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FROM THE AMERICAN PEOPLE

TB CARE I

TB CARE I
FINAL
REPORT

TB CARE I was led by KNCV Tuberculosis Foundation, who also led USAID's previous TB control projects: TB CAP (2005-2010) and TBCTA (2000-2005).



TB CARE I Partners

American Thoracic Society (ATS)

FHI 360

Japan Anti-Tuberculosis Association (JATA)

Management Sciences for Health (MSH)

International Union Against Tuberculosis and Lung Disease (The Union)

World Health Organization (WHO)



International Union Against
Tuberculosis and Lung Disease
Health solutions for the poor



World Health
Organization

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Disclaimer

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

Cover: TB patient and nurse, Nigeria (Photo by Tristan Bayly)
Above Right: Child with MDR-TB, Zimbabwe (Photo by Jeroen van Gorkom)



3 I's	Intensified TB case finding, Isoniazid Preventive Therapy and TB Infection control	MDR-TB	Multidrug-resistant Tuberculosis
ACSM	Advocacy Communication Social Mobilization	M&E	Monitoring and Evaluation
AFB	Acid Fast Bacilli	MGIT	Mycobacterial Growth Incubator Tube
ART	Antiretroviral Therapy	MoH	Ministry of Health
BSL	Biosafety Level	MSH	Management Sciences for Health
CAR	Central Asian Republics	NAP	National AIDS Program
CB-DOTS	Community-Based DOTS	NGO	Non-Governmental Organization
CTBC	Community-Based TB Care	NFM	New Funding Model
CDC	Centers for Disease Control and Prevention	NSP	National Strategic Plan
CoE	Center of Excellence	NTP	National TB Program
CDR	Case Detection Rate	NRL	National Reference Laboratory
CHW	Community Health Worker	OD	Operational District
CN	Concept Note	OGAC	US Office of the Global AIDS Coordinator
CNR	Case Notification Rate	OPD	Outpatient Department
CPT	Co-trimoxazole preventive therapy	OR	Operations Research
CSO	Civil Society Organization	PCA	Patient-Centered Approach
DOT	Directly Observed Treatment	PLHIV	People Living with HIV
DOTS	Directly Observed Treatment Short Course	PMDT	Programmatic Management of Drug-resistant Tuberculosis
DR	Drug Resistance	PoC	Protection of Civilian
DST	Drug Susceptibility Testing	PPM	Private Public Mix
ECSA	East, Central and Southern Africa	PSS	Psycho-social Support
EQA	External Quality Assurance	QMS	Quality management system
ERR	Electronic Recording and Reporting	R&R	Recording & Reporting
GF	Global Fund for Aids, Tuberculosis and Malaria	RDQA	Rapid Data Quality Assessment
GLC	Green Light Committee	RIF	Rifampicin
GLI	Global Laboratory Initiative	RR-TB	Rifampicin Resistant Tuberculosis
HC	Health center	SANAS	South Africa National Accreditation System
HCW	Healthcare Worker	SLD	Second Line Drug
HF	Health facility	SNRL	Supra-national Reference Laboratory
HSS	Health System Strengthening	SOP	Standard Operating Procedures
IC	Infection Control	SS+	Sputum Smear-Positive
ICF	Intensified Case Finding	TA	Technical Assistance
ICT	Information and Communications Technology	TB	Tuberculosis
IDP	Internally Displaced Persons	TB-IC	TB Infection Control
IEC	Information, Education and Communication	TB CAP	Tuberculosis Control Assistance Program
IPT	Isoniazid Preventive Therapy	TBCTA	Tuberculosis Coalition for Technical Assistance
ISTC	International Standards of Tuberculosis Care	TFM	Transitional Funding Mechanism
JATA	Japan Anti-Tuberculosis Association	USAID	United States Agency for International Development
KNCV	KNCV Tuberculosis Foundation	XDR-TB	Extensively Drug-Resistant Tuberculosis
LED	Light-emitting Diode (microscopy)	Xpert	GeneXpert MTB/RIF
LPA	Line Probe Assay	WHO	World Health Organization
LSP	Laboratory Strategic Plan		

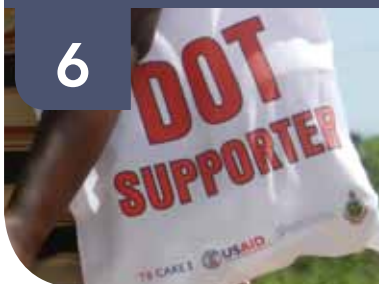
Message from the
Project Director

5



Executive Summary

6



Introduction

9

Contribution to USAID
Targets

11



Technical Areas

19



Country Achievements

54



Global Fund

104



The Way Forward

106



Knowledge Exchange

107



Acknowledgements

109





MESSAGE FROM THE PROJECT DIRECTOR

At the end of five years of implementation, in which we achieved a major step forward in the fight against TB. It is my pleasure to acknowledge and thank all of the people who contributed to TB CARE I's success.

First, I would like to thank USAID whose generous funding made our work possible, and specifically my colleagues on the USAID TB Team in Washington and the USAID Mission teams in the countries; you were so instrumental in making the project successful.

TB CARE I was truly a team effort, working towards a shared vision to improve TB prevention, treatment and care. The collaboration and commitment of the Ministries of Health and National TB Control Programs in the countries where the project worked were essential. It was through these productive and steadfast collaborations that TB CARE I was able to contribute to country-specific and global gains.

I would also like to thank the coalition partners that implemented the project: American Thoracic Society, FHI 360, The International Union Against Tuberculosis and Lung Disease, Japan Anti-Tuberculosis Association, Management Sciences for Health and the World Health Organization. The project's success was greater than the sum of its parts, and each coalition partner played a unique and substantial role in the project. In addition, I would like to thank the partner representatives and everyone that has worked for the project, as it was only through their day-to-day determination, intellect and hard work that the overall project achieved such notable results.

I would also like to acknowledge the numerous partners at the global, national, regional and grassroots level. Although too numerous to count, these partners were critical in carrying out the mandate of TB CARE I - from global guideline development to the

implementation of our interventions on the ground. I recognize the contribution of these diverse, experienced and valuable partners.

Finally, I would like to thank all my colleagues at KNCV Tuberculosis Foundation, and in particular, my team in the project management unit who worked so hard in successfully facilitating the implementation of this project.

Dr. Maarten van Cleeff, MD, PhD
TB CARE I Project Director



Implemented from 2010-2015, TB CARE I was a global cooperative agreement funded by the United States Agency for International Development (USAID). As one of the main global mechanisms for implementing the United States Government (USG) tuberculosis (TB) strategy and contributing to TB/HIV activities under the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), TB CARE I implemented 95 core/global projects, 10 regional projects and 22¹ country projects. Although technically a five-year project ending in September 2015, TB CARE I's successful ability to meet strong USAID demand and investment across numerous countries resulted in the majority of TB CARE I projects ending after only four years of implementation. This project made extraordinary contributions to USAID targets and TB control efforts globally as summarized below:

Between 2011-2014 (representing Years 1-4 of TB CARE I), nearly 4.5 million TB cases (all forms) were notified across the 21 TB CARE I countries including 2.1 million new bacteriologically confirmed TB cases. Kazakhstan remained the only country by the end of 2014 with a case detection rate (CDR) above the ambitious 84% target, but progress was made with 11 TB CARE I countries (52%) having a CDR above 70% in 2014 compared to only seven countries (33%) in 2010. Having more precise CDR estimates as a result of nine TB CARE I-supported national TB prevalence surveys is also a major achievement.

Treatment success improved substantially. Even with changes in case definition in 2013, improvements between 2009 and 2013 cohorts were noted in 12 countries (57%); eight countries exceeded the 87% treatment success rate (TSR) target in 2013 (verses only four countries (19%) in 2009). The successful treatment of 2,481,563 patients translated to a 97% achievement of the 2014 USAID target

(2.55 million SS+ patients successfully treated over five years).

Four more TB CARE I countries reported in 2014 (52% or 11 countries) on TB among healthcare workers (HCWs) than in 2010 (33%); globally in 2014, only 34% (74/217) of countries reported on TB among HCWs. Although the actual number of HCWs diagnosed with TB also increased (347 in 2010 to 643 in 2014), major efforts still need to be made to better diagnose and report on TB among HCWs.

Impressive results were seen in the diagnosis and treatment of multidrug-resistant TB (MDR-TB) as well. In 2014, 21,058 rifampicin resistant (RR-) or MDR-TB patients were diagnosed across all 21 TB CARE I countries - an 83% jump from the 2010 baseline (11,491). Treatment initiation for RR/MDR-TB also expanded considerably with 19,156 confirmed and unconfirmed MDR-TB cases started on treatment in 2014 - a 132% increase compared to 2010 (8,262). Between 2011-2014, 56,623 MDR-TB patients were initiated on second line drugs in TB CARE I countries, making up 99.3% of the global USAID target of diagnosing and starting on treatment 57,200 MDR-TB cases by 2014.

¹ Pakistan excluded from data collection and analyses based on limited scope and duration of TB CARE I in that country.

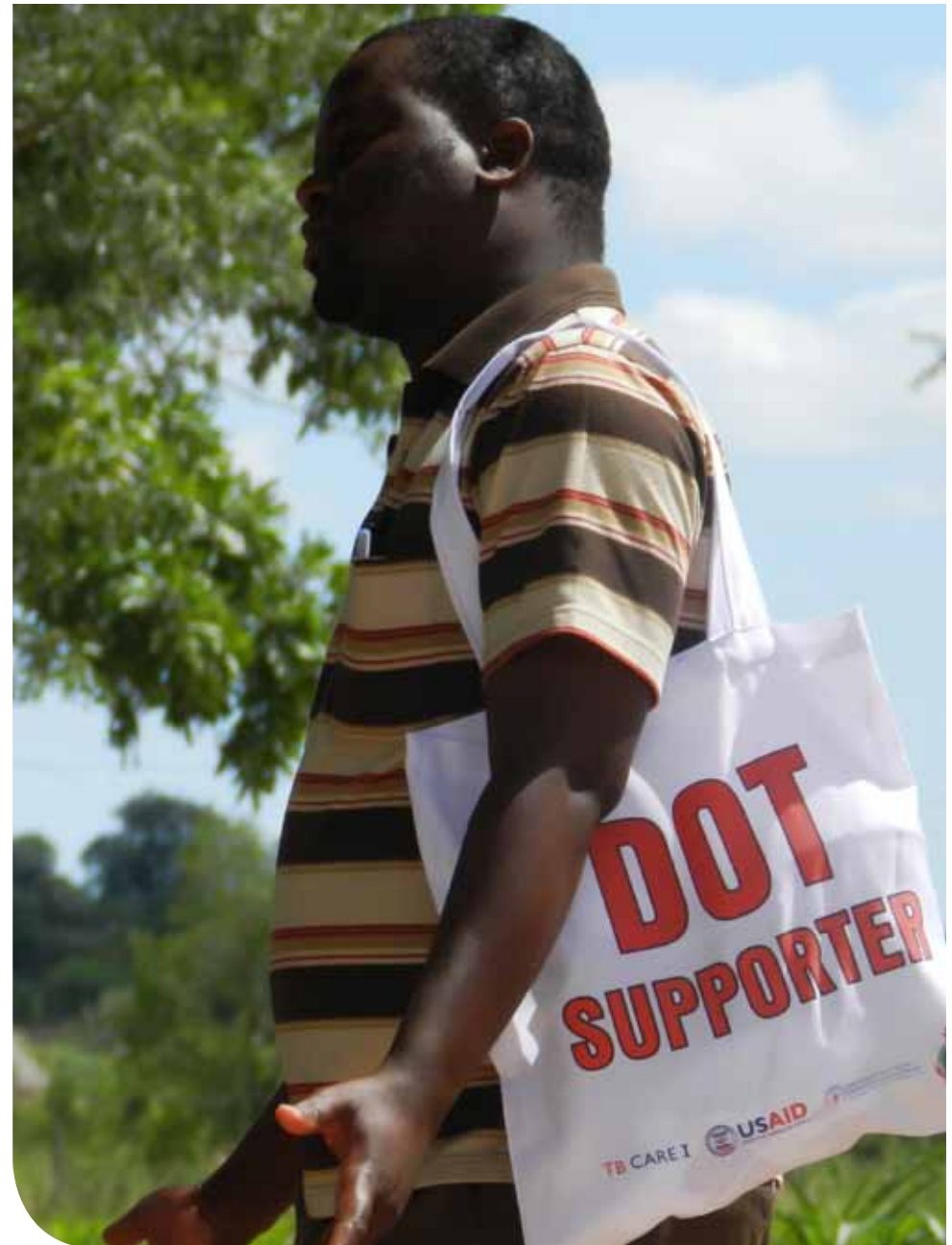
In addition to these impressive contributions to global USAID targets, TB CARE I achieved notable results across the eight technical areas of the project as highlighted below:

Universal and early access:

- Piloting of the patient-centered approach (PCA) package in Cambodia, Indonesia, Mozambique, Nigeria and Zambia demonstrated that the tools provided practical approaches that enabled national TB programs (NTPs) and health facilities to take steps to improving patient-centered care.
- In 2014, 83,222 pediatric TB cases were notified to NTPs in the 21 TB CARE I countries - a 13% increase from 2013 (73,751).
- In Year 4, 33,666 TB patients were notified by private providers in TB CARE I-supported areas - a more than four-fold increase from the same areas in Year 2 (6,415).

Laboratories:

- By the end of the project, 88% (15/17) of active TB CARE I countries had developed laboratory strategic plans, compared to only 39% (7/18) at baseline.
- In 2013, thanks to long term support from various partners, the Uganda National Reference Laboratory was accredited as the first Supra-National Reference Laboratory in East Africa.
- In total, 141,209 successful GeneXpert MTB/RIF tests were conducted with TB CARE I-supported machines; 43,966 samples tested positive for TB (31% positivity rate) of which 10,658 were rifampicin (RIF) resistant (24% RIF resistant rate).
- By the end of Year 4, all countries implemented external quality assurance (EQA) programs for microscopy with 12/17 countries (71%) having greater than 75% EQA coverage.



Above Right: DOTS supporter, Zimbabwe (Photo by Barnet Nyathi)

Infection Control (TB-IC):

- Compared to only 50% of TB CARE I countries at 2010 baseline (9/18), all TB CARE I countries had developed national TB-IC guidelines by the end of the project (17/17).
- The FAST (Finding cases Actively, Separating them safely and Treating them effectively) strategy was implemented in 12 high-volume hospitals in Nigeria. Seven hospitals out of the 12 (58%) managed to reduce time to diagnosis; six (50%) reduced both time to diagnosis and time to treatment.
- In Year 4 alone TB CARE I supported TB-IC activities in 479 health facilities across 14 countries.

Programmatic Management of Drug Resistant TB:

- Considerably more MDR-TB patients were successfully treated from the 2012 cohort (8,730) than the baseline 2009 cohort (3,863), although treatment success rates are still too low (65% in 2009 and 68% in 2012).
- Over the course of TB CARE I, ten country projects invested directly in the socio-economic support of TB and MDR-TB patients.
- Outpatient care for TB and MDR-TB patients was piloted and/or scaled up in six project countries.

TB/HIV:

- The percentage of HIV positive TB patients on antiretroviral therapy (ART) rose to 77% in 2014, up from 39% in 2010.
- Co-trimoxazole preventive therapy (CPT) coverage among HIV-positive TB patients increased slightly from 85% in 2010 to 88% in 2014.
- In 2014, 71% (15/21) of TB CARE I countries reported to WHO on screening for TB among people enrolled on HIV care compared to 57% (12/21) for 2010.

Health Systems Strengthening (HSS):

- TB CARE I contributed to formal NTP reviews in 12 countries, technically supported or led epidemiological assessments in six countries, and played a significant role in national strategic plan development in 16 countries.
- A total of 50,793 people were trained by TB CARE I (56% male/44% female).

Monitoring & Evaluation (M&E), Operations Research (OR) and Surveillance:

- By project end, 52% (11/21) of TB CARE I countries had case or patient-based electronic recording and reporting (ERR) systems compared to only 33% (7/21) at baseline.
- Ninety-four OR studies were completed across 18 countries.
- A special issue of Public Health Action (July 2015) summarized the TB CARE I-supported Ethiopian OR initiative and published results from six studies conducted through the initiative.
- In Year 4, 88% (15/17) of TB CARE I countries measured data quality on a regular basis, compared to 50% (9/18) of countries at baseline.

Drug Supply and Management:

- Updated Standard Operating Procedures (SOPs) for drug supply and management were available in 76% of active TB CARE I countries (13/17) at the end of Year 4, compared to 44% (8/18) of countries at baseline.
- In Year 5, the project developed a protocol for the rational and safe introduction of bedaquiline, a new TB drug for MDR-TB treatment. TB CARE I supported Indonesia, Kazakhstan and Vietnam to develop and implement country-specific versions of the protocol.

Launched in October 2010, TB CARE I was a five-year global cooperative agreement (2010-2015) funded by the United States Agency for International Development (USAID). Building and expanding upon previous USAID tuberculosis (TB) prevention and treatment efforts, namely the Tuberculosis Control Assistance Program (TB CAP, 2005-2010) and the Tuberculosis Coalition for Technical Assistance (TBCTA, 2000-2005), TB CARE I was designed to implement the United States Government (USG) Global Tuberculosis Strategy (2009-2014) and contribute to TB/HIV activities under the U.S. President's Emergency Plan for AIDS Relief (PEPFAR).

The USG TB strategy, which supported the objectives of the Global Plan to STOP TB, contained four main goals and targets:

1. Contribute to a 50 percent reduction in TB deaths and disease burden from the 1990 baseline;
2. Sustain or exceed the detection of at least 84 percent of sputum smear-positive (SS+) cases of TB and successfully treating at least 87 percent of cases detected in countries with established USG tuberculosis programs;
3. Successfully treat 2.55 million new sputum smear-positive TB patients under DOTS programs by 2014, primarily through support for needed services, commodities, health workers, and training, and additional treatment through coordinated multilateral efforts; and
4. Diagnose and initiate treatment of at least 57,200 new multi-drug resistant (MDR-TB) cases by 2014 and provide additional treatment through coordinated multilateral efforts.

As one of the main global mechanisms for implementing this strategy and contributing to the overall USG TB control targets, TB CARE I worked closely with national governments, other national

and international TB initiatives and local partners in providing technical support to national TB control efforts.

The project was implemented by a unique coalition of seven international organizations in TB control. KNCV Tuberculosis Foundation (KNCV) was the prime partner and collaborated closely with American Thoracic Society (ATS), FHI 360, International Union Against Tuberculosis and Lung Disease (The Union), Japan Anti-Tuberculosis Association (JATA), Management Sciences for Health (MSH) and the World Health Organization (WHO).

The project focused on eight priority technical areas that aligned with the USG TB strategy:

1. Universal and Early Access
2. Laboratories
3. Infection Control (IC)
4. Programmatic Management of Drug Resistant TB (PMDT)
5. TB/HIV
6. Health Systems Strengthening (HSS)
7. Monitoring & Evaluation (M&E), Operations Research (OR) and Surveillance
8. Drug Supply and Management

TB CARE I also followed four over-arching elements, representing the 'CARE' of TB CARE:

- **Collaboration and Coordination**
- **Access to TB services for all people**
- **Responsible and Responsive Management Practices**
- **Evidence-based M&E**

I INTRODUCTION

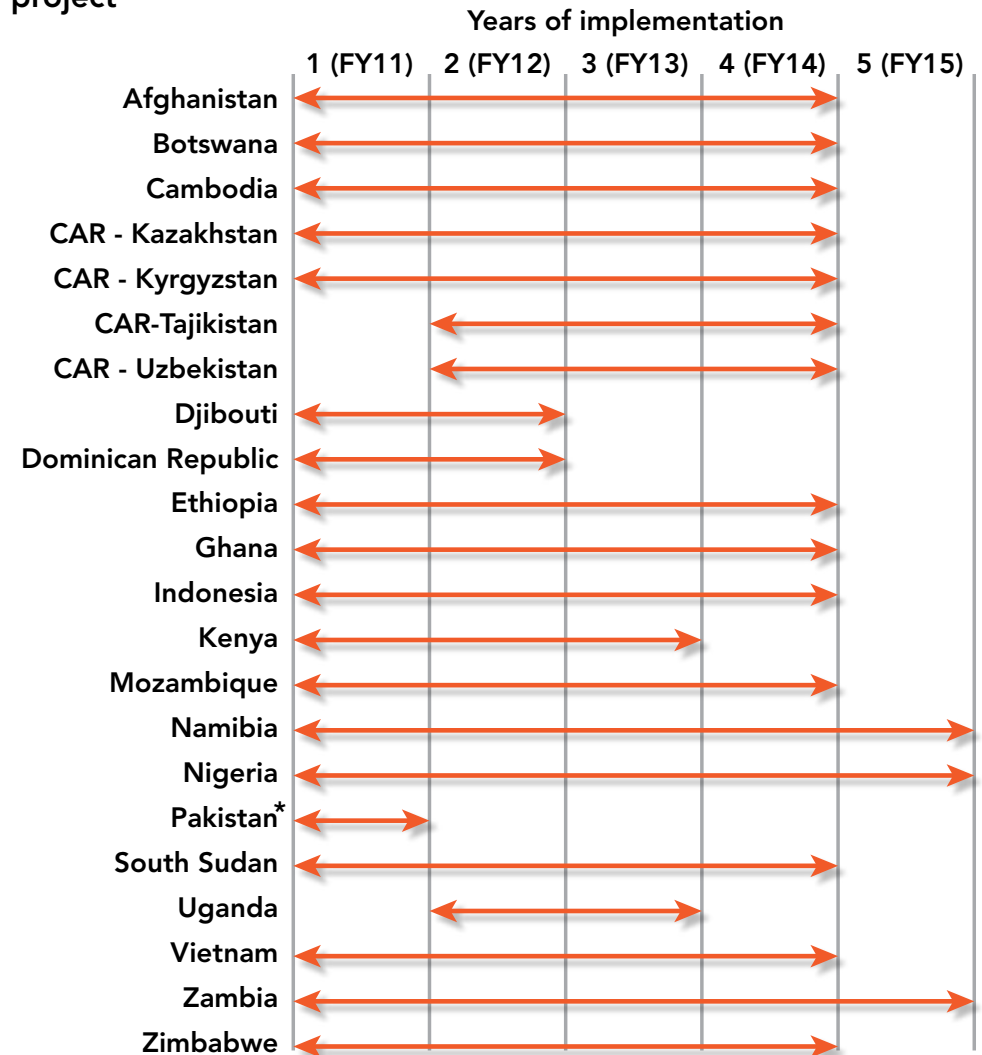
Over the life of the project, 95 core/global projects (including 35 multi-year projects), 10 regional projects and 22² country projects were implemented. A list of country projects and their duration are included on the right. Although technically a five-year project ending in September 2015, TB CARE I's successful ability to meet strong USAID demand and investment across numerous countries resulted in the majority of TB CARE I projects ending after only four years of implementation. This final report demonstrates the project's contribution to USAID's global targets and highlights key results across all technical areas and country projects during the life of the project.³



2 Total number of TB CARE I countries each year: Year 1 (18), Year 2 (21), Year 3 (19), Year 4 (17).

3 Whenever possible, country-level data were extracted from the WHO Global TB Report 2015; otherwise national data were collected by TB CARE I from National Tuberculosis Programs (NTPs) or other appropriate data sources (i.e. National AIDS Program (NAP), prison system). Pakistan was not included in data analyses for TB CARE I over the life of the project given its limited scope of work only in Year 1 (therefore data/results from 21 countries are included in this report). Additional details on country achievements and country-specific indicators can be found in the country-specific end-of-project reports, which are available upon request.

Figure 1: TB CARE I Country project duration over the life of the project



*TB CARE I-Pakistan was only implemented in Year 1 with a very specific scope of work so general data collection was not done in that country. Therefore, only 18 countries are included in the Year 1 country project count.

Above left: Prevalence survey, Pakistan (Photo by KNCV)

USAID's goal was to halve TB prevalence and mortality in USAID assisted countries by 2015 (relative to the 1990 baseline), which was consistent with the Global Plan to Stop TB. Three key targets were identified for achieving this goal:

- Sustain or exceed 84% case detection rate (CDR) and 87% treatment success rate (TSR) of those cases in countries with established USAID TB programs;
- Treat successfully 2,550,000 new smear-positive TB cases;
- Diagnose and initiate treatment for 57,200 new cases of MDR-TB.

TB CARE I's contribution to USAID targets was measured through the following key indicators at the national level as reported in the annual WHO Global TB Report:

- Number of cases notified (all forms and new confirmed)
- Case detection rate
- Treatment success rate
- Number (and percentage) of confirmed TB cases among healthcare workers (HCWs)
- Number of MDR cases diagnosed and put on treatment

Figure 2 provides a snapshot of TB CARE I's contributions to USAID targets between 2011 and 2014. Further achievements and analysis per indicator are provided in the subsequent sub-sections.

Figure 2: TB CARE I contributions towards USAID targets across 21 TB CARE I countries (WHO Global TB Report, 2015)

Key Indicators	2010 (Baseline)	2011	2012	2013	2014	2011-2014 Total
# of cases notified (all forms)	1,112,695	1,130,882	1,131,614	1,113,478	1,081,559	4,457,533
# of cases notified (new bacteriologically confirmed)	494,238	515,498	521,436	517,107	507,086	2,061,127
# countries with a CDR above 70% (above 84%)*	7 (1)	8 (1)	7 (1)	9 (3)	11 (1)	11 (1)
# countries with a TSR above 85% (above 87%)	2009: 7 (4)	2010: 7 (4)	2011: 8 (7)	2012: 9 (4)	2013: 12 (8)	12 (8)
# of new and relapse cases successfully treated **	2009: 415,679	2010: 430,374	2011: 431,032	2012: 808,319	2013: 811,766	2,481,563
# countries reporting confirmed TB cases among HCWs (# HCWs reported with TB)	7 (347)	6 (391)	8 (618)	9 (546)	11 (643)	11 (2,545)
# Rifampicin resistant (RR-) or confirmed MDR-TB cases diagnosed	11,491	13,387	16,982	19,561	21,058	70,988
# confirmed and unconfirmed MDR-TB cases initiated on treatment	8,262	8,911	13,024	15,532	19,156	56,623

*As reported in the WHO Global TB Report 2015

**The USAID target was for 2,550,000 new SS+ cases to be treated successfully. 2009-2011 data are for new SS+ TB cases while 2012-2013 data are for all new and relapse cases (in line with the new definitions).

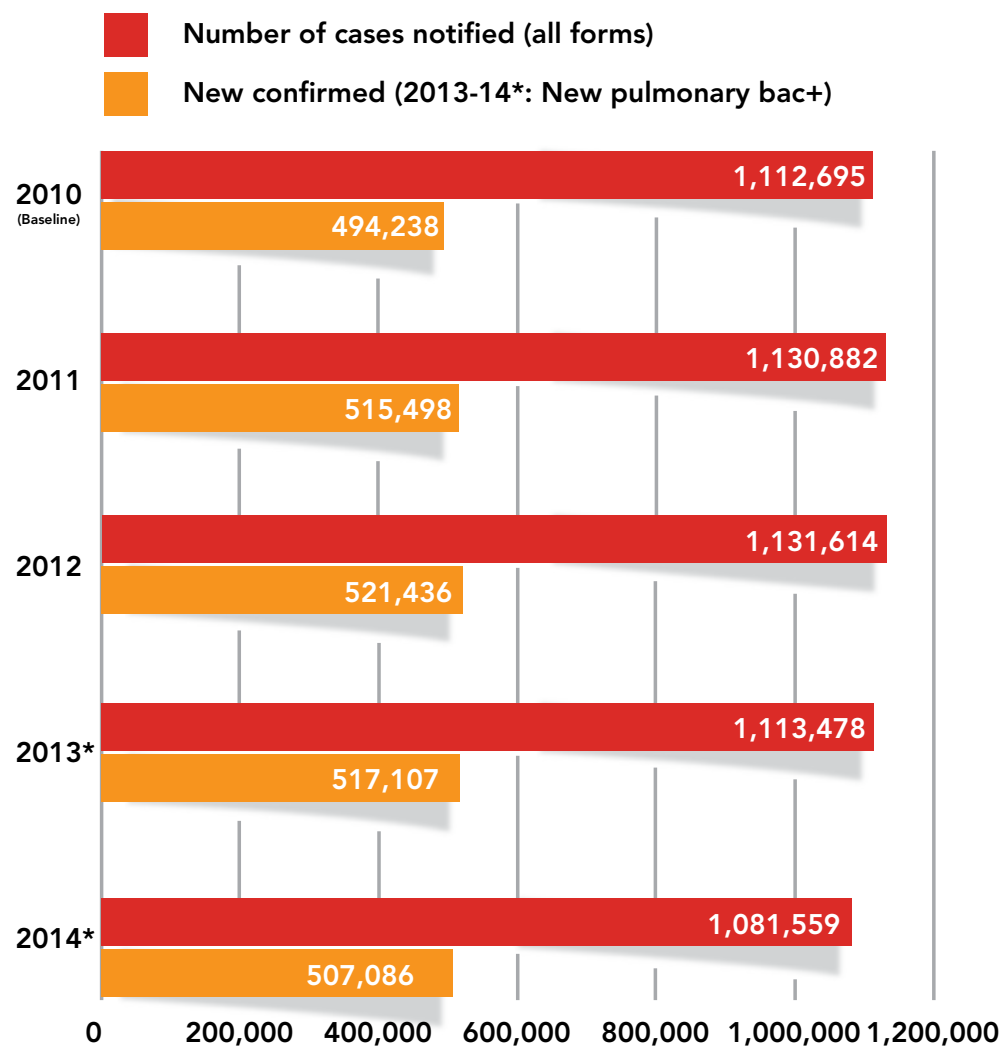
Case Notification

Between 2011-2014 (representing Years 1-4 of TB CARE I), nearly 4.5 million TB cases (all forms) were notified across the 21 TB CARE I countries including 2.1 million bacteriologically confirmed TB cases⁴. In 2014⁵, 1,081,559 TB cases (all forms) were notified of which 507,086 were new bacteriologically confirmed pulmonary TB cases (Figure 3). Consistent with the slow global decline in TB incidence, the number of notified TB cases (all forms) and new confirmed cases both decreased by 3% from 2010 (baseline) to 2014 across TB CARE I countries. However, countries that showed a notable increase in the number of new confirmed TB cases (2010-2014) included Afghanistan (14%), Kazakhstan (68%) and Mozambique (22%). In comparison to baseline (56%), 59% of all new and relapse TB cases in 2014 were male with the variation by country ranging from 41% in Afghanistan to 75% in Vietnam.

⁴ For patient-based data coming from WHO a denominator of 21 countries was used (i.e. Afghanistan, Botswana, Cambodia, Djibouti, Dominican Republic, Ethiopia, Ghana, Indonesia, Kazakhstan, Kenya, Kyrgyzstan, Mozambique, Namibia, Nigeria, South Sudan, Tajikistan, Uganda, Uzbekistan, Vietnam, Zambia and Zimbabwe).

⁵ For programmatic data (i.e. TB CARE I-collected for each fiscal year: October-September) the number of active countries was used as the denominator for that fiscal year (i.e. Year 1: 18, Year 2: 21, Year 3: 19, Year 4: 17).

Figure 3: Number of cases notified (all forms and new bacteriologically confirmed), 2010-2014*, in all 21 TB CARE I countries (WHO 2015)



*From 2010-2012, 'new confirmed' referred to new SS+ cases; from 2013-2014 'new confirmed' refers to new pulmonary bacteriologically confirmed TB cases.

