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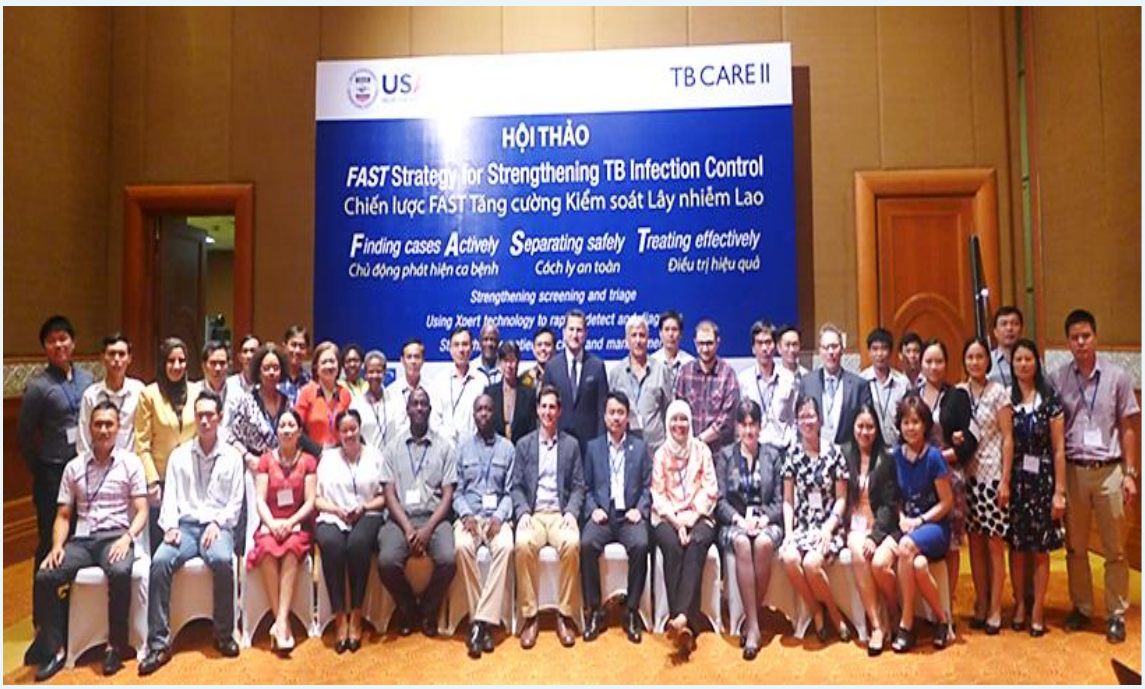
TB CARE II

USAID TB CARE II Project



CORE ANNUAL REPORT

October 1, 2015 – September 30, 2016

Submitted by:

URC

University Research Co., LLC

Bethesda, Maryland

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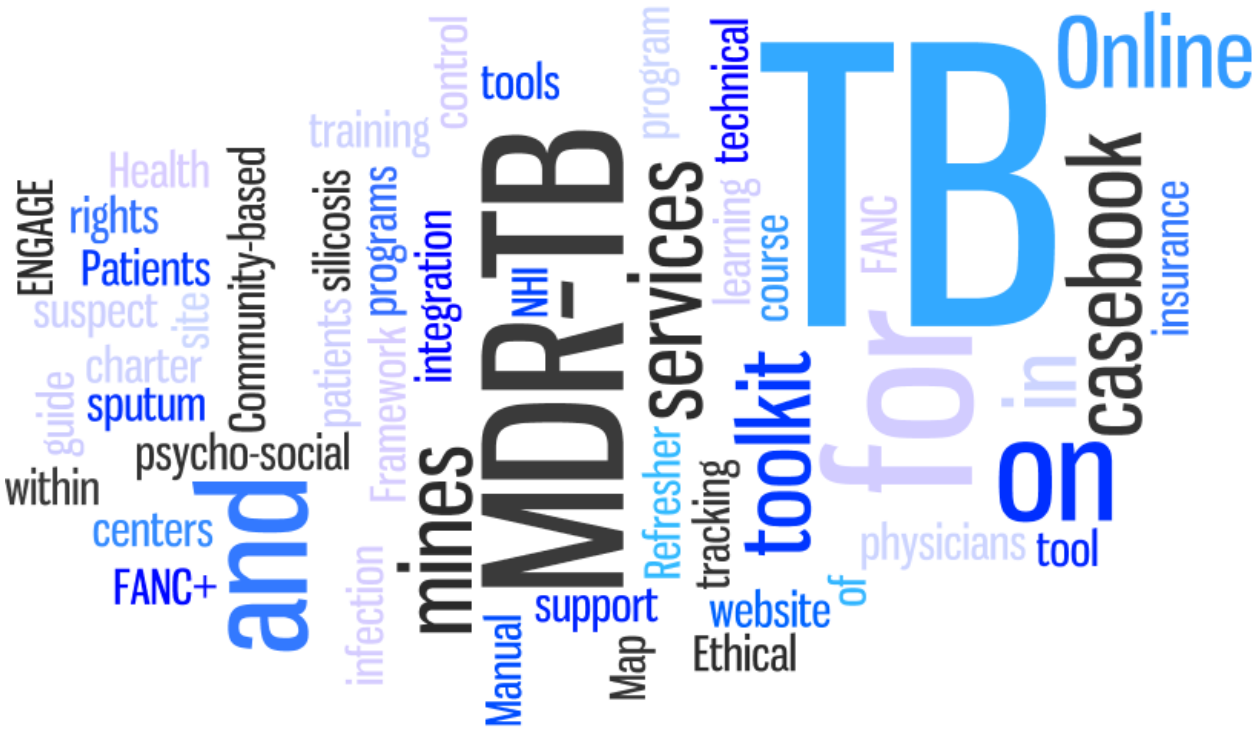
List of acronyms

AIDS	Acquired Immunodeficiency Syndrome
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers)
CIE	Commission Internationale de l'Eclairage (International Commission on Illumination)
CLA	Canadian Lung Association
CLSI	Clinical and Laboratory Standards Institute
COPD	Chronic Obstructive Pulmonary Disease
CSIR	Council for Scientific and Industrial Research
DOTS	Directly Observed Treatment Short-course
EHG	Euro Health Group
FAST	Finding TB cases Actively, Separately, Safely, and Treating effectively
GTBI	Global Tuberculosis Institute
GoS	Government of Swaziland
GUV	Germicidal Ultra-Violet
HIV	Human Immunodeficiency Virus
HVAC	Heating, Ventilation, and Air-Conditioning
ICE	Information, Communication, Education
ICU	Intensive Care Unit
IPC	Infection Prevention and Control
IPT	Isoniazid Preventive Therapy
ISTC	International Standards for Tuberculosis Care
MCH	Maternal and Child Health
MDR-TB	Multidrug Resistant Tuberculosis
M&E	Monitoring and Evaluation
MoH	Ministry of Health
NACO	National AIDS Control Organization
NGO	Non-Governmental Organization

NIOSH	National Institute for Occupational Safety and Health
NJGTBI	New Jersey Global Tuberculosis Institute
NTP	National Tuberculosis Program
OPD	Outpatient Department
PEPFAR	President's Emergency Plan for AIDS Relief
PIH	Partners In Health
PHTB&LD	Provincial Hospital of TB and Lung Disease
PLWH	People Living with HIV
PMDT	Programmatic Management of Drug-resistant TB
PMTCT	Prevention of Mother to Child Transmission
SADC	Southern African Development Community
SNAP	Swaziland National AIDS Program
QA	Quality Assurance
TAC	Technical Assistance Center
TAT	Turn-around Time
TB	Tuberculosis
TBCP	Tuberculosis Control Program
URC	University Research Co., LLC
USAID	United States Agency for International Development
WHO	World Health Organization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Executive Summary

In project Year Six (FY 2016), TB CARE II continued work on a diverse range of activities, many of them building on earlier work and focusing on strengthening and enhancing products and lessons developed from earlier investments. Several notable activities were initiated this year, including the FAST intervention that was introduced or expanded in 10 countries – South Africa (began FAST implementation discussions this year), Swaziland, and Vietnam (introduced previously in the country, but expanded upon this year). Through the FAST meeting held in FY 2016, a total of 89 participants from 10 countries were introduced to FAST, including Cambodia, Georgia, Indonesia, Myanmar, the Philippines, South Africa, Swaziland, Switzerland, the United States, and Vietnam. Participants were introduced to the FAST strategy, TB in Mines expanded in four countries (including Lesotho, South Africa, Swaziland, and Zimbabwe), and Implementing IPT Best Practices to Child Contacts and HIV-infected individuals was expanded in Swaziland and introduced in South Africa.

The activities successfully blended the array of talents and skills brought by the consortium members and included inputs from stakeholders at the country level, as well as from partners within the TB CARE II team. The transition between Year Five and Year Six activities was generally smooth, as many activities were designed to build on previous efforts in a stepwise manner. The project focused its activities on the core areas of universal access, infection control, TB in mines, and health systems strengthening.

Year Six was focused on disseminating the success of the project, including the results from the IPT study in Swaziland to key stakeholders and the tools created from the Ethics of TB Care and Treatment training. The project also worked to continue mutually beneficial partnerships that introduced leadership and expertise into high TB burden areas, such as by sponsoring students to attend advanced diagnostic courses and airborne infection control courses. TB CARE II is making innovative advancements in the TB field through the FAST activity in Vietnam, universal healthcare access tool development, and the various aspects of the GUV installation activity. The team focused on high burden populations by working with miners and mining communities to address TB and silicosis.

Year Seven, which is the project's final year, will focus on completing current efforts and bringing projects to a point where they can be sustainable or continued through other means. A considerable focus will be placed this year on developing the information and learning packages which summarize and explain the lessons gained through six years of implementation on these activities, and seeking out forums and opportunities to share information, materials, and products with the TB control community, so that they can continue to benefit from the project's investments.

Overview

Progress and Significant Achievements

In FY 2016, TB CARE II made progress in implementation of a wide range of diverse activities according to the work plan. Main achievements of the year are summarized below:

Best Practices of Isoniazid Preventive Therapy (IPT) Delivery to Child Contacts and HIV-infected Individuals: The Isoniazid Preventive Therapy (IPT) adherence methods study in Swaziland was completed. The data for the study was compiled and analyzed. The dissemination report was completed and printed. The team presented the final results to the stakeholders and Swaziland National AIDS Program (SNAP) that led to a discussion on plans for expanding IPT delivery nationwide.

Advanced TB Diagnostic Courses: TB CARE II sponsored 10 key policy makers, NTP staff, and national research institute staff from low-income countries to participate in advanced TB diagnostic courses, where they not only advanced their learning on TB diagnostics, but also learned how to adopt and implement innovative tools and approaches in their countries.

Standardized Germicidal Ultraviolet (GUV) Fixtures: In order to achieve the objective, TB CARE II has pursued the implementation of GUV guidelines from three different avenues: developing marketing strategies, testing GUV devices, and bringing together the key players for GUV implementation. A draft analysis of the marketing strategy for GUV implementation in India has also been created and contains interviews with key stakeholders and a market analysis. TB CARE II has been working with Cultivating Intertek to test GUV devices. From this collaboration, a draft of IES Germicidal UV lamp standardizations was developed. The TB team held a meeting of stakeholders in Pretoria, South Africa to discuss and determine action items required to develop International GUV Guidelines for implementation in healthcare settings.

FAST: Throughout the 30 months of the FAST implementation in Vietnam at both pilot sites, 42,925 people were screened for TB. Of those screened, 27,202 people were presumptive TB cases, 3,220 of which were MDR-TB presumptive cases. A total of 3,894 people were diagnosed with TB and 188 people were diagnosed with MDR-TB. TB CARE II hosted a meeting of key stakeholders to present the results of the FAST implementation activity in Vietnam and discussed scaling up FAST in other high TB burden areas.

Building Capacity for Infection Control: In Year Six, the Building Design and Engineering Controls for Airborne Infection Control (AIC) course was organized by the MASS Design Group in collaboration with

the Harvard School of Public Health Department (HSPH) of Environmental Health, CDC, and Partners In Health. TB CARE II sponsored 29 students to attend this course.

TB in Mines: In FY 2016, the TB CARE II team worked to make connections and collaborate with many key stakeholders in the TB and mining communities in the countries of and Lesotho, South Africa, Swaziland, and Zimbabwe. Collaborators included: South Africa Chamber of Mines, Department of Mineral Resources South Africa, Department of Health South Africa, South Africa National Department of Health, Zimbabwe National TB Program, Ministry of Health and Child Care Zimbabwe, National Social Security Authority (NSSA), Clinton Health Access Initiative, the International Union Against Tuberculosis and Lung Health (The Union), the Ministry of Mines and Mineral Resources, Zimbabwe Federation of Mine Workers, the Chamber of Mines, the World Health Organization, Zimbabwe Network of People Living Positively (ZNPP+), Zimbabwe National Employment Council, the Ministry of Labor Lesotho, Lesotho Ministry of Health, Lesotho Ministry of Mining, TEBA, Ex-miner Association, and the Mineworkers Development Agency. A total of 62,158 people were reached and educated on TB, 68,938 people were tested for TB, 2,061 were tested for TB, and 429 of whom were diagnosed with TB and started on treatment.

TB and Silicosis: A draft of the TB and silicosis training manual was developed and improvements to the draft were made based upon inputs from the field.

Universal Healthcare: The TB CARE II team expanded upon the work of FY 2015 and further developed the costing model to include a more comprehensive list of services for TB treatment. The team also finalized the assessment report of the quality of TB care through health insurance in the Philippines.

Ethics of TB Prevention, Care, and Control: The TB CARE II team worked to develop and pilot a training guide on the Ethics of TB Prevention, Treatment, and Care. The team also planned a workshop to disseminate the tool and inform key stakeholders of the training guide's use, need, and benefits.

Participants of the McGill Summer Courses on Advanced TB Diagnostics

Universal Access

Improving IPT Delivery to Children and HIV Contacts

A. Progress Against Expected Outcomes

The Isoniazid Preventive Therapy (IPT) adherence methods study in Swaziland was completed. The data for the study was compiled and analyzed. The dissemination report was completed and printed. The team presented the final results to the stakeholders and Swaziland National AIDS Program (SNAP) that led to a discussion on plans for expanding IPT delivery nationwide.

B. Background

The Government of Swaziland (GoS) began implementing a national multi-sectorial strategic framework to provide Isoniazid Preventive Therapy (IPT) to children and persons living with HIV. Since then, IPT implementation has been encouraged in national health facilities. Despite efforts in Swaziland to incorporate and adapt best global practices, an effective and sustainable model for IPT delivery has not been studied, and therefore, the best implementation methods are unknown. In Year Five, URC and its partner, Dartmouth University, in partnership with the National Tuberculosis Control Program (NTP) and Swaziland National AIDS Program (SNAP), began a study of IPT delivery models based on patient preferences to improve IPT uptake and outcomes. This prospective cohort study of patients on Isoniazid Preventive Therapy (IPT) was designed to assess patient adherence, determine patient outcomes, identify critical periods for future interventions, and investigate existing data collection practices in TB and ART clinics.

Prior to the beginning of the study, IPT delivery models adherence rates were reviewed. The study began smoothly with excellent (approaching 100%) acceptance of IPT by the eligible patients. The patients enrolled on IPT were monitored for outcome data: treatment completed, interrupted, lost to follow-up, or refused due to side effects, etc. Data was also collected from patients detailing reasons for choosing facility versus community-based IPT delivery. The adherence interventions that were studied were IPT integration into other healthcare services (including community care and HIV care), revisions of professional roles (including the use of lay health workers to support self-admin therapy), IPT by DOT, and incentives.

