features could inform enhancement of existing systems such as NIKSHAY:

- Real-time task flags
- Role-based dashboards
- Geo-tag validation

- Escalation prompts

The key learning from the digital experience is about how the system works, not about any one specific platform.

11.4 Human Resource Lessons

The ORW and Tele-caller roles (Chapter 7) demonstrated that structured task allocation improves continuity.

Future programming may consider:

- Integrating these functions into TU-level roles
- Creating surge-support cadres for high-burden districts
- Leveraging tele-support hubs during peak case periods

The insight is not to permanently create new parallel cadres, but to institutionalise structured follow-up capacity.

11.5 If There Is Another Iteration

Should another iteration be considered?

The experience suggests that a second-generation model could be:

- More targeted
- More digitally integrated with national platforms
- More focused on high-risk districts
- More embedded in state-level review systems

A future iteration could prioritise:

1. High-loss-to-follow-up districts
2. DR-TB-heavy geographies
3. Migration-prone urban centres
4. Districts with demonstrated digital readiness

Rather than rebuilding from scratch, a next iteration should:

- Begin with established convergence
- Deploy refined SOPs

- Embed verification from day one
- Include transition planning within design

The first phase showed that the model can work in practice. A second phase could focus on improving and refining it further.

11.6 Institutional Preparedness for Future Disruptions

The original C19RM design emerged from pandemic uncertainty (Chapter 1).

Public health systems will face future disruptions - whether pandemics, climate-related displacement, or migration shocks.

The 3-D TB Care Model demonstrated that:

- Decentralised service delivery is feasible
- Remote monitoring is manageable
- Digital traceability can preserve accountability
- Integration is possible without fragmentation

These lessons extend beyond TB.

They contribute to broader health system resilience planning.

11.7 The Larger Institutional Contribution

The most durable contribution of the 3-D TB Care Model may not be doorstep sputum collection or tele-consultation volumes.

It may well be the behavioural shift toward:

- Data-driven review culture
- Preventive monitoring
- Escalation transparency
- Verification normalisation

If these practices continue within NTEP, the intervention will have reshaped governance rather than simply delivered services.

11.8 Pool of Private Providers and Outreach Workers

As outlined in Chapter 3.1 (Roles and Responsibilities Across Levels) and Chapter 3.3 (Coordination Mechanisms: The Union, Public and Private Actors), the effectiveness of the C19 RM-supported 3-D TB Care Model depended significantly on building and sustaining a functional pool of private providers and Outreach Workers (ORWs). These two groups formed the operational backbone of service delivery - bridging clinical capacity and last-mile reach.

The engagement of private providers expanded the availability of diagnostic and clinical services within the programme. As discussed in Chapter 3.4 (End-to-End Service Delivery Pathway), private laboratories enabled timely access to investigations such as chest X-rays, blood tests, FNAC, and ultrasonography, while private physicians strengthened tele-consultation capacity. This was particularly critical in districts where public system capacity was constrained or unevenly distributed. The onboarding of providers was undertaken in coordination with district NTEP structures, ensuring alignment with programme protocols and avoiding fragmentation of care (see Chapter 3.3).

Parallel to this, the deployment of 265 Outreach Workers (ORWs) ensured that services translated into actual patient-level outcomes. As described in Chapter 3.1 (District-Level Roles) and operationalised through the service pathway in Chapter 3.4, ORWs were responsible for sputum collection, medicine delivery, adherence support, and coordination with TU-level staff. Their presence enabled the shift from facility-based to doorstep service delivery, reducing access barriers while maintaining continuity of care.

Importantly, both private providers and ORWs were not standalone actors; they operated within a structured, digitally monitored system anchored in the PSP and aligned with NTEP data and workflows (see Chapter 3.2: Information Flow and Escalation Pathways). This ensured that service delivery remained traceable, accountable, and integrated with national reporting systems.

The combined pool of private providers and ORWs demonstrates a key operational insight: scale in TB service delivery is achieved not only through infrastructure, but through strategically engaged human resources. When clinical capacity (private providers) and community-level reach (ORWs) are aligned within a coordinated framework, the system becomes both responsive and resilient—capable of delivering sustained outcomes even in constrained or emergency contexts.

Conclusion: Building Future Health System Resilience

The 3-D TB Care Model demonstrated operational viability across diverse geographies. Its enduring contribution lies in showing that structured processes, digital visibility, institutional alignment, and human-centred engagement can coexist within a single framework.

The way forward is therefore not only about expanding coverage or increasing numbers. It is about preserving the integrity of this framework and recognising that its design lessons are transferable. In any future public health project, the principles demonstrated here - clarity, accountability, convergence, adaptability, and PwTB-centred engagement - will remain critical determinants of programme success.

The original design of the 3-D TB Care Model emerged from pandemic uncertainty. However, its lasting relevance lies in the resilience it helped build within routine systems. The project demonstrated that decentralised service delivery, supported by real-time digital monitoring and structured verification, can maintain continuity even when traditional facility-based systems face constraints. By embedding escalation pathways and strengthening district-level review culture, the model prepared administrative systems to respond more quickly to emerging risks.

Importantly, these preparedness gains were not theoretical projections. They were validated through delivery dispute resolution, preventive re-engagement of PwTBs, dashboard-triggered managerial corrections, and smooth transition across implementation phases (Chapters 6, 9, and 10).