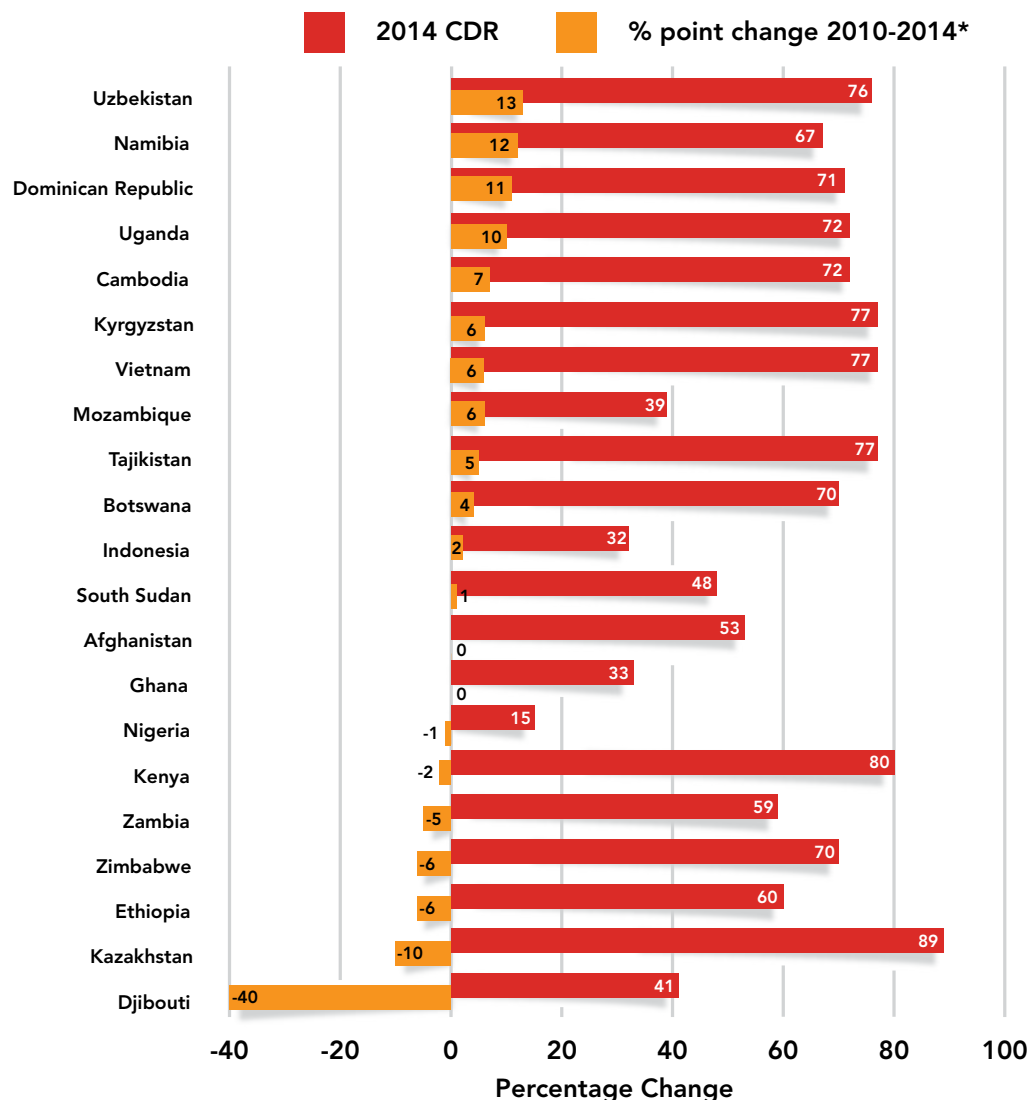
Case Detection Rate

Based on the WHO Global TB Report 2015, in 2010 (TB CARE I baseline) only 33% (7/21) of TB CARE I countries had a case detection rate above the Stop TB target of 70%; only Kazakhstan had a CDR above the USG target of 84%. By the end of 2014, 52% (11/21) of TB CARE I countries had a CDR above 70% and Kazakhstan remained the only country with a CDR above 84%. The CDR increased in 57% (12/21) of TB CARE I countries between 2010 and 2014; 33% (7/21) showed improvement in the last year alone. Notable increases in CDR from project start to 2014 include the Dominican Republic (60% to 71%), Namibia (55% to 67%), Uganda (62% to 72%) and Uzbekistan (63% to 76%) (Figure 4).

It can be difficult to track progress in CDRs over time as this is an estimated value⁶. Prevalence surveys and other information are used to re-estimate these values, often affecting previously reported estimates. TB CARE I provided substantial and varied technical and financial support for several national TB prevalence surveys (see page 48 for more details). Therefore, part of the success of reported case detection rates is the greater level of accuracy of new incidence estimates based on the prevalence surveys that TB CARE I supported. Although Ghana (33%), Indonesia (32%) and Nigeria (15%) have low CDRs, these have all been recently adjusted based upon TB CARE I-supported prevalence surveys. This underscores the importance and need for periodic prevalence surveys to understand the true burden and trend of TB disease.

⁶ Case detection rate (CDR) is the number of new cases reported to NTPs in a given year divided by estimated incidence for the same year. (WHO, 2015)

Figure 4: 2014 case detection rates and percentage point change from 2010-2014 for all 21 TB CARE I countries (WHO 2015)



*Percentage change measured between 2011 and 2013 for South Sudan.



Treatment Success Rate

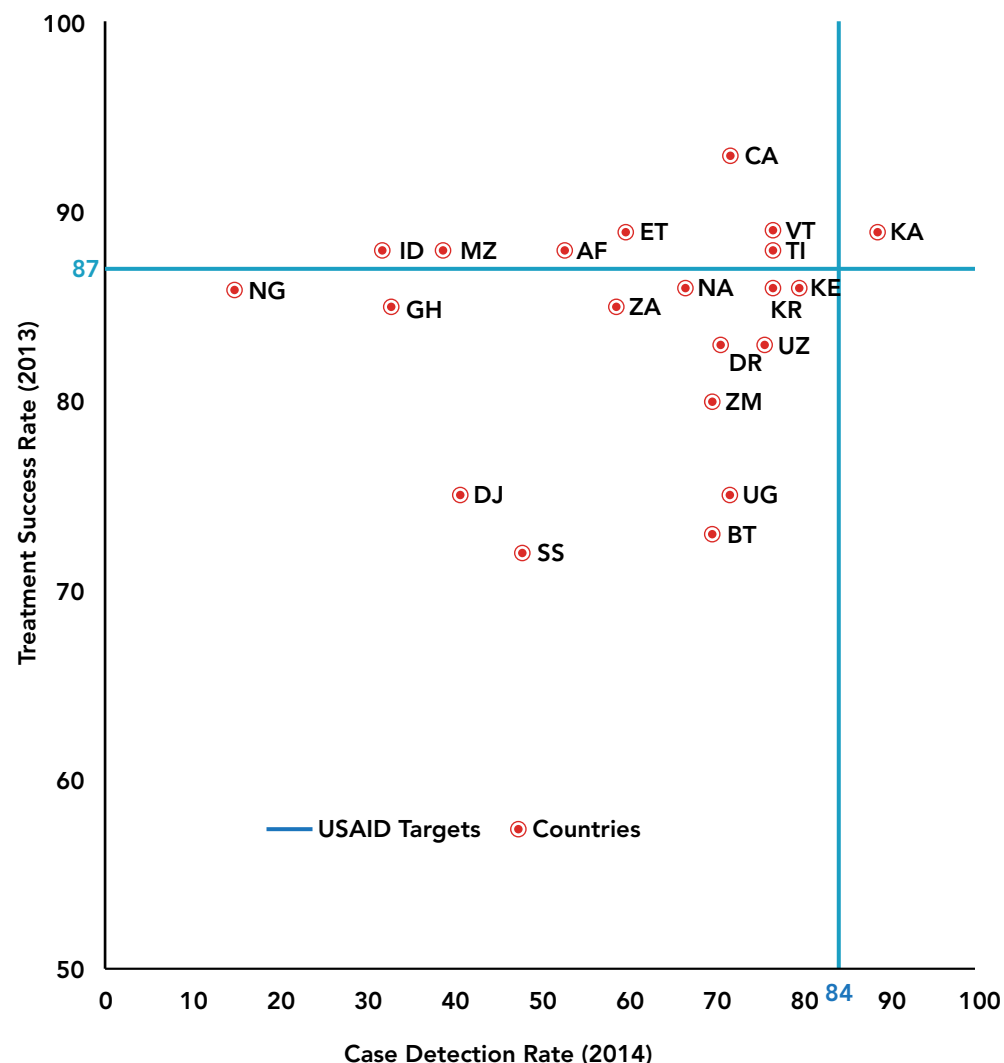
In 2013, WHO began calculating TSRs on all new and relapse patients (as opposed to previously only reporting treatment success for new sputum smear positive (SS+) cases). Therefore, data from the 2012 and 2013 cohorts are difficult to compare with data from previous years as the new definition is more inclusive (relapse and clinically diagnosed cases are included) resulting in lower TSRs in some countries. Nevertheless, TSRs in 2014 (for the 2013 cohort) were strong in most countries with 16 countries (76%) exceeding the 85% Stop TB target of which eight (38%) surpassed even the 87% USAID target. Figure 5 illustrates TB CARE I country status towards achieving these USAID targets (84% CDR and 87% TSR). Even with the change in definition, improvements between 2009 and 2013 were noted in 12 countries (Afghanistan, Ethiopia, Kazakhstan, Kyrgyzstan, Mozambique, Namibia, Nigeria, South Sudan⁷, Tajikistan, Uganda, Uzbekistan and Zimbabwe). The successful treatment of 861,406 SS+ patients from 2010-2011 and 1,620,157 new and relapse patients between 2012-2013 translates to a 97% achievement of the 2014 USAID target (2.55 million SS+ patients successfully treated over five years).⁸

Similar to treatment success, it is difficult to compare the number of reported deaths from the 2009 cohort (baseline) to the 2013 cohort given the change in case definitions that affected the 2012 and 2013 cohort. However, 3.4% of the 2009 cohort of new SS+ cases was reported to have died; 4.1% of the 2013 cohort of new and relapse cases died.

⁷ 2010 Cohort

⁸ Although TB CARE I didn't start until October 2010, many patients who started treatment in 2010 were being managed and supported with TB CARE I support during the course of their six-month treatment period.

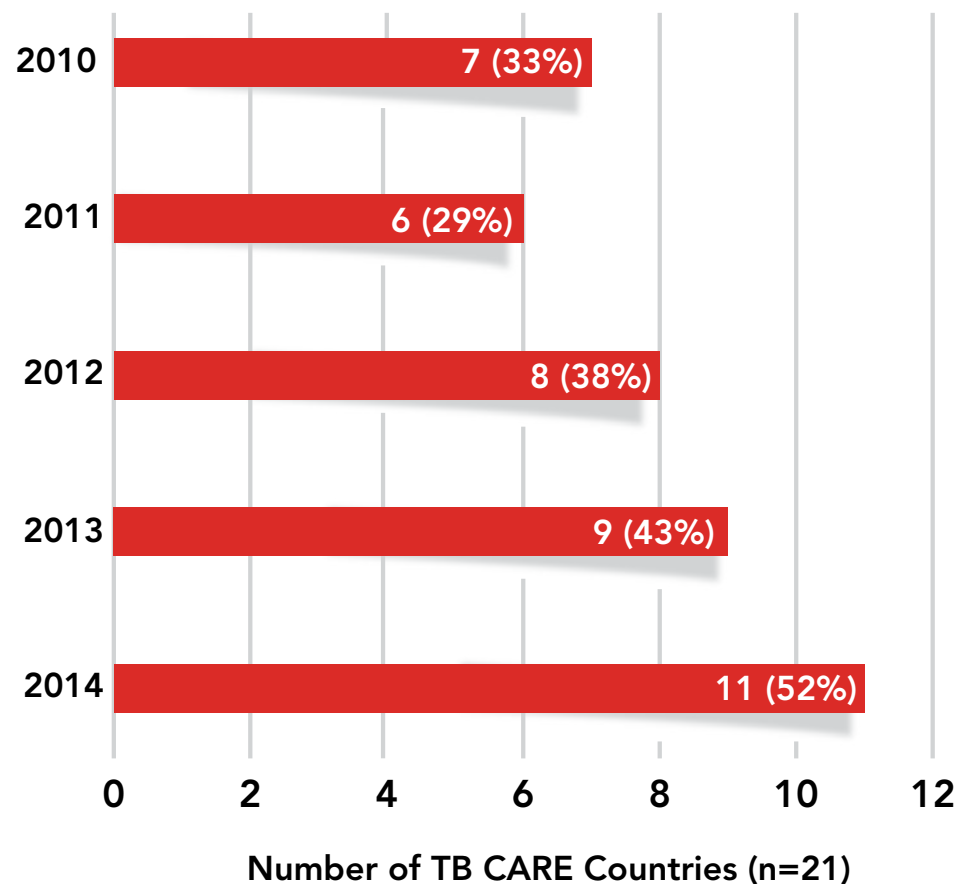
Figure 5: Comparison of TB CARE I countries' case detection rates (2014) and treatment success rates (2013) to USAID targets (WHO 2015)



Number (and percentage) of confirmed TB cases among healthcare workers

Monitoring TB among HCWs continues to be a challenge in many countries, including TB CARE I countries. Of all countries globally reporting to WHO, only 34% (74/217) reported the number of HCWs diagnosed with TB in 2014⁹. In comparison, 52% (11/21) of TB CARE I countries reported the number of HCWs diagnosed with TB in the same year to WHO (Botswana, Dominican Republic, Ghana, Kazakhstan, Kenya, Kyrgyzstan, Mozambique, Namibia, Tajikistan, Uganda and Uzbekistan). This is an improvement from only seven TB CARE I countries (33%) reporting these data at baseline in 2010 (Figure 6). Vietnam, Zambia and Zimbabwe started monitoring the number of HCWs diagnosed with TB on a quarterly basis in selected TB CARE I supported sentinel sites, but have not reported these data to WHO. Over the course of TB CARE I, although the number of reported HCWs with TB increased by 85% (347 in 2010 and 643 in 2014), the overall numbers are still very low. This suggests that recording and reporting (R&R) systems have to be further developed and that numbers are often still based on passive case finding or on subsets of HCW cadres (e.g. HCWs in TB facilities, sentinel sites), not on annual screening of HCWs.

Figure 6: TB CARE I countries reporting annually to WHO the number of HCWs diagnosed with TB (n=21)



⁹ WHO Global TB Report 2015

Overleaf: Practical exercise on archiving Xpert data, Kazakhstan (Photo by KNCV)



Number of MDR cases diagnosed and put on treatment

A major priority and success under TB CARE I was the scale up of PMDT to ultimately find and effectively treat more MDR-TB cases. In 2014, 21,058 patients with MDR-TB or rifampicin resistant tuberculosis (RR-TB) were diagnosed across all 21 TB CARE I countries - an 8% increase compared to 2013, and an even greater jump of 83% from the 2010 baseline (Figure 7). This highlights the contribution GeneXpert MTB/RIF (Xpert) has had on the diagnosis of drug-resistant TB (DR-TB) (see page 27 for more information on Xpert) as the increase in diagnosis of confirmed MDR-TB (excluding 13,269 RR-TB cases in 2014) has been less dramatic (21% increase from 2010 to 2014).

Treatment initiation for MDR-TB has also expanded considerably over the life of the project; in 2014, 19,156 TB cases¹⁰ were enrolled on MDR-TB treatment, a 23% and 132% increase compared to 2013 and 2010 respectively. Although the introduction of Xpert has successfully diagnosed more RR/MDR-TB cases, considerable effort has also been made to strengthen the PMDT systems to keep pace with diagnosis (scaling-up PMDT treatment services, implementing community-based PMDT, introducing outpatient care, etc.). A major achievement for TB CARE I was the project's contribution to USAID's global target of diagnosing and starting on treatment 57,200 MDR-TB cases by 2014. Between 2011-2014, TB CARE I countries contributed a total of 56,623 TB patients that initiated treatment for MDR-TB or 99.3% of the global USAID target.

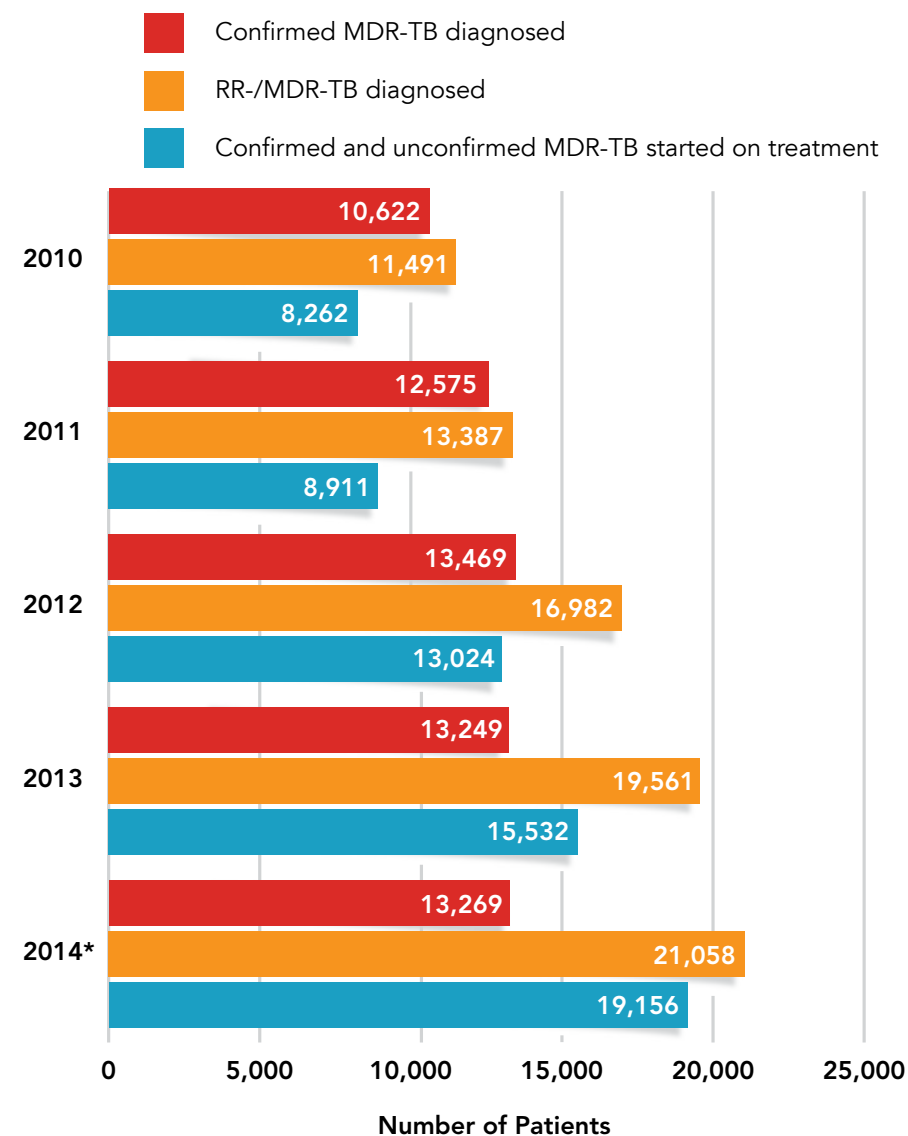
Also of note is the narrowing gap between patients being diagnosed and started on treatment, as can be seen in Figure 6. Although the cohorts of RR/MDR-TB patients diagnosed and initiated on treatment in 2014 are not necessarily the same (the treatment cohort may include patients diagnosed in the previous year),

roughly comparing the groups shows a gap of only 12% in 2014 compared to 31% in 2010 (confirmed MDR-TB only). Part of this remaining gap between diagnosis and treatment initiation is due to the rapid increase in diagnosis of RR-TB patients with Xpert - many PMDT programs can't keep pace with the numbers being diagnosed. However, countries are adapting their PMDT programs to better respond to the acceleration in RR/MDR-TB diagnosis (i.e. community-based PMDT, outpatient models); more information can be found in the PMDT section on page 36). Moreover, as electronic systems for MDR-TB treatment monitoring and reporting develop, countries will have greater capacity to track and respond to identified weaknesses in diagnosis, treatment initiation, treatment adherence, and successful treatment completion.

The Central Asian Republic (CAR) countries contributed more than half of all RR/MDR-TB patients diagnosed (62%) and started on treatment (68%) across all TB CARE I countries in 2014; however compared to 2010 when 88% of all MDR-TB cases were diagnosed and 86% of second-line treatment initiation occurred in the CAR countries, this shows how quickly PMDT is growing in other parts of the world. For example, impressive increases in treatment initiation from 2010 to 2014 were seen in Indonesia (142 to 1,284), Nigeria (23 to 423), Uganda (10 to 213), Vietnam (101 to 1,532), and Zimbabwe (27 to 381).

¹⁰ Includes both confirmed and unconfirmed MDR-TB patients. When just looking at confirmed MDR-TB patients, 18,582 patients were started on second-line treatment in 2014, which represents a 41% increase compared to 2013 and a 154% jump from baseline.

Figure 7 (right): Number of confirmed MDR-TB cases diagnosed by culture/drug susceptibility testing (C/DST), MDR-TB cases and additional RR-TB cases detected (Xpert and C/DST), and TB cases enrolled on MDR-TB treatment (i.e. confirmed and unconfirmed MDR-TB), across all 21 TB CARE I countries, 2010-2014 (WHO, 2015)*



*In 2014, WHO added variables on 'lab-confirmed RR- and MDR-TB cases identified' and 'laboratory-confirmed RR/MDR-TB patients who started treatment for MDR-TB', which may have affected how countries report on confirmed MDR-TB detected (as some countries cannot differentiate between MDR- and RR-TB based on their diagnostic algorithm). This may explain the stagnation in MDR-TB diagnosis, but major increases in RR/MDR-TB case notification. It may also be signaling that an increasing number of countries do not confirm an initial Xpert RR- test result with C/DST. This could be because of non-adherence to the algorithm (e.g. clinicians not requesting C/DST), and/or because the labs cannot keep up with the demand for C/DST.

Above: MDR-TB education exercise on treatment support, Nigeria (Photo by FHI 360)



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AIMS

To increase the demand for and use of high quality TB services and improve satisfaction with the services provided

To increase the quality of TB services delivered by all care providers

To reduce patient and service delivery delays.

Snapshot of key results:

- Piloting of the patient-centered approach package in Cambodia, Indonesia, Mozambique, Nigeria and Zambia demonstrated that the tools provided practical approaches that enabled TB programs and health facilities to take steps to improving patient-centered care.
- In 2014, 83,222 pediatric TB cases were notified to NTPs in the 21 TB CARE I countries - a 13% increase from 2013 (73,751).
- In Year 4, 33,666 TB patients were notified by private providers in TB CARE I-supported areas - a more than four-fold increase from Year 2 (6,415).

A cornerstone of TB CARE I effort to diagnose and treat more cases of TB and MDR-TB was the expansion of access to high-quality TB services, whether through the targeting of key populations (i.e. children, prisoners), engagement of new providers (i.e. private sector) or improving the quality of existing services to encourage early diagnosis and service provision (i.e. patient-centered). Below are key aspects of TB CARE I's approach to universal and early access with highlights from global, regional and country projects; many more country-specific achievements and results are found in the country section of this report (page 54).

Patient-Centered Approach

TB CARE I implemented a core project to pilot the patient-centered approach (PCA) package¹¹ and evaluate change towards improved patient centeredness in five countries: Cambodia, Indonesia, Mozambique, Nigeria and Zambia. The results of the PCA pilot demonstrated that the tools provided practical approaches that enabled TB programs and health facilities to take steps to improving patient-centered care. In general the tools were found to be easy to implement, with the exception of the *Tool to Estimate Patients' Costs*, which required more training/direction. This costing tool was then revised based on the experiences from Ethiopia, Indonesia and Kazakhstan.

The Patients' Charter was found to be a powerful tool to empower patients, based on pilot results. In four countries, patients became more aware of their rights and responsibilities, empowering them to demand better services, organize themselves and become involved in TB activities. An unexpected outcome was HCWs were

¹¹ The following tools (all available on the TB CARE I website) are included in the package: Patients' Charter for TB Care and Control, QUOTE TB Light, Tool to Estimate Patients' Costs, TB/HIV Literacy Toolkit and a Practical Guide to Improve the Quality of TB Services.

empowered with new insight into the experiences and challenges faced by patients in accessing TB services. They were also provided with new tools to strengthen their important role in providing information and adherence support to TB patients. *QUOTE TB Light* and the *Tool to Estimate Patients' Costs* identified several barriers and quality of care issues, providing each of the countries with an evidence base to develop country-specific interventions for PCA improvements.

All five pilot countries reported plans to scale up use of the PCA tools. Nigeria is integrating *QUOTE TB Light* into the NTP's supervision system. Nigeria and Zambia plan to train more HCWs on *The Patients' Charter*. Mozambique also scaled up the use of the Charter and the TB/HIV literacy toolkit in 28 districts where TB CARE I supports community based DOTS (CB-DOTS) activities. Indonesia has adapted the package to the country context and developed a strategy with practical Standard Operating Procedures (SOPs), which will be supported by the Global Fund (GF).

Childhood TB

Over the life of the project, TB CARE I invested in the quality diagnosis and treatment of TB in children in 13 countries (Afghanistan, Cambodia, Ethiopia, Ghana, Indonesia, Kazakhstan, Kyrgyzstan, Mozambique, Nigeria, Tajikistan, Uganda, Vietnam and Zimbabwe). Although difficult to compare childhood case notification at the beginning and end of TB CARE I due to changes in case definition in 2013, progress is still measurable between 2013 and 2014. In 2014, 83,222 pediatric TB cases were notified to NTPs in TB CARE I countries - a 13% increase from 2013 (73,751).

12 Before 2013 childhood case notifications included smear-positive, smear-negative, smear not done and extrapulmonary TB for all new patients. After 2013 childhood case notification includes all new and relapse cases irrespective of case type.

These pediatric cases made up 9% of all new and relapse cases with age information known, which is within the target range of 5-15% of all TB cases and an increase compared to the 8% in 2013.¹² Seventy-one percent (15/21) of TB CARE I countries fell within this 5-15% range, with the exception of Cambodia (28%), Djibouti (1%), Kazakhstan (3%), Vietnam (0.3%), Mozambique and South Sudan (age disaggregation not reported).

In Vietnam, the NTP recognized the need for childhood TB initiatives given the low numbers of notified childhood TB cases. The success of TB CARE I's piloted childhood TB strategy in four provinces has resulted in this approach becoming a model for the NTP, which will expand this strategy to 18 provinces with GF support (see page 104 for more information). Other country-specific successes are highlighted in the country section starting on page 54.



Above right: Patient-Centered Approach focus group, Cambodia (Photo by Pichenda Koeut)

The project has played a key role on a global level as well. In 2014, *WHO's Guidance for national tuberculosis programmes on the management of tuberculosis in children: second edition* was published with TB CARE I technical and financial support. Based on these updated guidelines and the *Desk Guide for Diagnosis and Management of TB in Children* (developed by The Union under TB CAP), The Union/TB CARE I launched the *Childhood TB Learning Portal* and *Childhood TB for healthcare workers online course* (<https://childhoodtb.theunion.org/>). The six-module curriculum covers how to diagnose, treat and prevent childhood TB. The Learning Portal offers a variety of resources aimed to support countries' efforts to address the 10-step plan outlined in The Roadmap for Childhood TB, published in 2013. In the first week of the portal's launch (March 2015), 291 people from 69 different countries had already registered for the course.

Leveraging KNCV's *Childhood TB Benchmarking Tool*¹³, Ethiopia, Indonesia, Kyrgyzstan, Tajikistan and Ukraine all conducted self-assessments with TB CARE I support in 2015 to gauge where the country stood in relation to following the WHO guidelines. The countries measured the implementation of standards down to the health facility level and identified remaining gaps (some of which could be covered by other USAID projects, such as Challenge TB).

Although not an established TB CARE I country, Somalia began receiving support from TB CARE I in Year 4 through regional funding for childhood TB technical assistance (TA). In a country with such major security concerns and no central government, the challenges of providing TB services - especially to children - are enormous. However, in less than one year the project has drafted a field guide for TB/MDR-TB in children, updated the child TB chapter in the

Somali TB guidelines, and developed an implementation plan for child TB activities. In addition, seven Somalis trained in Childhood TB at the Center of Excellence in Rwanda will play a key role in scaling up childhood TB services in country, as well as disseminating and implementing the key documents developed in collaboration with TB CARE I.



13 This tool was not developed under TB CARE I.

Above right: Children, Nigeria (Photo by Tristan Bayly)

Community-based initiatives

TB CARE I recognized the importance of working at the community level to expand access to TB diagnosis, treatment and care, reduce TB-related stigma and improve community member knowledge of TB. Since the start of the project, 14 TB CARE I country projects invested in community-based work to some capacity (Afghanistan, Botswana, Cambodia, Ethiopia, Kazakhstan, Kyrgyzstan, Mozambique, Namibia, Nigeria, South Sudan, Tajikistan, Uzbekistan, Zambia and Zimbabwe). Highlights from these projects can be found in the country section.

Several operations research studies have been conducted by TB CARE I on community-based initiatives (see http://www.tbcare1.org/publications/TB_CARE_I_OR_Results.pdf). One key study in Cambodia compared referrals from CB-DOTS watchers and private providers using the classic referral strategy based on TB symptoms versus an enhanced referral strategy targeted at high risk groups (smokers, diabetics and people >55 years). Referral over a six month period was statistically significantly higher in the intervention arm (2,242 total referrals or 7.7 referrals/trainee) than the control group (883 or 4.7 referrals/trainee). Referrals from the intervention arm were more likely to be children under 5, diabetics or smokers, but there was no difference in the proportion of elderly referred. Ninety-one percent (404/445) of TB cases detected in the intervention arm were attributable to referrals compared to only 51% (175/345) of TB cases in the control villages.

Public Private Mix (PPM) and increasing case detection

Major increases in case notification from private providers was seen over the life of the project. Across all 21 countries, the numbers of private-providers reporting TB cases more than tripled from 27,241

Above right: Raising community awareness, Mozambique (Photo by FHI 360)

in 2010 to 84,247 in 2014 (WHO 2015). TB CARE I implemented PPM activities in eight countries: Afghanistan, Botswana, Cambodia, Dominican Republic, Indonesia, Kenya, Namibia and Nigeria. Focusing on TB CARE I-supported areas in five countries that had substantial investment in PPM activities in Year 4 (Afghanistan, Botswana, Cambodia, Indonesia and Nigeria) reveals a major increase in cases diagnosed by private providers. In Year 4, 33,666 TB patients were notified by private providers in TB CARE I-supported areas - a 167% increase from Year 3 (12,589) and a four-fold increase on Year 2 notifications (6,415).

At a global level, TB CARE I supported the Stop TB PPM subgroup. In November 2012, a workshop on engaging the for-profit private sector was organized in conjunction with the PPM subgroup meeting in Kuala Lumpur, Malaysia. Using a TB CAP-developed PPM toolkit as the foundation, the workshop provided a platform to review and discuss new approaches to engage the for-profit private sector based on successful country experiences. The group convened again in Bangkok in August 2013. It reviewed global progress in PPM and discussed ways to accelerate PPM scale up within the context of the End TB strategy.



LABORATORIES

AIMS

To ensure capacity, availability and quality of laboratory testing to support the diagnosis and monitoring of TB patients

To ensure the availability and quality of technical assistance and services

To ensure the optimal use of new approaches for laboratory confirmation of TB and incorporation of these approaches in national strategic laboratory plans.

TB CARE I took a systems approach to improving national TB laboratory networks by addressing policy development, management, supervision and EQA systems for smear microscopy, culture and DST. In addition, TB CARE I supported targeted laboratory refurbishment, expansion of light-emitting diode (LED) microscopy and encouraged the introduction of new technologies, with a particular emphasis on Xpert. TB CARE I provided substantial local and international technical assistance across 17 TB CARE I countries, and further contributed to the development of the Global Laboratory Initiative's *Guide for providing technical support to TB laboratories in low- and middle-income countries*, which was officially released at the 2015 Union World Conference on Lung Health in Cape Town, South Africa.