C. Activities and Results

Financial year 2016 continued the work of the previous year and worked to complete the study and disseminate the findings. In the first quarter of FY 2016, the TB CARE II team continued follow-up and treatment with the remaining 120 participants. A stakeholder meeting of 35 people with representatives from Swaziland National AIDS Program (SNAP), TB Control Program (TBCP), and President's Emergency Plan for AIDS Relief (PEPFAR) was held to brainstorm the next steps in continued ITP delivery and scaling it up. The team also began the process of drafting a report and

a manuscript for submission to a peer-reviewed medical journal.

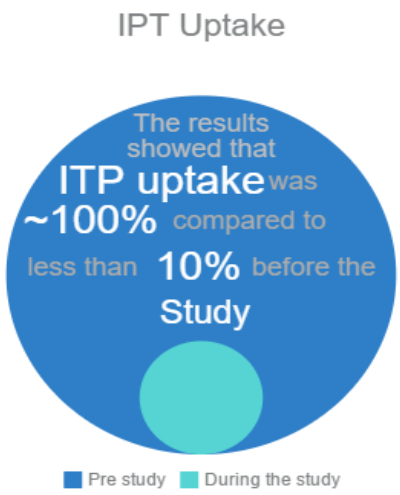
In the second quarter of the year, the reporting and analysis of the data continued and the team submitted an abstract to TB Union's World Conference on Lung Health to disseminate the findings. The abstract was accepted and the study findings will be presented in FY 2017. The team also continued to progress on the manuscript for publication. In the third quarter, the team continued to report and analyze the data, as well as to explore options to disseminate the data to key stakeholders.

Currently, patient enrollment in IPT has been completed in all five facilities in Swaziland selected for implementation of the study, with excellent acceptance of IPT by the eligible patients. The analysis of the data has been completed. The result showed that the IPT uptake was very high (~100%), compared to <10% prior to the start of the study, and exceeded the target enrollment of reaching 908 participants. Adherence levels were also high (>90% for both delivery arms) and treatment completion was also high at 89%. There were no significant differences between the two delivery models of the five facilities where IPT was offered. Monitoring of IPT adherence was conducted through a number of measures including pill counts and selected home visits (if IPT was not received from a community health worker). Patients provided the reasons for choosing facility versus community-based IPT delivery that was most convenient for them.

The study team plans to conduct exit interviews and additional qualitative research to determine if the patients' selection of healthcare delivery methods impacts their engagement in their own care. The primary conclusions of the study were that most interventions did not improve IPT completion, but there was modest improvement from incentives among vulnerable populations and the integration of TB and HIV services yielded high treatment completion rates in some settings. High quality studies are needed in high-risk populations in high TB burden settings to determine the best models of IPT delivery.

The primary conclusions of the study were that most interventions did not improve IPT completion, but there was modest improvement from incentives among vulnerable populations and the integration of TB and HIV services yielded high treatment completion rates in some settings.

At the end of the project, those IPT delivery models that were preferred by patients and yielded high treatment completion rates are expected to be continued as part of routine care delivery. Once implemented, continuation of the models of IPT delivery will be feasible since training and rollout will be achieved and no additional resources will be necessary to maintain these practices.



D. Challenges

The team faced a variety of challenges from supply shortages to methods of measuring indicators for adherence rates. Most of the patients treated at Baylor's Centre of Excellence were enrolled late due to the nationwide isoniazid shortage, which caused delays in the study. Due to a national shortage of isoniazid tablets in Swaziland during April-June 2016, the protocol had to be modified such that three 100mg tablets were dispensed (instead of one 300mg tablet, thereby increasing pill burden) and time to next refill had to be shortened from two to three months to two weeks.

Also, despite extensive efforts on the part of the study staff to remind patients to bring their pill bottles to the appointments, many patients forgot. Other patients came to the clinic when the study nurse was in the field and were therefore seen by a facility nurse who did not perform a pill count. To overcome this challenge, the team reviewed the available data on pill counts and devised an acceptable definition for adherence, in accordance with the current published literature.

E. Next Steps

A draft of the manuscript (for submission to a peer-reviewed journal) is expected in the next quarter. The findings of the ITP uptake will be presented during the oral abstract session at the TB Union's World Conference on Lung Health. Currently, detailed information about the reasons patients chose a facility versus community-based IPT delivery, or what features were most important in aiding them to complete their IPT, is unknown. The option of conducting follow-up qualitative research to determine if the very act of being able to choose one's healthcare delivery method impacts his engagement in his own care is currently being discussed.

F. Dissemination of Lessons Learned

A stakeholder meeting held on December 9, 2015 was well attended by 35 participants. Study personnel from each of the enrolling facilities and representatives from SNAP, TBCP, and PEPFAR were present. Stakeholders were pleased with the high treatment completion rate. The participants also brainstormed the next steps for continued IPT delivery and scale-up. The meeting provided some background information about the study, including study methodology, presented preliminary results of the study and highlighted key recommendations and next steps. Study limitations and challenges were discussed during the meeting.

A follow-up meeting was held in Swaziland from September 10th to 17th, 2016 for the in-country team to finalize the presentation and dissemination report for the stakeholders. The dissemination report was completed and printed, the team presented the final results to the stakeholders, and SNAP led a discussion on plans for expanding IPT delivery nationwide.

Advanced TB Diagnostics Course

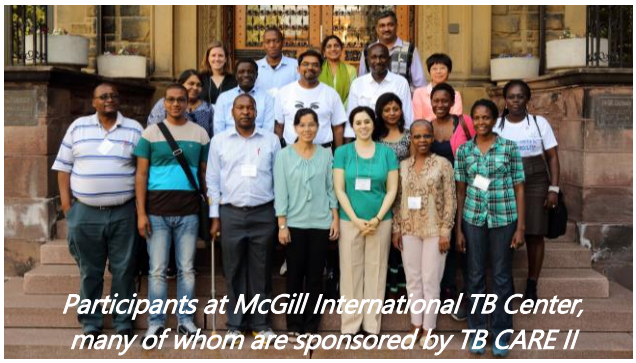
A. Progress Against Expected Outcomes

TB CARE II sponsored eleven key policy makers, NTP staff, and national research institute staff from low-income countries to participate in advanced TB diagnostic courses, where they not only advanced their learning on TB diagnostics, but also learned how to adopt and implement innovative tools and approaches in their countries.

B. Background

Early diagnosis and prompt treatment is the cornerstone of the global Stop TB Strategy. There is a lot of excitement in the TB field over the introduction of novel diagnostics, including the GeneXpert test that is widely hailed as a "game changer." However, public health impact of new tools will be realized only when new technologies are actively scaled-up in high TB burden countries. This will require advocacy at the country level for greater investments in new tools, and their adoption and implementation within National TB Program (NTP) policies. Thus, engagement of NTP managers and policy makers is critical for scale-up of innovations. Increasingly, it is evident that new tools should also be widely used in the private sector, for impact to be seen on early diagnosis.

For the past five years, with USAID TB CARE II support, the McGill International TB Centre, Montreal, has organized a week-long, summer course on advanced TB diagnostic research. This quarter, TB CARE II sent participants to McGill University to support the 6th annual summer courses that were offered from June 20-24, 2016, under the umbrella of the McGill University Summer Institute in Infectious Diseases and Global Health. This year, the Summer Institute courses were offered over two weeks with five courses that focused on TB research methods, global health diagnostics, molecular genetic epidemiology, tropical and parasitic diseases, and advanced TB diagnostics. These high-level courses with internationally renowned faculty and diverse participants offer many opportunities for networking and collaboration among participants and the faculty.

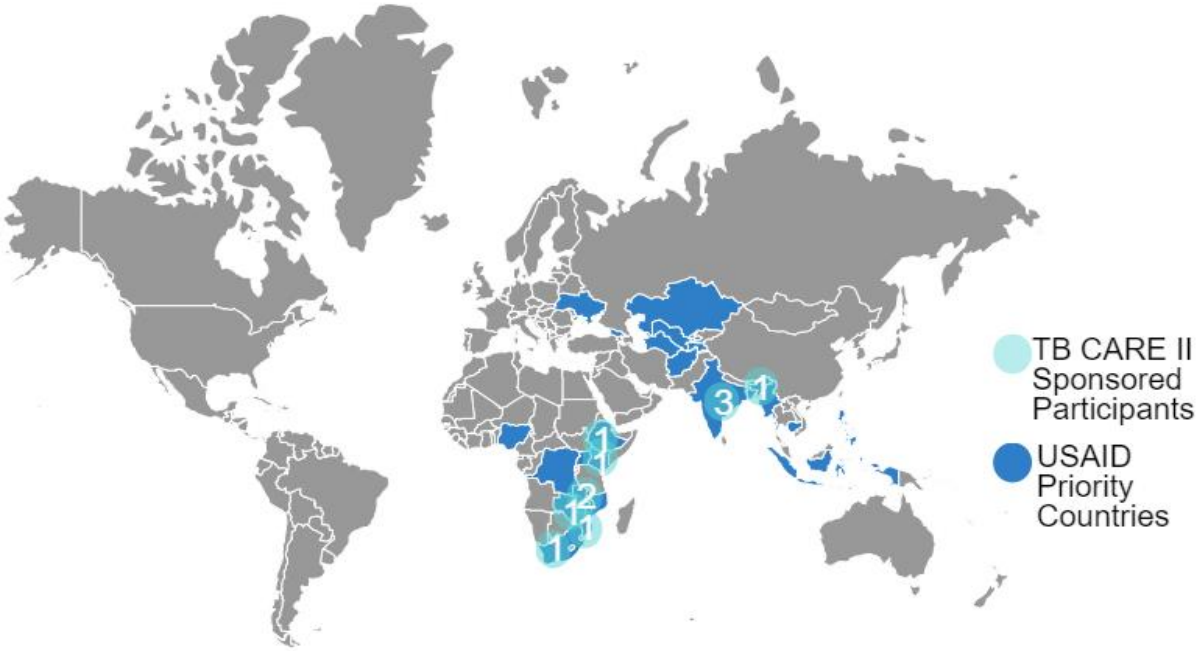


Participants at McGill International TB Center, many of whom are sponsored by TB CARE II

C. Activities and Results

In 2016, 400 participants were welcomed from 46 different countries and 40% of whom were from low- and middle-income countries. TB CARE II sponsored eleven key policy makers, NTP staff, and national research institute staff from low-income countries to participate in advanced TB diagnostic courses. The eleven participants represented eight different high burden TB countries (Bangladesh, Ethiopia, India, Mozambique, South Africa, Tanzania, Uganda, and Zimbabwe). The objective was for them to not only advance their learning on TB diagnostics, but also be inspired to adopt and implement innovative tools and approaches in their countries, and in turn become champions for TB control in their respective countries. Additionally, participants were able to network with other NTP staff, policy makers, academic researchers, and industry participants, with a view to support R&D on new technologies, and to ensure new tools meet the needs of policy makers. Aside from one participant, all attended at least two courses: nine attended the 6th Advanced TB Diagnostics Research course, seven attended the 3rd TB Research Methods course, three opted for the 2nd Global Health Diagnostics course, one attended the 1st Molecular and Genetic Epidemiology course, and one participated in the Tropical and Parasitic Diseases course as faculty. Figure 1 reflects the focused overlap of TB CARE II and USAID Priority Countries.

Figure 1: USAID TB CARE II Supported Participants 2016



The TB CARE II sponsorship covered the registration fee, hotel stay, flights, local transportation costs, and incidentals. Without this financial support, these individuals would not have been able to attend the courses. The participants now have the knowledge to become champions for new tools and delivery models in TB control in their countries, especially within NTPs, ministries of health, and in the private sector. TB CARE II-supported invitees also participated in panel discussions in the Advanced TB Diagnostics Research course or the Global Health Diagnostics course.

At the end of the two-week event, participants were asked to fill out an exit survey, including the URC-sponsored participants. A total of 159 participants completed the surveys for the Advanced TB Diagnostic Research course (60), the TB Research Methods course (43), and the Global Health Diagnostics course (56), the main three courses attended by USAID TB CARE II-supported participants. The graph below presents a summary of the answers to evaluations questions (note: not all courses asked the same questions or had the same answer options):

Graph 1: Course satisfaction – "Thinking about the course you attended, indicate if you agree with the following statements."

D. Challenges

No challenges were reported for this activity.

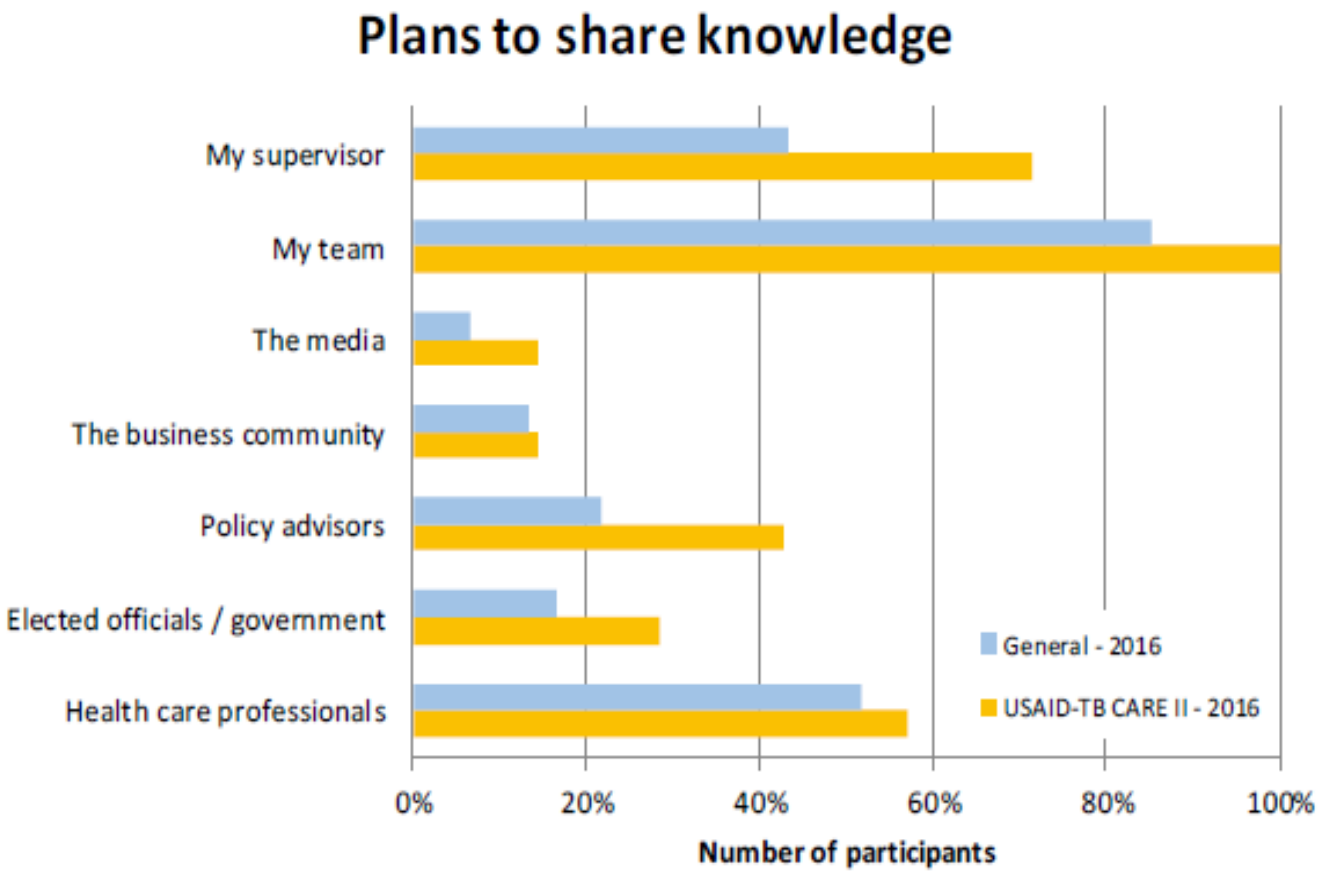
E. Next Steps

TB CARE II hopes to continue their relationship with McGill University and sponsor participants for next year's courses in FY 2017.