Future public health shocks are inevitable. The experience of this intervention suggests that resilience does not depend solely on emergency funding. It depends on institutionalising early-warning systems, decentralised delivery mechanisms, and disciplined monitoring practices.

If these elements are retained and adapted, the system will be better prepared for the next disruption - whether pandemic, environmental, or socio-economic.

ANNEXURES

ANNEXURE 1: QUESTIONNAIRE FOR STAKEHOLDERS

1. PWTBS (TB Beneficiaries)

1. Who explained this these services to you, and did you understand what support it would provide?
2. Was there any change (in language, form or questions, etc. asked when you felt this programme was easier to understand than before? If yes, what was that one change you felt made a difference?
3. How easy or difficult was it to get your TB medicines and tests on time?
4. How often were you contacted or followed up by programme staff?
5. Were these contacts helpful in solving problems, or mostly repetitive?
6. When you faced a difficulty, was it resolved? By whom?
7. Was there any change in the programme support (like timing, frequency of support, etc.) that helped continuing treatment easier? If yes, what was it?
8. How would you describe communication skills of programme staff when interacting with you?
9. Did this programme make it easier for you to continue and complete treatment?
10. What was the most helpful part of the programme for you?
11. What was the least helpful or most difficult part?
12. What made this programme feel different from previous government initiatives?
13. Overall, did this system work well for you? Why or why not?

2. TELECALLERS

1. How was your role and responsibility explained to you at the start?
2. What did your daily work typically involve?
3. How well did the digital platform support your work?
4. Were PwTBs able to understand the questions easily? If yes, why (language easy to understand, simply phrased, contextual to PwTB's situation, etc.)
5. What kinds of PwTB issues came up most frequently?
6. What happened when you escalated a problem - was it resolved?
7. Which SOPs were easy to follow, and which were difficult in practice?
8. What were the biggest challenges in doing your job?
9. What worked particularly well in this system?
10. Did you feel your work made a real difference to PwTBs? If yes, how and why?
11. What one change would improve this system the most?

3. TB NODAL COORDINATORS (DISTRICT)

1. What were your main responsibilities in this programme?
2. How clear was your authority to act on PwTB or field issues?
3. How did information flow from tele-callers and field staff to you?
4. Did the digital system help you manage cases effectively?
5. Which SOPs worked well on the ground?
6. Which SOPs were difficult to implement, and why?
7. What coordination challenges did you face?
8. What adaptations or workarounds were needed?
9. Where did the programme clearly succeed?
10. What made this programme feel different from previous government initiatives?

11. What would you change if this model continues?
12. Without this system, what gaps would immediately reappear?

4. DISTRICT TB OFFICERS (DTOs)

1. What was your role in overseeing this programme at district level?
2. Did implementation match the original design and intent?
3. How effective was coordination across different stakeholders/actors?
4. Did technology and dashboards support decision-making?
5. Were resources (manpower, technical, etc.) allocated to you adequate for effective implementation of programme mandate?
6. How well did the system engage private practitioners?
7. Were incentives and payments processed on time?
8. What improved TB service delivery because of this programme?
9. What constraints repeatedly affected implementation?
10. What made this programme feel different from previous government initiatives?
11. If this programme ended tomorrow, what district-level functions would be most affected?
12. Would you recommend continuing or scaling this model? Why?
13. Would this model work in Pandemic situations.

5. STATE TB OFFICERS (STOs)

1. What problem was the C19 RM mechanism designed to address?
2. How closely did implementation align with programme objective?
3. Were SOPs realistic across different state contexts?
4. How did feedback from districts reach the state level?
5. How effective was technology in strengthening programme delivery & oversight? Please illustrate with examples.
6. What variations did you observe across districts or states?
7. What worked well at scale?
8. What limitations did you face in implementation?
9. What made this programme feel different from previous government initiatives?
10. Is this model sustainable beyond the project period? Please explain.
11. Are there any aspects of programme design that you would like changed/redesigned? If yes, please explain these changes and why.
12. Would this model work in Pandemic situations? Why?

6. PRIVATE PRACTITIONERS

1. How were you introduced to this programme?
2. Were your roles and expectations clearly communicated?
3. How easy was it to report cases and follow procedures?
4. Did the digital system make participation easier or harder?
5. How was coordination with government and project staff ?
6. Were incentives or payments timely and predictable?
7. Did this programme benefit your PwTBs?
8. Without this system, what aspect of PwTB care would be most affected?
9. What challenges did you face in participating?
10. What worked well for you in this system?
11. What made this programme feel different from previous government initiatives?
12. What would make you continue or leave from this programme?

7. OUTREACH WORKERS (ORWs)

1. What were your primary responsibilities?
2. How were you linked to tele-callers and Nodal Coordinators?
3. How were sputum collections organised?
4. How were drug deliveries managed?
5. What logistical challenges did you face (distance, transport, weather)?
6. Did PwTBs welcome home visits?
7. Were there safety or privacy concerns?
8. Did PwTBs hide their diagnosis from family/neighbours?
9. Did doorstep visits increase or reduce stigma?
10. How did you handle sensitive situations?
11. Did you use a mobile app?
12. Was real-time reporting possible?
13. What were the challenges/efficiencies of using a mobile app?
14. How did using a mobile app make your work easy/difficult?
15. Were your visits verified?
16. Did verification affect reporting behaviour?
17. Was there any small operational change that improved field efficiency?