Laboratory Strategic Plans

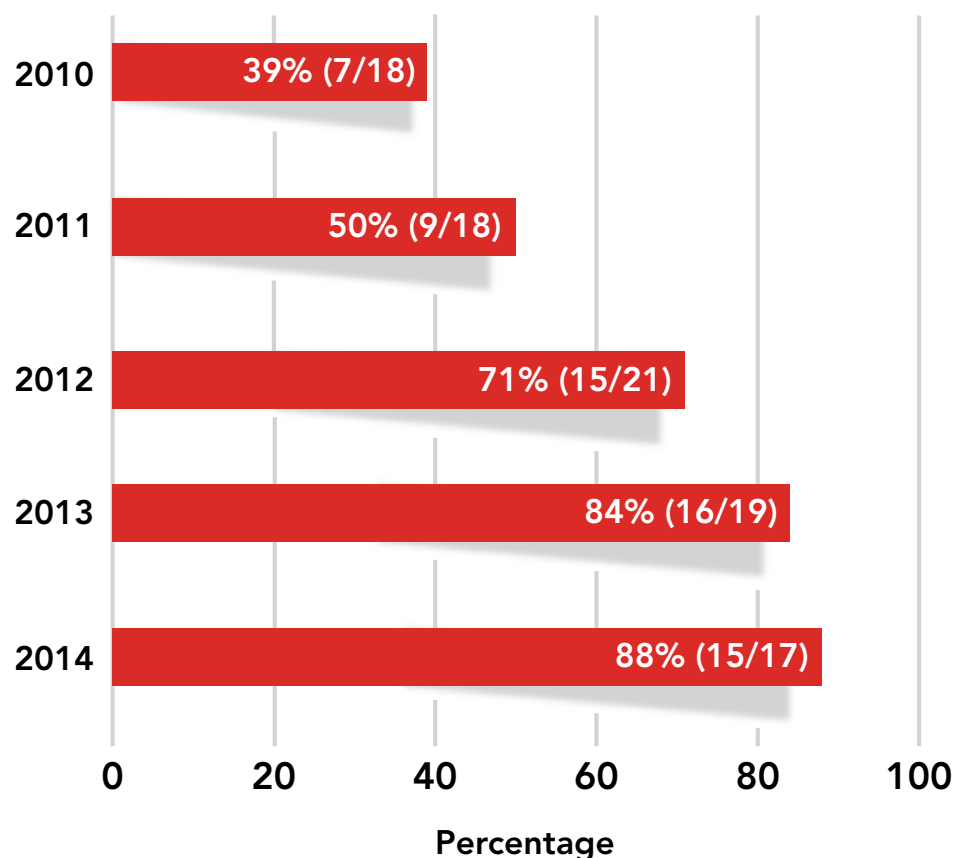
Over the life of the project, TB CARE I invested considerably in the development of LSPs and/or the inclusion of laboratory priorities in National Strategic Plans (NSPs). These plans have been a critical component for GF concept note writing as they provided the necessary gap analyses and structured development for capacity building and expansion to increase access to diagnosis for TB and DR-TB. In total, 88% (15/17) of active countries (Tajikistan and Zimbabwe excluded) developed LSPs by the end of the program, compared to only 39% (7/18) at baseline (Figure 8 - Overleaf). At least 10 of the countries with LSPs have allocated a budget for activities and are in the process of implementing the newly designed strategy. The development and utilization of the new tool *Practical Handbook for National TB Laboratory Strategic Planning* played a significant role in providing awareness of the need for focused planning and guidance on how to identify gaps and carve out a long-term strategy for TB laboratory network development.



Snapshot of key results:

- 88% (15/17) of active TB CARE I countries developed laboratory strategic plans (LSPs) by the end of the project, compared to only 39% (7/18) at baseline.
- In 2013, the Uganda national reference laboratory (NRL) was accredited as the first supra-national reference laboratory (SNRL) in East Africa.
- In total, 141,209 successful GeneXpert MTB/RIF tests were conducted with TB CARE I-supported platforms; 43,966 samples tested positive for TB (31%) of which 10,658 were resistant to rifampicin (24%).
- By the end of Year 4, all countries implemented external quality assurance (EQA) programs for microscopy with 12/17 countries (71%) having >75% EQA coverage.

Figure 8: Percentage of TB CARE I countries with laboratory strategic plans



Supranational Reference Laboratories

The SNRL Network plays a critical role providing long-term sustainable assistance from an external supervisory laboratory to NRLs for proficiency and quality assurance assessments. Linkages between NRLs and SNRLs are important as they

provide the expertise needed to advance technologies, provide support for surveillance activities, fill gaps in second line drug susceptibility testing (DST) and whole genome sequencing, assist with implementation of LSPs, and provide continuous training and mentoring for strengthening technical proficiencies and competencies. Over the course of TB CARE I, new linkages were established between NRLs and SNRLs. By the end of Year 4, all countries (17/17) were linked with an SNRL compared to only 61% (11/18) of countries in the first year of TB CARE I. In Year 4, all TB CARE I countries also had at least one on-site visit during the year whereas only 55% (6/11) of countries were visited in Year 1.

A major contribution to the global SNRL network was the development of a new TB SNRL (the first in East Africa) in Kampala, Uganda in 2013. After six years of hard work and investment from USAID (under TB CAP/TB CARE I) and additional support by the Centers for Disease Control and Prevention (CDC), the Uganda NRL successfully completed the accreditation process and became a part of the WHO Global SNRL Network.

Since accreditation, the Uganda SNRL provides support to 10 countries (Somalia, South Sudan, Eritrea, Kenya, Swaziland, Lesotho, Tanzania, Rwanda, Burundi and Zambia) with services that include TA for various laboratory activities and trainings, EQA for microscopy and C/DST by proficiency testing, first and second-line DST for patient evaluations, and sequencing of strains for surveillance and research purposes. The SNRL-Uganda is now officially linked via memorandums of understanding (MOU) with eight of the countries noted above. The Uganda SNRL is being proposed as the major SNRL for the East, Central and Southern Africa (ECSA) member states as well as other neighboring countries. The SNRL is now in an active leadership role to all regional NRLs.

“The Uganda SNRL is being proposed as the major SNRL for the East, Central and Southern Africa (ECSA) member states as well as other neighboring countries. ”

To enable the Uganda SNRL to function autonomously, TB CARE I assisted them with the development of a business and marketing plan. To further secure its sustainability, the SNRL and ECSA (both supported by TB CARE I) together submitted a GF Regional Concept Note, which has been awarded and may be obligated more than was originally requested.

To further expand reference laboratory capacity in Africa, TB CARE I was also involved in supporting the Benin NRL for four years implementing a quality management system (QMS) towards accreditation under the Global Laboratory Initiative (GLI) program. The Benin NRL has focused efforts on implementing an advanced-level laboratory QMS in the areas of biosafety, SOP finalization and supply management standards to achieve SNRL status and initiate the application process for ISO 15189:2012 accreditation. The laboratory is in its final implementation phases with accreditation targeted for early 2016.

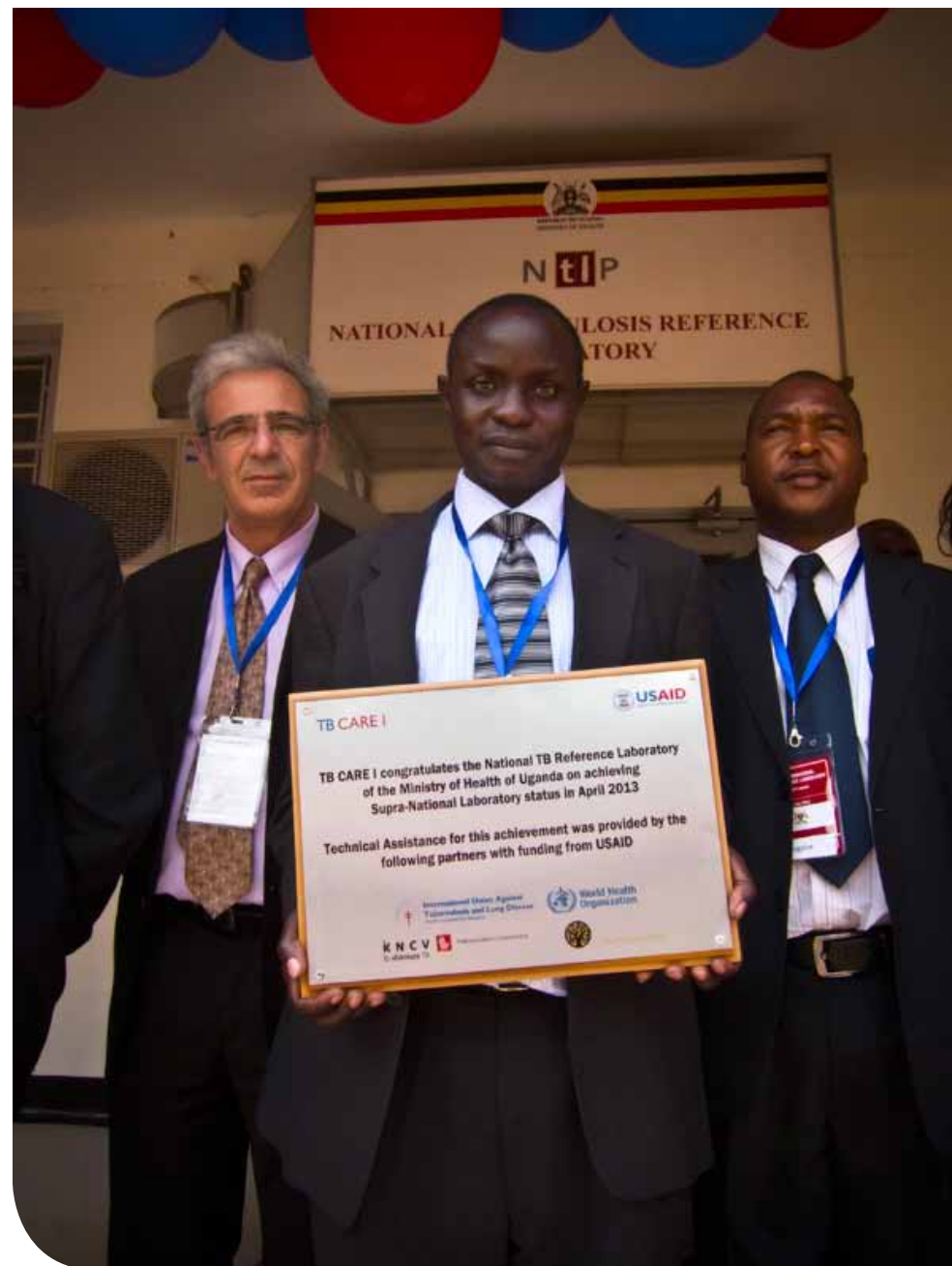


The Uganda Supranational Reference Laboratory - The Road to Success

Support to the Ugandan NRL for the supranational accreditation process was led by The Union in collaboration with the SNRL at the Tropical Institute in Antwerp, KNCV and the Royal Tropical Institute (KIT) in Amsterdam. This team worked continuously between 2008-2013 with the laboratory staff in Uganda. The strategy in 2008 was to first strengthen the knowledge and skills of staff, the infrastructure and technical capacity of the laboratory so it was able to fulfill its role and responsibilities of providing quality services throughout Uganda. Once that was established, the next step was to invest in the resources needed to ensure that the laboratory and its staff could provide additional international services to other national reference laboratories in the East Africa Region.

Four years later in early 2011, and after a wide range of activities, improvements and interventions had been carried out, an assessment conducted by the WHO found that the laboratory met the requirements to qualify as a SNRL-candidate. It was given a two-year probation period to prove its capacity to help other laboratories in the region.

Two years later, in April 2013, the goal of being a WHO-certified and registered SNRL was reached. The Director of the Stop TB Department, Dr. Mario Raviglione, said that he “recognized the hard work and the commitment made by the Uganda TB Laboratory in order to be awarded SNRL status” and he called upon other TB laboratories, especially those that are located in Africa, to strive for similar achievements.



Above right: Certification of the Uganda Supranational Reference Laboratory (Photo by Tristan Bayly)

Implementation of GeneXpert MTB/RIF technology

One of the greatest undertakings of TB CARE I was the rollout, strategic implementation, and expansion of Xpert throughout all TB CARE I countries. Although the level of investment and the role of TB CARE I varied from country to country, these efforts began with training and procurements, which then extended to providing extensive mentoring, supervision, and monitoring activities. As time progressed, challenges with implementation were identified globally, which required specialized TA in the areas of supply distribution logistics and management, development of routine maintenance protocols and waste management plans, as well as devising and implementing data capture systems to ensure effective and efficient recording and reporting. Further efforts were made in collaboration with country partners and implementers to enhance the uptake and utilization of testing through focused training programs for clinicians and program managers. Intensified trainings followed by intensified scale-ups, exponentially increased testing and thus improved rapid case detection for both TB and MDR-TB.

A critical component to Xpert rollout was to initiate a strategic plan for country implementation that addressed all technical, operational and programmatic aspects in order to ensure best practices and appropriate application of the test. Technical assistance provided under TB CARE I in several countries worked collaboratively with national programs to ensure phased strategies of implementation and the development of national Xpert guidelines. This approach included evaluating each country's situation and epidemiology to address the priority populations for testing. Most countries follow WHO recommendations - testing presumptive MDR-TB cases and people living with HIV (PLHIV) presumptive for TB. However, some countries have adapted algorithms to test all cases of TB, which

include children and extrapulmonary TB. The data overleaf provide a summary of the success from TB CARE I support with regard to procurement, implementation, operations, testing, turnaround times (TATs) and linkages to treatment as TB CARE I rolled-out Xpert. Scale-up of Xpert usage in TB CARE I countries was remarkable.

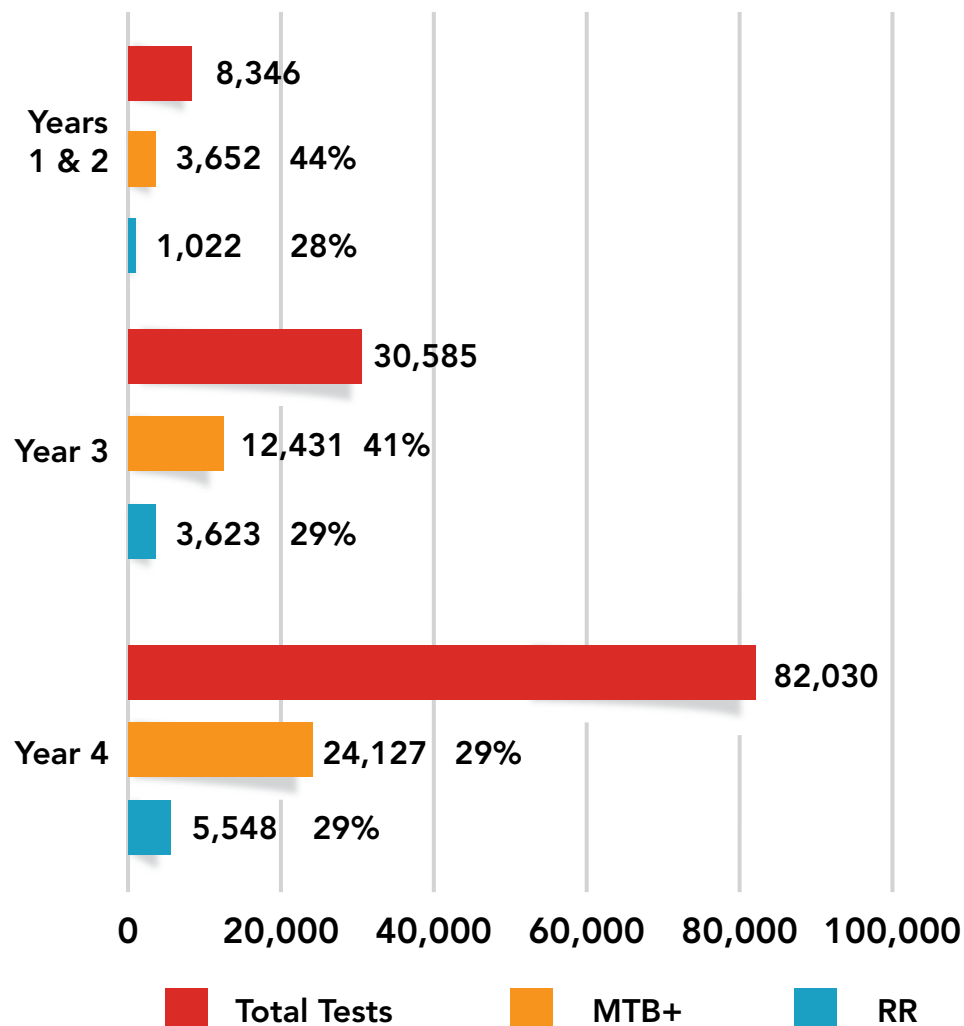


Above right: Laboratory supervisor preparing GeneXpert instrument for calibration, Nigeria (Photo - Manuela Rehr)

"Since the start of the project, over 141,209 TB CARE I-supported tests were conducted in 14 countries."

Since the start of TB CARE I, training, TA and mentoring were provided to 14 countries. TB CARE I supported the procurement of roughly 26% of the operational instruments in all implementing countries by the end of the project (127/485). In Year 4 alone, over 44,000 Xpert MTB/RIF cartridges were procured. Since the start of the project, over 141,209 TB CARE I-supported tests were conducted in 14 countries. In total, 43,966 (31% MTB positivity rate) TB cases were detected of which 10,658 were resistant to rifampicin (24% RR-TB detection rate). Figure 9 summarizes TB CARE I-supported Xpert testing from Years 1-4 (Year 5 not included as Xpert work was limited to Nigeria and Zambia only in that year). Testing jumped by 168% from Year 3 to Year 4 alone; 94% more samples in Year 4 detected TB (MTB+) than in Year 3 (53% more RR-TB was diagnosed). Figure 10 (overleaf) summarizes Xpert rollout in TB CARE I countries with the largest investment in the new technology. The graph illustrates the acceleration in Xpert testing conducted in TB CARE I-supported sites since the start of TB CARE I.

Figure 9: Summary of TB CARE I-supported Xpert testing activity, including TB positivity rate and rifampicin-resistance rates, Years 1-4 (n=13)*



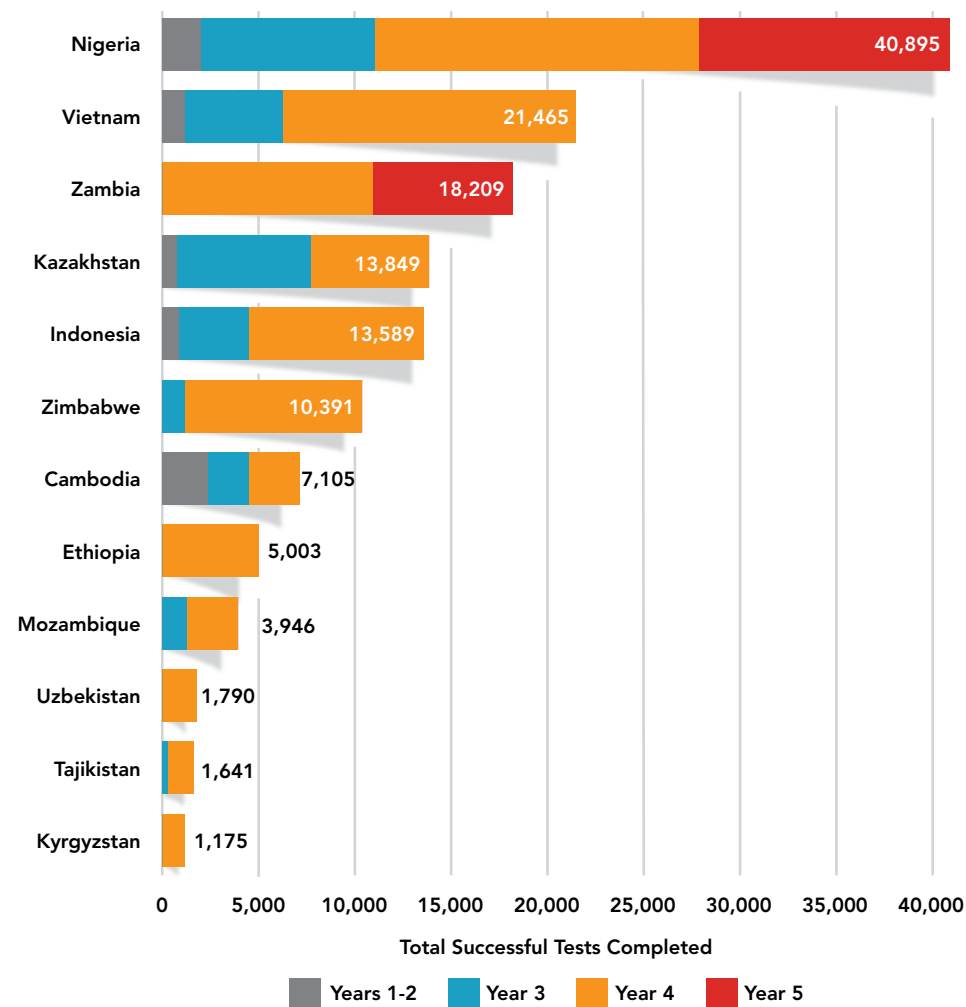
*The majority of TB CARE I country projects closed at the end of Year 4; Nigeria and Zambia were the only countries to support Xpert implementation in Year 5 so these data have not been included in the graph. Nigeria (Oct. 2014-June 2015): 12,990 tests conducted; 2,715 MTB+ (21%); 404 (15%). Zambia (Oct. 2014-May 2015): 7,258 tests conducted; 1,041 MTB+ (14%); 61 RR-TB (6%).

The rates of MTB positive and RR-TB depend on the criteria of eligibility, the diagnostic algorithms that are in use, and the prevalence of MDR-TB in the populations tested. Some countries focus testing on presumptive MDR-TB cases while others include testing for PLHIV presumptive for TB, all TB presumptive cases, or have added presumptive extrapulmonary TB to their algorithms. Countries such as Nigeria, Indonesia, Vietnam and Kazakhstan have higher testing numbers as these countries were the first to implement the technology under TB CARE I; Figure 11 (overleaf) summarizes testing numbers, MTB positivity rates and rifampicin resistance rates by TB CARE I country, organized by year of Xpert scale-up.



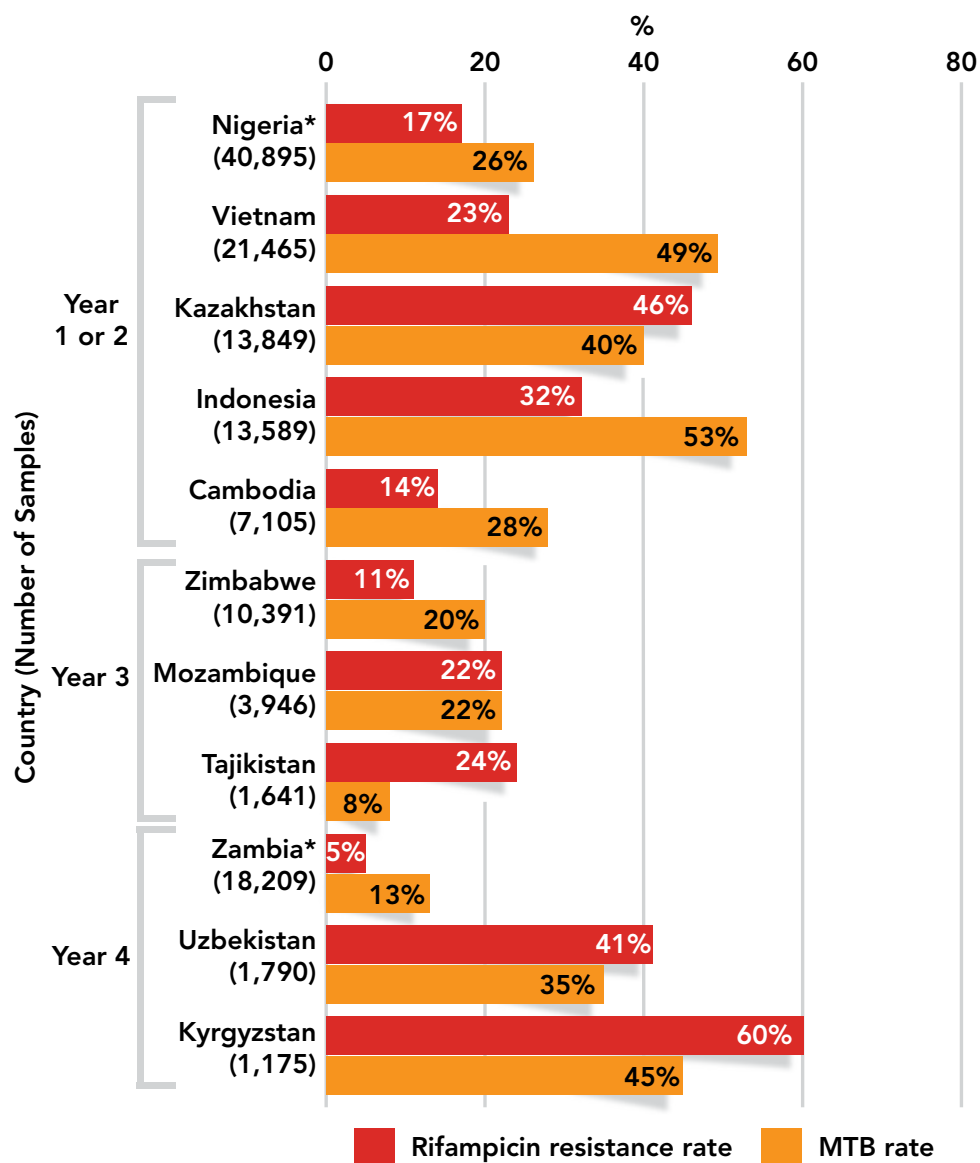
Above: Sample testing with Xpert, Zambia (Photo - Roberston Chibumbya)

Figure 10: Total successful Xpert tests conducted in TB CARE I-supported sites, Year 1-5*



*Data only shown for countries where TB CARE I has had moderate/substantial investment in Xpert (Djibouti and Kenya not shown). Data from Year 5 are only displayed for Zambia (through May 2015) and Nigeria (June 2015) as these are the only countries that implemented Xpert activities beyond September 2014.

Figure 11: Country-specific MTB positivity and rifampicin-resistance rates by year of TB CARE I-supported Xpert start-up



Overleaf: Microscopy SNRL Kampala, Uganda (Photo by Tristan Bayly)

Expansion of quality microscopy

Throughout TB CARE I, quality microscopy has been a major focus. Expanding services to improve access, implementing LED microscopy, and quality assurance are a continued focus of microscopy networks. As we move forward with new rapid molecular diagnostics for case detection, we must continue to support and maintain the quality of microscopy as it continues to be a necessary tool for patient management and care. By the end of Year 4, all countries implemented EQA programs for microscopy with 12/17 (71%) countries having >75% EQA coverage. The performance level for EQA in TB CARE I-supported areas was above 80% in all but one country (Indonesia).

TB CARE I provided major support for EQA programs over the past four years. When evaluating the progress of these programs it is important to understand the country situation. For example in South Sudan (a major conflict zone with severe challenges), where microscopy is the only tool for diagnosing TB, continued TB CARE I support helped to sustain activities. Even though coverage for EQA was limited (25%), the quality was maintained at a performance of >85%. In Mozambique, a substantial amount of support was provided to improve the national microscopy and EQA network. This network increased in the number of microscopy examination centers (114 to 232) and improved in EQA coverage from 39% to 60%.

*Nigeria includes data from October 2014-June 2015; Zambia includes data from October 2014-May 2015 (Year 5)

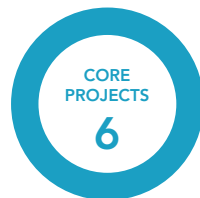
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TECHNICAL AREAS - LABORATORIES





INFECTION CONTROL



AIMS

- To increase TB-IC political commitment
- To scale-up the implementation of TB-IC strategies
- To strengthen TB-IC monitoring & measurement
- To improve TB-IC human resources.

Snapshot of key results:

- Compared to only 50% at baseline, all TB CARE I countries had developed national TB infection control (TB-IC) guidelines by the end of the project (17/17).
- The FAST (Finding cases Actively, Separating them safely and Treating them effectively) strategy was implemented in 12 high-volume hospitals in Nigeria. Seven hospitals out of the 12 (58%) managed to reduce time to diagnosis; six (50%) reduced both time to diagnosis and time to treatment.
- In Year 4 alone, TB CARE I supported TB-IC activities in 479 health facilities across 14 countries.

Increased TB-IC political commitment

TB CARE I played a key role in drawing attention to the importance of TB-IC at the national and intermediate level through policy and guideline development. Compared to only 50% of countries at 2010 baseline, all TB CARE I countries (17 in Year 4) had developed national TB-IC guidelines by the end of the project. Ahead of the foreseen revision of the 2009 WHO policy, Indonesia, Namibia and Nigeria updated their national TB-IC guidelines to include the latest evidence and expert guidance on infection control measures, standard procedures and tools. In addition, TB-IC is also incorporated in the overall national infection prevention and control (IPC) policy of all TB CARE I countries. Integrating TB-IC in national IPC policies has been propagated by TB CARE I as an approach to strengthen the health system, accelerate the scaling up of TB-IC and sustain the gains of its implementation. In Ethiopia, TB CARE I provided assistance through the NTP to the Ministry of Health (MoH) for the development of building design and engineering standards of healthcare facilities for the prevention of airborne infections. Ethiopia now has complementary regulations on the building design of healthcare facilities to prevent the transmission of airborne infectious diseases, including TB - only the second country in the Sub-Saharan African region (after South Africa) to have these important regulations.

Scaled-up implementation of TB-IC strategies

At the facility level, TB CARE I invested in TB-IC by offering training to facility level staff, TA for facility risk assessments and the development of facility IC plans, provision of commodities such as surgical masks, respirators and fans, and the completion of minor refurbishments. Over the life of the project, TB CARE I implemented TB-IC activities in health facilities across 18 countries; in Year 4 alone 479 facilities were supported by the project.

Introduction of the FAST strategy

TB CARE I worked closely with TB CARE II in developing the FAST strategy. The strategy refocuses on a well-defined subset of administrative controls with the aim to accelerate TB-IC implementation and scale-up: **F**inding cases **A**ctively, **S**eparating them safely and **T**reating them effectively. The strategy assumes that getting TB patients on effective treatment faster will reduce the transmission of TB, even before the conversion of sputum smear or culture to negative. Ethiopia, Indonesia, Mozambique, Nigeria, Vietnam and Zambia piloted the strategy in the last year of TB CARE I, and the NTPs in Nigeria and Indonesia adopted the strategy. In Bahasa Indonesia the FAST strategy is called TEMPO (*Temukan pasien secepatnya, Pisahkan secara aman dan Obati secara tepat*). Indonesia, Mozambique and Nigeria were invited to present their approaches, experiences and preliminary results of the FAST pilots at a consultative TB CARE I/II meeting for first implementers in 2015.

In Nigeria, 12 high-volume hospitals implemented the strategy. Seven hospitals out of the 12 (58%) managed to reduce time to diagnosis; six (50%) reduced both time to diagnosis and time to treatment (five of the hospitals had Xpert instruments on-site). Five hospitals (41%) reported an increase in presumptive TB cases; however, only three hospitals reported an increase in notified TB cases due to service interruptions of more than three months during the six-month pilot in 11 of the 12 sites. The turnaround time from diagnosis to treatment improved from a baseline of five days to two days following implementation of the strategy.

Strengthened TB-IC monitoring & measurement

Monitoring TB among HCWs was a common challenge across most TB CARE I countries (see page 15 for more information). TB CARE I and II published the *Guide on the Monitoring of TB Disease Incidence Among Health Care Workers* to help countries establish a screening program and surveillance system for detecting and monitoring TB disease among HCWs. The *Guide to Measure the Prevalence of Active TB Disease among Health Care Workers* was also developed by TB CARE I/II. Measuring the TB prevalence among HCWs helps guide the NTP and other decision-makers on the necessary interventions to improve infection control and protect HCWs.

Between October 2011 and June 2014, TB CARE I implemented a core-funded project in 15 healthcare facilities in Ndola District, Zambia, to establish a demonstration site for safe work practices on the basis of TB-IC principles. The project was implemented to demonstrate the feasibility and effectiveness of introducing and sustaining TB-IC policies and practices on (reduced) nosocomial transmission as measured by TB notification among HCWs. Under the guidance of the NTP, the implementation of the project was coordinated by the Copperbelt Provincial Medical Office and the Ndola District Community Medical Office. Partners from TB CARE I and TB CARE II provided technical, administrative and logistical support during the implementation period. Kitwe District, also situated in Copperbelt Province, served as a control district.

The implementation and compliance with TB-IC policies and practices was monitored on a quarterly basis showing more than 80% compliance being achieved by 12 of the 15 intervention sites (80%). Expedited diagnosis and start of treatment was part of the intervention, and the average time to TB diagnosis and time to

initiation of TB treatment was reduced by half. Both are considered good process indicators for reducing the risk of nosocomial transmission. Additionally, Ndola District reported a 5% increase in notified TB cases (all forms) for 2013 after the implementation of the project. The increase in case notification for Ndola District is noteworthy because the number of notified cases decreased in 2013 for both Kitwe District (control district) and the Copperbelt Province (-13% and -4% respectively). The reported increase in TB notifications is probably a result of active case finding among until then unsuspected and undiagnosed general outpatients and inpatients. If Xpert had been available as one of the planned interventions of the project, then the number of notified TB cases and the proportion of bacteriologically confirmed TB cases would probably have been even higher.