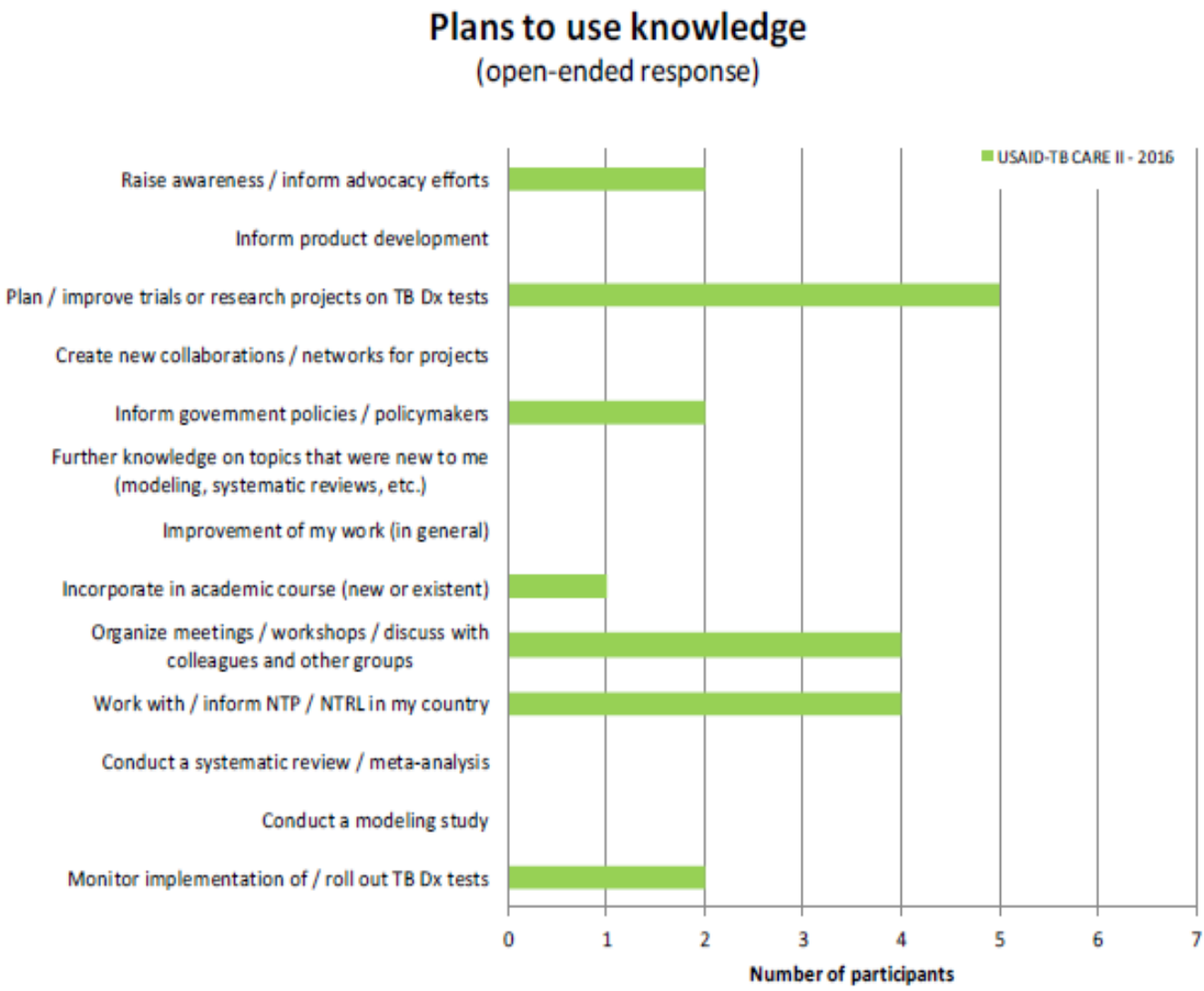
F. Dissemination of Lessons Learned

The participants of the course were asked with whom they would share the knowledge they gained from the course in order to increase the capacity to diagnose TB in their home countries. TB CARE II-sponsored participants were more likely to share data than the common participants as seen in Graph 2. Graph 3 shows the response of the TB CARE II-sponsored participants when asked how they would use the knowledge they learned.

Graph 2: Sharing knowledge – "Who do you plan on sharing your new knowledge with after the course?"



Graph 3: Plans to use knowledge – "How do you plan on using your new knowledge after the course?"



Participants at the FAST meeting in Vietnam

Infection Control

Standardized GUV Fixture

A. Progress Against Expected Outcomes

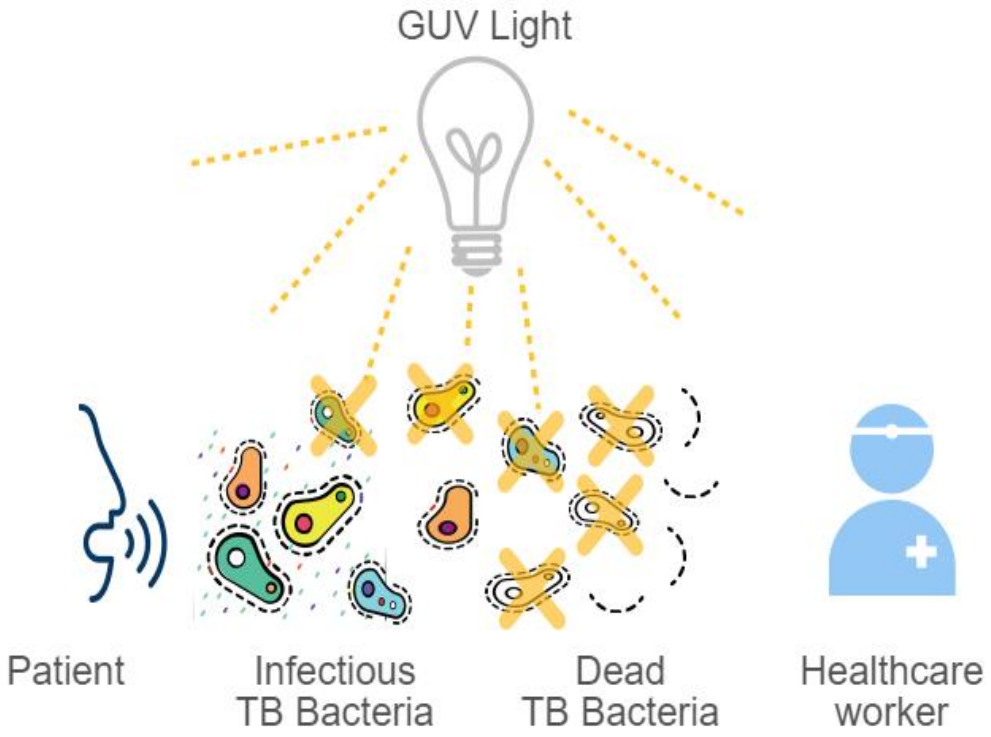
Expected outcome: publish standard, high quality, GUV unit design(s) and Standard International GUV Guidelines for use and maintenance.

Progress: In order to achieve the objective, TB CARE II has pursued the implementation of GUV guidelines from three different avenues: developing marketing strategies, testing GUV devices, and bringing together the key players for GUV implementation.

A draft analysis of the marketing strategy for GUV implementation in India has also been created and contains interviews with key stakeholders and a market analysis. TB CARE II has been working with Cultivating Intertek to test GUV devices. From this collaboration, a draft of IES Germicidal UV lamp standardizations was developed. The TB CARE II team held a meeting of stakeholders in Pretoria, South Africa to discuss and determine action items required to develop International GUV Guidelines for implementation in healthcare settings.

B. Background

Upper room GUV (previously referred to as UVGI) air disinfection with air mixing has proven to be highly effective in real hospital settings in Peru and South Africa (Escombe, Nardell). Germicidal Ultra Violet (GUV) uses ultraviolet radiation to kill bacteria present in ambient air. Although natural ventilation is the most widely available environmental control strategy, and can be highly effective at times, natural ventilation is by definition



unreliable, often ineffective at night when windows are closed and when outside conditions are not favorable. Moreover, efficacy depends on: proper deployment in the correct settings; availability of quality GUV equipment (ideally locally made); use of evidence-based guidelines; commissioning before use for safety and efficacy; and ongoing evidence-based fixture maintenance and lamp replacement.

The global experience, in rich and poor countries alike, is that hospital technical staff are generally not able to properly plan, purchase, install, or maintain upper room GUV systems. Poor maintenance is not unique to GUV systems, but applies to mechanical ventilation systems, biological safety cabinets, and a variety of mechanical or electronic interventions for many purposes in hospitals. GUV systems are available in two configurations – installed within building HVAC systems and as stand-alone "upper room" systems. Upper room GUV systems use wall-mounted UV lamps (fixtures) to uniformly irradiate air in the upper reaches of a hospital ward or room. Upper-room GUV systems are simpler to install and maintain, and are well suited to conditions where the majority of hospital facilities do not have a central HVAC system. Upper room GUV is a discrete and highly effective intervention to sterilize the air in health facilities.

There are many players involved in GUV from healthcare actors to government agencies and NGOs. TB CARE II has been working with the various players of GUV to unite them under the goal of providing healthcare facilities in high burden TB areas with GUV guidelines to reduce airborne TB transmission to healthcare workers and patients. In 2015, TB CARE II hosted a GUV workshop to outline the steps and requirements that are needed to make GUV a standard requirement in health facilities. From this meeting, it was determined that international protocols and guidelines need to be developed to inform and direct health facilities on the installation and maintenance of the GUV devices. It was also noted that the benefits and concept of GUV should be further spread to key stakeholders to create GUV champions.

C. Activities and Results

During the last two years, TB CARE II collaborators have developed guidelines for safe and effective use of GUV fixtures in healthcare settings. At the beginning of project FY 6, the team started activities to transfer sustainable GUV technology expertise to South Africa and India, as well as other high burden TB settings, through our partnership with Harvard, which has more than 30 years' experience in GUV research. A group of public health researchers, clinical experts, and industry specialists affiliated with the Harvard Medical School, the Harvard School of Public Health, Mt. Sinai School of Medicine, and the Center for Disease Control (hereafter referred to as the "GUV Group"), are working to promote the use of upper room GUV fixtures in Indian healthcare facilities. The GUV Group now seeks to develop a mechanism through which GUV fixtures can be widely disseminated across Indian healthcare facilities in a scalable and sustainable manner. Harvard has been

working with the GUV team in partnership with a local group in India, "Lattice group", on global sustainable GUV implementation under TB CARE II. The Lattice group is working to develop a marketing strategy for GUV focusing on India for an implementation site. The bring their expertise in India-specific market development and commercialization to the efforts.

Starting in FY 2016, the team developed a public-private partnership model that outlined a GUV assessment tool for TB control. The company will be responsible for designing, installing, and maintaining locally made GUV fixtures. Lattice group will offer hospitals the equipment along with maintenance services. The hospitals will not be responsible to buy and maintain the GUV fixtures. They will lease the equipment and receive the maintenance service for the period of contract. Lattice proposed to design and execute the go-to-market plan in phases – discovery, design, development, and delivery. The discovery phase is market-focused. Next, the design and development phase builds up the capabilities necessary to meet market demand and concludes with developing a business plan. The delivery phase brings all of the activities together to generate sales and lay the foundation for a scalable and sustainable product.

In the third quarter of this year, Lattice engaged with key stakeholders in the GUV community to develop a survey to administer to hospital administrators, hospital owners, and infection control staff. Across rural and urban India, 12 healthcare facilities were identified for interview-based primary research. The interview sites are diverse in geographic location and business models. The process of in-person interviews was kicked off at the National AIDS Control Organization (NACO). To develop the interview guides and begin the interview process, the following steps were taken.

TB CARE II has been working with Cultivating Intertek, a global testing company, to take a lead role in providing a lighting laboratory to test GUV luminaires according to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers ASHRAE) and the Commission

Steps Taken for the Interview process

1. Analyzed market segments and sizing: the interview questionnaire (guideline) was completed and the interviews were started
2. Developed value proposition and product positioning: work began on product positioning strategies and positioning statements
3. Identified competition/barriers to adoption: interviews with hospital equipment suppliers (HVAC systems) to understand hospital purchasing processes were completed
4. Engaged with decision makers and influencers in public health agencies, the Ministry of Health and Family Welfare, and the Government of India: met with officials at NACO to discuss GUV implementation
5. Collated information on guidelines, standards, and regulations with respect to airborne infection control and GUV Lattice innovations: information collation was completed and the analysis has started.

Internationale de l'Eclairage (CIE, International Commission on Illumination,) to test GUV devices to ensure the safety of their use in healthcare settings. A successful meeting in July 2016 resulted in Intertek agreeing to establish the first GUV testing in North America with a promise to invest in other international sites based on the market demand. The team has been working to drive a GUV luminaire testing protocol through CIE TC 6-52 (TC 6-52 = Technical Committee entitled Proper Measurement of Passive UV Air Disinfection Sources) that works to specify the biologically meaningful measurement distances and positions in installations of UV germicidal lamps for open, upper-air disinfection. A document was prepared for review by the CIE Division 6 editor and then was submitted for final committee vote in September 2016. The submitted report has been sent to the committee for voting. Also, a draft for IES Germicidal UV lamp standardization in Aberdeen was developed in September 2016.

The team also began a collaboration with a Fogarty Engineering Fellow and other colleagues in South Africa to identify potential photometric labs for standardized testing of GUV fixture output. The team is working in collaboration with The National Institute for Occupational Safety and Health (NIOSH) and Fogarty-funded efforts to continue to seek a feasible hospital site in South Africa that would be adequate for implementation of the first instance of egg-crate GUV and pilot testing of efficacy using real-time viable particle counting. One strong possibility is Tshwane Hospital in Pretoria, where a new TB ward has recently opened. The team continues to explore opportunities to relocate the existing Airborne Infection Research facility into Pretoria. If that becomes a reality, a plan for adequate ceiling height to install (and evaluate) the efficacy of egg-crate GUV will be developed. A space adjacent to Tshwane Hospital has been identified as one possibility.

The team is also exploring alternative methods for testing GUV fixture output that are potentially less onerous. TB CARE II is working with Global Health Equity to examine new approaches to GUV. Together, the teams have received the LED UV prototype fixtures in Boston and have started to prepare for testing them in the chamber at the Harvard School of Public Health (HSPH). A one-day meeting was held at HSPH in mid-September with our BWH/HSPH team and representatives from Crystal IS and Excelitas, manufacturers of the LED lights and fixtures, respectively. The details for reviewing the LED UV specifications, expected performance, and maintenance, as well as our needs for sustainable use in low-resource settings were received. The team provided feedback on fixture design and also showed them the HSPH test chamber.

In the fourth quarter of the year, TB CARE II hosted a meeting entitled "Global Implementation of Sustainable Upper Room Germicidal Air Disinfection: From Bench to Business" of GUV stakeholders with the idea to publish one or more papers summarizing a path forward to evidence-based implementation of sustainable upper room GUV as a result of the meeting. The

meeting was interactive, with short, focused presentations, and many opportunities to listen to the experience of others, ask questions, present data, and express opinions leading to consensus on the sustainable implementation of GUV for air-disinfection in high-risk TB settings. Sessions covered topics on: how GUV can reduce TB in healthcare settings; GUV manufacturers' perspective; GUV luminaire testing protocol and testing labs; CIE testing protocol for testing GUV luminaires; sustainable GUV guidelines; development of sustainable GUV business models; drafting GUV maintenance manual; GUV efficacy and safety, and overcoming barriers; designing, installing, commissioning, and maintaining GUV air mixing systems; GUV Initiatives: Ethiopia, India, Pakistan, and South Africa; policies needed to enable sustainable GUV air disinfection; and early experience and testing of prototype LED UV luminaires. The meeting provided a platform for all of the different players of GUV to come together and understand each other's perspective to help overcome barriers to GUV installation.