Spotlight: Case notification rate among HCWs at Ndola District TB-IC demonstration site

Between May 2013-April 2014, a total of 1,011 (62%) out of 1,619 HCWs and 71 (51%) out of 138 community volunteers were screened on-site by a screening clinician or nurse. Five percent of those screened were presumptive TB patients. At least five HCWs were diagnosed with TB as a result of this screening. In total, 18 out of 1,757 HCW or volunteers had TB, showing a notified incidence of 1% (95% CI 0.6-1.6). One HCW died of TB; 59% of HCWs knew their HIV status (HIV-positive or HIV-negative and had been tested in the previous year). A manuscript on these findings has been submitted for publication in a peer-reviewed journal. Screening tools (forms and registers) are available on the website (<http://www.challengeb.org/library/ic>).



Above right: Using a UVC meter in a TB dispensary, Kazakhstan (Photo - KNCV)

“Over the life of the project, TB CARE I implemented TB-IC activities in health facilities across 18 countries; in Year 4 alone 479 facilities were supported by the project.”

Improved TB-IC human resources

Building the capacity of national and international TB-IC consultants was especially important during the first half of TB CARE I. In the first two years of the project, TB CARE I trained and mentored 12 professionals (i.e. architects, biosafety experts and public health practitioners) from Africa and Asia to become international TB-IC consultants. More than 22 independent international consultancies for TB CARE I and GF were conducted by the mentored international TB-IC consultants. In addition, the TB CARE I project supported individuals to attend an internationally-recognized “Building Design and Engineering” course at Harvard University. Participants were supported through TB CARE I country work plans (Years 1-3¹⁴). In 2015, three participants from Ethiopia, India and Swaziland were supported by TB CARE I. These participants were trained to provide local and regional TA for TB CARE I/Challenge TB and Global Fund-supported countries going forward.

¹⁴ There was no course in Year 4.

Above right: Measuring laboratory airflow for infection control, Uzbekistan (Photo - KNCV)





PROGRAMMATIC MANAGEMENT OF DRUG RESISTANT TB

AIM

To improve the treatment success of MDR-TB.

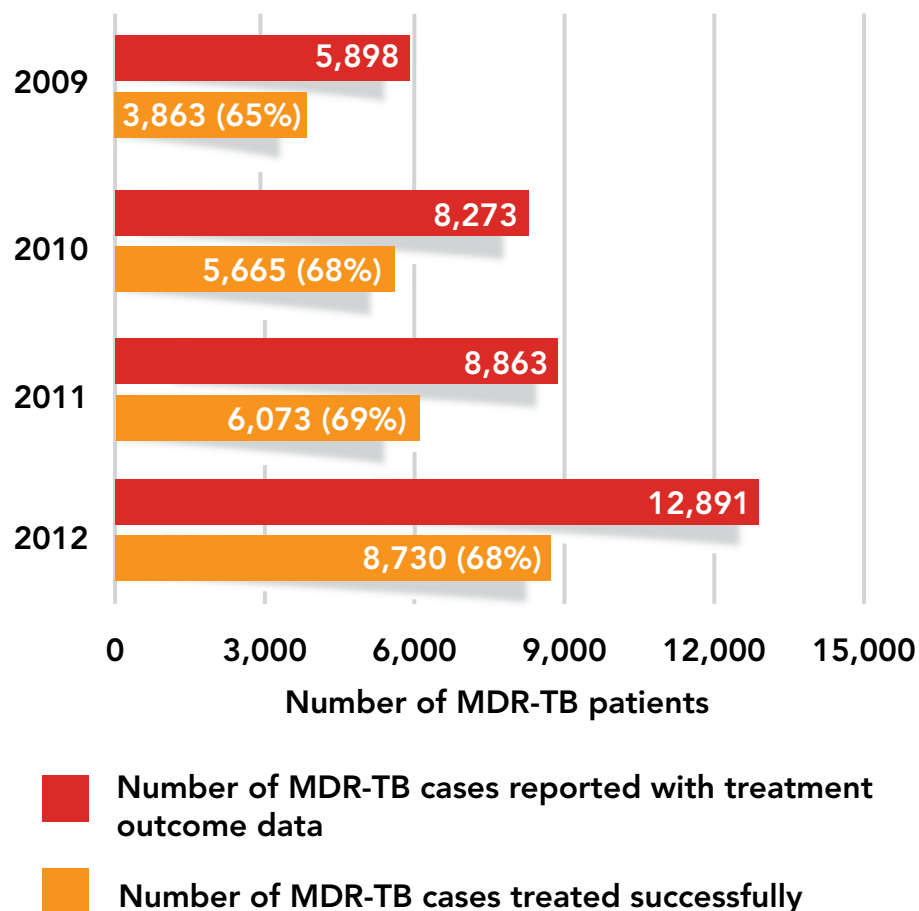
Snapshot of key results:

- Considerably more MDR-TB patients were successfully treated from the 2012 cohort (8,730) than the baseline 2009 cohort (3,863), although treatment success rates still are too low (65% in 2009 and 68% in 2012).
- Over the course of TB CARE I, ten country projects invested directly in the socio-economic support of (MDR-) TB patients.
- Outpatient care for (MDR-) TB was piloted and/or scaled up in six TB CARE I countries.

Improving Treatment Success

As the diagnosis and treatment initiation for MDR-TB are scaled up in most countries, it is essential to also ensure the quality and completion of treatment. As PMDT programs expand, many countries have seen treatment success rates decrease or remain low as the complexities of managing more patients rise. In general, this has not been the trend in TB CARE I countries. The number of successfully treated MDR-TB patients more than doubled from 3,863 at baseline (2009 cohort) to 8,730 for the 2012 cohort (Figure 12, overleaf). This translated to a slightly increasing TSR from 65% (2009) to 68% (2012) even while globally only 50% of MDR-TB patients from the 2012 cohort were successfully treated. Although major work still needs to be done to improve treatment success, 29% (6/21) of project countries met or surpassed the internationally recognized target of at least 75% treatment success for MDR-TB. Ethiopia (83% TSR), Kenya (83%), Uganda (80%), Cambodia (79%), Zimbabwe (75%) and Ghana (100%, n=2) were the only countries to exceed 75% TSR, although Kazakhstan (73%), Dominican Republic (72%), Afghanistan (71%), Vietnam (71%) and Botswana (70%) neared the target. In Kyrgyzstan, although still below the international target, major improvements in MDR-TB treatment success were seen (35% in 2009 to 63% in 2012), perhaps in part due to TB CARE I's introduction of outpatient care.

Figure 12: Number of MDR-TB patients registered on treatment and number (percent) that successfully completed treatment in the 21 TB CARE I countries by cohort year, 2009-2012 (WHO 2015)*



*Although TB CARE I started its operations in October 2010, many patients who started MDR-TB treatment in 2009 and 2010 were being managed and supported with TB CARE I support during the course of their two-year journey through treatment. Successful completion of treatment includes 'cured' and 'completed treatment'.

At the global level, TB CARE I has been supporting guideline development and creating/adapting tools to help countries better scale-up PMDT and improve patient outcomes. In Year 4, TB CARE I collaborated with TB CARE II to develop the *Medical Management of Multidrug-Resistant Tuberculosis - 2nd Edition*. This pocket guide (also available in Russian) was designed to provide practitioners with useful information for the clinical management of MDR-TB patients and draws from WHO international guidelines whenever possible. When WHO guidelines do not cover a specific topic, it provides recommendations based on interpretations of cohort studies, clinical trials, case reports and personal experience.

One of the obstacles to the scale up of PMDT is the poor linkage of PMDT with hospitals and private practitioners. To address this TB CARE I developed the *PPM PMDT Linkage - A Toolkit*. This tool was designed to help establish better links and is a collection of best practices and lessons learnt from the experiences in the participating countries, including inputs for improvement and the use of PPM PMDT linkage assessment and planning.

In addition to the 21 TB CARE I countries that had project offices, the project provided PMDT TA to the NTP in Senegal. During Year 4, based on in-country site visits and workshops with NTP staff and key stakeholders, a plan for MDR-TB management in Senegal for 2014-2017 was developed and submitted to the GF. TB CARE I also developed a study protocol for the NTP on the use of a nine-month MDR-TB regimen.

Psycho-Socio-economic support and outpatient care of TB/MDR-TB patients

Psycho-socio-economic support to patients with TB or MDR-TB can play a critical role in enabling adherence to treatment, reducing patient costs and decreasing the effects that stigmatization or discrimination can have on patients. Over the course of TB CARE I, ten country projects (Cambodia, Ethiopia, Ghana, Indonesia, Kenya, Namibia, Nigeria, Uganda, Zambia and Zimbabwe) invested directly in the socio-economic support of (MDR-) TB patients including accommodation, hospitalization, nutrition, tests/screenings, transportation, psychosocial support, consultative meetings and treatment support (side effect mitigation, etc.). In 2015, TB CARE I also released *Lessons Learned from Best Practices in Psycho-Socio-Economic Support for Tuberculosis Patients*. Drawing from experiences across the globe, the document provides knowledge about what works in specific situations and contexts, without using inordinate resources to achieve the desired results.

Building on the principles of a patient-centered approach, community-based care and support, ambulatory care - or outpatient care - can be a successful approach for improving TB/MDR-TB treatment outcomes, by reducing costs to both the health system and the patient, and allowing for more rapid expansion of PMDT (reducing dependency on availability of hospital beds for initiating treatment). Outpatient care for TB and MDR-TB was piloted and/or scaled up in six TB CARE I countries (Ethiopia, Indonesia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan). In Kazakhstan, based on TB CARE I's pilot of outpatient care in Akmola Region, the MoH has mandated the administration of outpatient care nationwide for the first time using the admission criteria developed by TB CARE I.



Above right: Directly observed MDT-TB treatment, Kyrgyzstan (Photo - KNCV)

TB/HIV

AIMS

To strengthen the prevention of TB/HIV co-infection

To improve the diagnosis/treatment of TB/HIV co-infection



Snapshot of key results:

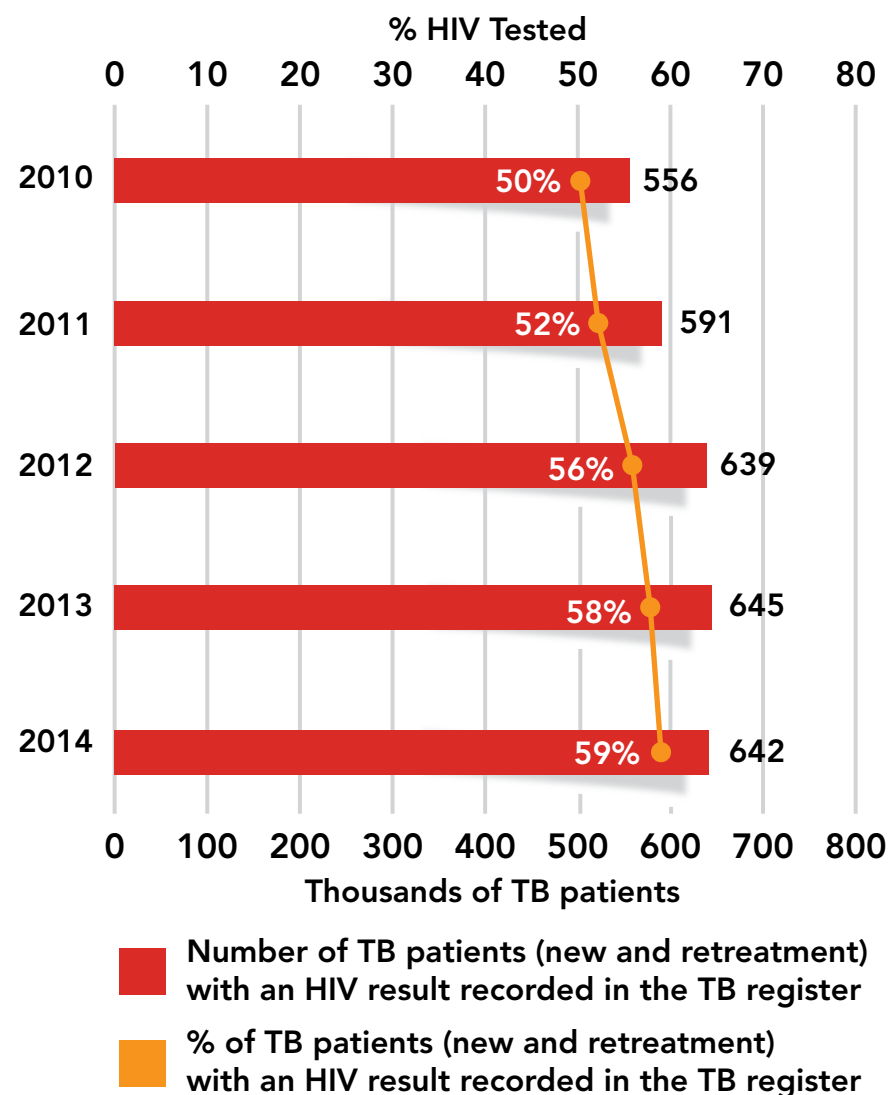
- The percentage of HIV-positive TB patients on antiretroviral therapy (ART) rose to 77% in 2014, up from 39% in 2010 (globally: 77%).
- CPT coverage among HIV-positive TB patients increased slightly from 85% in 2010 to 88% in 2014 (globally: 87%).
- In 2014, 71% (15/21) of TB CARE I countries reported to WHO on screening for TB among people enrolled on HIV care compared to 57% (12/21) for 2010.

Testing for HIV

With 59% of TB patients having HIV test results recorded in the TB register in 2014, slow but steady improvements were made over the course of TB CARE I (compared to 50% in 2010) (Figure 12 - overleaf). Globally in 2014, 51% of notified TB patients had a documented HIV test result (48% in 2013), which illustrates that TB CARE I countries are generally ahead of the curve. When data are disaggregated by region (Africa and Asia/Caribbean), dramatic differences in progress are seen; 88% of TB patients in the 12 African TB CARE I countries had an HIV test result recorded in the TB register in 2014, versus 73% in 2010. Only 33% of TB patients had a recorded HIV result in the nine Asian/Caribbean countries in 2014 (compared to 25% in 2010). Moreover, Indonesia (where HIV testing was historically limited in the presence of a concentrated HIV epidemic and low overall prevalence, as well as high TB prevalence) greatly affects the overall progress; when Indonesia (5% tested for HIV in 2014) is excluded, the testing rate jumps to 71% for the remaining eight countries in 2014 (versus 57% in 2010).

One of the TB CARE I countries with the greatest improvements in HIV testing is Nigeria, where TB CARE I has made substantial investments in TB/HIV services; HIV testing among TB patients has increased from 79% in 2010 to 92% in 2014. During Year 4, in the 35 states supported by TB CARE I for TB/HIV services, 93% of TB patients had HIV test results recorded in the TB register.

Figure 13: Number and percentage of TB patients with an HIV test result recorded in the TB register in all 21 TB CARE I countries, 2010-2014 (WHO 2015)



Spotlight: TB/HIV coverage improving in Zimbabwe

Zimbabwe has successfully rolled out a nurse-led, decentralized and integrated TB/HIV care model in 17 urban communities, involving a total of 23 primary health care facilities. The facilities received a package of assistance from TB CARE I, which included capacity building of HCWs in collaborative TB/HIV services and clinical management of patients with both HIV infection and TB. To facilitate early initiation of HIV-positive TB patients on ART (and in turn improve patient outcomes), point-of-care CD4 testing machines were installed at the 23 sites in Year 4. This support facilitated the provision of a comprehensive package of joint TB/HIV services at the facilities, including decentralized TB and HIV diagnostics, TB treatment and HIV care/ART services, and contributed towards sustained gains in the key TB/HIV service indicators.

The national target in Zimbabwe is to test all registered TB patients for HIV and commence all HIV-positive TB patients on both CPT and ART. The percentage of TB patients with recorded HIV results increased from 90% (January - March 2013) to 98% (July to September 2014). Over the same time period, the percentage of co-infected patients receiving CPT increased from 86% to 91%, while the percentage of HIV-positive TB patients receiving ART increased from 70% to 84%. These outcomes demonstrate the feasibility of decentralization and integration of TB/HIV services, including ART initiation in urban settings.

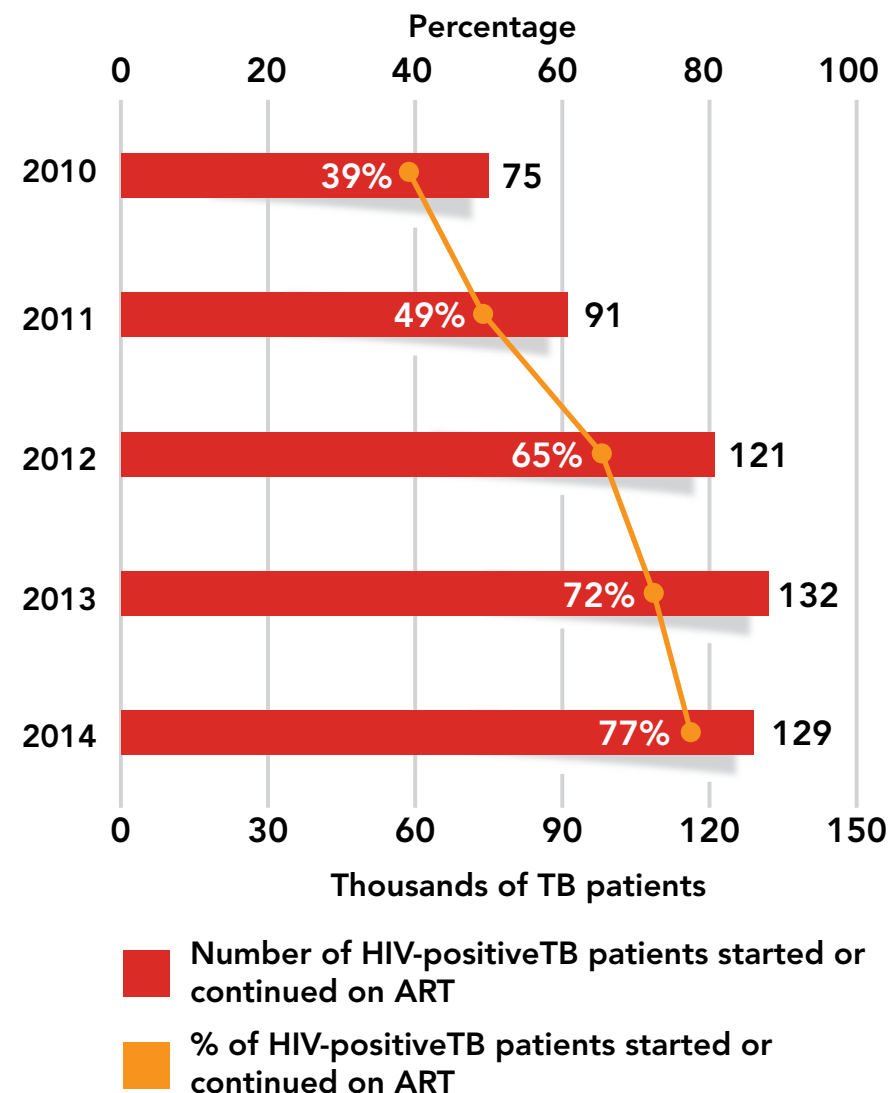
Antiretroviral Therapy (ART) and Cotrimoxazole Preventive Therapy (CPT)

A cornerstone of TB/HIV collaboration/integration is the provision of ART and CPT to TB/HIV co-infected patients. TB CARE I has worked in ten countries over the life of the project to expand ART and/or CPT coverage among co-infected patients (Botswana, Ethiopia, Ghana, Indonesia, Mozambique, Namibia, Nigeria, South Sudan, Zambia and Zimbabwe). Considerable expansion of ART was achieved, the average percentage of HIV-positive TB patients on ART rose from 39% in 2010 to 77% in 2014 (Figure 14). The global average also rose from 70% (2013) to 77% in 2014. From 2010 to 2014, dramatic improvements in ART coverage were seen in several countries: Botswana (43% to 78%), Mozambique (25% to 81%), Namibia (44% to 84%), Nigeria (33% to 75%), South Sudan (27% in 2011 to 62%), Zambia (48% to 73%) and Zimbabwe (45% to 86%). Further decentralization of ART services will be necessary to achieve the 100% target set for 2015.



Above: ART registers, Zimbabwe (Photo - KNCV)

Figure 14: Number and percentage of HIV-positive TB patients started or continued on ART in all 21 TB CARE I countries, 2010-2014 (WHO 2015)



CPT coverage among HIV-positive TB patients has remained fairly stable (85% in 2010, 87% in 2011, 90% in 2012 and 88% in both 2013 and 2014). Globally, 87% of HIV positive TB patients received CPT. In Indonesia where CPT is lagging (only 41% in 2014), coverage is expected to increase dramatically with the MoH's newly introduced 'test and treat initiative', which mandates all co-infected patients to receive ART and CPT immediately after the diagnosis of HIV. In Zimbabwe TB CARE I implemented a TB/HIV integrated care approach in 23 sites. Although CPT coverage in the sites is only slightly higher than the national average (96% compared to 94%), these results are especially impressive as CPT coverage is measured at the time of TB notification in the TB/HIV integrated sites, versus at the end of TB treatment, which is the practice for national data in Zimbabwe. This implies co-infected patients are having immediate access to both TB and HIV services at the TB CARE I-supported integrated sites.

Screening for TB and treatment of latent TB infection (LTBI)

Screening for TB and treatment of LTBI among HIV-positive clients was a challenge during TB CARE I, as was the reporting of these strategies. In 2014, 71% (15/21) of TB CARE I countries reported to WHO on screening for TB among people enrolled on HIV care compared to 57% (12/21) for 2010. Moreover, only 52% (11/21) of TB CARE I countries reported on the treatment of LTBI with isoniazid preventative therapy (IPT) in 2014 compared to 48% (10/21) in 2010. Only 23% of countries globally and 32% (13/41) of the high TB/HIV burden countries reported provision of IPT to PLHIV. Often this is because the reporting system does not capture these data or because providing IPT for PLHIV is not yet implemented by the NTP/ National AIDS Program (NAP).

The Three 'I's Initiative - Strengthening TB/HIV collaboration

Zambia and Namibia both began implementing the joint USAID/ CDC Three I's Initiative (3 I's)¹⁵ in 2013. The project was a three-year initiative funded by the US Office of the Global AIDS Coordinator (OGAC) to demonstrate how improved resources could strengthen TB/HIV collaboration as well as expand service delivery in the areas of intensified case finding (ICF) for TB among PLHIV, IC and IPT.

In Namibia, TB CARE I accelerated the utilization of Xpert testing (machines provided by CDC/OGAC) in four project areas as part of the ongoing second National Drug Resistance Survey in which all patients with presumed pulmonary TB (PTB) were tested with Xpert and sputum-smear microscopy simultaneously. Out of 21,614 Xpert tests performed nationally between July 2014-March 2015, 5,605 (26%) were conducted in the four 3 I's districts, out of which 13% were MTB+. In total, 31 Xpert machines in 25 sites are now operational country-wide, having been funded by CDC/OGAC through the Namibian Institute of Pathology (NIP), which will assist in the bacteriologic confirmation of PTB among PLHIV. Additional 3 I's results can be found in the Namibia section (page 84).

In Zambia, sputum collection points were established during Year 4 at supported health facilities across four 3 I's provinces. Community volunteers collected sputum from presumptive TB patients identified at the registration desk or outpatient departments of the participating health facilities. Thirteen Xpert machines were installed by TB CARE I across the four provinces to support ICF. Through this initiative, 18,209 samples were successfully tested from which 2,449 (13%) individuals were diagnosed with TB including 121 (5%) RR-TB (12 of which were confirmed phenotypically as MDR-TB).

Spotlight: Strengthening Xpert use for increasing TB case detection among PLHIV in Nigeria and Zimbabwe

Early experiences with Xpert, specifically in Sub-Saharan Africa countries, primarily focused on testing presumptive MDR-TB cases, while Xpert was also recommended by the WHO to be used for testing PLHIV. In response to this, TB CARE I developed a practical model for increasing the access of PLHIV to Xpert testing as a part of routine health care services. The project aimed to demonstrate implementation of Xpert in HIV care settings in Zimbabwe and Nigeria, as well as to strengthen collaboration (and integration) between HIV and TB programs.

Following rapid assessments in Nigeria and Zimbabwe, a model was designed based within the existing TB/HIV programs and made up of five elements:

1. Increase active case finding;
2. Increase awareness through training on Xpert and TB/HIV case management;
3. Strengthen supportive supervision;
4. Increase access through the implementation of specimen transportation;
5. Simplify care and treatment at the health care facility.

A so-called 'hub and spokes' model was developed to ensure access to the Xpert machines in both countries. The existing referral mechanisms were strengthened by linking peripheral facilities to a tertiary or secondary facility with an Xpert machine. A specimen transportation system was supported to ensure sputum specimens were brought to the Xpert machine and hard copies of the results were returned to the referring facility.

Implemented between October 2013-June 2015 in the pilot areas, the results show that the model was successful and resulted in a significant increase (183%) in the number of PLHIVs screened for TB and tested with Xpert in both countries - in Nigeria 418 at baseline compared to 1,534 (nearly 266% increase) during the pilot period and Zimbabwe 887 at baseline compared to 2,167 (144% increase) during the pilot period. The increase in the screening of PLHIVs for TB and testing with Xpert also yielded an increase in the number of notified bacteriologically confirmed cases - from 285 at baseline to 580 during the pilot (104% increase); the increase varied per country Nigeria (92% increase) with a more dramatic increase observed in Zimbabwe (122% increase).

Three elements of the model were found to be critical factors for its success, namely: raising awareness about Xpert in relation to TB/HIV case management and increasing access to Xpert and strengthening supportive supervision. While the model was successful according to the results, it also demonstrated that there is a need to focus on basic elements of TB/HIV case management. Data recording at the facility level improved over time, however there were large discrepancies in data between the different types of registers. For instance, when the same indicator was assessed in the presumptive TB register and in the laboratory register the results differed. Due to the absence of unique personal identifiers, cross validation of these discrepancies could not be done. In addition, there remains a need to ensure HCWs are empowered with knowledge and supported through training and mentoring to implement new technologies, perform their tasks as caregivers and document the story of that care.

COUNTRIES

20

CORE
PROJECTS

9

PEOPLE
TRAINED
IN HSS

3,771

HEALTH SYSTEMS STRENGTHENING

AIMS

TB control is embedded as a priority within the national health strategies and plans, with matching domestic financing and supported by the engagement of partners

TB control components (e.g. drug supply and management, laboratories, community care and M&E) form an integral part of national plans, strategies and service delivery.

Snapshot of key results:

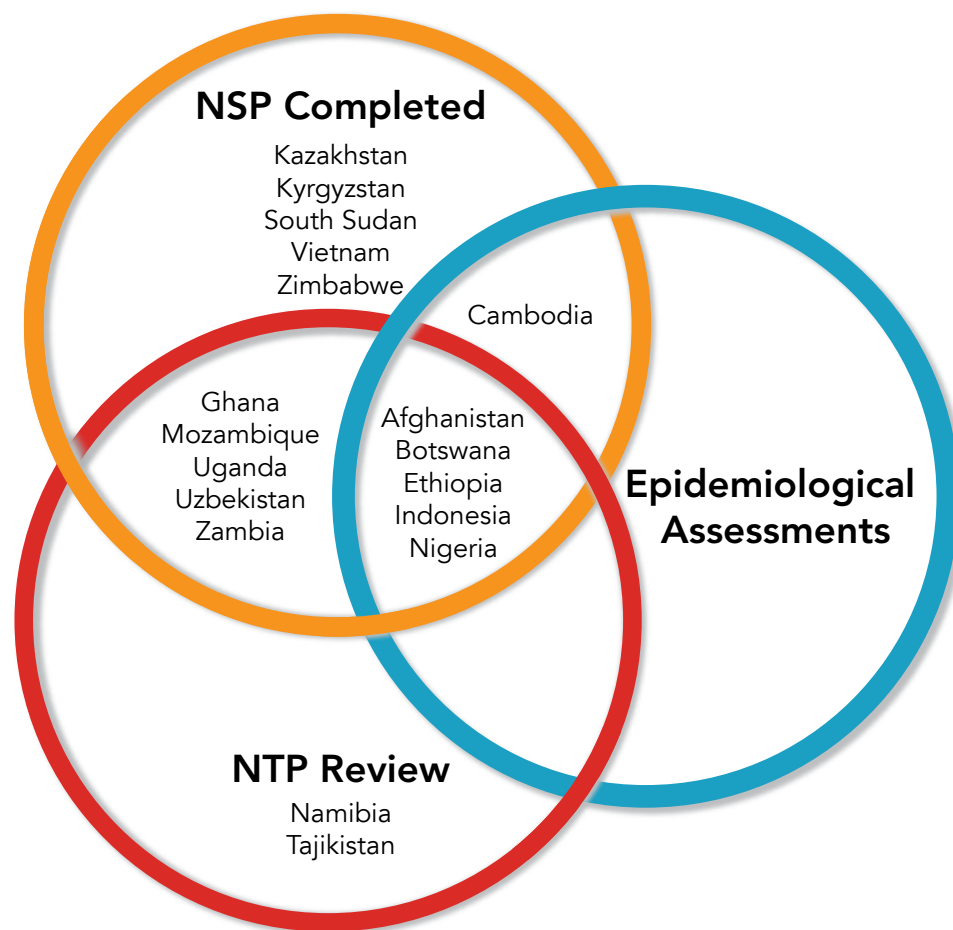
- TB CARE I contributed to formal NTP reviews in 12 countries, technically supported or led epidemiological assessments in six countries, and played a significant role in national strategic plan (NSP) development in 16 countries.
- A total of 50,793 people were trained by TB CARE I (56% male/44% female).

TB CARE I adopted a comprehensive approach to strengthening health systems. The project focused on helping NTPs to analyze overall health system weaknesses, develop responsive strategies and address challenges within the building block of HSS (i.e. service delivery, health workforce, information, medical products and technologies, financing, and leadership/governance). Given the cross-cutting nature of HSS, several of these components are addressed through other TB CARE I technical areas (i.e. 'service delivery' in UA, 'information' in M&E, and 'medical products and technologies' in M&E and drug supply management).

Strategic Planning - Using health information for decision-making

An NSP is an essential management document and guide to help the NTP and its partners efficiently implement the policies for TB prevention, care and control, over a defined period of time. These documents have been especially critical in the last few years as NSPs have become a requirement for informing GF grant applications (see page 104 for more information on GF collaboration and support). TB CARE I played a crucial role in both the information gathering phase (i.e. epidemiological assessments and NTP reviews) and the development of NSPs. TB CARE I contributed to formal NTP reviews (i.e. Joint External Monitoring Missions) in 12 countries, technically supported or led epidemiological (epi) assessments in six countries, and played a significant role in NSP development in 16 countries (Figure 14). At the regional level, the Integrated Strategic Plan for HIV/AIDS, TB and other Infectious Disease for ECSA was supported by TB CARE I.

Figure 15: TB CARE I technical contributions to NTP reviews, epidemiological assessments and NSP development



Building the capacity of the health workforce

During the life of the project, TB CARE I has invested in human resource development across all TB CARE I countries and technical areas. Strengthening and building the capacity of staff at all levels of the health system was achieved through several approaches including cascade, in-person and on-the-job trainings, as well as mentorship, supportive supervision and the secondment of staff to the NTP. Numerous examples of capacity building are highlighted throughout this report including a TB-IC mentorship program (page 35) and the Center of Excellence in Kigali, Rwanda (page 103).

Looking across all projects, by the end of the project a total of 50,793 people had been trained (56% male/44% female). Overall, the male/female distribution of trainees did not change greatly from year to year, but differed greatly by country (e.g., 11% of Year 4 trainees were female in Afghanistan versus 81% in Kyrgyzstan). As seen in Figure 16, with 4,604 trained in the first year, this number increased rapidly in the following years. The highest number of people trained was in the technical area of Universal Access (32%) compared to only 2% of people trained under the technical area of Drug Supply and Management. These figures correlate to the number of countries working in the technical areas - while 20 (95%) countries have worked under Universal Access, only seven (33%) worked in the area of Drug Supply and Management - an area that was usually covered by other USAID mechanisms such as the SIAPS program.

Figure 16: Number of people trained with TB CARE I support by training type (i.e. country technical area or funding source), Years 1-4

Training Type	Year 1*	Year 2	Year 3	Year 4	Grand Totals (%)
Universal Access	1,415	3,978	5,736	4,851	15,980 (31)
Laboratories	619	1,569	2,270	2,498	6,956 (14)
TB/IC	620	2,424	1,741	1,916	6,701 (13)
PMDT	348	638	1,407	1,494	3,889 (8)
TB/HIV	284	980	703	1,055	3,022 (6)
HSS	348	1,179	1,265	979	3,771 (7)
M&E	352	331	2,466	1,156	4,305 (8)
Drug Supply and Management	63	89	250	445	847 (2)
Other	372	1,624	226	2,076	4,298 (8)
Core Funded	183	187	243	232	845 (2)
Regional Funded	-	-	73	106	179 (0.4)
Totals	4,604	12,999	16,380	16,810	50,793

Supervisory visits by NTP staff were conducted on a regular basis with TB CARE I support as another main approach to strengthening local capacity. The number of supervisory visits supported by TB CARE I surpassed 32,000 over the life of the project. It needs to be mentioned, however, that 65% (21,224) of the visits were conducted to Kenya alone during Year 2 when the country relied heavily on TB CARE I for the functioning of their supportive supervision activities. When Kenya is excluded, a two-fold increase in project-supported supervisory visits was seen from Year 2 (2,112) to Year 4 (6,723).

* During Year 1, the number of people trained was not stratified by technical area; therefore the distribution across technical areas for Year 1 was estimated based on the percentage of trainees per technical area from Year 2-4.

Above right: Trainees conducting a health facility risk assessment, Ethiopia (Photo - Max Meis)



Health financing

NTPs have begun exploring sustainable financing strategies to reduce their country's reliance on donor funding and to fully fund their national strategic plans. To assist, TB CARE I developed a suite of four costing tools that donors and governments can use to model costs, estimate the economic burden of TB, estimate patient costs, and analyze cost-effectiveness. All of the developed costing tools - *TB Services Costing Tool*, *MDR-TB Cost Effectiveness Analysis Tool*, *TB Economic Burden Analysis Tool*, and *Tool to Estimate Patients' Costs* (<http://www.challengetb.org/library/costing>) - are open source and meant to be used by NTP planners and managers.

TB CARE I-Indonesia worked closely with the Government to diversify the funding of TB control (e.g. use more domestic resources) as donor funding reduces and costs increase due to the expansion of TB and MDR-TB detection and treatment. National guidelines for the financial sustainability of the program were developed guiding local governments on allocations necessary to sustain TB control. Indonesia also conducted several costing exercises at national and provincial level with project support. Comparisons of the service delivery cost and economic burden showed clearly the economic benefit of investing more in case detection and successful treatment. The results of all costing exercises were used by the NTP to advocate for increased government financing, inform strategic planning and advocate for the use of insurance to pay for TB services. Due in part to the costing work, and other TB CARE I assistance, the MoH and the National Health Insurance System agreed that the long-term personal health services for TB (diagnosis and treatment) would be financed through national social insurance while public health

services for TB (e.g. active case finding) would be financed by the Government.

In Ethiopia, use of the *Tool to Estimate Patients' Costs* showed that on average, each patient spent more than US\$233 on diagnosis, treatment, travel and food. Most of the patients lost their jobs and, on average, patients lost 40% of their income. To cover the diagnosis and treatment costs, 38% of the patients sold property (mostly livestock), 14% leased out property (mostly land) and 41% took out loans. In both cases this reduced their household financial reserves and their current and future income. Forty-seven percent of the patients received some assistance from donors, but the amounts involved were generally much smaller than the costs. The cost to families was overwhelmingly catastrophic and if they were not already poor before catching MDR-TB they certainly were afterwards.



Above right: Health care worker with an MDR-TB patient, Ethiopia (Photo - David Collins)

COUNTRIES

7

CORE
PROJECTS

1

PEOPLE
TRAINED

4,035

MONITORING & EVALUATION, SURVEILLANCE AND OR

AIMS

To strengthen TB surveillance

To improve the capacity of NTP's to analyze and use quality data for the management of the TB program.

Snapshot of key results:

- By project end, 52% (11/21) of TB CARE I countries had case- or patient-based ERR systems compared to only 33% (7/21) at baseline.
- Ninety-four OR studies were completed across 18 countries.
- A special issue of Public Health Action (July 2015) summarized the TB CARE I-supported Ethiopian OR initiative and published results from six studies conducted through the initiative.
- TB CARE I supported National TB prevalence surveys in nine countries and drug resistance surveys in eight countries.
- In Year 4, 88% (15/17) of TB CARE I countries measured data quality on a regular basis, compared to 50% (9/18) of countries at baseline.

Strengthening TB surveillance and surveys

TB surveillance - routine or periodic - is a cornerstone to any well-functioning national TB program. TB CARE I played a key role in the development and piloting of WHO's *Standards and benchmarks for tuberculosis surveillance and vital registration systems* - a key tool to help countries identify aspects of their surveillance systems that need to be strengthened to improve TB control.

For routine TB surveillance, a major focus under TB CARE I was the establishment or improvement of electronic recording and reporting (ERR) in project countries. In Year I, TB CARE I developed the *Guide on Electronic Recording and Reporting for TB Care and Control*, to help constructively inform the scale-up of ERR in USAID priority countries.

At the start of the project, only 33% of countries (7/21) had a case- or patient based ERR database at the national level. By project end, 52% (11/21) of TB CARE I countries had such a system (Botswana, Cambodia, Indonesia, Kazakhstan, Kenya, Kyrgyzstan (not fully functional), Namibia, Nigeria, Tajikistan, Uzbekistan and Vietnam) - a major contribution to data quality and an important tool for decision-making. Of these countries, TB CARE I provided notable support for ERR in Cambodia, Indonesia, Kenya, Nigeria and Vietnam. In Cambodia, TB CARE I helped the NTP develop an ERR for DR-TB (e-TB manager), which the NTP has since decided to expand to include drug-sensitive TB patients as well. In Indonesia, the project played a major role in the roll-out of the web-based Integrated Tuberculosis Information System (SITT) for regular TB R&R, and e-TB Manager for DR-TB, which successfully scaled up in pace with PMDT expansion (23 sites by project end). The NTP in Kenya developed its own web-based TB program management system with substantial technical assistance from TB CARE I (see

box on page 51 for more information). Similarly, e-TB manager was adopted and rolled out in Nigeria for DR-TB management with TB CARE I assistance.

In Vietnam, TB CARE I supported both VITIMES, the TB Information Management Electronic System for drug-sensitive TB, as well as e-TB manager for DR-TB in all 41 PMDT sites. With e-TB manager, data across all aspects of PMDT, including information on presumptive MDR-TB patients, the management of co-morbidities like HIV, drug supply and management, laboratory test results, treatment, and outcomes for all MDR-TB patients at all sites are now easily accessible from multiple levels of the health system. This has catalyzed data use for decision-making and facilitating further PMDT expansion.

The project also provided support in Ethiopia, Mozambique and Zimbabwe to lay the groundwork for electronic systems that are currently being developed. Further details on all of these achievements can be found in the country-specific sections.

TB CARE I has supported the implementation of national TB prevalence surveys in nine countries since the start of the project: Botswana (costed plan only), Ethiopia, Ghana, Indonesia, Kenya, Mozambique, Pakistan, Uganda and Zambia. TB CARE I not only played a key role in the general implementation of the prevalence survey in Zambia, but also demonstrated for the first time ever that digital data collection and data processing approaches could be used successfully in a national prevalence survey.

Drug resistance surveys were conducted and supported by TB CARE I in eight countries: Cambodia, Ethiopia, Indonesia, Mozambique, Namibia, Vietnam, Zambia and Zimbabwe.

Maximizing data quality, analysis and use

To help strengthen in-country M&E capacity, TB CARE I implemented a multi-year core project to help strengthen M&E efforts in 16 countries. In Year 1, a three-day in-person training was conducted and mini-M&E plans were developed and implemented in 11 of 16 participating countries. In Year 3, a five-day follow-on training, which focused primarily on data quality was conducted in Nairobi, Kenya for the NTP and project M&E officers from 16 countries. Countries again developed targeted M&E action plans, 15 of which were incorporated into TB CARE I country Year 4 work plans (or other USAID-funded project work plans). Workshop materials from the Nairobi course were compiled in the *Innovations in TB Data Quality - An M&E Workshop Facilitators Guide* for use and adaptation at country level.

Throughout the life of the project, TB CARE I has put great emphasis on the importance of data quality and the use of data for decision-making. TB CARE I has worked in 17 (77%) project countries to improve the quality of data at various levels of the system. The measurement of data quality has consistently gained greater traction with 88% (15/17) of TB CARE I countries in Year 4 measuring data quality on a regular basis, compared to 50% (9/18) of countries at baseline. For example, in Ghana TB CARE I developed and rolled out a Rapid Data Quality Assessment Tool (RDQA) in seven regions to assess data accuracy, consistency, and completeness at multiple levels of the reporting system. In Afghanistan, TB CARE I invested heavily in strengthening the reporting system and data quality. A TB CARE I-led data quality assessment in 2013 showed an 11 percentage point improvement in overall data accuracy from 79% in 2008 to 90% in 2013.

TB CARE I has also been investing in data quality and use at the global level. In the last year of TB CARE I, the handbook *Understanding and Using TB Data* was released. The document shows how to use various data sources, presents existing tools to analyze the quality of data and describes methods to estimate the burden of TB and related trends. It is aimed at NTP managers, M&E officers, researchers including epidemiologists and statisticians, and staff working with technical, financial and development agencies.

Operations Research

Operations Research plays a critical role in informing TB control program implementation - providing insight on whether current practices/approaches are working or if/how interventions need to change. Under TB CARE I, a total of 122 OR studies were initiated within 18 countries from which 94 were completed (77%). TB CARE I projects in Ethiopia (32 studies), Zimbabwe (13) and Indonesia (10) and Vietnam (10) initiated the greatest number of OR studies. The OR studies covered a wide range of topics such as case finding, TB in prisons, PMDT and TB/HIV. Nearly half of the completed studies fell under Universal Access (48%), followed by PMDT (15%), M&E/Epidemiology (12%), and TB/HIV (9%) (Figure 17).

Many of the completed OR studies were not only shared with MoHs, NTPs or other stakeholders, but were also presented at (inter-) national scientific conferences or published in scientific journals. A summary of all completed OR studies that have results available and that were disseminated to a wider audience for knowledge exchange or decision-making purposes can be found here: http://www.tbcare1.org/publications/TB_CARE_I_OR_Results.pdf

Figure 17: Number of operations research studies completed with TB CARE I support by technical area

Technical Area/Topic	Number (%) of studies completed per technical area
Universal Access	45 (48%)
Laboratories	3 (3%)
Infection Control	3 (3%)
PMDT	14 (15%)
TB/HIV	8 (9%)
Health Systems Strengthening	4 (4%)
M&E/Epidemiology	11 (12%)
Drugs	1 (1%)
Morbidity/Mortality	5 (5%)
Total	94



Above: Community engagement, Kenya (Photo - KNCV)

Supporting an innovative web-based TB program management system in Kenya

In Kenya, with support from TB CARE I, the NTP developed an innovative web based TB program management system integrated with mobile technology—the first of its kind to be implemented in Africa. TIBU (“to treat” in Swahili) enables the TB program to easily access data for informed decision-making at all levels. It is strengthening and improving recording and reporting with real time data from the facility level up to the central unit, as well as the provision of feedback. The system is also strengthening and improving governance and accountability through the utilization of mobile money transfer to make payments for supervision and provide MDR-TB patient support.

Data is collected electronically with tablet computers and uploaded into the central database of the NTP. In addition, TIBU can be used for logistics planning of commodities and MDR patient support. To enable integration, TIBU is also linked with the national District Health Information System for TB data sharing at the Ministerial level.

TIBU was developed through a unique partnership led by the NTP and USAID Kenya with TB CARE I and three Kenya information, communications and technology (ICT) companies - Safaricom, Iridium Interactive and Tangazoletu. TB CARE I was the main partner working with the NTP between 2012 and 2013 to roll out and manage TIBU. TB CARE I also provided support to improve data quality to ensure TIBU is used to its maximum capacity. The project also helped integrate the supervision checklist used in the field into TIBU.

Although still in the early stages of implementation at the end of TB CARE I-Kenya (June 2013), the system was able to generate cohort and case finding reports for 2012 and the first two quarters of 2013 - initial signs of a functional, timely system with quality data.



DRUG SUPPLY & MANAGEMENT

AIM

To ensure nationwide systems for a sustainable supply of drugs.

Drug supply and management had the smallest level of investment of all eight technical areas under TB CARE I. Eleven country projects (Cambodia, Ethiopia, Indonesia, Kazakhstan, Kenya, Kyrgyzstan, Mozambique, Nigeria, Uzbekistan, Vietnam and Zambia) conducted drug management activities at some point during the project. National forecasts for first- and second-line drugs (SLD) were conducted in all TB CARE I countries from 2013-2015 (excluding Cambodia in 2013); the presence of e-TB manager (which has a drug management component) in five TB CARE I countries greatly facilitated SLD forecasting in those countries.

Over the life of the project, substantial improvements were seen in the number of countries with updated SOPs for the selection, quantification, procurement, and management of TB medicines. Updated SOPs were available in 76% of active TB CARE I countries (13/17) at the end of Year 4, compared to 44% (8/18) of countries at baseline. TB CARE I played a key role in the development/update of these documents in Indonesia and Mozambique.

In Indonesia, TB CARE I assisted with the development of the \$11 million Procurement and Supply Management (PSM) Plan for Global Fund Phase 2. As a result, the NTP successfully secured a logistics budget from the GF Grant Round 8 Phase 2, Round 10, and Single Stream Funding (SSF) phases I and II. In Indonesia, TB CARE I also supported the establishment of a nationwide Logistics Management Information System (LMIS) to ensure a sustainable/uninterrupted supply of drugs to support effective TB treatment services.

Snapshot of key results:

- Updated SOPs were available in 76% of active TB CARE I countries (13/17) at the end of Year 4, compared to 44% (8/18) of TB CARE I countries at baseline.
- In Year 5, TB CARE I developed a protocol for the rational and safe introduction of bedaquiline, a new TB drug for MDR-TB treatment, and supported Indonesia, Kazakhstan and Vietnam to develop country-specific versions of the protocol, which are now being implemented.

In Vietnam, TB CARE I provided assistance to the NTP to develop a PSM assessment tool to measure and track its compliance with WHO good practices for procurement, storage and distribution. This tool was regularly used to assess the current status of TB pharmaceutical supply chain management activity in Vietnam. In Year 4, challenges with distribution and budgeting/financing were identified and have informed NTP priorities going forward.

New TB drug introduction

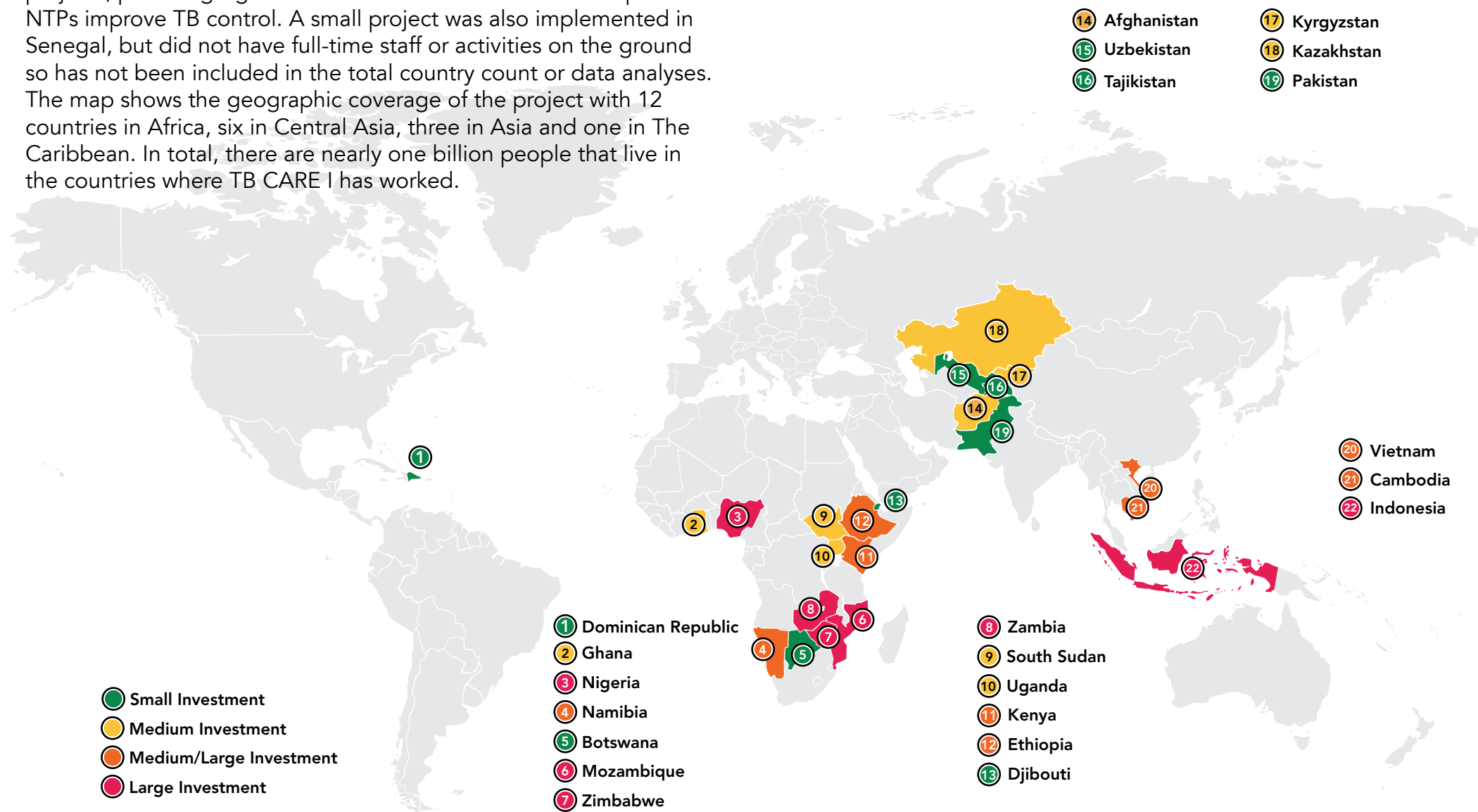
A fundamental aspect of the rational introduction of new TB drugs in countries is to ensure that national authorities establish the necessary conditions for optimal and responsible use of new TB drugs/regimens. These conditions include: development/update of national guidelines, inventory of minimal infrastructure and resources required (clinical, laboratory, recording & reporting, monitoring and evaluation, drug supply and management etc.) for proper case-management, efficient pharmacovigilance, and surveillance of drug resistance. In Year 5, TB CARE I developed a protocol for the rational and safe introduction of bedaquiline, a new TB drug for MDR-TB treatment, and supported Indonesia, Kazakhstan and Vietnam to develop country-specific versions of the protocol. Participating countries are now implementing their plans (in Indonesia with GF support) to collect information on safety (through active pharmacovigilance), as well as the feasibility and effectiveness of implementation. In addition, *The Use of Delamanid in the Treatment of Multidrug-resistant Tuberculosis: Interim Policy Guidance*, was developed with TB CARE I support and published as a WHO document in 2014.



Above right: Individual DOTS dosages, Afghanistan (Photo - MSH)

Over the life of the project, TB CARE I implemented 22 country projects, providing significant reach across continents to help NTPs improve TB control. A small project was also implemented in Senegal, but did not have full-time staff or activities on the ground so has not been included in the total country count or data analyses. The map shows the geographic coverage of the project with 12 countries in Africa, six in Central Asia, three in Asia and one in The Caribbean. In total, there are nearly one billion people that live in the countries where TB CARE I has worked.

Figure 18: TB CARE I countries and level of investment, Year 1-4



Population: 31,627,506

TB CARE I Timeframe: July 2011 - Dec 2014

Lead Partner: MSH

Collaborating Partners: KNCV, WHO

Technical Areas: Universal Access, TB-IC, Health Systems Strengthening and M&E.

Mortality (excluding HIV+, rate per 100,000 population per year)*: 44

Prevalence (Rate per 100,000)*: 340

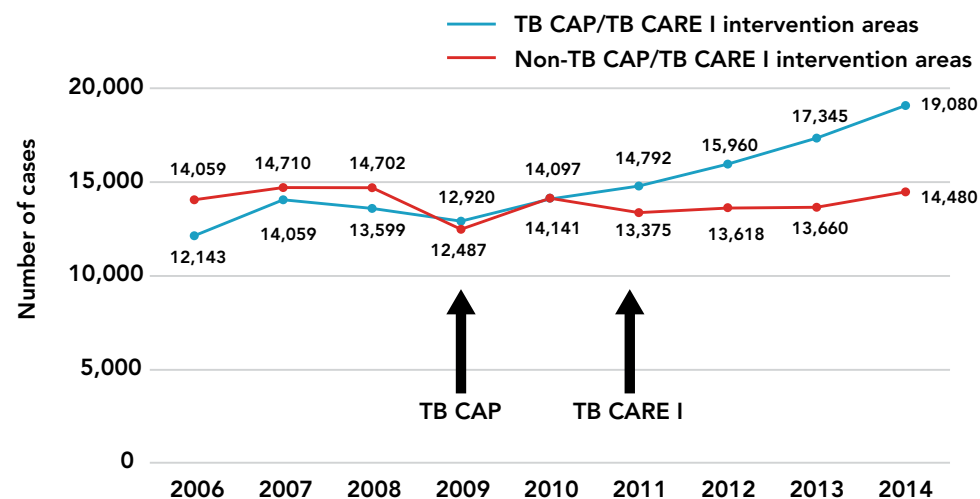
Incidence (Rate per 100,000 per year)*: 189

CB-DOTS contribution - One of the ways TB CARE I supported the NTP's efforts to increase TB case notification was by helping to increase access to quality TB services. The project ensured that people residing in hard-to-reach and remote areas received access to TB services through CB-DOTS. The implementation of CB-DOTS was conducted through partnerships with three implementers of a basic package for health services (BPHS) in six provinces and with BRAC in seven provinces (13 TB CARE I-supported provinces in total). From 2011 to 2014, 73,943 persons with presumed TB were identified and referred to TB diagnostic centers by community health workers (CHWs). From these referrals, 4,119 (6%) were diagnosed as bacteriologically confirmed TB cases and were put on treatment. In addition, 4,541 TB patients received their treatment with support from CHWs and community members. In total, 19% of all new bacteriologically positive TB patients notified in the 13 TB CARE I provinces received their directly observed therapy (DOT) from CHWs. The treatment success rate for those TB patients who received their treatment from CHWs was 98% compared to the national rate of 90%. The TB CARE I intervention also contributed

* (WHO, 2015)

to a changing trend of TB case notification in Afghanistan. Data showed that more TB cases were notified in the 13 USAID-supported provinces compared to 21 non-USAID supported provinces after the onset of the TB CARE I and TB CAP projects. (Figure 19).

Figure 19: Trend in number of TB cases notified in USAID-supported (13) vs. non-supported provinces (21), 2006-2014



Urban DOTS contribution - With substantial TB CARE I assistance, the NTP expanded Kabul City residents' access to TB services through the NTP's Urban DOTS program, which was developed in partnership with TB CARE I, WHO, the private sector, and other sectors of the government (i.e. Ministries of Education, Higher Education, Interior, Justice and Defense). At the end of TB CARE I (2014), Urban DOTS was available in 71% (80) public and private health facilities in Kabul City compared to only 48% (53) of urban facilities in 2011. As a result, more presumptive and confirmed TB cases were notified in Kabul City. Fifty percent more presumptive TB patients were seen at urban health facilities in 2014 (17,861) compared to 2011 (11,900). In turn, 9% more bacteriologically confirmed cases were notified in 2014 (1,280) than in 2011 (1,082), while a 65% increase in all forms of TB was measured over the same time period (2,728 vs. 4,500). Urban DOTS assisted the NTP to notify more TB cases and significantly helped improve treatment outcomes by improving registration, reporting and follow-up of patients who transferred to other provinces. In 2014, the treatment success rate in Kabul rose to 74% compared to a baseline of 44% in 2011.

Contact investigations implemented - TB CARE I assisted the NTP to implement a screening program for household contacts of TB patients. In 2014, the NTP screened 6,000 household contacts, identified 1,007 presumptive TB patients (17%), and notified 60 TB cases (all forms) (6%) of which 51 were bacteriologically confirmed. Also with TB CARE I support, the NTP screened and identified 3,661 children under the age of five who had contact with TB patients for signs and symptoms of TB, and put them on IPT.

NTP Leadership and Management Capacity-Building - TB CARE I assisted the NTP in developing its NSP for 2014-2018. The role of TB CARE I was significant as the project team assisted the NTP with data collection, conducting an epidemiological assessment of TB

data, and writing of the NSP and concept note (CN) for the GF. The GF approved the CN in November 2014 and Afghanistan secured \$12.4 million for the period 2015-2017.

Evaluation workshops conducted - TB CARE I also provided technical and financial assistance to the NTP to conduct annual national evaluation workshops in April 2012 and August 2014. During these workshops, the NTP was able to assess its performance based on annual data and to plan for the next year. In addition, the NTP gained the commitment of the Ministry of Public Health, donors, and local and international organizations to secure funding for quality TB activity implementation in Afghanistan.



Above right: Raising awareness of TB with school children, Bamyan, Afghanistan (Photo - MSH)

Surveillance and M&E System Strengthening - TB CARE I helped the NTP to improve TB surveillance by strengthening and streamlining the recording and reporting system. TB data is now aggregated at the provincial level, entered into a database, and sent electronically to the national health management information system (HMIS) and TB surveillance department. The HMIS now collects more than 95% of electronic reports from all 34 provinces compared to only five participating provinces before the system was established.

Data quality improved - Improving data quality was a major priority for TB CARE I. The project assisted the NTP to conduct quarterly review workshops in all 13 TB CARE I-supported provinces from 2011-2014. The workshops aimed to review each health care facility's performance on TB, provide feedback, and propose innovative approaches to increase TB case findings and treatment success rates. On average, more than 800 non-governmental organization (NGO) representatives, provincial public health officers, frontline health care staff members, and provincial TB team members, attended these events. The project also supported the NTP to conduct data quality assessments in 2013. Results showed that the surveillance system strengthening initiatives led to an 11 percentage point improvement in overall data quality from 2008 (79%) to 2013 (90%).

Operations research implemented - TB CARE I also assisted the NTP in conducting operations research, the results of which were often submitted to The Union World Conference on Lung Health each year. In total, 23 abstracts were submitted to the Union conference, 16 of which were accepted for either poster or oral presentation.

TB-IC strengthened - The project expanded TB-IC to 140 health facilities during the last year of the project, making healthcare settings safer for healthcare staff, clients, and communities. The time spent at health facilities by presumptive TB patients and for TB patients has reduced, notably; the mean time from arrival at a health facility to identification as a presumptive TB patient was 26 minutes less (from 58 to 32 minutes) in intervention facilities compared to control facilities.



Above right: Community health worker providing DOT, Afghanistan (Photo - Mostafa Shefa)

Population: 2,219,937

TB CARE I Timeframe: Oct 2010 - Dec 2014

Lead Partner: KNCV

Technical Areas: Universal Access, Laboratories, PMDT

Mortality (excluding HIV+, rate per 100,000 population per year): 28

Prevalence (Rate per 100,000): 354

Incidence (Rate per 100,000 per year): 385

TB CARE I supported capacity building at both the NTP and the NRL with a staff person seconded at both sites. Although a relatively small project, strong, comprehensive technical support contributed to the following achievements:

Community TB Care Expansion - Historically, high defaulter rates and low TSRs have been a challenge in Botswana due to patients' limited access to a health facility and limited organizational and staff capacity of the NTP. As a result, TB CARE I helped to expand and strengthen the NTP's community TB care (CTBC) program by building the NTP's capacity and assisting with supportive supervision. Since the start of TB CARE I, CTBC has expanded in the country and uptake improved from 45% (2011) to 65% in 2013. A national evaluation of CTBC implementation in Botswana was completed with TB CARE I support to guide the NTP/MoH to adopt and scale-up an appropriate CTBC approach, taking into consideration future declines in donor funding. CTBC approaches using incentivized volunteers were deemed the most effective and of the highest quality, despite sustainability concerns. CTBC

approaches managed by civil society organizations (CSOs) were noted to be very effective for hard to reach populations. The sustained scale-up of CTBC through increased engagement of civil society will go a long way in empowering TB patients and affected communities to meaningfully participate and contribute to TB control.

PPM Engagement - A national PPM framework for the engagement of the private sector in TB control was finalized and disseminated with TB CARE I support. In total, 278 HCWs from the private sector were trained on TB care and prevention using the guideline during the life of the project. About 20 private health care facilities are currently engaged in the management of TB, and during Year 4, 70 TB patients (1% of all TB cases) were managed in the private sector under the PPM scheme.

NRL accreditation and SNRL status - With substantial technical support from TB CARE I, the NRL received its accreditation to ISO 15189 through the South Africa Accreditation Systems (SANAS) and continued to retain its status as an ISO 15189 accredited laboratory. The NRL was also nominated as a candidate to be developed as a Southern Africa Development Community (SADC) Regional Supra-national Reference Laboratory. TB CARE I supported implementation of the quality management system and the strengthening of culture and drug susceptibility testing capacity, which were among the key criteria for selection.

GeneXpert MTB/RIF roll-out - TB CARE I contributed to the development of a comprehensive roll-out plan for Xpert implementation. TB CARE I also supported staff training, the update of Xpert algorithms in line with WHO recommendations and M&E tools, sites assessment, selection of appropriate sites and deployment of the machines at the health facilities. As a result, Xpert machines (not procured by TB CARE I) have been rolled out to 34 health facilities placed at laboratory and point-of-care sites across all 28 health districts in the country.

Routine audiology services - To measure the side effects on hearing of MDR-TB treatment, tele-audiology services (Kudu wave) have been established in all five MDR-TB treatment initiation sites as a result of TB CARE I technical guidance. Routine audiology services are now provided in all MDR-TB treatment initiation sites and linked to the national Center of Excellence in Princes Marina Hospital in Gaborone.

Strategic planning and grant preparation - TB CARE I provided TA to develop a robust NSP for 2013-2017, which was developed through regular consultative meetings with stakeholders including CSOs. The project also funded a budget expert to cost the strategic

plan. TB CARE I then supported the development of an addendum to the NSP in line with the WHO post-2015 End TB strategy and the Global Fund New Funding Model requirements. To inform this process, TB CARE I also supported an epidemiological and impact analysis (Epi-analysis) and TB program desk review.

The TB CARE I team closely supported GF grant implementation and grant writing (Round 5, Transitional Funding Mechanism (TFM), and development of a single TB/HIV concept note under the new funding model). Most recently, the TFM proposal was successful, securing roughly \$2.7 million for TB care and prevention in Botswana.



Above right: NTRL Staff and SANAS assessors after accreditation recommendations, Botswana (Photo - KNCV)

Population: 15,328,136

TB CARE I Timeframe: Oct 2010 - Dec 2014

Lead Partner: KNCV

Collaborating Partners: FHI 360, JATA, MSH, WHO

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, TB/HIV, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 58

Prevalence (Rate per 100,000): 668

Incidence (Rate per 100,000 per year): 390

Childhood TB - The national guideline for Childhood TB was introduced in 2008, but its implementation was limited. In 2011, TB CARE I and the NTP began piloting routine childhood TB services in three operational districts. TB CARE I continued to successfully expand the diagnosis and treatment sites to 27 operational districts (OD) within 13 provinces over the course of the project. During the project period, a total of 79,441 presumptive pediatric TB patients were referred from communities and health centers for further diagnosis at referral hospitals. Of these, 14,180 children (18%) were diagnosed with TB and put on treatment. IPT was introduced and expanded to health centers in 27 ODs with the project's support. A total of 5,825 children were successfully registered for IPT over the life of the project. Moreover, 96% (1,965/2,050) of the children who were registered for IPT in 2013 completed the six-month course of treatment.

Hospital Engagement - Cambodia has a 10% diabetes and 15% pre-diabetes prevalence, that highlights the importance of screening for TB among this risk group; managing diabetes mellitus (DM) among TB patients (bidirectional framework for TB and DM) is

also critical for the overall health and treatment success of these patients. As a result, TB screening began in five large hospitals among patients visiting the hospital's outpatient department (OPD) or diabetes clinics. From January to September 2014, 4,715 clients visited these OPDs and diabetes clinics and were then referred and screened for TB at TB units within the hospitals. In turn, 745 (16%) of the screened patients were diagnosed with TB and put on treatment.