Key Points from the GUV Meeting

- Preparing countries to make GUV operational
- Releasing the ASHRAE guidelines
- Sharing CIE test protocols
- Sharing results from commercial testing of GUV equipment
- Developing in-country skills to maintain systems
- End user's assurance that GUV will help and not harm
- Discussing the future of investment in GUV, end user education, and the bundling of GUV with other infection control measures
- Lifting SATS 1706 as a trigger for SA Moratorium
- Inspiring in-country GUV champions

D. Challenges

No challenges were reported for this activity.

E. Next Steps

In the upcoming year, the project's FY 7, the TB CARE II team will advance their marketing strategy development for GUV implementation in India. The team perceives that the analysis and executive summary for the analysis, market segments, and sizing will be completed. Also, the data analysis for the interviews and the executive summary for the development of the value proposition and product placement is in progress to be completed next quarter. The final revisions for the collation of information on guidelines, standards, and regulations are on track to also be completed in the next quarter.

The testing of GUV devices is also anticipated to progress in the coming year. The development of the International GUV Guidelines through ASHRAE is ongoing and expected to be finalized in January 2017 and presented at the Las Vegas ASHRAE Conference. Dr. Nardell (a member of the GUV team) plans to visit the Tshwane Hospital in Pretoria site in October with colleagues from the University of Pretoria and the Council for Scientific and Industrial

Research (CSIR) to discuss GUV implementation and complete a site visit.

As a result of the GUV Meeting action items to further progress the development of international implementation, guidelines for GUV in healthcare settings were devised. The meeting resulted in many action items:

- Malawi stated they need to address several issues before full implementation such as, cost, support, overcoming HCWs' fears, and they need partners to help move forward.
- Nigeria stated a need to work on policy documents, guidelines, and NTCP guidelines on infection control, which do not have much emphasis on GUV. They are trying to introduce and might need to start with two centers, a laboratory, and an MDR-TB ward to gauge usefulness. Working with KNCV, Challenge TB, and others would be a good place to start. They would need support in terms of capacity building and training. Having WHO guidelines on GUV would take this a long way to convincing acceptance.
- In South Africa, it is time to lift the moratorium, and there will be a meeting for the DGG team to present the package in the first quarter of 2017. This meeting will cover the planning process, budgeting risk assessments from partners to inform the procurement process, and negotiating prices, all with the aim of developing a plan for scalability.
- Swaziland stated they need help getting buy-in and support from NTP to include GUV within the national strategic plan. Installing GUV in a center of excellence would be a start.
- Zimbabwe is moving ahead with an assessment of sites in 10 provinces and will be revising the strategic national plan next year with the hope to include GUV. They need strategic funding partners. Guidelines will be important to set the tone for GUV. Zimbabwe noted that MDR-TB wards with all patients on effective therapy may not be as dangerous as other places, but may actually be a strategic model for showing that once GUV is installed, it's safe and can improve HCWs' negative perceptions.
- The Philippines regional coordinator needs documents to convince the NTP program manager. The concept will be promoted in congregate settings and two penal colonies. They welcome technical partners.
- Vietnam has support from TB Challenge to implement activities. Vietnam NTP wants to make a systematic nationwide implementation. Costing will be based on the global fund. They need a detailed plan for systematic implementation at an MDR-TB hospital and PMDR.
- Georgia has used GUV since the mid-20th century and the Ministry of Health doesn't have capacity to do this on its own. There is interest in GUV I the NTP for high-risk areas, but they need training and help identifying equipment.
- In Uganda, there is always fear of the unknown, but when concepts are explained, things move. They will meet with partners and introduce GUV. They want to working with NGOs.

F. Dissemination of Lessons Learned

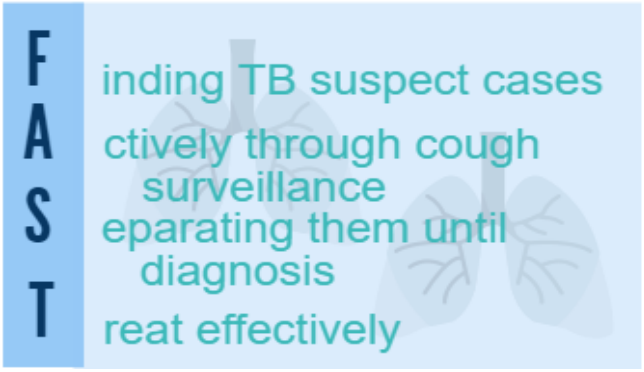
The team networked with the participants to share the benefits and progress on GUV implementation in high TB burden areas. The benefits of GUV were also presented during the FAST meeting in Hanoi, Vietnam to further educate key TB stakeholders and encourage their involvement in becoming champions of GUV. Many participants also attended the GUV meeting in Pretoria, South Africa.

Capacity Building for Infection Prevention and Control-Vietnam FAST Activity

A. Progress Against Expected Outcomes

Through the 30 months of the FAST implementation in Vietnam at both pilot sites, 42,925 people were screened for TB. Of those screened, 27,202 people were presumptive TB cases, 3,220 of which were MDR-TB presumptive cases. A total of 3,894 people were diagnosed with TB and 188 people were diagnosed with MDR-TB. TB CARE II hosted a meeting of key stakeholders to present the results of the FAST implementation activity in Vietnam and discuss scaling up FAST in other high TB burden areas.

B. Background



Vietnam, with an estimated 199 new TB cases/100,000 population, ranks 12th among the 22 high TB burden countries. Additionally, the country ranks 14th among the 27 countries bearing the highest MDR-TB burden. The case detection rate for allforms of TB was only 56%. MDR-TB prevalence is estimated to be 2.7% among new TB patients and 19% among re-treatment patients. Currently, the level of detection of MDR-TB and subsequent enrollment to treatment is very low, making it a national priority to strengthen and expand facilities for diagnosis and management of MDR-TB.

The TB CARE II supported project sites for implementation of FAST are Nam Dinh and Quang Nam Provincial Hospitals of TB & Lung Diseases (PHTB&LD). Nam Dinh province, which includes Nam Dinh city and nine districts, has a population of 1.8 million people reporting approximately 1,900 TB cases annually. The PHTB&LD diagnoses and reports nearly half of all TB cases in the province, and serves as an MDR-TB satellite site with eight MDR-TB beds.

Quang Nam province includes the cities Tam Ky and Hoi An and 16 districts, housing a population of 1.4 million and reporting approximately 1,700 TB cases annually. While Quang Nam PHTB&LD diagnoses the majority of TB cases, most are subsequently transferred to the 18 district facilities for registration and reporting. As a result, Quang Nam PHTB&LD had no system for tracking and reporting TB cases diagnosed

and initiated on treatment. The facility serves as an MDR-TB satellite site with six beds for MDR-TB.

The TB CARE II project assisted in introducing the FAST strategy to strengthen patient screening and triaging at OPDs and ICUs, as well as patient tracking and management, at both PHTB&LD facilities. The FAST strategy focuses on early detection and treatment of TB and MDR-TB cases in order to reduce disease transmission among both healthcare workers and patients.

The activity focuses on implementation of FAST to reduce TB transmission among both healthcare workers and patients in healthcare facilities and in the community. The specific objectives of the activity included:

- Promoting the adoption of safe work practices, such that TB transmission among both healthcare workers and patients within these facilities is reduced.
- Strengthening the leadership, ownership, and institutional capacities of institutions in charge of TB in the province.
- Sharing experiences, lessons learned, and effective monitoring tools for expanding successful practices to other provinces in Vietnam.

To monitor the progress of the activity, TB CARE II staff made frequent field visits and participated in monthly meetings and performance reviews. Together the facility staff and the TB CARE II team discussed solutions and issues, and brainstormed solutions. An identified best practice was that masks were provided to all patients at the point of entry to reduce transmission in the common and waiting areas. Another major accomplishment was the project staff developed and installed a computerized database for tracking and reporting visiting patients, replacing a paper-based system that hampered correct recording and timely monitoring. Since FY 2015, a comprehensive hospital software was developed and installed to improve patient information management at both facilities. All patient information was directly entered into the hospital software. The hospital software allows all departments access to the same patient records on a single network. The use of a unique code for each patient visiting the facilities has enabled patients to be tracked and managed effectively including histories of TB exposure, symptoms, lab tests, diagnosis and treatment, and their associated dates, main diagnosis, disease complications, and drug allergies. Such instant access to the patient information assisted doctors in making quicker patient classification, appropriate tests, and more accurate diagnosis and effective treatment in compliance with FAST strategy.

Management of TB, MDR-TB, and other chronic lung diseases, such as asthma and COPD, were added to the software for effective patient information management and more completeness of patient records. The software was designed to generate patient logbooks for the National TB program, reducing a great burden of handwritings on logbooks with more accuracy and completeness.

C. Activities and Results

TB case notification in Vietnam has a pattern consisting of lower numbers of cases in the first and the last quarters of a year and higher numbers in the two middle quarters. Therefore, the numbers of cases are usually compared among the same quarters. Higher numbers of pulmonary TB patients were diagnosed compared to those in the same quarter in 2014 at both hospitals. The results are shown below in Tables 1 and 2 and Graphs 4 and 5.

Table 1: Monitoring Indicators in Nam Dinh PHTB&LD from April 2014 – September 2016

No.	Indicators	2014			2015				2016			Total
		Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	2014-2016
1.	No. of patients screened with a patient information form	1,254	1,186	1,115	1,088	1,519	1,187	1,902	1,996	2,949	2,667	16,863
2.	No. of presumptive TB cases identified	681	932	956	954	1,369	1,090	1,213	1,534	1,995	1,459	12,183
3.	No. of presumptive MDR-TB cases identified	11	17	23	70	18	19	28	159	226	158	729
4.	No. of Pulmonary TB patients diagnosed	203	185	113	126	187	167	176	140	201	164	1,662
5.	No. of MDR-TB patients diagnosed	12	9	8	11	11	18	10	17	17	11	124

Graph 4: Monitoring Indicators in Nam Dinh PHTB&LD from April 2014 – September 2016

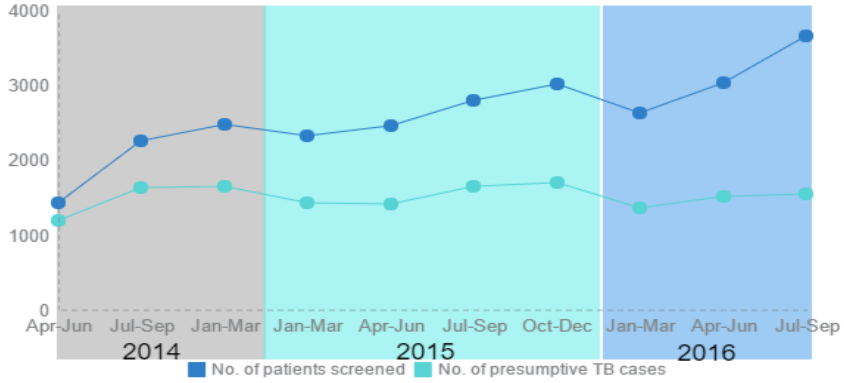


Table 2: Monitoring Indicators in Quang Nam PHTB&LD from May 2014 – September 2016

No.	Indicators	2014			2015				2016			Total
		Apr-Jun	Jul-Sep	Jan-Mar	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	2014-2016
1.	No. of patients screened with a patient information form	1,417	2,256	2,473	2,328	2,459	2,794	3,017	2,627	3,026	3,665	26,062
2.	No. of presumptive TB cases identified	1,189	1,624	1,638	1,419	1,401	1,640	1,703	1,354	1,507	1,544	15,019
3.	No. of presumptive MDR-TB cases identified	8	138	377	405	339	215	274	256	220	259	2,491
4.	No. of Pulmonary TB patients diagnosed	146	201	188	208	268	253	204	206	254	304	2,232
5.	No. of MDR-TB patients diagnosed	8	9	11	2	7	7	8	3	5	4	64

Graph 5: Monitoring indicators in Quang Nam PHTB&LD in the period of May, 2014 to September, 2016

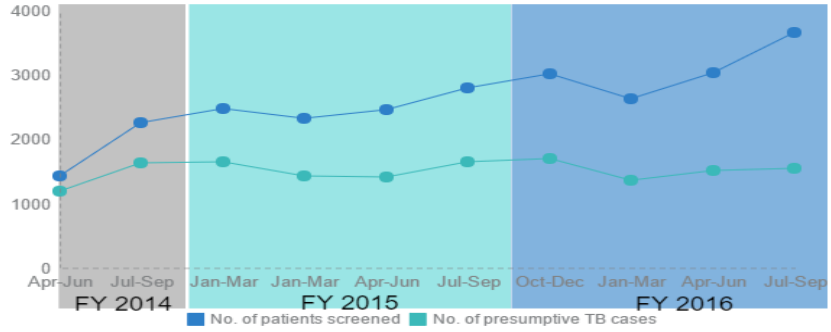
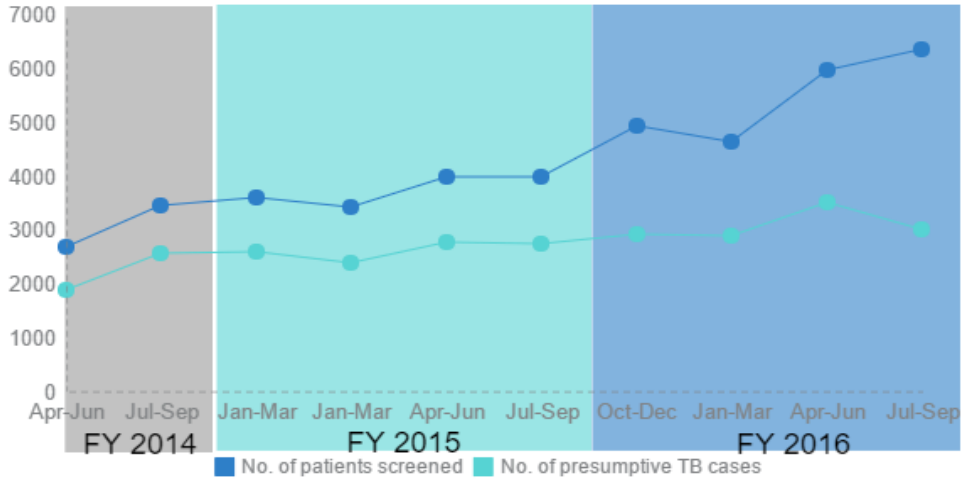


Table 3: Table of totals of monitoring indicators for both implementation sites

No.	Indicators	2014			2015				2016			Total
		Apr-Jun	Jul-Sep	Jan-Mar	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	2014-2016
1.	No. of patients screened with a patient information form	2,671	3,442	3,588	3,416	3,978	3,981	4,919	4,623	5,975	6,332	42,925
2.	No. of presumptive TB cases identified	1,870	2,556	2,594	2,373	2,770	2,730	2,916	2,888	3,502	3,003	27,202
3.	No. of presumptive MDR-TB cases identified	19	155	400	475	357	234	302	415	446	417	3,220
4.	No. of Pulmonary TB patients diagnosed	349	386	301	334	455	420	380	346	455	468	3,894
5.	No. of MDR-TB patients diagnosed	20	18	19	13	18	25	18	20	22	15	188

Graph 3: Monitoring indicators totals in the period of May, 2014 to September, 2016



Through the 30 months of the FAST implementation in Vietnam at both pilot sites, 42,925 people were screened for TB. Of those screened, 27,202 people were presumptive TB cases, 3,220 of which were MDR-TB presumptive cases. A total of 3,894 people were diagnosed with TB and 188 people were diagnosed with MDR-TB (as shown in Table 3 and Graph 4).