Public-Private Mix - The 2011 prevalence survey show that approximately 45% of presumptive TB patients visited the private sector prior to presenting at a public sector health facility, highlighting the importance of engaging the private sector in TB diagnosis and treatment. TB CARE I supported PPM engagement in 26 ODs over seven provinces, engaging over 1,323 private providers. Since the project's start, a total of 1,626 patients have been diagnosed through PPM activities, exceeding the target of 1,243. Private providers most often comprise pharmacists in urban and peri-urban areas; the rate of referrals from these providers of presumptive TB patients who reached the public system for diagnosis and treatment rose from 50% to 71%.

Prisons - In 2009, the prevalence rate in prisons was 18 times that of the general population (approximately 5,000 per 100,000) and in 2011, the rate had decreased to approximately 3,000 per 100,000. Under TB CARE I, case notification rates (CNR) doubled in 2011 from active case finding conducted in the nine prisons covered in the project's catchment area. In 2011, 4,804 prisoners were screened from which 95 TB cases (2%) were diagnosed and started on treatment (4,901 were screened in 2012 with 140 TB cases (3%) being diagnosed and started on treatment). Unfortunately, trends in CNR decreased as active case finding in prisons was discontinued; this emphasizes the importance of not only demonstrating the added value of a case finding approach, but also ensuring its sustainability.

Innovative technology to strengthen TB diagnosis and management

A very promising mobile health initiative was developed by TB CARE I to expedite sputum smear results to health center staff. This mobile and online short message service (SMS) system has been piloted in 43 health centers and six labs. The system also uses a live database allowing supervisors to monitor and follow-up with TB labs if results are delayed (<http://tblab.cenat.gov.kh>). As a result, the turnaround time for delivery of test results decreased dramatically over the life of the project - from 15 days in the first three months of pilot implementation to four days in the final year of the project.

Diagnosing and treating MDR-TB - Introduction of the Xpert technology, in part with TB CARE I support (three machines procured and TA provided), has begun to decrease the diagnosis gap for MDR-TB. Throughout the life of the project, the number of presumptive MDR-TB patients tested for drug resistance (including Xpert, culture and drug sensitive testing) increased sharply from 535

in 2010 to 1,593 in 2013. Between 2012 and the end of the project, 7,256 patients had sputum samples analyzed by the three TB CARE I Xpert machines, and among those, 1,566 TB cases (22%) were diagnosed with TB, of which 181 (12%) were RR-TB.

The number of patients with Xpert RR- or MDR-TB enrolled on SLD treatment also increased three-fold increase, from 31 cases in 2010 to 121 cases in 2013. TB CARE I supported efforts to maintain and improve treatment success by providing enablers for MDR-TB patients (i.e. food, transportation, psychological support, and monthly medical follow-ups). Approximately 180 MDR-TB patients on second-line treatment received this comprehensive package of support between 2012 and 2014. Treatment success rates are relatively high by international standards (79% for the 2012 cohort), and these have been maintained likely through the mobilization of CB-DOTS as well as these enablers for MDR-TB patients.



Above right: Health provider sending results by SMS, Cambodia (Photo - Len Aynara)
Overleaf: Prisoner health check, Cambodia (Photo - Ly Mena)



SMS Alert System Dramatically Reduces Delivery Time for Positive Test Results in Cambodia

Health center (HC) staff in Cambodia used to collect sputum samples from people presenting with TB symptoms, prepare the sputum smear slides, and deliver them to the nearest microscopy laboratory on a weekly basis. During the same trip, the test results for slides submitted previously were also collected. Patients are asked to return to the HC when the test results are expected to be available. Test results were usually available in seven to twelve days, however they were often delayed by public holidays, if responsible staff are on leave, or if the results were not collected by HC staff or were not available from the laboratory for some other reason. This meant several days may elapse between the patient receiving their results and their return to the HC to begin treatment.

TB CARE I designed and implemented a web-based SMS or text messaging system to deliver the test results to HC staff and community TB volunteers. The project covered 43 health facilities, six laboratories, and the community volunteers linked to the health centers. The volunteers identify people with TB symptoms in their communities and refer them to the HCs. They also often serve as treatment supporters for TB patients, and make sure that people diagnosed with TB and started on treatment are supported throughout the six-months of treatment.

The SMS system works in the following way: When the sputum smear slides are collected for delivery to the TB labs, HC staff send a coded SMS message containing details about the specimen. The SMS system, which is pre-populated with the phone numbers of users, automatically relays this information via SMS to the appropriate laboratory technician. Once the sputum smears are

received and examined, the laboratory technician sends the results to the web-based system that in turn automatically relays the results to the HC staff and the community volunteer assigned to the patient. Only positive sputum smear results are transmitted to the community volunteer. The system also uses a live database to allow supervisors to monitor and follow-up if results are delayed.



When the SMS system was first launched, the turnaround time (the elapsed time between the date a sample was sent to the lab by a HC and the date the TB lab provided results) was an average of 23 days. Now the turnaround time has been reduced to four days.

The SMS system is fundamental for rapid diagnosis and for the prompt initiation of TB treatment. HC staff are very satisfied with the system as it allows them to know the results without traveling to the lab and they can start TB patients on treatment earlier. Community volunteers receive the results at the same time as the HCs, so they are able to instruct sputum smear positive patients to visit the HC earlier than the previously scheduled appointment date. Going forward, the NTP is considering the nationwide use of this approach.

Population: 876,174

TB CARE I Timeframe: Oct 2010 - Dec 2012

Lead Partner: WHO

Collaborating Partners: FHI 360, JATA, MSH, WHO

Technical Areas: Laboratories, TB-IC, PMDT,
Health Systems Strengthening.

Mortality (excluding HIV+, rate per 100,000 population per year): 120

Prevalence (Rate per 100,000): 996

Incidence (Rate per 100,000 per year): 619

This small-scale project was only implemented in Years 1 and 2.

Xpert introduction and the revision of diagnostic algorithms - In Year 2, Xpert was introduced by TB CARE I to ensure early diagnosis of TB (notably among PLHIV and children) and RR-TB among retreatment cases and contacts of MDR-TB cases. TB CARE I procured and installed one Xpert machine at the NRL. Although the project ended at the end of Year 2, initial results from August-September 2012 showed 136 tests were conducted from which 30 samples were identified as MTB+ (22%) including 17 that were rifampicin resistant (56%). The project also helped develop the algorithm for diagnosing TB and MDR-TB based on new rapid diagnostic technologies available in the country and subsequently trained 29 healthcare providers on its use. These algorithms were in turn incorporated into the NTP manual, which TB CARE I also helped develop.

Supportive supervision - TB CARE I was instrumental in filling the financial gap for supervisory visits nationwide arising from the

cancellation of the second phase of GF R6 TB. As a result, 135 supportive supervision visits (96% of target) were supported both technically (TB CAP-developed checklist and supervision guide) and financially by TB CARE I. Over the course of the year, DOTS personnel also improved their skills in maintaining TB and laboratory registers as well as their capacity to manage TB drugs.

Global Fund support - In 2012, TB CARE I helped to successfully develop the GF proposal and technical documents needed for the grant negotiation phase before its signature and ultimate implementation.

Feedback to peripheral levels - A new approach to data collection and sharing was introduced by TB CARE I in Year 2; the NTP began disseminating feedback reports to lower levels of the NTP system. All 16 DOTS units received quarterly feedback reports based on the annual analysis of the main TB indicators for 2011 and 2012. The reports provided comparative feedback and also highlighted achievements and challenges at the national level and by DOTS unit.



Population: 10,405,943

TB CARE I Timeframe: Apr 2011 - Mar 2013

Lead Partner: KNCV

Technical Areas: Universal Access, TB-IC, PMDT, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 3.9

Prevalence (Rate per 100,000): 73

Incidence (Rate per 100,000 per year): 60

Implemented only in Years 1 and 2, the project worked in twelve prioritized provinces (out of 31) and the eight health areas of the province of Santo Domingo.

Communication campaigns - A key focus of TB CARE I in the Dominican Republic was the use of advocacy, communication and social mobilization (ACSM) approaches to inform Dominicans about TB and available TB services, reduce stigma around TB and ultimately help to find and treat more TB cases. A national toll free TB hotline was also established with TB CARE I support to raise public awareness and provide general information about TB and TB-related services. This service continued to function after the close of TB CARE I with technical and financial support from the government. Four videos were also developed for a patient-centered mass media campaign and to be played in health facilities waiting rooms. Some of the country's most influential celebrities participated in the popular videos, bringing greater visibility to the messages¹⁷.

Photovoices¹⁸ - Photovoices is a powerful initiative for advocacy and patient empowerment. Using a coaching methodology, a group of TB patients developed a photo collection to tell their stories and to raise awareness on TB and its human face among the general population. Photovoices was also used as an advocacy tool for political decision-making. The Exhibition "Invisibles" toured over 20 sites including several prominent sites such as the Ministry of Culture, MoH, the National Congress and The National Postal Service. Photovoices was also used to advocate government authorities for the inclusion of TB patients in the social assistance programs.

¹⁷ The four videos can be viewed here: <https://vimeo.com/album/3772904>

¹⁸ The Photovoices methodology was developed by a US-based organization called TB Photovoice and adapted by TB CARE I for use in the Dominican Republic.

STOP TB committees - Started as a pilot in the slum areas of Santo Domingo and then expanded to other urban and rural areas, the project helped create 71 STOP TB committees at the community or municipal level. These committees aimed to mobilize the community to increase awareness around TB. Community- and faith-based organizations, opinion leaders, and students were engaged. Different adaptations of this initiative were implemented, each tailored to the needs of the communities, with varying scopes and participants involved.

Private sector collaboration - In Year 1, TB CARE I initiated an approach in Zonas Francas, which is the second most important industrial park in the country. The project assessed and verified that the industries have good ventilation and workers were not working in a high-risk environment. Feedback was provided to design information, education and communication (IEC) materials for workplaces. As a result, the companies in the industrial park and TB CARE I implemented “Quick TB Chats” - disseminating health messages using the sound system of the compound during the work day so that the employees’ did not have to stop working. The private medical service of the industrial park was also made available to deliver DOTS when needed. Over 1,000 people received brochures and other information materials, and hundreds heard the “Quick TB Chats”. The Photovoices exhibit was also displayed in the industrial park.

Infection Control - A “*Practical Planning Guide*” for the implementation of IC measures was developed by TB CARE I for the NTP. Infection control committees were established in two of the country’s largest hospitals. Eight health facilities (HFs) elaborated their IC plan, involving 69 staff members, and 11 HFs were refurbished.



Above right: TB message on phone box, Dominican Republic (Photo - Netty Kamp)
Overleaf: TB mural, Dominican Republic (Photo - Netty Kamp)



UNIENDO VOLUNTADES— PARA PREVENIR LA TUBERCULOSIS

¿CÓMO SE PREVIENE
LA TUBERCULOSIS?
DETECTANDO LAS PERSONAS
CON SÍNTOMAS Y HACIENDO
DIAGNÓSTICO TEMPRANO
DANDO UN TRATAMIENTO OPORTUNO



Population: 96,958,732

TB CARE I Timeframe: Oct 2010 - Sep 2014

Lead Partner: KNCV

Collaborating Partners: WHO, MSH, The Union

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E, Drug Supply & Management

Mortality (excluding HIV+, rate per 100,000 population per year): 33

Prevalence (Rate per 100,000): 200

Incidence (Rate per 100,000 per year): 207

PMDT scale-up - Over the course of TB CARE I, scale-up of PMDT services was a major priority for the MoH and the project. At the start of the project, there was limited laboratory capacity for diagnosing drug-resistant TB and a long wait list for initiating SLD treatment. TB CARE I supported the development of an MDR-TB strategic framework (2011-2015) and a protocol for an ambulatory care model, which laid the groundwork for the PMDT system. The project's support for the expansion of PMDT services was comprehensive from the refurbishment and equipping of Treatment Initiation Centers (TICs) to the capacity building of HCWs in MDR-TB diagnosis, care and treatment and implementation of supportive supervision. The project also supported the procurement of SLDs for 350 patients and ancillary drugs for more than 1,400 MDR-TB patients; patient support was provided to 243 MDR-TB patients. From 2011-2014, service expansion increased from three TICs to 32 and from about 30 Treatment Follow-up Centers to 336. Diagnosed and enrolled MDR-TB cases increased from 116 in 2011 to 598 in 2014. There are now no more MDR-TB patients on the waiting list. Treatment success rates increased from 12% in 2011 to 77% in 2012.

Civil Society involvement - In collaboration with the Addis Ababa Regional Health Bureau, from July 2013-August 2014 TB CARE I initiated the engagement of a 56-member women's CSO in TB control efforts. TB CARE I trained these women on the basics of TB and TB/HIV after which the members raised awareness around TB, referred presumptive TB patients to health facilities, provided adherence support and traced patients who interrupted treatment in two impoverished suburbs of Addis Ababa. Over the one-year period, 406 people with TB symptoms were referred by organization members, of which 275 (68%) were reported to have reached the nearby health facilities and were evaluated for TB. Of these 275 referrals, 35 (13%) were diagnosed with TB and started on treatment. Eight patients who interrupted treatment were traced and resumed treatment. Through community conversation sessions and coffee ceremonies, more than 117,000 men and women also received education related to TB and TB/HIV. The project demonstrated that community-based efforts can help prevent the spread of the disease by raising community awareness and by supporting the diagnosis and treatment of TB.

Operations research initiative - Ethiopia has a strong history of conducting OR, but translating research results into policy or practice has been limited. In 2012, the MoH launched a multi-year initiative with USAID/TB CARE I and other key partners to build sustainable capacity for TB OR with the aim of developing strong technical capacity at the national and regional levels to enhance the use of TB research for evidence-based TB prevention and control. TB CARE I, together with the NTP and the TB research advisory committee (TRAC), conducted intensive modular training for regional OR teams consisting of TB and TB/HIV program staff together with academia who as a team conducted an OR project in line with national priorities. OR teams were mentored throughout the process by experienced Ethiopian researchers from regional universities who were backstopped by international facilitators operating under TB CARE I. Since 2012, 52 people were trained in two cohorts on OR who conducted 13 different OR projects in teams. Six OR projects and two grant projects have been completed. The OR results were presented at the Union conference satellite symposium held in Barcelona. The OR initiative was published as a supplement to the December 2014 issue of the Public Health Action journal (see http://www.tbcare1.org/publications/TB_CARE_I_OR_Results.pdf).

Laboratory strengthening - TB CARE I supported the development of the EQA guideline for acid fast bacilli (AFB) microscopy and the strengthening of the EQA network. As a result of this support, EQA throughout the four supported regions (Tigray, Amhara, Oromia and SNNP) improved from 28% to 75% (1,816/2,410) over the life of the project. TB CARE I also supported the expansion of culture and DST laboratories from one laboratory in 2011 to eight in 2014. Scale-up of Xpert was heavily supported by the project including a prolonged Xpert validation exercise (at the request of the MoH), capacity building, the development of the national Xpert guidelines, training materials and the roll-out plan being supported by TB CARE I. In

addition, 19 Xpert machines and 20,000 cartridges were procured and installed by TB CARE I. Between July-December 2014, 5,003 tests were performed in 13 TB CARE I-supported sites. TB was detected in 765 samples (15%) of which 116 also were resistant to rifampicin (15%).



Above right: TB culture training, Ethiopia (Photo - Meron Seyoum)

Population: 26,786,598

TB CARE I Timeframe: Jan 2011 - Dec 2014

Lead Partner: MSH

Collaborating Partners: KNCV, WHO

Technical Areas: Universal Access, Laboratories,
TB-IC, PMDT, TB/HIV,
Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 36

Prevalence (Rate per 100,000): 282

Incidence (Rate per 100,000 per year): 165

Global Fund support and collaboration - Providing high-quality TA to the NTP for GF planning, grant development and implementation was one of TB CARE I's highest priorities. In 2013, a comprehensive review of the TB program by external consultants was successfully conducted with major contributions from TB CARE I. TB CARE I external consultants conducted an epidemiological analysis and prepared a research road map for the country. All of these deliverables were used to inform the development of the NSP and the GF concept note. TB CARE I supported the process further by reviewing the M&E and IC components of these key documents as well as participating in all NSP and CN development meetings with the country coordinating mechanism (CCM).

Intensified hospital-based case finding - TB CARE I began supporting the implementation of an intensified hospital-based TB case detection intervention in six hospitals in the Eastern Region of Ghana in early 2012. SOPs were used by HCWs to systematize the process of finding new cases of TB among OPD attendants and admitted patients. An assessment of the SOP approach showed that

the number of TB cases identified consistently increased after the SOPs were introduced. In 2012, there was an increase of 54% (519 TB cases, all forms) relative to the 2011 baseline (338) and in 2013 a 10% increase (569, all forms) relative to 2012. The SOPs improved the capacity of clinicians to manage TB complications as well. The total number of TB patients dying during TB treatment in these six hospitals decreased from 87 in 2011 to 45 in 2013 (48% decrease) and to 11 between January-September 2014 (87% decrease).

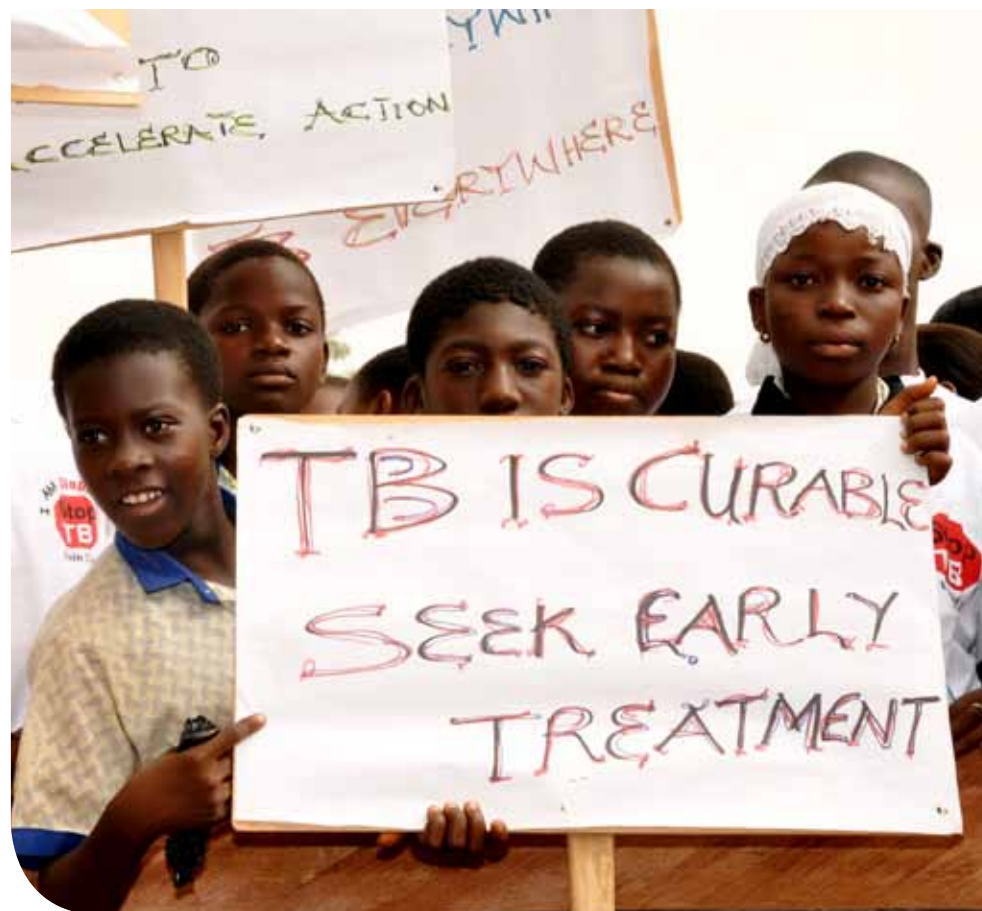
Monitoring and evaluation - The project supported the NTP in many different ways to strengthen the M&E system from the national level to the facility level through in-country and external TA. The in-country technical team worked with the NTP to review, assess and update their routine data collection tools and developed a data dashboard with live charts for data from 2007 to 2014. To improve data validation at all levels, TB CARE I developed an RDQA tool for conducting monitoring and supervision at the national, regional and district levels to check for data accuracy, consistency and completeness. Seven regions were supported by TB CARE I to

use the RDQA tool to improve data quality. In an effort to address the data inaccuracies and inconsistencies at various levels of the reporting system, TB CARE I introduced an innovative approach for the Ghana NTP for conducting regional data validation review meetings in seven regions. During the meetings TB Treatment Registers were swapped between District TB Coordinators thus permitting peers to review and validate each other's quarterly case-finding and treatment outcome reports.

TB education - TB CARE I produced a TB Case Detection Awareness documentary for the purpose of improving TB case detection and reducing TB deaths. The TB case detection documentary was released on May 15, 2014, and has been handed over to the NTP for distribution to the regions, districts and facilities. The film specifically targeted policy makers, development partners, senior managers of the MoH and Ghana Health Service, and other relevant government ministries and departments for the purpose of advocating for continued funding of TB control services across the country in order to sustain the gains made over the last decade. The TB documentary also targets the public at large, including unconventional healthcare providers such as prayer camps.

National TB Prevalence Survey completion - TB CARE I provided substantial support to the NTP to conduct an national TB prevalence survey to assess the true burden of TB in the country and also serve as a baseline to assess trends of TB disease prevalence over time. Support included the designing of tools and a questionnaire at the preparatory stage, funding the electronic data capturing software for the survey, and providing TA and financial support for the monitoring of field work throughout the entire survey. The study measured a prevalence rate of 282/100,000 [95% CI: 111-530], as opposed to the earlier estimate of 92/100,000 population (all forms of TB).

GeneXpert MTB/RIF implementation - In an effort to help increase case detection, especially among PLHIV, TB CARE I procured and installed 12 Xpert machines across the country. Between March-September 2014, 135 MTB+ cases were detected with Xpert (17% positivity rate) of which 21 (16%) were RR-TB. Future trainers were trained on the use and maintenance of these machines to ensure sustainability. The project also supported the NTP in developing Xpert guidelines and a scale-up plan for the development of the new NSP and CN.



Above right: World TB Day, Ghana (Photo - MSH)

Ghanaian prayer camp leader promotes medical treatment for TB

The early diagnosis and treatment of TB is a challenge in Ghana. In many communities, like Lower Manya Krobo District, this challenge is compounded by the belief that TB is a spiritual disease. Many Ghanaians who contract TB seek healing in prayer camps and shrines, rather than going to health facilities for testing and treatment, and by the time these patients seek medical care, it often is too late. The district has 18 health facilities that serve over 93,000 residents, and a high incidence of TB (209 cases per 100,000 people in 2011). The district is also home to 50 of the nation's many prayer camps, where local healers provide daily services for ill residents.

Grace Tsawe owns a prayer camp in this district, and she usually sees over 100 patients a day in her main clinic. Until recently, she did not see the need to refer her patients to health facilities, as she believed TB could only be cured through prayer. However, in December 2011, Grace developed a persistent cough and began rapidly losing weight. Although she prayed fervently, her symptoms persisted, and she eventually decided to visit Atua Government Hospital. At the hospital she was tested for TB, and when found to be infected, she was immediately started on treatment.



TB CARE I-Ghana has been working to increase TB case detection in the district since early 2012. As part of this process, the project

Above: Prayer camp owner, Grace Tsawe, Ghana (Photo - B. Adusei)

facilitated a workshop on TB control for over 120 of the district's health workers. In addition to training the staff on TB screening, diagnosis, and treatment, TB CARE I has also taught them to encourage prayer camp owners to screen their patients for TB and refer them to health facilities if they are in need of testing and treatment.

One of the project's trainees, Victoria, is a TB Coordinator at Atua Government Hospital. After Grace began TB treatment, Victoria encouraged her to give her prayer camp clients the same opportunity for testing and treatment. Having experienced a full recovery, Grace was easily persuaded and Victoria taught her how to identify TB symptoms and refer patients to the hospital. Grace is pleased to see how TB screening and treatment have helped to improve her patients' health and is now encouraging her fellow prayer camp owners to refer patients who they suspect of having TB to the hospital.

"I now know that TB is not a spiritual disease and, when it is promptly tested and treated, TB is indeed curable. TB treatment has saved my life and I am ready to proudly give my testimony to my counterparts across the country,"

Grace Tsawe - Prayer camp owner

Grace requested support from the hospital to hold a workshop for other prayer camp owners so they can be trained in TB infection control. TB CARE I and the Atua Hospital managers worked with Grace to organize this training. Last year TB CARE I also arranged for Grace to give her testimony to a gathering of over 200 health professionals and local residents in Koforidua Region.

Population: 254,454,778

TB CARE I Timeframe: Oct 2010 - Dec 2014

Lead Partner: KNCV

Collaborating Partners: ATS, MSH, WHO, JATA, FHI 360, The Union

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 41

Prevalence (Rate per 100,000): 647

Incidence (Rate per 100,000 per year): 399

Indonesia was the largest of the TB CARE I countries in terms of both size and financial investment. The TB CARE I country project worked closely with the NTP at national level as well as extending TA to provincial health offices (PHOs) in ten provinces (covering 65% of the Indonesian population).

Strengthening case notification policies and regulations -

Significant advances have been made in developing a strong enabling policy and regulatory environment. A new National Health Insurance (NHI) scheme was launched by the Government of Indonesia in January 2014. TB CARE I collaborated with local partners to ensure that TB services were included in this insurance package. Moreover, in collaboration with the Indonesian Medical Association (IMA) the project was instrumental in ensuring that International Standards for TB Care (ISTC) were incorporated into the National Medical Practice Standards and National Hospital Accreditation Standards. In order to assure the quality of TB case management by private practitioners, the project supported the IMA to design a TB-certification system and develop technical

guidelines for certification. Implementation of the DOTS strategy is now one of the basic requirements for hospital accreditation and provider certification. All these regulations and standards will serve as a basis for quality assurance for TB services and, as such, improve transparency and accountability for reimbursement by health insurance providers in future. Incorporation of TB services into the insurance package is crucial to ensure the financial sustainability of the NTP.

Hospital-DOTS linkage - Under TB CAP there was already almost full DOTS coverage at the public health center (puskesmas) level, while hospitals were often still not fully engaged by the NTP nor implementing quality DOTS. Over the life of TB CARE I, the number of these hospitals implementing good quality DOTS expanded from 127 (2011) to 265 (2014) in TB CARE I-supported areas. The number of TB patients notified by these hospitals increased from 32,708 in 2010 to 54,004 in 2013 (65% increase).

PMDT scale-up - Over the life of the project, the number of PMDT sites has rapidly expanded from two to 26 fully operational PMDT referral centers in 24 provinces, along with nine sub-referral hospitals and 698 satellites. The number of presumptive MDR-TB patients tested by the NTP significantly increased from 148 patients in 2009 to 7,412 patients in 2014. The number of confirmed RR/MDR-TB cases rose dramatically from 216 in 2010 to 1,414 in 2014 with Xpert playing a key role (see below). Cumulatively, over the full five-year period, 15,637 presumptive MDR-TB patients were tested, of whom 4,009 (26%) were confirmed as having MDR-TB/RR-TB, and 2,681 (65%) were enrolled for SLD treatment. Treatment initiation rose slightly over the course of the project (64% in 2010 versus 71% in 2014), however the lack of socio-economic support for patients, loss of income, high transportation costs, doctor delay and limitations in counseling skills are some of the challenges impacting treatment initiation, with a high percentage of patients also refusing treatment. The treatment success of patients who initiated treatment in 2012 was only 54%, due to a high case fatality and lost-to-follow-up rate as a result of the many factors described above.

Innovative technologies introduced - Indonesia was one of the first high-burden countries to implement Xpert for the diagnosis of TB and MDR-TB. Currently 41 Xpert machines are operational through TB CARE I support. Since 2011, when Xpert was introduced, the average time between registration of presumptive MDR-TB cases and second-line treatment initiation has dropped from 81 to only 15 days. Xpert technology has considerably enhanced screening of drug-resistant TB, significantly boosting the number of RR-TB cases being diagnosed from 216 in 2010 to 1,414 in 2014. The proportion of patients dying between lab request and start of MDR-TB treatment decreased significantly from 11% in 2012 to 2% in 2014. Twenty one percent of HIV patients tested through Xpert were MTB+ and 2.5% were rifampicin resistant.

Above right: Xpert test preparation, Indonesia (Photo - Sanne van Kampen)



TB/HIV coordination - Indonesia has one of the fastest growing HIV epidemics in Asia. The number of PLHIV is estimated to have increased from 500,000 in 2010 to 660,000 in 2014 (UNAIDS, 2014). The estimated incidence of TB among HIV patients is 6.2% nationally (WHO, 2015). TB CARE I-Indonesia has focused on improving TB and HIV coordination, including linkages between TB/HIV and PMDT services, and the scale-up of IPT implementation. This has resulted in a steady increase (from 28% to 81%) of all ARV hospitals now implementing DOTS. ICF among PLHIV has significantly improved but is still far from optimal (93% of PLHIV screened for TB and treated accordingly). In contrast, testing for HIV among TB patients is still limited. Only 5% of TB patients are tested for HIV, of whom 16% were HIV-positive.

Diagnostic network expansion - Through TB CARE I, 12 reference laboratories have upgraded their infrastructure and equipment to meet international biosafety standards and provide quality services. Eight of these laboratories were upgraded and certified as C/DST reference laboratories, including three national reference laboratories that now fully meet international standards and are performing various reference functions including quality assurance, specialist expertise, and capacity building. Quality assurance protocols and best practices for laboratories have been rolled out nationwide.

National TB Prevalence Survey supported - A prevalence survey was conducted in 2013-2014 and TB CARE I investments were essential to achieving a high quality survey: Intensive TA during preparation and implementation, improved quality of laboratories, and screening using Xpert contributed to improved case detection compared to earlier surveys that applied TB symptom screening and less sensitive sputum smear examination. The survey revealed that the TB burden (prevalence) in Indonesia is more than double

what was previously estimated. The average prevalence of bacteriologically confirmed TB cases is now estimated at around 0.65% of the general population - which equates to some 1.6 million TB cases, with one million new cases annually. This indicates that transmission is still very high, and that the gap in notification is even wider than previously assumed. Meanwhile, the prevalence of symptomatic SS+ TB patients only slightly decreased, from 120 per 100,000 population in 2004, to 111 in 2013. This annual 1% decrease is not enough to effectively cut transmission of TB in the community. The results of this survey will certainly drive the strategies of future USAID-funded TB prevention and care projects in Indonesia.



Above right: Focus group discussion using Patient-Centered Approach tools, Indonesia (Photo - Nana Widiestu)

Population: 17,371,621

TB CARE I Timeframe: Oct 2010 - Dec 2014

Lead Partner: KNCV

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 8.6

Prevalence (Rate per 100,000): 127

Incidence (Rate per 100,000 per year): 99

Outpatient care demonstrated and adopted - A major focus of TB CARE I in Kazakhstan was the transition from hospital-based PMDT to an outpatient approach for MDR-TB treatment and care. TB CARE I developed and implemented a protocol on the administration of outpatient care and psychosocial patient support in the Akmola Oblast. As a result, the numbers of inpatient TB beds decreased and different types of outpatient care settings were established, reducing the duration of inpatient TB treatment to less than a month for TB and only 2-3 months for MDR-TB (only for the infectious phase of treatment compared to the entire length of treatment in some cases). Due to successful implementation of the full outpatient care model in Akmola Oblast, the percentage of patients enrolled in outpatient care reached 32% in Year 4, compared to only 10% in Year 1. As a result, this outpatient model was taken as a basis for the expansion of outpatient treatment nationwide and is included in the "Complex Plan for National TB" (2014-2020) (TB National

Strategic Plan 2014-2020). Funds released due to the reduction of hospital beds have been redirected to fund the outpatient settings, development of staff, and hiring of new staff such as psychologists, lawyers and social workers.

Xpert introduced - Xpert was introduced in Kazakhstan with the technical and financial support of TB CARE I. TB CARE I helped to develop and roll out the national Xpert implementation strategy, including the procurement of four Xpert machines, establishing the recording and reporting system, and providing substantial TA to Xpert sites. These efforts contributed to reducing the time to get a patient on treatment from 76 days to 8.5 days. Between Years 3-4, 12,983 samples were tested with Xpert from which 5,018 (39%) were MTB+, of which 2,321 (46%) that were RR-TB.

PMDT strengthened - TB CARE I worked to strengthen PMDT nationwide by developing and implementing MDR-TB treatment guidelines, conducting and strengthening supportive supervision, conducting on-the-job training, leading regional workshops and organizing PMDT coordination meetings. In 2014, 100% of MDR-TB patients (987) started on the appropriate course of SLDs in TB CARE pilot sites in comparison to 62% (1,802) in 2012.

Electronic surveillance strengthened - TB CARE I introduced a new electronic surveillance database that has been installed in the penitentiary system. The national centralized TB online database allows for the exchange of TB patient data between departments, allows staff to receive single summary tables, and increases the sensitivity, completeness, reliability and surveillance of TB in the country.



Above right: MDR-TB patient, Kazakhstan (Photo - KNCV)

Population: 44,863,583

TB CARE I Timeframe: Oct 2010 - Sep 2013

Lead Partner: KNCV

Collaborating Partners: ATS, FHI 360, MSH

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, Health Systems Strengthening, M&E, Drug Supply & Management.

Mortality (excluding HIV+, rate per 100,000 population per year): 21

Prevalence (Rate per 100,000): 266

Incidence (Rate per 100,000 per year): 246

Improving quality through supportive supervision and quarterly reviews - The heart of the project was support for routine NTP operations, namely supervision by NTP staff and quarterly review meetings. TB CARE I provided 100% support for the NTP supervision system at the district, provincial and national level. Over Years 1-3, 62,982 supervision visits out of 87,605 scheduled visits (72%) were conducted to health facilities countrywide - the equivalent of 84 visits each day (250 working days per year). All planned quarterly review meetings at the district and provincial level took place. These activities ensured that the NTP collected data on a regular basis, maintained contact with health facilities, and ensured issues affecting implementation of TB control activities were identified and the necessary decisions were made to maintain quality TB care.

Engaging all care providers - TB CARE I invested to increase the participation of all care providers in TB care and prevention. At the end of the project (Year 3), the number of private facilities providing diagnostic services increased from 147 in 2009 to 237 in 2013 (61%

increase); similarly, the number of treatment centers increased by 34% (187 centers in 2009 to 251 in 2013). Furthermore, prior to TB CARE I support in Kenya, in 2009, the private sector notified 3,156 TB cases, which was equivalent to 3% of national case finding. By the end of TB CARE I, the private sector notified 10,392 TB cases in 2012 which translates to about 10% of national case finding.

EQA strengthened - With TB CARE I support, Kenya significantly strengthened its EQA system for AFB microscopy. The EQA coverage prior to TB CARE I support was as low as 28% (930 laboratories, baseline in 2009), but substantial improvements were seen with 88% coverage (1,800 laboratories) by 2012, which is above the WHO standard of 80% EQA coverage. Additionally, the EQA error rates dropped dramatically from 11% in 2010 to 2.8% in 2012 which is below the WHO allowable error rate of 5%. Furthermore, the project was successful in supporting the NTP to increase the number of retreatment cases screened for drug resistance at the central reference laboratory (CRL) from 59% (5,930/10,000) in 2010 to 83 of retreatment cases (8,870 out of 10,686).

Electronic program management and reporting system - With support from TB CARE I, the NTP began implementing an innovative web-based TB program management system integrated with mobile technology—the first of its kind to be implemented in Africa. TIBU ("to treat" in Swahili) is a unique system developed for use by the NTP based on a two pronged approach that enables the TB program to easily access data for informed decision-making at all levels:

1. It is strengthening and improving recording and reporting with real time data from the facility level up to the central unit, as well as providing feedback; and
2. TIBU is also strengthening and improving management and accountability through utilization of mobile money transfer to make payments for supervision. See page 51 for more information.



Population: 5,843,617

TB CARE I Timeframe: Oct 2010 - Dec 2014

Lead Partner: KNCV

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 11

Prevalence (Rate per 100,000): 196

Incidence (Rate per 100,000 per year): 142

Outpatient care implemented - TB CARE I worked in key geographic areas including the capital of the country (Bishkek) and Issyk-Kul Oblast. The percentage of TB patients put on outpatient care treatment in six family medicine centers of Bishkek increased from 18% in 2012, to 26% in 2014. The TSR in Bishkek City remained stable at 86% over this period illustrating outpatient care can provide equivalent (or better) treatment outcomes than the traditional inpatient approach.

Management of DR-TB in children - In Kyrgyzstan the treatment of children with DR-TB was overlooked for years, but was brought to the attention of decision makers by the efforts of TB CARE I specialists. As a result, the Guidelines on Management of DR-TB in Children were developed and approved by the MoH in December 2012. These guidelines were introduced nationwide by TB CARE I-supported trainings during Year 3.

Strengthening the health system through NTP guidelines - TB CARE I was a key partner at the national level, supporting numerous key guidelines and strategy documents that are now shaping the future of TB care and prevention in Kyrgyzstan. TB CARE I supported the development of the National Program "Tuberculosis IV" (2013-2016), which was adopted by the government in June 2013. In August 2014, the MoH adopted the National Laboratory Plan, which included an Xpert implementation strategy, diagnostic algorithm, Xpert data collection tool and laboratory equipment maintenance plan; all of these documents were developed with TB CARE I support. The project also contributed to the National M&E Plan and developed key guidelines, protocols, regulations and instructions on DR-TB management, TB in children, TB-IC and the palliative care of TB patients.

Outpatient treatment makes recovery easier

In Kyrgyzstan new methods of patient-centered care are being developed to combat TB. With the support of the USAID-funded TB CARE I project, the NTP has begun piloting full outpatient care, allowing TB patients to be treated without hospitalization. The pilot is taking place in the urban setting of Bishkek City, where the approach is proving to be very effective.

Aizada Abdykadyrova, a young mother and former TB patient, moved from her native Naryn to Bishkek as a child. At the age of 15, she dreamt of becoming a model. After becoming ill with what she initially believed was pneumonia, Aizada was subsequently diagnosed with TB. The diagnosis was devastating, and despite her desire to be cared for at home, she was admitted for treatment at the hospital - a deteriorating, government-run TB facility, where she was denied access to her loved ones. After several months of treatment, Aizada was discharged and she returned home. Although she tried to put the experience behind her, the emotional and physical scars remained.

She moved to Dubai to work in fashion retail, ultimately returning to Kyrgyzstan to get married and have a child. When she next went to Dubai she lived in a small room with seven other women in order to save money. During a routine health assessment, two of her coworkers were diagnosed with TB, which led to a full workplace screening and she received the crushing news that she too had again contracted the disease and she was immediately deported.

As Aizada recounts the story, she is clearly still upset: *"You can't even begin to imagine how shocked I was to hear the news. It broke my heart to think I'd have to relive the trauma of that experience all over again."*

Above right: Former TB patient, Aizada Abdykadirova, Kyrgyzstan (Photo: Aida Estevesova).

Back in Bishkek, she went to the city TB center for treatment. As she choked back painful memories of her previous treatment and the isolation she experienced, to her surprise she was informed that the facility was part of a pilot project that advocated for outpatient care. This meant she would not have to be separated from her family or suffer the shame and trauma of protracted hospitalization; she could enjoy the convenience, safety, and anonymity of outpatient treatment.



"The community nurse who oversees my treatment is wonderful. She ensures that I take my medication and never alters our care routine."

In contrast, Aizada remembers that during her first hospitalization: *"The personnel were never strict about adhering to treatment and often gave me pills to take on my own."*

Aizada says that the opportunity to get high quality, supervised treatment close to home made it far easier to cope with the disease, and has led to her full recovery. When learning that this new process was being piloted by TB CARE I with the hope of universal availability, she pledged her support. *"I've never concealed my TB story; in fact, I wish more patients knew they had other options for treatment that make a full recovery easier. Perhaps my voice can strengthen the call to widen the practice of outpatient care."*

Population: 27,216,276

TB CARE I Timeframe: Oct 2010 - Sep 2015

Lead Partner: FHI 360

Collaborating Partners: KNCV, MSH, WHO

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, Health Systems Strengthening, M&E, Drug Supply & Management (Malaria)

Mortality (excluding HIV+, rate per 100,000 population per year): 67

Prevalence (Rate per 100,000): 554

Incidence (Rate per 100,000 per year): 551

CB-DOTS expansion - As a response to the NSP to expand CB-DOTS coverage, the project supported the consolidation and expansion of CB-DOTS implementation to 53 districts in seven target provinces, including 25 districts that were previously covered through TB CAP. In total, 52% of the national population was covered by CB-DOTS with support from TB CARE I. Through collaboration with nine local implementing agencies, a total of 4,532 CHWs including community volunteers and traditional healers, 742 health technicians, 55 Elementary Community Health Agents, and 85 Implementing agency field officers were trained in CB-DOTS. The project also conducted supportive supervision and awareness raising in support of CB-DOTS. Nationally, the number of cases notified (all forms) increased from 47,452 cases in 2011 to 57,773 cases in 2014 (22% increase). The TSR of confirmed TB cases improved from 85% (2011) to 88% (2014). Over the same period, the number of MDR-TB cases diagnosed nearly tripled from 184 to 544 cases and those put on treatment increased from 146 to 482 cases.

Reaching more children with TB - The number of pediatric TB cases diagnosed increased from 2,822 in 2013 to 5,778 in 2014, a 105% increase. The proportion of cases that were pediatric cases also increased, from 6% to 10% over the same period. The pediatric TB training for healthcare workers conducted by the NTP with support from TB CARE I likely contributed to this increase.

Laboratory strengthening - The Nampula Regional TB Reference Laboratory was renovated and equipped for Xpert, liquid culture and DST of first-line drugs (FLDs) in 2011. The project also supported the introduction of three Xpert machines and 60 LED microscopes. Between October 2012-June 2014 a total of 3,984 Xpert tests were conducted with 865 MTB+ (22% positivity rate), of which 191 were RR-TB (22%).

Malaria control - TB CARE I-Mozambique was unique in that it was the only TB CARE I country project to support malaria interventions (with funding coming from the USG's President's Malaria Initiative), in addition to its TB care and prevention work. The project provided national-level support to the Malaria Control Program from 2010 to 2013, with some activities completed in 2014. An antimalarial drug efficacy study was successfully completed during the project that examined the drug efficacy of the anti-malarial drug combinations, Artemether-Lumefantrine and Artesunate-Amodiaquine, in children. A comparative analysis of malaria case management indicators shows that the percentage of severe malaria cases managed according to national guidelines increased for both drug combinations. Treatment with Quinine increased from 60 to 90% and treatment with Artesunate increased from 20% to 65%. In addition to the study, TB CARE I strengthened malaria diagnosis and treatment through the training of 1,137 laboratory technicians (95% of all laboratory technicians nationally in 2011) in malaria laboratory diagnosis and laboratory management, including EQA. The project also trained 1,250 clinicians in clinical diagnosis to ensure accurate malaria diagnosis at facility level.



Above right: Julietta, TB patient, Mozambique (Photo - FHI 360)

Population: 2,402,858

TB CARE I Timeframe: Oct 2010 - Sep 2015

Lead Partner: KNCV

Collaborating Partners: MSH, The Union, WHO

Technical Areas: Universal Access, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 63

Prevalence (Rate per 100,000): 627

Incidence (Rate per 100,000 per year): 561

CB-DOTS supported - TB CARE I improved access to CB-DOTS by supporting infrastructure renovation and the installation of 24 community TB care points. Refurbished second-hand sea containers were turned into DOTS points with good cross ventilation, expanding access to TB services in affected communities. The success of CB-DOTS (with TB CARE I's involvement in Erongo and Karas Regions) may have been a key factor in the treatment success rate improving nationwide from 83% in 2010 to 87% in 2014. After close to eight years of supporting CB-DOTS in Erongo and Karas regions through TB CAP and TB CARE I, the project successfully handed over the financial responsibility and management to the district MoH.

CB-DOTS evaluated - A CB-DOTS evaluation and cost-effectiveness analysis was supported by the project in 2013-2014, providing important information for the MoH on the costs of this model and important cost-differentials between implementing NGOs and geographic areas. Although the MoH is not yet prepared to absorb the cadre of current Field Promoters into the ranks of the

MoH, this report will be important for future decision-making on the sustainable financing of CB-DOTS in Namibia. The CB-DOTS approach implemented by TB CARE I came out as the second most cost-effective approach among all other implementing CSOs/NGOs.

TB-IC - TB-IC is acknowledged as an important issue by the MoH. TB-IC assessments were conducted in all 34 districts of the country over the life of the project, resulting in the development of TB-IC plans for each district. Focal TB-IC persons have been identified in all districts, and regional teams have been trained to perform these assessments. TB CARE I helped to revise and publish the second edition of the national TB-IC guidelines, conduct engineering modifications and build TB-IC capacity at district hospitals and larger health facilities. Scale-up of the FAST strategy is a key element of the national strategy and surveillance of TB among HCWs is now on the agenda of the MoH.

TB/HIV 3 I's project - During Year 3 of the project, additional resources (funded by OGAC) were provided to implement the three-

year TB/HIV (3 I's) demonstration project in Windhoek, Oshakati, Engela and Katima Mulilo Districts. The aim was to strengthen the integration of TB/HIV collaborative activities into existing facilities and community-based TB and HIV/AIDS organizations using best practices and evidence-based approaches. The project also aimed to leverage advancements in TB diagnostics (Xpert) in four selected districts (Windhoek, Oshakati, Engela and Katima Mulilo). The 3 I's project became fully operational in July 2014 when 30 community health workers were hired, placed and trained on the project in the four districts to assist health workers in health facilities with staff shortages. TB CARE I/3 I's supported assessments and training on TB-IC SOPs, as well as assessments and renovations for TB-IC in 18 health facilities resulting in improved natural ventilation. Additional 3 I's results were presented on page 42.

Capacity building - TB CARE I worked closely with the NTP and NAP to develop updated TB/HIV training curricula and conduct trainings. The project contributed to the training of 1,672 doctors, nurses and community-based HCWs. Support was also provided for international training of MoH staff in TB-IC and OR. TB CARE I organized and supported international training courses in Namibia (a TB/HIV course and the Intensive Course on the Management of Drug Resistant TB, facilitated by The Union). These trainings were essential for clearing the backlog of training and keeping up with the high level of trained HCW attrition, a result of inadequate pre-service training, quarterly routine rotation of nurses, and frequent rotation of foreign health workers on two-year contracts (most of them from Zimbabwe, DRC, Kenya and Zambia).

Treatment success of MDR-TB improved - The project seconded a PMDT Medical Officer to the NTP; this person supported frequent meetings of the MDR-TB Clinical Committee that reviews every patient indication for MDR-TB treatment, introduced and maintained

e-TB Manager, conducted MDR-TB supervision, and conducted formal and on-the-job MDR-TB training. This hands-on support may have contributed to improvements in the MDR-TB treatment success rate, which increased from 44% (2008 cohort, n=221) to 66% (2012 cohort, n=216) over the life of the project.

Operations research capacity building - The project developed local capacity for OR after supporting the development of a national research agenda. This resulted in the completion of five studies and fifteen abstracts at international conferences, including The Union annual conference (select study results are summarized here: http://www.tbcare1.org/publications/TB_CARE_I_OR_Results.pdf).



Above right: CB-DOTS providers at a DOTS point, Namibia (Photo - KNCV)

Population: 177,475,986

TB CARE I Timeframe: Jan 2011 - Dec 2014

Lead Partner: KNCV

Collaborating Partners: WHO, FHI 360, MSH

Technical Areas: Universal Access, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E, Drug Supply & Management.

Mortality (excluding HIV+, rate per 100,000 population per year): 97

Prevalence (Rate per 100,000): 330

Incidence (Rate per 100,000 per year): 322

Childhood TB - TB CARE I supported the development of the national desk guide for the diagnosis and management of childhood TB in Nigeria. Through this process a total of 2,004 child TB cases (0-4 yrs) representing 2.1% of the total reported national TB cases (96,045) were notified in Year 4 (October 2013-September 2014). The Year 4 data did not show much improvement (1.9%) over the baseline figure of 1,966 childhood TB cases notified in 2012.

Case finding approaches - TB CARE I facilitated the engagement of Patent Medicine Vendors (PMVs) and community pharmacists to provide community TB care services in 105 communities of six focus states (Lagos, Kano, Cross Rivers, Oyo, Osun and Kaduna). Cumulatively, a total of 22,303 presumptive TB patients were referred for diagnosis out of which 2,492 (11%) TB cases were detected and also placed on treatment. An ICF strategy was also implemented using SOPs in health facilities in six focus states; 5,076 TB cases were detected during the reporting year representing a 2% increase over the Year 4 target of 5,000 TB cases.

PPM expansion - As of the end of 2013, a total of 775 PPM sites were providing DOTS nationally with TB CARE I contributing 31% of the site expansion (240). A total of 12,995 cases were notified through PPM in 2013. In Year 4, a total of 13,915 TB cases were notified through the PPM sites illustrating at least a 7% increase compared to 2013 notifications.

Xpert contributing to better diagnosis - Nationally in 2014, the country had 96 Xpert machines of which TB CARE I contributed 26 (27%). TB CARE I procured 49,220 cartridges over the life of the project, supplying the 26 TB CARE I-procured machines as well as eight additional sites. Since the start of the project, a total of 29,849 sputum samples were tested in TB CARE I supported Xpert sites; 7,278 (24%) TB cases were detected of which 1,020 (14%) were RR-TB.

FAST diagnosis - Through the implementation of the FAST strategy in 12 TB/HIV health facilities, the average time for the diagnosis of a TB case improved to two days from a baseline of three days.

Turnaround time from diagnosis to treatment improved from a baseline of five days to two days following the introduction of the FAST strategy.

PMDT scale-up - The national drug resistance survey in 2009 highlighted the need for institutionalized care for diagnosed MDR-TB patients. As a result, TB CARE I upgraded and renovated five MDR-TB treatment centers nationwide, including three reference laboratories with BSL-2 or 3 capacity. TB CARE I also assisted with the renovation of University College Hospital MDR-Treatment sites and supported the procurement of SLDs for 80 patients. Nationally, there have been exponential increases in the number of MDR-TB patients enrolled, from 25 in 2010 when PMDT commenced to 1,144 in 2014. However, treatment enrolment has been limited by the low number of MDR-TB treatment centers in the country and the requirement to admit all patients during the injection phase; as a result, the NTP began ambulatory PMDT services with TB CARE I support in 2014. A total of 102 MDR-TB patients were enrolled on community PMDT in 10 pilot states and all were provided with care and support including the provision of ancillary investigations and treatment, transportation and food packages during the year.

TB/HIV collaboration - TB CARE I has played a key role in helping the NTP scale-up TB/HIV collaborative activities; TB/HIV services were expanded from 283 facilities in 23 states to 548 facilities in 35 (94%) states. A total of 21,181 (93%) of registered TB cases (all forms) were tested for HIV in TB CARE I supported sites in Year 4 (compared to 86% in Year 1). Of those tested, 3,570 (17%) were HIV co-infected; 2,593 (73%) accessed ART services (Year 1: 86%) while 3,171 (89%) of the co-infected accessed CPT treatment (Year 1: 46%). Over the life of the project, a total of 62,609 TB patients were tested and counseled for HIV.

Electronic recording and reporting for DR-TB - At the beginning of Year 2, the NTP's routine surveillance and M&E system for DR-TB was paper-based and inadequate to address the complexities inherent in managing and monitoring PMDT services. Therefore, TB CARE I provided TA to customize e-TB manager, a web based data management tool, for DR-TB recording and reporting. As of the end of TB CARE I, e-TB manager is in use in all 12 MDR-TB treatment sites as well as by all the state program managers of the 36 states and the Federal Capital Territory. All cases enrolled (100%) are currently being managed and monitored through e-TB manager, including clinical and commodity management. e-TB manager will be customized to include drug susceptible TB, a priority for the NTP in the coming year.



Above right: MDR-TB patient supported by his community DOTS provider, Nigeria (Photo - FHI 360)
Overleaf: Women in the TB ward in Zaria, Nigeria (Photo - Tristan Bayly)

N

NIGERIA



Population: 185,044,286

TB CARE I Timeframe: Apr 2011 - Mar 2012

Lead Partner: KNCV

Technical Areas: M&E

Mortality (excluding HIV+, rate per 100,000 population per year): 26

Prevalence (Rate per 100,000): 341

Incidence (Rate per 100,000 per year): 270

TB CARE I-Pakistan was a short-term project specifically implemented to complete the TB prevalence survey started under TB CAP. Following a series of delays, the full survey started in December 2010 and was successfully completed by March 2012 without any significant security incidents. The prevalence of pulmonary TB in Pakistan was 321 per 100,000 adult population (95% CI: 269-373/100,000); this is lower than the previous estimate of 350/100,000 (158-618) (WHO Report 2012), but much more precise.



Above right: Field work during the TB prevalence survey, Pakistan (Photo - KNCV)

Population: 11,911,184

TB CARE I Timeframe: Oct 2010 - Dec 2013

Lead Partner: MSH

Collaborating Partners: KNCV, WHO

Technical Areas: Universal Access, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 29

Prevalence (Rate per 100,000): 319

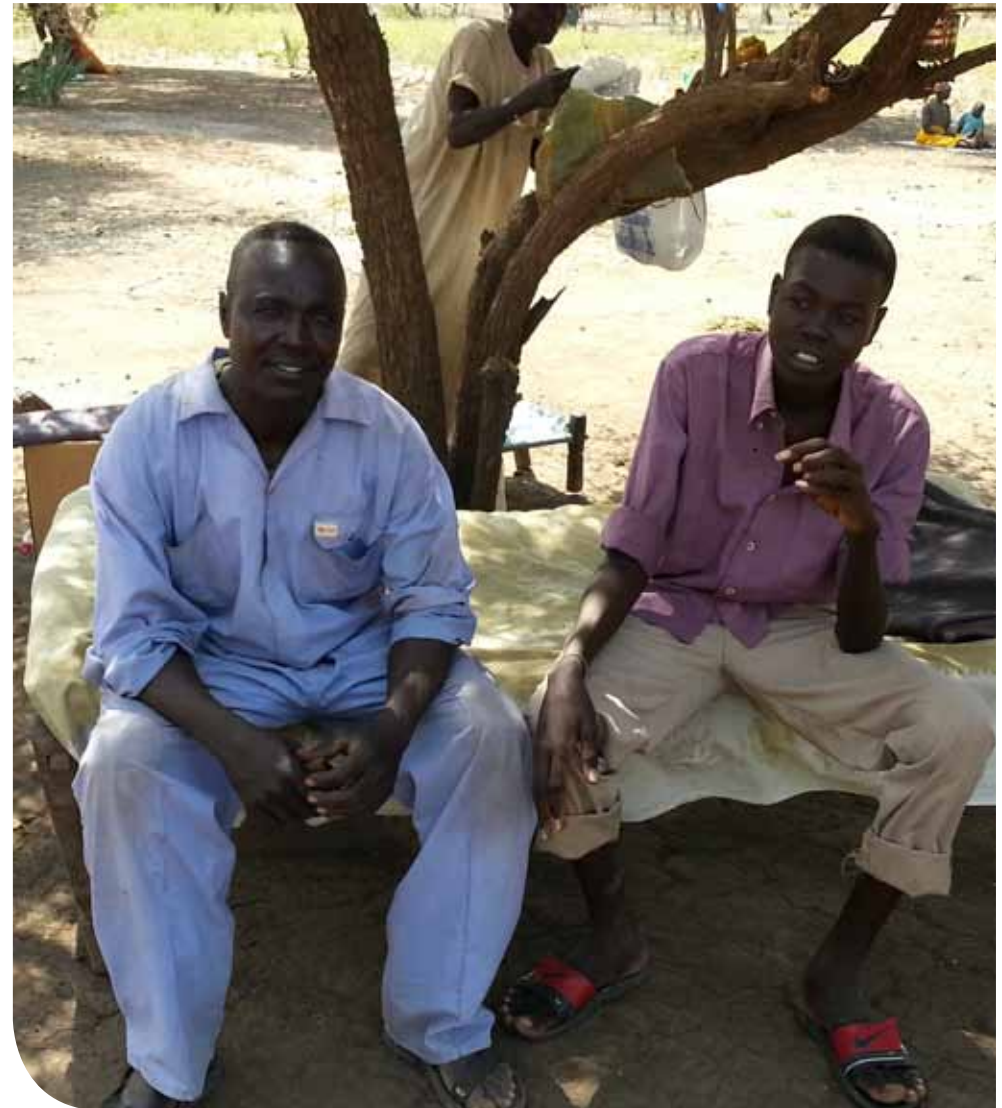
Incidence (Rate per 100,000 per year): 146

Increased access to TB services - Case notifications increased by 39% over the life of TB CARE I from 6,411 in 2010 to 8,924 in 2013. TB CARE I's support to the NTP to expand DOTS centers from 65 in 2010 to 87 in 2014 (34% increase) likely contributed to this increase in case notification. Access to services was also expanded at a community level. In June of 2013, 159 community mobilizers were trained to refer suspects and follow-up patients for treatment adherence. Over 43,100 people were sensitized on TB and 1,249 community members with symptoms of TB were referred for TB testing. Roughly 3% (43/1,249) of presumptive TB patients were diagnosed with TB (SS+). In Juba County, through the involvement of community mobilizers, the TSR improved in Munuki Primary Health Care Center from 52% (cohort Q1 2012) to 92% (cohort Q3 2013). The Juba Teaching Hospital, which is without community mobilizers, reported a treatment success rate of 60% (cohort Q1 2012) and 58% (cohort Q3 2013).

Microscopy network strengthened - The quality of AFB microscopy has improved and expanded through the refurbishment and supply of equipment and starter kits for the newly established TB diagnostic centers. TB CARE I has renovated 10 peripheral and one state level laboratory. This has increased the number of labs performing TB microscopy from 65 in 2010 to 87 in 2014. TB CARE I established EQA in four states; as a result, 33% (29/87) of the laboratories nationwide are included in the EQA network (with the remaining states to be rolled out through GF). In the second quarter of 2014, 21 out of 29 laboratories participated in EQA blinded re-checking, out of which 81% (17/21) performed acceptably.

Strategic planning and sustainability - TB CARE I revised the second NSP (2012-2016) and developed the third NSP (2015-2019). The revision is an attempt to improve program performance, address the challenges faced during implementation of the previous plan, and to be in line with the End TB Strategy. The project also conducted an epi-analysis of NTP data to support the NSP review process. In addition, TB CARE I supported the writing of the CN to apply for the GF through the New Funding Model (NFM). This offers an opportunity for the NTP to access more financial resources to scale up TB service delivery in South Sudan.

TB/HIV expansion - TB CARE I partnered with local and international NGOs to address the delivery of TB/HIV services to internally displaced refugee populations. TB CARE I supported the establishment of TB/HIV services in Maban (Bunj Hospital) for over 100,000 refugees. The process of establishing TB services for internally displaced persons (IDP) in the Protection of Civilian (PoC) sites was on-going in Juba and in the IDP camp in Mingkaman. Between April-July 2014, over 10,000 IDPs in Juba were sensitized on TB and over 345 presumptive TB patients were referred for further evaluation at the PoC hospital. Sputum samples were collected from 81 presumptive TB patients and transported to Juba Teaching Hospital for AFB microscopy from which 48 TB cases were diagnosed and enrolled on TB treatment.



Population: 8,295,840

TB CARE I Timeframe: May 2012 - Dec 2014

Lead Partner: KNCV

Technical Areas: Universal Access, TB-IC, PMDT, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 3.3

Prevalence (Rate per 100,000): 128

Incidence (Rate per 100,000 per year): 91

Supporting TB and MDR-TB patients throughout treatment - The major achievement of TB CARE I-Tajikistan was increasing the involvement and getting the commitment of local municipal authorities and communities on the provision of social support to TB and MDR-TB patients during ambulatory treatment. As a result, 192 TB and MDR-TB patients received different types of social support that included allocation of land plots to establish vegetable gardens or orchards, construction of housing, exemption from property taxes and utility payments, and the provision with food and hygienic packages. This approach had not been tried before and produced positive results; the TSR for drug-sensitive TB improved from 80% for the 2010 cohort to 88% in 2013. Treatment success for MDR-TB has also shown some improvement from 61% in 2010 to 66% for the 2012 cohort.

Increases in case notification - In Tajikistan, there was a significant increase in the detection of TB and MDR-TB cases in TB CARE I pilots. Overall, in 2013 the number of notified TB cases (all forms) increased in all TB CARE I pilots; these increases varied from

11% (Rasht, Nurabad districts) to 92% (Tajikabad) in comparison with 2012. In addition, the detection of MDR TB cases more than doubled. This was achieved by the introduction of Xpert testing, the development of the National Strategy on the Implementation of GeneXpert MTB/RIF including diagnostic algorithms and clinical protocols for Xpert, strengthening the sample transportation system, and training TB and PHC providers on rapid diagnostic technology and the sample transportation protocol.

PMDT expanded - A PMDT program was introduced in nine TB CARE I pilot districts. All detected MDR-TB patients from Rasht area and four districts of Khatlon Region have been enrolled on treatment (28 MDR-TB patients in 2013 and 54 in 2014). The quality care of these patients was ensured in all TB CARE I pilots by training medical providers involved in treatment of DR-TB and regular monitoring and supervision visits.

Population: 37,782,971

TB CARE I Timeframe: Jan 2012 - Dec 2014

Lead Partner: KNCV

Technical Areas: Universal Access, PMDT, TB/HIV, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 12

Prevalence (Rate per 100,000): 159

Incidence (Rate per 100,000 per year): 161

Strengthening TB services in Kampala - At the onset of TB CARE I, Kampala had gaps in recording and reporting, weak supervision of health facilities, erratic supply of TB drugs and poor patient adherence to treatment. In response, the project implemented numerous interventions such as providing mentoring of division TB focal persons and TB clinic staff on management of TB patient records, as well as monitoring TB drug stocks at health facilities. By the end of the 21-month project the TSR for Kampala increased to 70% in 2012 from a baseline of 49% in 2011.

PMDT expansion - TB CARE I supported the NTP to strengthen capacity to initiate and implement a quality MDR-TB program. Project interventions specifically addressed the inadequate technical capacity to manage MDR-TB at health facility level, the capacity for coordination at NTP central level and the need for more admission capacity for MDR-TB at Mulago Hospital, Kampala. As a result of TB CARE I support, a fully remodeled and equipped 39 bed capacity MDR-TB isolation ward was established at the Mulago Hospital. The number of MDR-TB patients enrolled on treatment increased from 16 in 2011 to 44 in 2012 at three supported MDR-TB sites. From January-September 2013, 81 MDR-TB patients started treatment

at the same sites, contributing 63% of the nationwide MDR-TB treatment enrolment (129) for this period.

TB/HIV collaboration - TB CARE I worked with the NTP, NAP and partners to reactivate the National Coordination Committee (NCC) and to conduct TB/HIV joint supervision in selected districts across the country. The NTP was already performing well in 2011 with respect to the proportion of notified TB patients tested for HIV (80%) and of HIV positive TB patients given CPT (93%), but only 32% of HIV positive TB patients were on ART. In 2012, ART uptake for HIV positive TB patients increased to 49% (WHO) while in the first and second quarters of 2013, ART uptake was reported at 51% and 57%, respectively (NTP quarterly reports).

U

UGANDA



Population: 29,469,913

TB CARE I Timeframe: May 2012 - Dec 2014

Lead Partner: WHO

Collaborating Partners: KNCV

Technical Areas: Universal Access, Laboratories, TB-IC, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 9.1

Prevalence (Rate per 100,000): 122

Incidence (Rate per 100,000 per year): 82

Strengthening PMDT through NTP guidelines/resources - TB CARE I and the MoH have developed a number of important strategic and methodological documents in the area of TB control - the National Plan on Multidrug and Extensively Drug-resistant TB (M/XDR-TB) Prevention and Control for 2012-2015, Guidelines on TB-IC, National Strategy on Xpert MTB/RIF Use, and guidelines on psychosocial support to TB patients. In response to a need for a unified, standard approach to PMDT training (previous trainings focused on separate components of PMDT) training modules on comprehensive, programmatic management of DR-TB utilizing cross cutting content were developed by TB CARE I. Modules include the clinical management of MDR-TB, TB-IC, Xpert, provision of care in outpatient settings, TB/HIV and SLD side effects.

Outpatient care policy developed - Admission criteria for outpatient treatment developed jointly by the NTP and TB CARE I have been included in the consolidated order (prikaz) on TB care and prevention approved by MoH in Oct 2014. This will reduce the time of hospital stay for most patients and allow the treatment of eligible patients including SS+ patients in their homes, provided appropriate TB-IC measures are implemented.

Population: 92,423,338

TB CARE I Timeframe: Oct 2010 - Dec 2014

Lead Partner: KNCV

Collaborating Partners: MSH, WHO

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E, Drug Supply & Management.