Due to the success of the FAST implementation seen in Vietnam at the two pilot sites, the TB CARE II project wanted to educate key stakeholders on FAST implementation and scale-up FAST to other high burden TB countries. A meeting entitled "Implementation of FAST (Find Actively, Separate, and Treat) Strategy for Strengthening Tuberculosis Infection Control" was held from September 27th to the 30th, 2016 to educate key TB stakeholders for targeted TB countries to share the FAST implementation methods and encourage participants to become FAST champions. The objectives of the meeting were to:

The meeting was interactive, with short, focused presentations, and many opportunities to listen to the experience of others, ask questions, present data, express opinions, and visit existing FAST implementation sites. Topics covered in the meeting included: the successful implementation of FAST in two pilot site in

- Discuss the FAST implementation experience to identify critical success factors and barriers at systemic, programmatic, and facility levels.
- Describe resources, processes, and procedures needed for successful roll-out of the FAST strategy.
- Review implications for improving access to timely treatment and reducing nosocomial TB transmission in healthcare settings and communities.
- Review opportunities for integrating the FAST strategy into the overall infection control framework and identify specific actions towards sustainability of FAST interventions in various settings.

hospitals in Vietnam, sustainable FAST implementation, challenges and solutions of FAST implementation, introducing FAST in different programmatic settings, adapting the FAST core package, key indicators when collecting data, and lessons learned from FAST implementation in Vietnam.

A total of 89 participants
from
10 countries
attended the meeting, including
Cambodia, Georgia, Indonesia, Myanmar, the Philippines, South Africa, Swaziland, Switzerland, United States, and Vietnam.

D. Challenges

The TB CARE II team overcame many challenges to successfully implement the activity. The first challenge was working with the hospital software. The new hospital software was not designed to record, monitor, and report diseases for specialty hospitals such as TB, MDR-TB, asthma, and COPD. In order to fix this issue, the TB CARE II team communicated with directors and staff from both PHTB&LDs, along with representatives from the software companies. Ultimately, an agreement was reached and the software company added the management of those diseases to the software. The data was closely monitored and guided the process of designing windows for data entry and patients' logbooks for recording and managing TB, MDR-TB, asthma, and COPD into the hospital software. A shortage of manpower at both hospitals presented a major problem, inhibiting capacity development for software operation and management. The project staff discussed this issue with hospital management and they agreed to assign staff to perform the hospital software administrator duties in addition to their normal workload.

Also, there were many parallel databases that required direct data entry to be maintained and managed by different hospital departments for their own recording and monitoring needs, which were time consuming and contained different pieces of patient information. This kind of patient information management system was ineffective. It could not track a patient through even one hospital episode or link hospital episodes of the same patient for better services.

Another challenge was when national health insurance changed the names of the TB lab services which became effective in April 2016, resulting in a modification of log books and reports previously designed for better patient management. The NTP recently introduced new TB lab test request forms, patient logbooks, and modified reports, which took effect in July 2016. This added a much greater workload because it was required to add the new form and design new logbooks and reports in compliance with the NTP's guidelines.

E. Next steps

After a successful pilot deployment of the TB and lung disease data entry and management on the hospital software at Nam Dinh PHTB&LD, this addition will be

continuously discussed the NTP and Hai Phong, Thanh Hoa, Nghe An, and Ha Giang PHTB&LDs and others for expanding this application. Patient logbooks and reports for the TB and lung disease programs will be generated from the hospital software. This application will reduce a great burden of handwritings on logbooks and manual counts for reports with more accuracy and completeness.

In addition, the software will generate data files that will be compatible with the web-based National TB and MDR-TB surveillance databases. This is the current database that the PHTB&LD staff have been using to conduct data entry of direct sputum smears, presumptive MDR-TB, TB and MDR-TB patients. The possibility of exchanging data files between those systems has been discussed between the NTP and URC/TB CARE II staff. Electronically exchanging data files between the PHTB&LD and the National TB/MDR-TB databases will be an innovative intervention. This application will let the PHTB&LD conduct data entry into one database, resulting in increasing data quality and consistency, as well as reducing typo errors and manpower for data entry into different databases.

The FAST meeting held in Vietnam identified many action items to scale up FAST in high TB burden areas. Introducing FAST into other high TB burden areas would help to increase the evidence that shows the success of FAST. Potential countries for implementation were determined to be: Georgia, Myanmar, the Philippines, South Africa, and Swaziland. Also, further refining the list of FAST indicators that can be used in the new areas of implementation would better show the impact of FAST, including indicators for each letter of the FAST acronym. Once more evidence is produced, the findings should be published along with the current success from Vietnam. Findings can also be disseminated via workshops, meeting, and conferences. The additional published evidence will provide WHO with an evidence-based action package for FAST to support its efforts to integrate this strategy into the global IPC strategy.

The participants also thought it was important to develop a package of FAST implementation that can be used by healthcare administrators as a step-by-step guide to FAST implementation in any global healthcare setting. Some participants also mentioned integrating GUV into the implementation plan.

F. Dissemination of Lessons Learned

In November 2015, the project staff met with representatives from the National Tuberculosis Program (NTP) and presented the newly designed data management software recently installed at Nam Dinh PHTB&LD. The NTP expressed interest in expanding use of this software to other PHTB&LDs and also discussed the possible electronic exchange of data files between the PHTB&LD and the National TB/MDR-TB databases. Each PHTB&LD organized routine meetings to review and improve data quality, utility and exchangeability, and to strengthen collaboration among departments. A technical brief on FAST implementation in Vietnam was produced and distributed at the 46th World

AIC Participants for 2016

Conference on Lung Health in Cape Town, South Africa in December 2015.

At the TB Partner Meeting organized by WHO on February 25, 2016 in Hanoi, the TB CARE II team shared the hospital software including TB patient management deployed at Nam Dinh PHTB&LD and participated in a scientific meeting, sharing and discussing the preliminary results of FAST implementation at the Pulmonary TB Department of the National Lung Hospital.

At the National Annual TB Review Meeting on March 17, 2016 in Hanoi, the TB CARE II team shared the results of the software integration with TB patient management deployed at Nam Dinh PHTB&LD with representatives from the Ministry of Health, the NTP, 63 provincial TB programs, and the NTP's international and national partners in attendance.

TB CARE II received 2 awards of recognition from Vietnam's NTP for the project's outstanding contribution to Vietnam's tuberculosis prevention and treatment efforts in 2015.

A meeting entitled "Implementation of FAST (Find Actively, Separate, and Treat) Strategy for Strengthening Tuberculosis Infection Control" was held from September 27th to the 30th, 2016 to educate key TB stakeholders for targeted TB countries to share the FAST implementation methods and encourage participants to become FAST champions.

In late October, Dr. Tierney from Partners In Health will present an overview of FAST as a TB transmission control strategy as part of a workshop on FAST and GUV at the Union Liverpool meetings.

Building Capacity for Infection Control

Progress Against Expected Outcomes

In Year Six, the Building Design and Engineering Controls for Airborne Infection Control (AIC) course was organized by the MASS Design Group in collaboration with the Harvard School of Public Health Department (HSPH) of Environmental Health, CDC, and Partners In Health. TB CARE II sponsored 29 students to attend this course.

A. Background

Building capacity in TB infection control consultants, both for general and specific experts in building design and engineering, has been the goal of three interrelated activities over the prior four years: 1) the Airborne Infection Control (AIC) summer course on Building Design and Engineering Approaches to Airborne Infection Control, 2) mentored visits for selective would-be

consultants, and 3) the TB Design Roster to connect projects in need of consultants with persons who have undergone special training. Together, these three interrelated activities try to address the inability of projects to identify consultants in infection control with both training and some field experience.

The Airborne Infection Control (AIC) course, *Building Design and Engineering Approaches for Airborne Infection Control,* is a two-week multidisciplinary course dedicated to educating professionals about the prevention of transmitting airborne disease in high-risk spaces including clinics, hospitals, laboratories, and congregate living settings. These strategies are devised to create solutions that are feasible and effective for both resource-rich and resource-limited settings. As of 2015, the course has been hosted by MASS Design Group in collaboration with the CDC and the Harvard School of Public Health with great success.

The AIC summer course (and derivative one-week courses in Pretoria and India) was created to build global capacity in the technical aspects of building design and engineering in airborne infection control. However, the course does not focus exclusively on building design and engineering. It teaches respirator use, fit-testing, and emphasizes administrative controls—the impact of active case finding, early diagnosis, and effective treatment on transmission. The focus on building design and engineering, however, is definitely its strength, not its weakness.

General infection control courses are more widely available and do not require the laboratory and human technical resources available for this course. More importantly, general courses do not require the specialized background in engineering and building design upon which can be added detailed guidance for the use of ventilation, filtration, GUV air disinfection, and building design. The course accepts administrators who will use architects and engineers as well as engineers themselves. In an effort to build global capacity, we select students based on geography and potential for global impact. Therefore, to fill gaps geographically, more engineers and architects who work for ministries of health, rather than for just one hospital, are accepted. Commercial architects and engineers are accepted because their services can be widely used. General infection control practitioners also accepted into the course. The August 2016 course had 38 participants:

- 11 students received full AIC scholarships
- Four students were partially funded by AIC scholarships and partially by their home institution
- Four students were fully funded by their home institution
- Three students were funded by a combination of AIC scholarship, their home institution, and personal funds
- Four students were fully funded as Fogarty Fellows

B. Activities and Results

In Year Six, the Building Design and Engineering Controls for Airborne Infection Control (AIC) course was organized by the MASS Design Group in collaboration with the Harvard School of Public Health Department (HSPH) of Environmental Health, CDC, and Partners In Health. TB CARE II sponsored 29 students to attend this course. Roughly 40 students from a number of low-resource countries attended the course, as well as TB CARE II representatives in both educator and participatory capacities. All the TB CARE-supported participants were from resource-limited settings and either work directly for or with NTP Programs. Success of the course has been documented in Year Six student surveys. Sample excerpts on the are included here:

*"It will **influence the way we design healthcare facilities and pubic projects** to reduce chances of airborne diseases contamination."*
- 2016 AIC course student, Rwanda

*"**The program exceeded my expectations** and even made me think that I should have attended two years back, in order [to] have made a meaningful contribution, and informed suggestions to the ongoing refurbishments and renovations including construction of health facilities in my country. **A thirty percent increase in efficiency in my work is foreseen** and [we] also hope to see improvement in implementation of future projects, rational use of resources and better quality of health care under a healthy ambience. The **program can assist many architects and engineers in our Africa region to be conscious of good ventilation** in whatever building they design, but more so for health facilities and hospitals to make them safe places but with adequate amenities."*
- Llang Maama, MD, National TB Program Manager, Ministry of Health, Maseru, Lesotho

*"The course has **influenced my thinking** on the infection control measure and it will **effect on my routine IC activities**."*
- 2016 AIC course student, Myanmar

*"It will **improve airborne infection control practices in my organization.** This is because **I am going to advocate** for best practices and also **educate others.**"*
- 2016 AIC course student, Zambia

Challenges

No challenges were reported for this activity.

C. Next steps

TB CARE II hopes to continue their relationship with MASS and sponsor participants for next year's courses in FY 2017.

D. Dissemination of Lessons Learned

Course participation and course materials give students the tools, resources, and building blocks to apply, spread, and disseminate knowledge of air borne infection control practices. This embedded knowledge creates a sustainable source of expertise that is shared to the student's respective communities and fields of practice. The knowledge gained by students through this course will continue to influence the healthcare sector for years to come. The benefits of the course are expressed in the following sample quotes.

One student stated,

*"I'm **excited** to **bring back this knowledge** to my non-technical colleagues and to discuss how to foster this kind of programming with my technical colleagues. Personally, I think this **course helped me see my own potential** to move beyond cross-cutting work (in communications) in order to **share technical knowledge with implementers.** It has given me the confidence to jump feet into field experience and an academic program that would **give me strong***

Another student shared,

*""I have a much **deeper and complete knowledge of the major aspects and crucial components of TB IPC** which will help me to help the WHO EURO member states in their IPC assessments, **currently there is nobody at [the] technical level with the appropriate training** available at the organization. With this having attentively followed this course and with continued work on the provided materials **I can fulfill my role as IPC focal point much better.**"*

TB CARE II team members visit the mines

TB and Silicosis in Mines

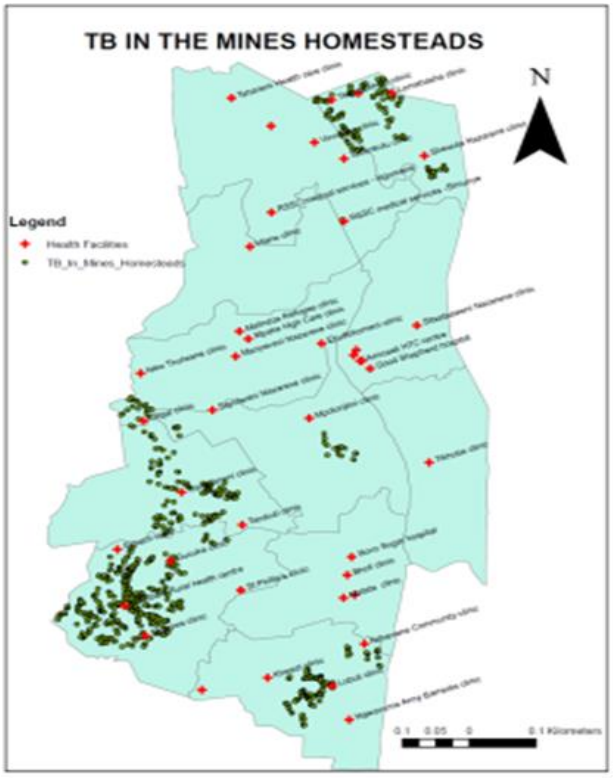
TB in Mines

A. Progress Against Expected Outcomes

In FY 2016, the TB CARE II team worked to make connections and collaborate with many key stakeholders in the TB and mining communities in the countries of Lesotho, South Africa, Swaziland, and Zimbabwe. Collaborators included: South Africa Chamber of Mines, Department of Mineral Resources South Africa, Department of Health South Africa, South Africa National Department of Health, Zimbabwe National TB Program, Ministry of Health and Child Care Zimbabwe, National Social Security Authority (NSSA), Clinton Health Access Initiative, the International Union Against Tuberculosis and Lung Health (The Union), the Ministry of Mines and Mineral Resources, Zimbabwe Federation of Mine Workers, the Chamber of Mines, the World Health Organization, Zimbabwe Network of People Living Positively (ZNPP+), Zimbabwe National Employment Council, the Ministry of Labor Lesotho, Lesotho Ministry of Health, Lesotho Ministry of Mining, TEBA, Ex-miner Association, and the Mineworkers Development Agency. A total of 62,158 people were reached and educated on TB, 68,938 people were tested for TB, 2,061 were tested for TB, and 429 of whom were diagnosed with TB and started on treatment.

B. Background

The Southern African Development Community (SADC) region is rich in minerals and has a thriving mining sector, with miners being drawn from the region to the large and small mines, most of which are in South Africa. The South African mining industry heavily depends on migrant workers from the neighboring countries, mainly from Lesotho, Mozambique, and Swaziland. Mine workers are exposed to a multitude of factors that compound their risk of TB infection. These risk factors include their working conditions (prolonged exposure to silica dust, poor ventilation, and exposure to occupational injuries); socio-economic factors (migrant status, cramped and unsanitary living conditions, and lack of knowledge of the health system or their rights regarding access to care); and their



Map of Lubombo showing the distribution of facilities and mines

disease burden (co-exposure to HIV, silicosis, or both). In many countries, only the large and well-established mining companies are able to provide comprehensive health services to their full time employees, fewer offer the same to employees' dependents, most do not cover contract workers, and many more (especially the small- and medium-sized mines) do not provide any health services beyond basic care, relying instead on the national health system to look after their employees. While most large mining companies may provide regular TB screening and treatment support to their workers, retired or sick miners who return to their countries have to depend on local health systems for TB and other lung diseases (e.g., silicosis).