Mortality (excluding HIV+, rate per 100,000 population per year): 18

Prevalence (Rate per 100,000): 198

Incidence (Rate per 100,000 per year): 140

Management of TB in children - A new strategy was successfully piloted in four provinces with high HIV burden, covering a total of 38 districts and 704 communes/wards. These project activities started late in Year 2 and by the end of Year 4 involved 1,578 HCWs who were trained on the new WHO-endorsed strategy on childhood TB. Between 2012-2014, 7,144 children that were household contacts of SS+ TB patients were screened and registered; 549 (8%) were diagnosed with TB (all forms) and 61% of eligible children were started on IPT (1,710/2,803). The success of this new strategy has resulted in this approach becoming a model for the NTP, which intends to expand this strategy to 18 provinces with GF support. As a result of the new strategy's success, representatives of TB CARE I and the NTP were invited to share experiences and lesson learned on implementation of the new approach at the Global Consultation on Childhood TB for High Burden Countries in the Eastern Mediterranean, South East Asia and Western Pacific Regions in Jakarta, Indonesia (September 2014) and in the WHO Annual Meeting of the Childhood TB Subgroup, in Barcelona, Spain (October 2014).

Strengthening TB-IC - New strategies for TB-IC were introduced with a special focus on nine TB hospitals, which were chosen to become the country's primary PMDT treatment centers. HIV clinics and district TB centers were also included in the project. After the development of a national TB-IC policy with complementary SOPs and training materials for HIV clinics and district TB units, training and on-the-job support were given, as well as support for necessary renovations. With substantial TB CARE I support, the nine PMDT treatment centers have met the minimum requirements for the diagnosis and treatment of MDR-TB, which contributed to the increased enrollment of MDR-TB patients over the past four years. From 2011-2014, 3,094 MDR-TB patients were initiated on treatment under safe conditions. In 2012, Vietnam introduced surveillance of TB among HCWs, starting in high risk settings (TB hospitals). This resulted in the first ever report on TB among HCWs in 2013. Preliminary collected data showed that the proportion of health care staff per 100,000 having TB in 67 units of TB control at central and provincial level were 522 in 2009, 476 (2010), 272 (2011), 265 (2012), and 295 (2013), which shows a significant decrease over the 2009-2013 period.

Xpert implemented - Through substantial TB CARE I support, Xpert MTB/RIF testing was introduced and rolled-out in Vietnam. TB CARE I provided the necessary management, coordination, cartridge supply management system, recording and reporting, and technical support for the routine use of Xpert. As of September 2014, 17 Xpert machines were functional, with 22,752 total tests done since June 2012. Among the 22,752 tests, 17,308 (76%) were presumed MDR-TB patients, 3,753 (16%) were presumed TB in PLHIV and 1,635 (7%) were presumed TB in children. Between June 2012 and September 2014, 10,831 (49%) TB cases were detected, of which 2,554 (24%) were RR-TB. This was a major contribution by TB CARE I to the diagnosis of MDR-TB in Vietnam.

PMDT Expansion - In-depth TA from TB CARE I provided continuous and consistent advice on the development, management, coordination and professional expertise in PMDT. The TA supported program and laboratory management systems to build and strengthen capacity, policies for detection and management of cases of drug-resistant TB, drug supply management, human resource management, data management, TB-IC and access for special targeted groups. With such contributions, it was possible for PMDT in Vietnam to scale up from one treatment center in 2009 with 101 MDR-TB patients to more than 3,000 patients enrolled at 41 treatment centers and satellite sites nationwide at the end of Year 4.

Electronic data management system for PMDT implemented - e-TB Manager was introduced for managing all information needed by the NTP for PMDT. The new system is readily available at all current PMDT treatment centers and treatment satellites, a total of 41 by the end of 2014. With e-TB manager, all data across all aspects of PMDT, including information on presumptive (MDR)-TB patients, the management of co-morbidities like HIV, drug supply

and management, laboratory test results for diagnosis and follow-up, treatment, and outcomes for all MDR-TB patients at all sites are easily accessible. Thus, the new system plays an increasingly important role in the management of MDR-TB. This has laid the foundation for the NTP to further utilize the tool in the coming years to support the expansion of PMDT across the nation.

Increasing political commitment - Vietnam's National Tuberculosis Strategy for 2020 with a vision up to 2030 - a new strategy for TB control - was approved in March 2014 by the Prime Minister. The strategy paper enables the NTP to mobilize financial support from domestic and external sources. The approval marks an increase in the political commitment of the Vietnamese Government for TB control in Vietnam. With this new policy, Vietnam became the first TB and HIV high burden lower middle income country to demonstrate a strong political commitment to eliminate TB by 2050.



Above right: DOT for MDR-TB, Vietnam (Photo - Matthieu Zellweger)

Population: 15,721,343

TB CARE I Timeframe: Oct 2010 - July 2015

Lead Partner: FHI 360

Collaborating Partners: KNCV, MSH, WHO

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E, Drug Supply & Management.

Mortality (excluding HIV+, rate per 100,000 population per year): 32

Prevalence (Rate per 100,000): 436

Incidence (Rate per 100,000 per year): 406

National TB Prevalence Survey completed - TB CARE I successfully partnered with the NTP to conduct the first national prevalence survey, providing TA on the development of the protocol and SOPs, provision of quality assured field implementation, data collection, data management and report writing. A total of 46,099 people participated in the survey out of a target of 54,400, with a participation rate of 85%. During the dissemination meeting, it was reported that the prevalence of bacteriologically confirmed TB was 638 per 100,000 population (CI: 502 - 774), higher than the WHO estimated prevalence of 338 per 100,000 (CI: 193-524). Key equipment was procured for the survey that included three liquid culture Mycobacterial Growth Incubator Tube (MGIT) machines, which were placed at three reference laboratories. The project also supported the digitalization of X-ray images from three analogue X-ray machines used on all survey participants and procured all commodities for the field survey activities.

Developed and secured funding for the NSP - The TB CARE I partnership provided leadership in the development of the NSP (2014-2016) that provided a platform for the development of the combined TB/HIV GF concept note. The country was successful with the application and received \$152,453,652 for TB/HIV. The total cost of the TB activities in the NSP was \$67,438,311. The Zambian government committed \$18 million (31%), while \$38 million (56%) was provided by partners and the current GF allocation under the Transitional Funding Model. The NFM allocation of \$11 million covers the remaining gap (16.5%).

Community volunteers conduct contact tracing - In response to the NTP's efforts to engage communities in the provision of health services at facility or community level, TB CARE I trained over 400 community volunteers in DOTS from Years 1-5 in all six target provinces. Under the 3 I's initiative (see page 42 for more information), 125 community TB treatment supporters were actively engaged and retained for one year to support health facility and community level active case finding. The supporters traced 3,987 individuals who had contact with an individual diagnosed with TB in their households and 109 (3%) of these contacts were diagnosed with TB.

Laboratory capacity strengthened - The TB CARE I project procured key laboratory equipment for the enhanced diagnosis of TB, provision of liquid culture and confirmation of drug resistant samples through DST. Thirteen Xpert machines, three MGIT machines, and one MTBDR genotype were procured. The equipment enhanced the diagnosis of TB from the national TB reference level to the regional and facility level laboratories. Renovation support was also provided at the NRL and the Tropical Diseases Research Centre before placement of the MTBDR genotype equipment. With the Xpert machines, 18,209 tests were performed from September 2013 to May 2015. Active TB disease was diagnosed in 2,449 patients (13%) and rifampicin resistance was detected in 121 of the diagnosed cases (5%). Seven percent (1,311) of the 18,209 Xpert tests were from five prison facilities, of which 67 (5%) were positive for MTB. Seventeen HCWs were hired by the TB CARE I project to support these activities.



Population: 15,245,855

TB CARE I Timeframe: Oct 2010 - Dec 2014

Lead Partner: The Union

Collaborating Partners: KNCV, FHI 360

Technical Areas: Universal Access, Laboratories, TB-IC, PMDT, TB/HIV, Health Systems Strengthening, M&E.

Mortality (excluding HIV+, rate per 100,000 population per year): 15

Prevalence (Rate per 100,000): 292

Incidence (Rate per 100,000 per year): 278

Sputum transport system established - TB CARE I in partnership with Riders for Health launched a pilot motorcycle specimen transport (ST) system in three major cities in 2010. The system was set up to transport sputum specimens for microscopy examination and other specimens for laboratory analysis. Following the successful pilot, the ST system was expanded to 24 districts with 42 motorcycles serving a total of 649 health facilities. This has improved access to laboratory diagnosis and follow-up testing for TB and other endemic health conditions. In 2010, a total 38,663 specimens were transported; this figure increased more than four-fold to 176,981 specimens in 2013. The turnaround times from sputum collection to receiving results in patients with positive microscopy or, more recently, Xpert test results declined dramatically. Prior to the introduction of the ST system, the turnaround time in remote rural districts was two to three weeks and after the establishment of the ST system it went down to only seven days. In urban settings, the turnaround time was reduced from a week to one to two days. This is likely to contribute to prompt diagnosis and early treatment of TB patients thereby reducing transmission. The percentage of new pulmonary TB cases without initial smear investigations above

the age of five years reduced from 19% in 2010 to 9% by mid-year of 2014. The ST system also carries follow-up sputum for treatment monitoring, which is critical for defining treatment outcomes, particularly cure rates. The cure rate improved from 71% in 2010 to 75% by mid-2013.

TB/HIV services successfully integrated - Zimbabwe has successfully rolled out a nurse-led decentralized and integrated TB/HIV care model in 17 urban communities, involving a total of 23 primary health care facilities. The facilities received a package of assistance from TB CARE I, which included capacity building of HCWs in collaborative TB/HIV services and clinical management of patients with both HIV infection and TB. This support facilitated the provision of a comprehensive package of joint TB/HIV services at the facilities, including decentralized TB and HIV diagnostics, TB treatment and HIV care/ART services, and contributed towards sustained gains in the key TB/HIV service indicators. The percentage of TB patients with recorded HIV results increased from 90% (January to March 2013) to 98% (July to September 2014). Similarly, the percentage of HIV-positive patients receiving CPT increased from

86% to 91%, while the percentage of those HIV-positive TB patients receiving ART increased from 70% to 84% in the same period. These outcomes demonstrate the feasibility of decentralization and integration of TB/HIV services.

M&E systems strengthened - TB CARE I supported the development of a guide on the collection, analysis and use of TB data for HCWs at all levels. The guide took into consideration the revised national TB R&R tools based on the new framework and definitions by WHO of 2013 also supported through TB CARE I. An inaugural pilot training based on the Data Collection, Analysis and Use Guide was supported to train a total 35 provincial managers in order to strengthen TB surveillance and improve their capacity to analyze and use data for the management of the TB program at all levels. TB CARE I also supported the development of the Electronic TB Recording and Reporting (ETRR) system. The introduction of the ETRR was necessary to serve the needs of a highly mobile TB patient population in the country, reduce the need for multiple entries on multiple forms and to avoid duplication through use of a unique personal identifier.

PMDT scaled-up - PMDT was established with the support of TB CARE I in Zimbabwe. PMDT guidelines and training materials were developed followed by capacity building of HCWs at all levels of care. Xpert was scaled up through TB CARE I support and its use has resulted in a sustained increase in the number of diagnosed cases with DR-TB - from 40 in 2010 to 393 in 2013. The proportion of diagnosed MDR-TB patients initiated on treatment rose from 70% to 89% over the same period. To date, a total of 62 Xpert machines have been installed across the country, of which 26 were procured through TB CARE I. Xpert implementation has contributed to more accessible and rapid tests for identify patients with RR/MDR-TB.



Above right: Sputum transport motorbike, Zimbabwe (Photo - The Union)

Unique Transportation Project Significantly Improves TB Diagnosis in Three Zimbabwean Cities

Lack of access to sputum microscopy services in urban and rural areas is a major barrier to effective TB control in Zimbabwe. Getting sputum samples from a patient suspected of having TB to the laboratory is a significant challenge. Consequently, many people remain undiagnosed and untreated. The same problem exists at the end of treatment, when without sputum results it cannot be determined whether the patient has been cured.

In collaboration with Riders for Health, an international NGO with expertise in transportation management, TB CARE I initiated a specimen transportation system in 2010 in the cities of Bulawayo, Chitungwiza, and Harare, covering a population of 2.6 million. The system was expanded to 24 districts with 42 motorcycles serving a total of 649 health facilities - over 40% of the country's health establishments. The system delivers all types of specimens to the laboratory on a daily basis, and collects test results from the laboratories for distribution back to the clinics.

In 2010, a total 38,663 specimens were transported; this figure increased nearly four-fold to 176,981 specimens in 2013. The turnaround times from sputum collection to receiving results for patients with positive microscopy or, more recently, Xpert test results decreased from 2-3 weeks to seven days. In urban settings, the turnaround time has been reduced from a week to one to two days. As a result, patients started on treatment earlier, and those who are not responding to treatment were identified early and referred to a specialist.

A TB clinic nurse stated: "We used to collect samples from patients and keep them for three or four days. Sometimes we were forced to discard the sample because there was no reliable transport to take the specimen to the laboratory. If the samples were collected, the results would come back after three to four weeks, if at all. Patients had lost confidence in us because the service delivery was poor, but now more and more patients are coming to be tested for TB because they know they will get their results within two days."

The transportation system has eliminated the need for patients suspected of having TB to travel long distances and incur associated transportation costs. It has improved efficiency in the diagnosis of TB and other diseases and, consequently, improved TB control outcomes.



Above right: Rider delivering specimen at Ranyararo Clinic, Masvingo, Zimbabwe (Photo: Nqobile Mlilo)

In addition to country and core (i.e. global, cross-cutting) projects, TB CARE I had three long-term projects that were funded and implemented in the East Africa region: the Supranational Reference Laboratory in Uganda, the Center of Excellence (CoE) on PMDT Training in Rwanda, and the East, Central and Southern African Health Community (ECSA). A few short-term (i.e. one-year) regionally-funded projects were also implemented under TB CARE I (i.e. achievements from a Somalia Childhood TB project were highlighted on page 21). The SNRL in Uganda was highlighted in the Laboratory section (see page 24) while achievements of the CoE and ECSA are highlighted below.

Center of Excellence on PMDT Training

The CoE on PMDT Training, based in Kigali Rwanda, brings together the National TB and Leprosy Program of Rwanda, the National Reference Laboratory and the School of Public Health, National University of Rwanda. The CoE was established to build technical capacity on PMDT in the region using the Rwandan PMDT program as an example of excellence. Partially funded by and receiving technical support from TB CARE I, this center has been a regional success, expanding to other technical areas important to the region (i.e. childhood TB). In Year 4, five international trainings were carried out by the center with TB CARE I support: TB-IC, PMDT, TB/HIV, laboratory strengthening and childhood TB. In total 87 trainees participated from 17 African countries and one Asian country (India). Childhood TB was a new topic for the center in Year 4 and a new curriculum and course on the management of childhood TB was developed. At each of these trainings, there has been a combination of participants funded by the CoE and other sources (i.e. NTPs sending their staff from country funding). This demonstrates the CoE's marketability and the trend towards greater self-sufficiency and sustainability in the region.

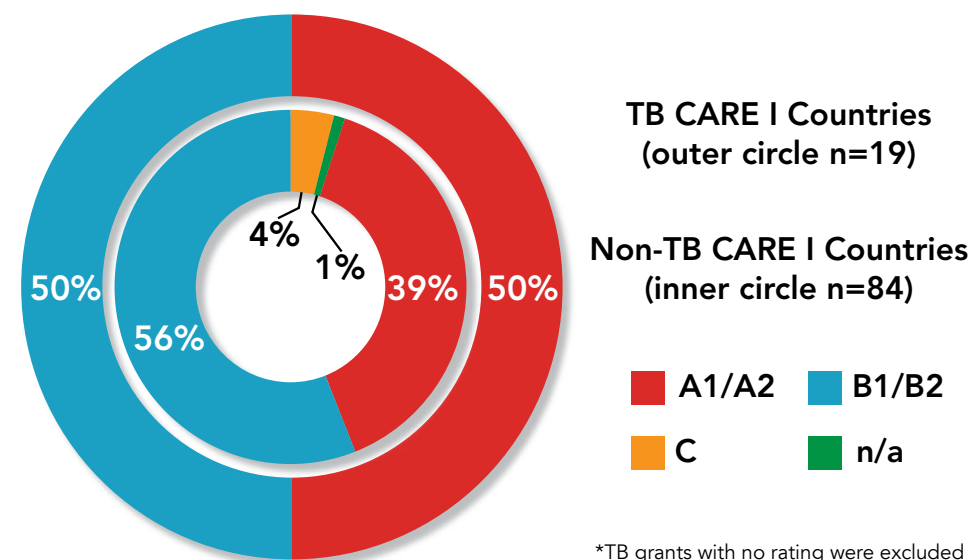
East, Central and Southern African Health Community

The ECSA project has been implemented by KNCV and WHO since 2011. The main objective of the project was to shift PMDT higher on the regional agenda, with the idea to gain commitment from Ministers of Health in their respective countries at a time when PMDT was limited. Since the project's inception, there has been increased visibility of MDR-TB in the health ministers' conference evidenced by four resolutions on TB in the last four years and increased availability of treatment with no patients on the MDR-TB treatment waiting list. A regional strategy for cross-border TB control, draft policy for M/XDR-TB failure management, a TB curriculum for nurse training institutions and a strategic plan for the HIV/TB and infectious diseases program at ECSA were all developed. A regional TB expert forum was initiated under the umbrella of ECSA, which has been used to disseminate a total of 22 guidelines and policies and facilitated quick implementation of the Health Ministers' resolutions. Finally, as a key win for sustainability, ECSA collaborated with the SNRL in Uganda (also TB CARE I-supported) to submit a concept note to the Global Fund to support lab networks in the region. The concept note was accepted for award and is projected to be granted more funds than originally requested.

Since the start of TB CARE I, the project played a key role in collaborating with and supporting Global Fund globally and at country level. However, since the introduction of the GF NFM in late 2012 TB CARE I's support ramped up considerably, working closely with many NTPs to provide critical technical, financial, managerial and strategic support throughout the GF application and implementation process. Years 3 and 4 were an especially critical time in supporting countries to prepare for and submit GF concept notes; as previously mentioned, TB CARE I supported 12 NTP reviews, helped to develop 16 national strategic plans and conducted six epidemiological assessments (see page 44 for more details). Building on this intensive support, TB CARE I also helped 15 countries develop GF concept notes (88% of the 17 active TB CARE I countries in Year 4): Afghanistan, Botswana, Cambodia, Ethiopia, Ghana, Indonesia, Kazakhstan, Mozambique, Namibia, Nigeria, South Sudan, Uzbekistan, Vietnam, Zambia and Zimbabwe.

Global Fund TB grant performance at the end of Year 4 was stronger in TB CARE I countries compared to non-TB CARE I countries (Figure 20). While 50% of all grants in TB CARE I countries were rated as A1/A2, only 39% of grants in non-TB CARE I countries had the same rating. In Indonesia, major managerial and technical support was provided to the MoH, the principal recipient of an ongoing GF grant. At request of the GF, KNCV was appointed as sub-recipient on the MoH grant to manage and advise on all GF-related TA (an indication of TB CARE I's successful approach to TA in country). In collaboration with partners, KNCV developed a TA plan, which began implementation in October 2014.

Figure 20: Comparison of Global Fund TB grant performance in TB CARE I and non-TB CARE I countries as of October 2014*



At the global level, TB CARE I liaised regularly with the GF, USAID/ Washington, key partners and country teams to ensure the provision of quality, timely and relevant support in TB CARE I countries. TB CARE I staff regularly participated in meetings in Geneva organized by WHO, Stop TB Partnership and/or GF. TB CARE I senior staff were members of the TB Disease Committee and the Strategy, Investment and Impact Committee. In Year 3, project staff both from the central and country offices participated in TBTEAM instruction workshops on providing TA on the NFM.

The project supported or collaborated with the Global Fund in every TB CARE I country¹⁹. Below are a few examples of the diversity and depth of the project's country level engagement:

Afghanistan: Country Director headed the CCM, and TB CARE I played a key role in the development of the NSP.

Botswana: Provided TA for a position paper for the CCM and a grant closure plan, provided TA on the development of a Single TB/HIV Concept Note under the NFM.

Cambodia: Assisted the NTP to apply to the NFM including the development of the NSP (2014-2020).

Djibouti: Helped to develop the successful GF proposal as well as technical documents for the grant negotiation phase.

Dominican Republic: Leveraged GF resources by strategically supplementing GF activities with the TA of TB CARE I (i.e. GF funded the national broadcast of TB CARE I-developed TB awareness videos).

Ethiopia: Supported and facilitated fund utilization and program performance improvements at all levels; assisted the NTP with TB/HIV joint concept note writing.

Ghana: Country Director chaired the CCM HIV/TB Oversight Committee, which provided support to ensure grant performance.

Indonesia: Successfully assisted the PR in Phase 2 proposal development and grant negotiations including improving MDR-TB program quality and strengthening financial management capacity.

Kazakhstan: Collaborated closely with the GF in PMDT, Xpert implementation and M&E areas. Supported the development of the concept note, which focused on the expansion of outpatient care nationwide based on the experience of the TB CARE I pilot in Akmola Oblast.

Kenya: Collaborated closely with the GF to ensure TB CARE I and GF-supported activities were complimentary.

Kyrgyzstan: Supported the National Program "Tuberculosis IV" (2013-2016), a road map for implementing TB activities and applying for GF support in the country.

Mozambique: Supported the development of key documents used for the concept note, and provided TA to the writing of the Single TB/HIV Concept Note.

Namibia: Supported the successful GF application under Round 10. The TB CARE I Country Director is on the TB committee that advises CCM Namibia.

Nigeria: TB CARE I activities dovetailed with the GF plan, particularly on PMDT activities with patient support and second line drugs for patients. Comprehensive grant application support (epi assessment, NSP, CN development including budget proposal, etc.).

South Sudan: Provided TA for the development of the GF NFM application.

Tajikistan: Collaborated closely with the GF, especially on Xpert implementation, PMDT and M&E.

Uzbekistan: Developed an MDR-TB outpatient model, which served as a policy framework for the GF-supported NTP; and provided TA to the development of a NFM Concept Note.

Vietnam: Assisted in the review and update of the NSP and the development of a Single TB/HIV Concept Note.

Zambia: Supported the revision of the NSP (2014-2016) and the combined TB/HIV GF concept note.

Zimbabwe: Led the situation analysis, and epidemiological and impact assessment, which informed the revised NSP; supported the development of the successful CN, including the organization of stakeholder consultation meetings and support for the CN budget proposal.

¹⁹ Pakistan excluded based on limited scope and duration of TB CARE I in that country.



Reflecting on TB CARE I results through the lenses of the USG TB strategy and the End TB Strategy, there are many lessons to learn from TB CARE I and new approaches to prioritize going forward.

TB CARE I worked at every level of the health system - from the national and intermediate levels down to the health facility and community level - to strengthen the health system to find and effectively treat more TB cases. To further expand on these gains, additional support needs to be provided at the **grassroots level** where patients and health services meet. With a greater focus at this level, TB CARE I's lessons learned and successes with patient-centered approaches can be further expanded, and patients' groups can be empowered to participate in the design, scale-up, and evaluation of comprehensive care and services that meet their needs. A focus on both expanding access to TB services and improving the quality of those services is key in finding the missing cases.

When prioritizing a **patient-centered**, grassroots approach, TB CARE I has already supported numerous case notification interventions at this level. Community-based care and treatment approaches, Urban DOTS and the FAST approach are just a few important case notification approaches that were implemented or introduced under TB CARE I that can be learned from and built upon.

The project has been a technical powerhouse with deep TB knowledge, expertise and 'know how'. However, in order to find the more than three million missing cases and accelerate beyond the current successes, **innovation is paramount**. The Coalition must remain innovative and constantly evaluate results and approaches for possible scale-up or adaptation. For example, with a new generation

of diagnostic tools like Xpert, much can be learned from the results to date, better informing future scale-up or targeted use. In addition, as new treatment regimens become available, early results need to be evaluated and acted upon.

To accelerate the decline of the TB epidemic, programs must prevent more people from becoming infected and developing TB disease. Although some attention was given to TB-IC under TB CARE I, much more attention must be paid to **active case finding** and the treatment of LTBI. Countries should be supported to scale-up the diagnosis of and therapy for LTBI, prioritizing high-risk groups.

TB CARE I provided substantial technical and financial support to host governments to prepare strong and targeted National Strategic Plans. Going forward, it will be even more important to work closely with NTPs and the Global Fund to implement NSPs in the context of the **End TB Strategy**.

At a regional level, TB CARE I played a major role in strengthening technical expertise and expanding resources for the East Africa Region through the SNRL in Uganda, the CoE in Rwanda and ECSA. By better connecting these groups, the strengths of these regional assets can be leveraged for even greater impact.

Alongside our work on the ground, TB CARE I also produced a wide range of reports, guidelines, manuals and tools to aid in the fight against TB. These publications were not only useful in the countries where we had direct interventions, but across the entire world. They were one of the main features of our website and the number of downloads they attracted was quite astonishing. The TB CARE I website hosts more than 500 documents that cover Laboratories, TB/HIV, Infection Control, Patient Costs, Universal Access, Drug Supply and Management, Monitoring and Evaluation, Health Systems Strengthening, as well as Annual and Quarterly Reports, brochures and newsletters. Seventy-two of these documents were produced under TB CARE I (Figure 21). Of these documents, 19 were developed in a specific country, but which are adaptable to or are relevant to other countries/settings.

A complete list of all the documents published under TB CARE I can be found here:

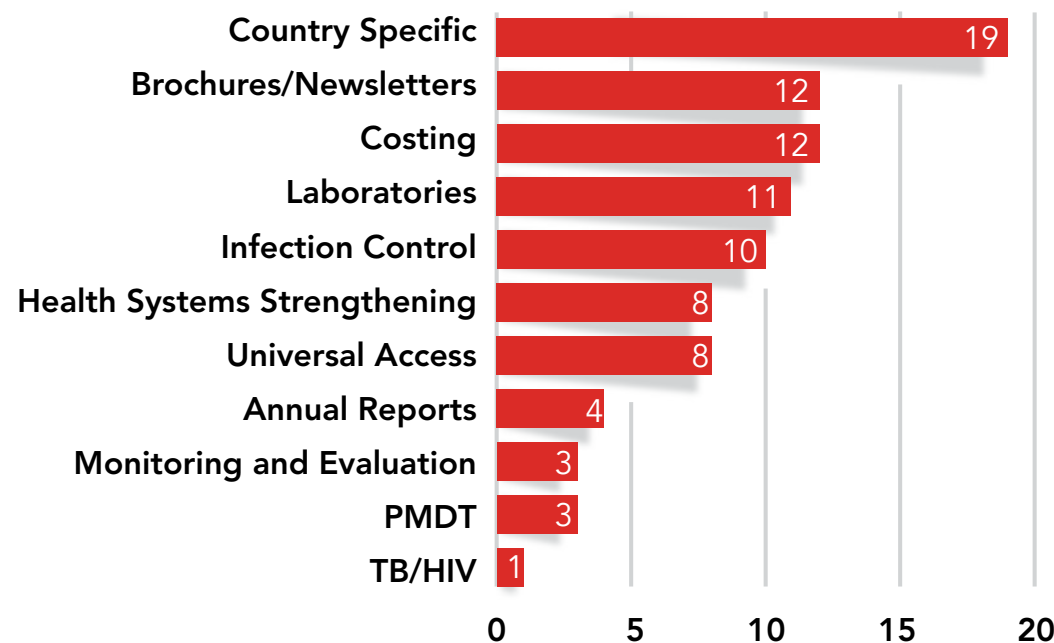
http://www.tbcare1.org/publications/TB_CARE_I_Publications.pdf

The results and dissemination information for completed TB CARE I operations research studies can be downloaded here:

http://www.tbcare1.org/publications/TB_CARE_I_OR_Results.pdf

Figure 21: Total number of documents developed by TB CARE I at the global level, October 2010-September 2015

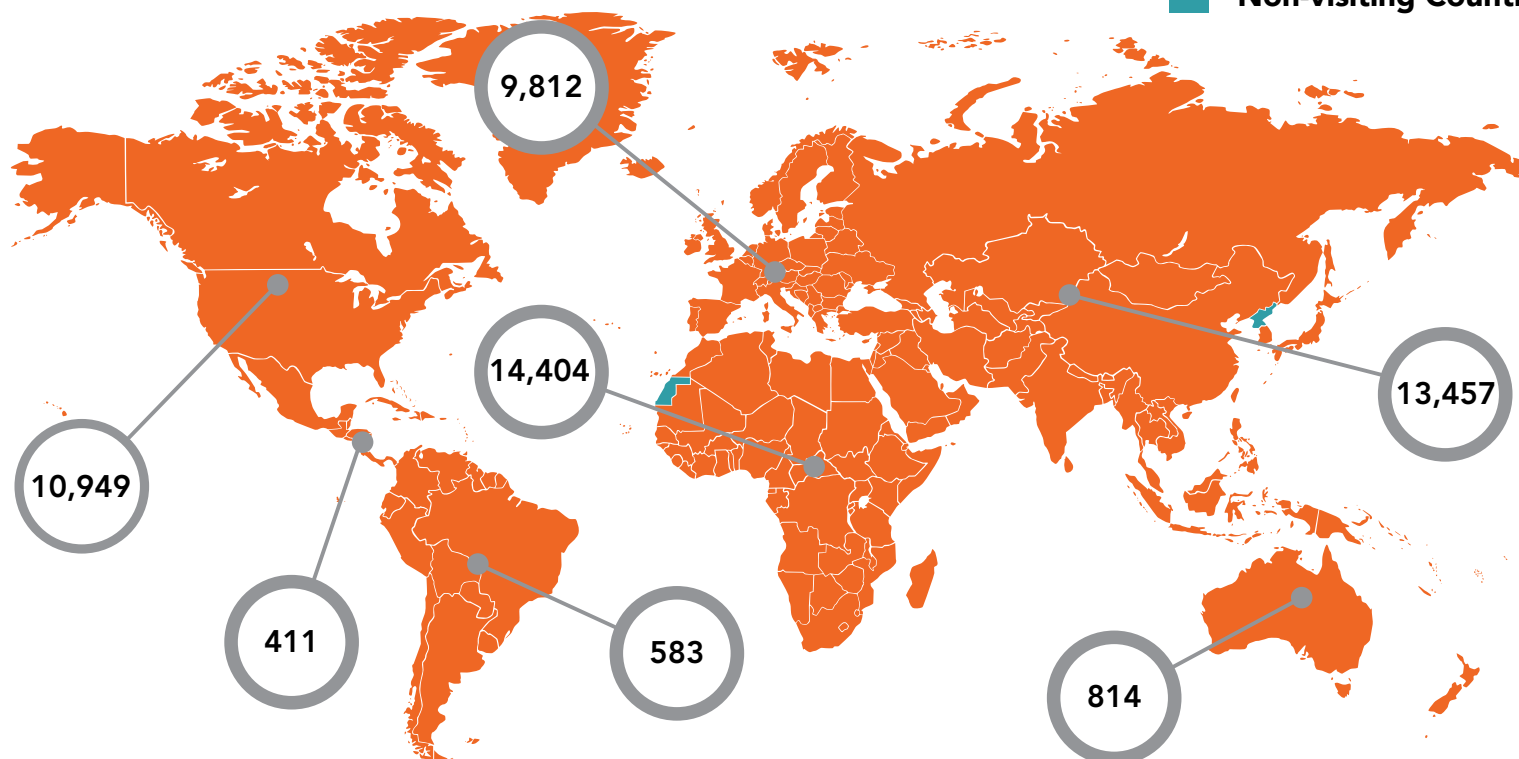
(some tools may fall under multiple categories, but are only counted under one).



Visits by Geographic Area

Visiting Country
Non-visiting Country

Top Ten Countries



Top Ten Downloads

1. Patient-Centered Approach Package
2. Rapid Implementation of the Xpert MTB/RIF Diagnostic Test
3. Guide to Measure the Prevalence of Active TB Disease Among Health Care Workers
4. TB Infection Control at the Community Level: A Training Handbook
5. Integration of HIV-testing in Routine TB Drug Resistance Surveillance in Kazakhstan and Kenya
6. International Standards For Tuberculosis Care 3rd Edition
7. Strategic Guide for Building Public Private Mix Partnerships to Support Tuberculosis Control
8. Understanding and Using Tuberculosis Data
9. Tuberculosis Infection Prevention Procedures - Job Aid
10. Refresher (Advanced) Training Course & Workshop on TB Infection Control for Consultants

51,139
Visitors

Downloads
28,957

170,129
Page Views

Many people contributed to the success of TB CARE I, here are just a few of them:

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