An estimated one-third of TB infections in the Southern African region are linked to mining activities. An estimated 3-7% of miners are becoming ill with the disease each year. The majority of those working in South African mines are migrant workers from neighboring countries, resulting in a huge threat of cross-border spread. Each migrant worker who returns home with TB spreads the disease to an estimated 10 to 15 people in his/her community. Mine workers are exposed to a multitude of factors that compound their risk of TB infection.

On behalf of the Southern African Regional Coordinating Mechanism (RCM), the Wits Health Consortium Limited (WHC) was appointed as the Principal Recipient (PR) for a grant from the Global Fund to contribute to the reduction of the TB burden in the mining sector in 10 Southern African countries, namely Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia, and Zimbabwe.

The overall objective of this activity is to improve detection and management of TB and other co-morbidities among the mine workers and their families, who are at increased risk of TB infection. Project strategies for achieving objectives include providing policy support and coordination to strengthen regional initiatives, capacity development, and improving interventions in small- and medium-mines in the Southern African region, including labor sending and receiving countries. Under this activity, TB CARE II aims to provide support to the PR to:

- *Increase TB case finding among key populations in Southern Africa.*
- *Increase effective management of TB and improvement of treatment outcomes.*
- *Ensure effective integration of TB and HIV services in the countries of interest.*
- *Contribute to policy support, coordination, and collaboration between PR and RCM to strengthen regional initiatives to improve diagnosis and management of TB miners in small- and medium-sized mines.*

The TB CARE II project started the TB in Mines activities in FY 2015. Rapid assessments were conducted in the targeted countries to determine the disease burden among miners, available infrastructure for diagnosis and management of TB and silicosis, and technical assistance needs to strengthen capacity. The project set up

coordination mechanism with targeted mining companies and respective governments and supporting training of staff from the mining companies and NTP.

C. Activities and Results

In FY 2016, these activities were scaled up to cover the additional number of small and medium mines in the targeted countries. The project focused on two key areas as common themes for the four different countries involved in the activity: improved partnership and collaboration, and the direction of treatment of TB, MDR-TB, silicosis, and other lung health. While the project works to collaborate among the countries, the activities progress and actions vary based off of the individual needs and environments of the countries. Thus, the reporting is divided by country.

South Africa

Improved Partnership and Collaboration

TB CARE II hosted a round-table discussion on public-private partnerships in Limpopo, Northern Cape, and North West in the previous quarters. The meeting participants identified critical elements in getting to Zero TB at Work:

- Developing a comprehensive and integrated health and wellness workplace program which extends to employees' families
- Developing workplace strategies for addressing stigma and discrimination related to TB and HIV through diversity and equity management and use of peer educators
- Increasing TB awareness and education through inclusion of TB in all HIV and health and wellness capacity building or training in workplaces
- Institutionalizing peer educators in the workplace by having a peer educators program in each workplace with Key Performance Areas related to the role
- Ensuring sustainability of TB and HIV health and wellness workplace programs by maintaining public-private and civil society partnerships

The TB CARE II team is a member of the national TB and HIV steering committee hosted by the Chamber of Mines in collaboration with the Department of Mineral Resources and Department of Health. In Dr. Kenneth Kaunda District, the team is a member of the sub-district Public-Private Partnership Forum on TB in the mines. In Bojanala District, the team was invited to present the findings to the Rustenburg Forum on the Mines, as part of efforts to strengthen the response to TB in this sector. The activity, in partnership with the Dr. Kenneth Kaunda District Department of Health and Anglo Gold Ashanti, established a district-level, public-private partnership forum that engages various mine houses in the district, as well as the Department of Mineral and Resources and other key stakeholders.

The TB CARE II team met with the Global Fund team in the National Department of Health to discuss collaboration on targeted TB screening in the mines and active contact tracing in peri-mining communities, in order to prevent duplication of efforts and to maximize resource utilization.

Detection and Treatment of TB, MDR-TB, Silicosis, and Other Lung Health

In South Africa, under the public-private partnership portfolio of the USAID TB CARE II South Africa program, the project participated in and supported TB screening activities that were conducted in various peri-mining communities in the Northern Cape, North-West, Limpopo, and Mpumalanga Provinces. At West Vaal Mine Hospital in Orkney, Matlosana Sub-District in the Dr. Kenneth Kaunda District in the North West Province, in efforts to strengthen systems and facilitate active and effective contact tracing in the mines, the project trained community health workers, including ward-based outreach teams, on planning contact tracing, contact management and recoding, and reporting. Peer educators were trained on basic TB management and on TB screening. This resulted in improved contact tracing and TB screening totals for FY 2016 in the North-West, as shown in Table 4:

Table 4: Improved Contract Tracing and TB Screening for FY 2016 in the North-West

	# People reached	# People screened for TB	# People symptomatic for TB	# People tested for TB	# People diagnosed with TB	# People started on TB treatment
Total in FY 2016	61,531	61,359	2,093	2,034	174	174

Zimbabwe

Improved Partnership and Collaboration

At the start of the year, the major focus was active case finding in mining communities in the Sanyati and Shurugwi districts of Mashonaland West and Midlands provinces, respectively. The first activity to support this focus was building a stakeholder coalition in each province. The team visited each province to meet with the provincial medical director's team, the Ministry of Mines officials, and local government authorities. The team informed the local leadership about active TB case finding and requested that they identify the districts and sites where the activity would take place. They also discussed staff to carry out the case finding. For purposes of capacity building and sustainability of the project, it was agreed that most tasks could be performed by local staff. The District Health Team would be tasked with selecting local staff close to the selected site to man the active case finding clinic.

The team was able to travel to Mashonaland East province to meet the provincial leadership and to Sanyati district in the same province. The sites selected were: Patchway Mine, Golden Valley Mine, Chakari Mine, Rimuka high-density suburban area, Rio Tinto Zimbabwe, and Kadoma town. Most informal miners live in Rimuka and Kadoma town.

The team carried out on-site mentoring for all healthcare workers during the active case finding activities. These were on an individual level, either when requested by the individual or when a weakness was identified. A national or district team

member helped those struggling with the implementation of the project at an individual weakness level.

In collaboration with the National TB Program, the project convened a workshop to develop the first national strategic plan on TB in the mining sector. Participants were drawn from key stakeholders, including the Ministry of Health an Child Care, the National Social Security Authority (NSSA), Clinton Health Access Initiative, the International Union Against Tuberculosis and Lung Health (The Union), the Ministry of Mines and Mineral Resources, Zimbabwe Federation of Mine Workers, the Chamber of Mines, the World Health Organization, Zimbabwe Network of People Living Positively (ZNPP+), Zimbabwe National Employment Council, and private mining operations. The National Strategic Plan to address TB in the mining sector in Zimbabwe was finalized and reviewed by the Advocacy, Communication and Social Mobilization (ACSM) team for compliance with USAID TB CARE II branding requirements. The plan was then submitted to the Zimbabwe Ministry of Health and Child Care (MOHCC) for approval. The MOHCC has proposed a national stakeholders' meeting to approve the final document. This meeting will include the Ministries of Home Affairs, of Legal Affairs and Parliamentary Services, of Labour, and Social Services of Mines. These ministries were not involved in the development of the national strategic plan, but will be involved in the development and implementation of interventions to address issues related to artisanal mining. Other participants in the proposed stakeholders' meeting include the Chamber of Mines, organizations representing artisanal miners, people living with HIV, former miner's associations, and labour unions. The request for this meeting is a new development which was not mentioned in earlier planning meetings.

Detection and Treatment of TB, MDR-TB, Silicosis, and Other Lung Health

Active case finding activities commenced in October 2015 in the Chakari mining community in Sanyati District in Mashonaland West Province and in Chirimanzu District in the Midlands. These activities were conducted through the use of two trucks (one in each province) that the NTP provided. The trucks were equipped with a digital X-ray machine, and were previously used in the national TB prevalence survey conducted in 2013. The personnel performing the screening activities were from the district and provincial health teams, and the project supported their travel and accommodation expenses.

Everyone presenting at the site was screened using a questionnaire developed by the project, offered HIV testing, and had a chest x-ray taken that was read on-site by a medical officer. Persons presumed to have TB were requested to submit sputum for microscopy and/or GeneXpert on-site. The specimens were then sent for processing at the nearest health facility with such services. The results were collected from the mobile unit.

Data entry for the questionnaires took place through the end of December 2015, and double entry began in January 2016. The total number of TB cases found during the exercise in the two districts is roughly 123. This translates to 2,001 cases per 100,000

population screened. The national prevalence study put the prevalence of TB in Zimbabwe at 340 per 100,000 population.

Twenty participants were trained in a national pilot training using the same curriculum and training materials. The workshop was a TOT utilizing TB CARE II-developed materials to create Zimbabwe-specific training materials for use to train health workers. Participants included senior personnel from the Ministry of Health and Child Care Headquarters, the Chamber of Mines, the National Social Security Authority (NSSA), and medical officers drawn from districts with high mining activities.

Targeted screening in key populations has the potential to detect many missing cases of TB. Two districts in two provinces with high mining activities, were purposefully selected, and sites within the districts were selected for the mass screening effort. A multidisciplinary awareness and demand creation team visited the selected sites a week before screening commenced. The screening team used a truck equipped with a digital X-ray machine for chest radiograph, sputum collection, and HIV testing materials. Two teams conducted TB mass screening between October and December 2015 at 16 sites in the two districts.

Of those who were screened 6,148 (82%) had completed questionnaires. Of these, 2,686 (44%) were male, 3,385 (55%) were female and 1% did not indicate gender; 726 (12%) were formally employed and 1,367 (22%) were artisanal miners. Of the latter, 394 (29%) were female.

During the active case finding exercise, a total of

7,508 clients were screened for TB,

2,861 clients were tested for HIV and

359 (13%) were positive.

A total of **129** TB cases were newly diagnosed and enrolled on treatment (1,718 case per 100,000 population).

This short intervention showed that it was possible to increase case detection, and demonstrated a TB prevalence in peri-mining communities that was four times higher than the national prevalence of 344 cases/100,000 population shown by the 2014 National TB Prevalence Survey. Active case finding is a feasible approach and can detect additional TB cases.

As a follow-up to active case finding (ACF) activities in Sanyati and Shurugwi, and the subsequent enhanced contact tracing, TB CARE II cascaded the training on the prevention and management of TB and silicosis in the mining sector to Zimbabwe. The three-day training was attended by 15 medical practitioners with six from the Ministry of Health and Child Care, the Chamber of Mines, and the National Social Security Authority (NSSA). The course evaluation was very positive and comments show that there is a need to cascade this training in Zimbabwe.

Swaziland

Improved Partnership and Collaboration

The project held a meeting with the Lubombo Regional TB Coordinator and DR-TB doctors to communicate approval of the

provision of occupational lung health services at Sithobela Health Center and to solicit his support in the integration of TB in the Mines Project into Regional TB Activities. The project team will liaise with the DR-TB doctor to establish a reliable referral and linkage system that will ensure all ex-miners with a positive DR-TB screening receive appropriate treatment.

Detection and Treatment of TB, MDR-TB, Silicosis, and Other Lung Health

A clinical service delivery for the Lung Health Clinic in Sithobela was started in May 2016. Over the three months between July and September 2016, a comprehensive clinic was held every Tuesday during which a dedicated doctor and nurse provided consultations for the complex patients; it was also held on a daily basis for the refills of prescriptions and minor ailments. Table 5 summarizes the coverage of the clinic to date.

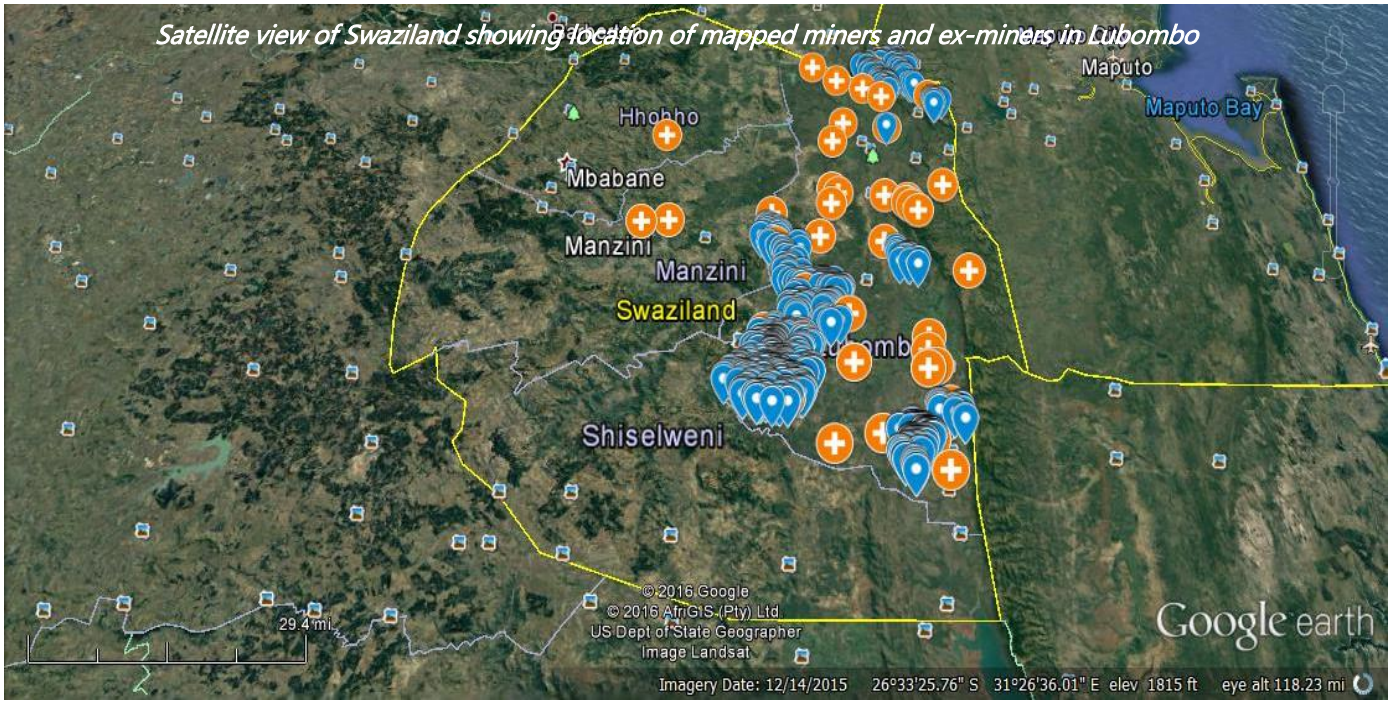
The project, in collaboration with the National Tuberculosis Control Program (NTCP), initiated a mapping exercise. The exercise aimed to identify miners in the Lubombo region and their proximity to the nearest health facility to allow for better planning of appropriate service delivery for this population. The mapping exercise commenced on July 15, 2016. To date, 951 ex- and current miners have been mapped, however, a complete data set is only available for 936.

Table 5: Summary of Clinical Services Coverage Offered by the Lung Health Clinic at Sithobela Health Centre

	# People reached	# People screened	# People symptomatic	# People tested	# People diagnosed	# People started on treatment
TB	62	59	27	27	3	3
MDR-TB	62	59	27	27	1	1
Silicosis	62	59	43	50	37	37
COPD	62	59	51	49	11	11
Impaired Hearing	62	59	28	28 (referred for Audiometry)	-	-
HIV	62	59	-	50	16	16
Hypertension	62	59	-	-	20	20

Table 6: Mapped Characteristics of the Mining Population in the Lubombo region

Type of mine	Number of miners	Disease spectrum	Currently employed	Location of mine
Gold	810	Total reported lung disease – 647 TB/MDR-TB – 17 COPD – 185 Silicosis – 178 Mixed disease – 267	26 20/26 report lung disease (12 – COPD, 2 – Silicosis, 2 – TB, 4 – mixed disease)	All in South Africa
Platinum	33	Total reported lung Disease – 19 COPD – 6 Silicosis – 3 TB/MDR-TB – 2 Mixed disease – 7	4 1 reported lung disease	All in South Africa
Diamond	6	Total lung disease – 4 TB – 1 COPD – 2 Silicosis – 1	0	5 – South Africa 1 – Lesotho
Marble	5	Total lung disease – 4 Mixed Disease – 2 COPD – 1 Silicosis – 1	0	South Africa
Coal	90	Total reported lung disease – 9 COPD – 2 TB/MDR-TB – 2 Silicosis – 2 Mixed disease – 3	72 2 reported lung disease	Swaziland – 65 miners South Africa – 5 Lesotho – 1 No information provided – 1



Satellite view of Swaziland showing location of mapped miners and ex-miners in Lubombo

The median age for all miners who were mapped was 60 years, however, the median age for those still employed was 42 years. Only 101 (10.7%) of those mapped are still employed. Six hundred and forty-seven (68%) of those mapped reported lung disease. Chronic Obstructive Pulmonary Disease was the most common lung health issue reported (448/647, 69.2%), followed by silicosis (429/647, 66.3%). A summary of the findings is provided in Table 6.

In collaboration with the Swaziland ex-miners' association, advocacy, social mobilization, and communication sessions were done in eight communities, targeting ex-miners. The sensitizations addressed prevention and management of effects of TB/HIV/Silicosis among ex-miners. The sensitizations also encourage prompt health seeking behavior for any new or worsening symptoms they may experience. During these sensitizations, referrals and linkage to care and treatment were provided for the community members who had previously sought care and did not follow up. A summary of community activities are seen in Table 7

Through the advocacy and social mobilization activities, a treatment adherence support group for ex-miners who are on ART has been formed at Sithobela Health Centre. The Sithobela Health Centre TB unit manager suggested that other non-miner males should be invited to join the support group to reduce stigma and discrimination.

There are existing IEC materials, treatment directories, and registers that were developed in the first phase of the project. These have been distributed to facilities that are in the Inkhundla where mapping has been conducted. The distribution of the miners by Inkhundla is shown in Table 8.

Table 7: Community Sensitizations for the Mining Community in the Lubombo region Conducted by the Project Team

Community reached	Purpose	Meeting dates	Numbers of ex-miners reached
1. Sithobela – 3 community meetings	Advocacy and social mobilization on TB/HIV/Silicosis. Introduction of mhealth. Formation of men treatment adherence support group	June 9, July 6, and August 10 and 24	162
2. Hlane Inkhundla – 1 advocacy meeting with leaders	Advocacy meeting for community dialogues with ex-miners in on TB/HIV/Silicosis. Community ART and Test and treat approaches discussed	August 23, 2016	15
3. Mafucula Chiefdom – 1 community meeting	Introduction of mHealth and importance of active case finding amongst ex-miners and their families	August 24, 2016	91
4. Mnjoli Community – 1 community meeting	Social mobilization on TB/HIV/Silicosis. Stigma and discrimination as a deterrent to treatment adherence	September 20, 2016	38
5. Khuphuka Community – 2 community meetings	Community Dialogue on TB/HIV/Silicosis. Stigma and discrimination as a deterrent to treatment adherence	September 20, 2016	49
6. Shewula – 1 community meeting	Introduction of mHealth and importance of active case finding amongst ex-miners and their families	September 24, 2016	98
7. Malindza Community – 1 community meeting	Social mobilization on TB/HIV/Silicosis. Stigma and discrimination as a deterrent to treatment adherence	September 26, 2016	35
8. Ntandweni community – 1 community meeting	Community Dialogue on TB/HIV/Silicosis. Stigma and discrimination as a deterrent to treatment adherence	September 26, 2016	41

Table 8: Distribution of Miners by Inkhundla

Inkhundla communities	Number of miners mapped
Siphofaneni	178
Sithobela	384
Lomahasha	136
Lubuli	215
Lugongolweni	2
Mhlume	2
Mpolonjeni	19

Lesotho

Improved Partnership and Collaboration

TB CARE II is a member of the technical working group (TWG) that guides the development and implementation of strategies to address TB in the mines, including the Southern Africa Global Fund grant on TB in the mines. Other members of the TWG include the MOH and the International Organization of Migration (IOM). The project staff participated in a training course on TB/HIV co-infection for community-based organizations, which was convened by the Lesotho Non-Governmental Organization Council and the MOH.

TB CARE II provided technical and financial support in the development of the country's first operational guidelines on engaging CBOs/NGOs to strengthen TB prevention, diagnosis, treatment and care services at the community level. The project convened a three-day workshop where these guidelines were developed collaboratively by various stakeholders including 10 CBOs and three government ministries. The guidelines are based on the World Health Organization's ENGAGE TB Guidelines. The project supported the printing of 1,500 Lesotho ENGAGE TB guidelines, which were subsequently launched by the Ministry of Health. Regional workshops were conducted to sensitize key stakeholders about the operational guidance contained within the guidelines. The aim is to strengthen the collaboration between different stakeholders, especially between the National TB and Leprosy Program (NTLP) and CBOs, and NGOs and communities. The adoption of the first Lesotho ENGAGE TB guidelines shows the importance of collaboration in the development of policy and strategies, and bodes well for the successful implementation of the guidelines across the country.

The project staff participated in a meeting of key stakeholders, including the Ministry of Labor, Ministry of Health, Ministry of Mining, TEBA, Ex-miner Association, and Mineworkers Development Agency, which culminated in the formation of the Local Organizing Committee (LOC) to guide the establishment of a "One Stop Shop" facility, including the services to be provided. The project has drafted the concept note for the "One Stop Shop" to guide the LOC in seeking funding for the facility. The concept will be presented to relevant government ministries and stakeholders.

Detection and Treatment of TB, MDR-TB, Silicosis, and Other Lung Health

The project procured the following equipment to the Occupational Health Clinic at the Queen Elizabeth II Hospital in Maseru: a spirometer and consumables, two

stethoscopes, two X-ray viewing boxes, a scale and height gauge, and a filing cabinet. Two doctors were trained on the use of the spirometer by the vendor. TB CARE II also supported the procurement and printing of TB patient cards for use at the clinic and in the community.

In collaboration with the NTP and the IOM, TB CARE II participated in cross-border TB screening, HIV testing, and refilling of medication during the Christmas holidays at Maputsoe Bridge, in support of the Leribe and Phelisanang Bophelong District Health Management Teams.

D. Challenges

No challenges were reported for this activity.

E. Next Steps

The TB CARE II team is working to finalize the TB and silicosis training package (training guide and participants' manuals) and develop generic job aids to facilitate TB and silicosis diagnosis and treatment. The team is also working to develop and finalize curriculum on leadership for TB and silicosis prevention and management. After the curriculum is developed, the team seeks to conduct regional leadership training for TB and silicosis for managers from the mining sectors in supported countries.

In South Africa specifically, the team is pursuing conducting a regional training-of-trainers course on TB and silicosis for participants from provinces with mining activities. In Zimbabwe, the team will provide technical support in the finalization of the national strategy on TB in the mines, using guidance from the national stakeholders' meeting to finalize the document.

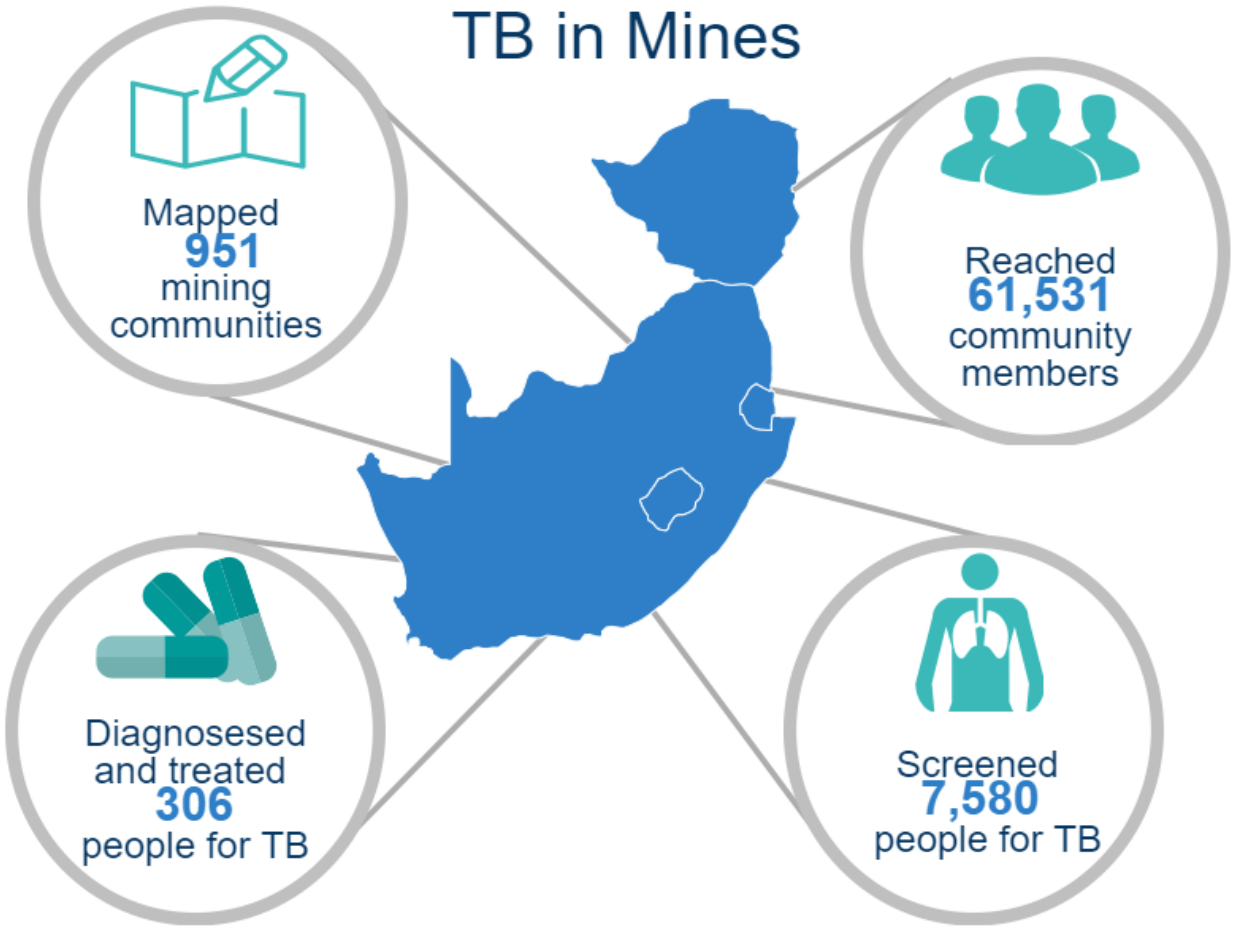
The Swaziland team is working on data cleaning for the mapping exercise that has just concluded. An in-depth analysis will be done and a report generated over the coming period. Also in Swaziland, a five-day off-site training is planned for healthcare workers in October. This training will focus on occupational lung health, management of TB/HIV amongst miners/ex-miners, and socioeconomic factors affecting ex-miners in Swaziland. On-site training on TB and Silicosis is scheduled for four clinics in Lubombo region after the National Training. In Lesotho, the team is working to conduct pilot training on TB and silicosis for clinicians, as well as to support the screening of current and former miners at occupational health clinics in Maseru.

F. Dissemination of Lessons Learned

TB CARE II project participated in a project report meeting at the Royal Swazi Convention Centre. Participants included URC Vice President Dr. Refiloe, URC Country Director Dr. Haumba, NTCP manager and staff, PEPFAR partners, representatives from the Mine Workers Association, the IOM Country Coordinator, URC staff, and other stakeholders.

The Swaziland HIV/AIDS conference was held from July 12th to 14th, 2016. The theme of the conference was "From Crisis to Opportunities." The project team developed and submitted an abstract entitled "High Rates of Silicosis, Tuberculosis, and Occupational Related Disabilities amongst Ex-Miners in Swaziland". The abstract was accepted for an oral presentation.

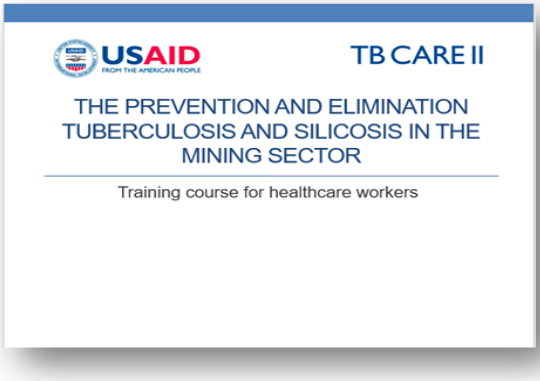
Two abstracts were developed from the intervention to improve TB screening in mining communities in Zimbabwe, and submitted for presentation at the 43rd Union Global Conference on Lung Health to be held in Liverpool, England in October 2016.



TB and Silicosis Training Package

A. Progress Against Expected Outcomes

A draft of the TB and silicosis training manual was developed and improvements to the draft were made based upon inputs from the field.



B. Background

Prolonged exposure to silica dust increases the risk of silicosis. The risk of a person with silicosis developing TB is 2.8 to 39 times

higher than that in healthy controls. Healthcare providers in the mining sector need to understand the significance of TB and silicosis, to correctly identify the key features, and to appropriately manage and prevent these diseases. Under this activity, TB CARE II plans to provide TA to mining industries and governments to improve the quality of TB services for miners and increase the access to the quality care by: 1) Developing a training package (including job aids) that focuses on lung health and emphasizes the interstitial lung diseases (silicosis and others) and TB in the mining industry; 2) Training healthcare workers on TB and silicosis, and providing services to miners to increase their capacity for management of TB/MDR-TB and silicosis; and 3) Developing a system to follow up the training outcomes.

C. Activities and Results

The development of this package will be followed by a regional training-of-trainers course followed by two pilot trainings in Lesotho and Zimbabwe, culminating in the production of a final package based on field testing and evaluation.

In year six of TB CARE II, terms of reference for the development of the training package were developed and negotiations commenced with a service provider.

D. Challenges

The service provider contracted to develop the training package failed to deliver any of the deliverables, leading to cancellation of the contract. A draft TB and silicosis training curriculum was developed and input was received from the field, as part of the preparation for the development of a training package on TB and silicosis that will train clinicians to be trainers-of-trainers.

E. Next Steps

The next steps after pre-finalization of the curriculum will be a regional training-of-trainers course followed by two pilot trainings in Lesotho and Zimbabwe, culminating in the production of a final package based on field testing and evaluation.

F. Dissemination of Lessons Learned

No dissemination was reported for this activity. However, the team seeks to disseminate the findings after the pilot trainings.

Presenting the Ethics of TB care and treatment at the Union Lung Health Conference

Health Systems Strengthening

Strengthening Coverage for TB Through Universal Healthcare

A. Progress Against Expected Outcomes

The TB CARE II team expanded upon the work of FY 2015 and further developed the costing model to include a more comprehensive list of services for TB treatment. The team also finalized the assessment report of the quality of TB care through health insurance in the Philippines.

B. Background

Through TB CARE II support, URC has conducted literature review and case studies in India, Peru, the Philippines, and Thailand, to examine the extent to which TB services have been integrated within state-supported insurance schemes and examine the roles of TB stakeholders within the design and implementation of health insurance programs. A framework was developed for analyzing TB service integration in insurance-based systems. Case studies generated findings and recommendations for improved delivery of TB services within health insurance models. Additionally, a manual was developed on TB service integration within National Health Insurance (NHI) programs that has been adapted in two countries. A workshop on strategies to improve successful delivery of TB services within insurance programs was conducted in the Philippines. Data was collected and analyzed in all three implementation sites (with many clinical observations from the various facilities), allowing for a considerable sample size when both populations are analyzed.

C. Activities and Results

In Year Six, after successful development of the tool and case studies, URC started discussions to move forward and develop policy documents on integration of the TB services in the National Health Insurance system. The team designed the costing model for inclusion of additional services in TB benefits package (e.g., MDR-TB) and defined additional health systems requirements for delivery of TB insurance package and streamline processes. Also, the assessment report of the quality of TB care through health insurance in the Philippines was finalized. Currently, TB CARE II is conducting desk top review of NHI and other documents to review progress in integrating TB with NHI programs in the past two years. The team is also consulting with key people in select countries to generate additional information to further refine the Insurance Manual and Models tool. This task includes three components: revising/updating the TB CARE II Insurance Manual on TB service integration within NHI programs with NTB programs in some countries; costing out inclusion of additional services in TB benefits package (e.g., MDR-TB) and defining additional health systems requirements for delivery of TB insurance package and streamline processes; and conducting an assessment of additional administrative responsibilities required to integrate TB diagnosis and services at different levels of the health

system to determine training needs and personnel time requirements.

D. Challenges

No challenges were reported for this activity.

E. Next steps

TB CARE II, in partnership with WHO, will organize regional consultation meetings in Asia and Africa. The Asian Consultation Meeting will engage key stakeholders from Cambodia, India, Indonesia, the Philippines, and Thailand to discuss current strategies for integrating TB/MDR-TB with NHIs. Similarly, the Africa Consultation meeting will engage stakeholders from Ghana, Kenya, Rwanda, South Africa, Tanzania, and Uganda. The meetings will be organized in FY 2017 in Jakarta and Pretoria and work towards the development of a policy framework on integration of the TB services in the National Health Insurance system. The meeting will also work towards the development of a financing strategy as part of social protection to ensure that poor people have access to high quality TB and MDR-TB services. The third activity of the meeting will include expanding the framework designed for cost analysis of TB service integration in health insurance programs.

F. Dissemination of Lessons Learned

No dissemination was reported for this activity.

Ethics Assessment Tool and Ethical TB Program Management Training Curriculum

A. Progress Against Expected Outcomes

The TB CARE II team worked to develop and pilot a training guide on the Ethics of TB Prevention, Treatment, and Care. The team also planned a workshop to disseminate the tool and inform key stakeholders of the training guide's use, need, and benefits.

B. Background

There is an increased focus on a human-rights based approach to TB prevention, care, and control, and the Ethics of TB Prevention, Care and Control: An Assessment Tool for National Tuberculosis Programs and Ethics of Tuberculosis Prevention, Care and Control Training Curriculum, developed during the TB CARE II project, fill a unique need in this arena.

WHO guidelines on MDR-TB management recognized palliative care as an essential part of health systems and programs including TB programs. TB CARE II, in coordination with WHO, has developed comprehensive guidelines for TB and DR-TB palliative care and support. The different aspects of palliative care such as pain and symptom control, psychosocial care, and end-of-life issues should be managed in an ethical manner in line with the cardinal ethical principles of autonomy, beneficence, non-maleficence, and justice.

C. Activities and Results

In Year Six, TB CARE II, in consultation with WHO and in partnership with Global Tuberculosis Institute (GTBI), worked to integrate palliative care into Ethics of Tuberculosis Prevention, Care and Control Training Curriculum. The training curriculum also included sections on ethics and new drugs. In conjunction with key experts at WHO and TB CARE II, the team completed a workshop on ethics, human rights, and TB. The team collaborated to plan pilot testing of the one-day training, which took place in East London, South Africa for healthcare workers in the Eastern Cape Province. Presenters included team staff and provincial staff. The training included lectures and interactive activities, which were reviewed by various team staff and select external reviewers. A draft facilitator guide was also developed. An observer from the NTP also attended. The training was well reviewed by presenters and attendees. The course content and facilitator-led training guide were also reviewed by content and training experts from GTBI, the Union, and the CDC. Materials were revised and finalized based on review and feedback, and were submitted for further review. The curriculum is now available online and has been disseminated.

The TB CARE II team planned a workshop on ethics, human rights, and TB in conjunction with key experts at WHO and URC. Initial consultations were conducted with WHO to identify key topics and locations and how the TB CARE II project can collaborate effectively with WHO. A workshop for the European Region Union Conference in Bratislava, held on June 24, 2016, highlighted current challenges in the region, as well as WHO efforts and the Ethics Assessment Tool and Training Curriculum previously developed under TB Care II.

Team staff were invited to attend the WHO Ethics Guidance Consultation in Geneva in July 2016. Attendance and information from this meeting will be utilized to begin updating the ethics assessment tool and curriculum based on the forthcoming updated WHO guidance. Information from this meeting will allow for preliminary review to begin, though a more complete draft based on the expert consultation will be needed for substantive work to continue. The materials cannot be finalized until the updated WHO guidance is approved and finalized.

D. Challenges

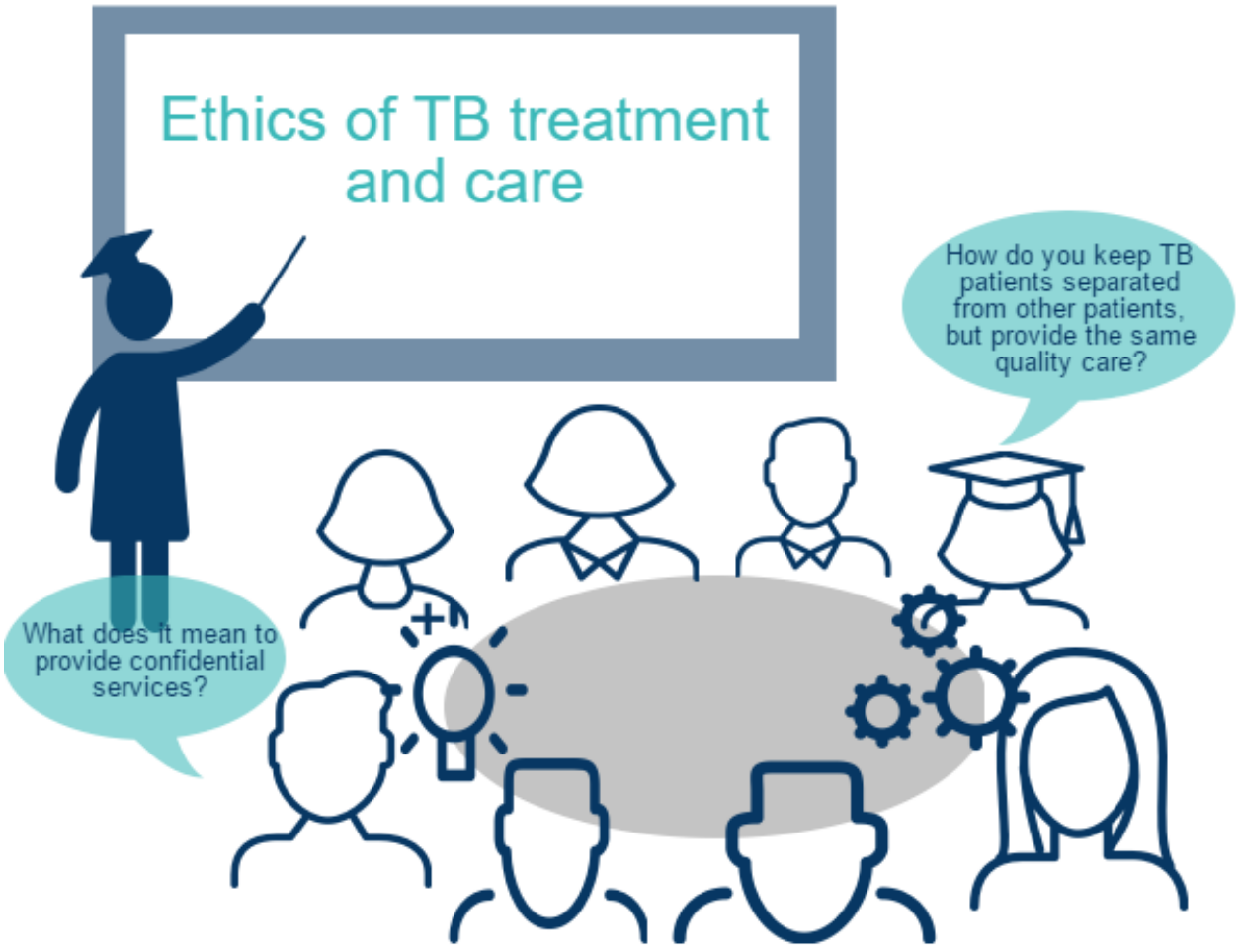
No challenges were reported for this activity.

E. Next steps

Tools, curriculum, and facilitator-led training guides will be revised in the next quarter to reflect the feedback from WHO.

F. Dissemination of Lessons Learned

The curriculum page is now posted on the GTBI and TB CARE II websites. The curriculum and previously developed training tool were presented to the WHO's Ethics Guidance Expert Group Meeting in November and flyers were prepared for distribution at the Union World Conference in Cape Town. The curriculum was presented at the Educational Materials Discussion session at the UNION World Conference. The curriculum will also be disseminated to the Union Ethics, Advisory Group, the World Medical Association, and other organizations.



Knowledge Management

The TB CARE II team continues to update and showcase the achievements of their activities. This quarter, technical briefs, spotlights, and fact sheets were developed to highlight the success of the project. These documents, as well as many other tools developed by the project, can be found on tbcare2.com. A documentary highlighting the project was also created to be showcased at the FAST, GUV, and Union Lung Health conferences, along with the materials that were developed.

The TB CARE II website has been updated to include the current focuses of the project. The website continues to be a source of information for TB experts and learners around the world. Table 9 shows the activities on the TB CARE website that highlights the viewership and majority areas of activity. Note that the indicators for the website began the reporting in April 2016 and previous data is unavailable.

The TB CARE II team also hosted and attended many events to bring together key stakeholders. Table 10 shows all of the events for FY 2016 under TB CARE II.

Table 9: Website Indicators

April 1 to September 30, 2016 Website Analytics			
	TB CARE II Core	TB CARE II South Africa	Combined
Sessions	4,212	4,570	8,782
Users	3,668	4,014	7,682
Page views	8,436	8,856	17,292
New visitors	85.00%	83.50%	84.25%
Top countries	Bangladesh, US, India, Kenya, South Africa, Philippines, UK, Malawi, Indonesia	SA, Kenya, US, India, Netherlands, UK, Philippines, Nigeria, Germany	
Downloads	456	372	828
Top pages	Bangladesh, PMDT, Malawi, Malawi, TB DOTS, Infection Control, About TBCARE2, Employment opportunities, TB/HIV	Grantees, Arum Inst, Grants summary, Directions to URC office, Improve quality of TB services, Where we work, Contact Us, About us, Basic Mgt & Treatment	

Table 10: List of TB CARE II Events in FY 2016

Event	Location	Date(s)	Role
NTP Meeting	Vietnam	Nov. 15, 2015	Participated
IPT Stakeholder Meeting	Swaziland	Dec. 9, 2015	Hosted
TB Partner Meeting	Vietnam	Feb. 25, 2016	Participated
National Annual TB Review Meeting	Vietnam	March 17, 2016	Participated and Presented
Royal Swazi Convention	Swaziland	-	Participated and Presented
Swazi HIV and AIDS Conference	Swaziland	July 12-14, 2016	Participated and Presented
Airborne Infection Control Course	Boston, USA	August 1-12, 2016	Participated and Presented
IPT Stakeholders meeting	Swaziland	Sept. 10-19, 2016	Hosted
FAST Workshop	Vietnam	Sept. 27-30, 2016	Hosted
UVGI Workshop	South Africa	Oct. 10-11, 2016	Hosted
Union Global Conference on Lung Health	Pretoria, South Africa Liverpool, UK	Dec. 2-6, 2015 Oct. 25-29, 2016	Participated and Presented

Success Stories

Sharing and Learning with Colleges at the Union Lung Health Conference

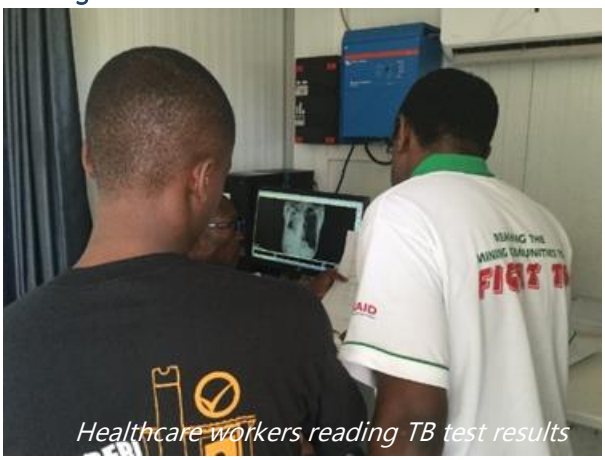
With USAID approval, the project supported four participants to attend the International Union against Tuberculosis and Lung Disease (The Union) World Conference on Lung Health held in Cape Town, South Africa from December 2-6, 2015. The conference focused on the theme "A New Agenda-Lung Health Beyond, 2015." The participants attended a variety of symposia and workshops, and engaged in networking and sharing lessons learned through the TB CARE II project with TB experts from around the world. URC also had a booth which served as a meeting/focal point to engage TB CARE II consortium members and MOH/NTP officials attending the conference. URC developed different technical updates on TB CARE II core supported activities (e.g., FAST, TB in Mines, health insurance) and shared them with the

TB CARE II team member at the Union Conference

conference participants. In addition, Dr. Neeraj Kak made a presentation on Integration of TB with National Health Insurance Programs and Dr. Samson Haumba also spoke on Planning and Building Coalitions between Providers and Service Points for Establishing Community MDR-TB Programs Post-Graduate Courses. Dr. Haumba additionally chaired a session on Collaborative Services for TB & Diabetes.

The USAID TB CARE II South Africa Project also hosted two well-attended post graduate courses on integrating palliative care into the continuum of MDR-TB care and establishing community MDR-TB programs. The TB CARE II South Africa project also presented in several sessions on: TB/DM, mHealth, and universal health coverage.

Finding the Missing Cases Among Informal Mining Communities


Healthcare workers reading TB test results

TB CARE II supported active case finding in two districts in Zimbabwe that were characterized by high levels of artisanal mining. A multidisciplinary awareness raising campaign was conducted in the districts, followed by a screening campaign reviewing clients by means of a standardised questionnaire, digital chest

radiology, HIV testing, and sputum microscopy and/or GeneXpert.

The personnel performing the screening activities were from the district and provincial health teams. A total of 6,148 clients were screened for TB and HIV in the two districts, of whom 123 were diagnosed with TB and initiated on treatment. The burden of TB in these communities was 2,001 cases per 100,000 population screened, about six times higher than the national prevalence study of 340 cases per 100,000 population. This pilot demonstrated that active case finding is a feasible and effective approach to increase case finding in mining and peri-mining communities, and that it can be done using local resources. Findings from this intervention will be presented at the 47th Union World Conference on Lung Health in Liverpool, England in October 2016.

Capacity Building for Improved Prevention and Management of TB Silicosis in the Mining Sector

TB CARE II developed a training package to improve the skills and knowledge of clinicians on the prevention and management of TB, silicosis, and other occupational lung diseases in the mining sector. A regional workshop was conducted in South Africa, with the aim of building the capacity of clinicians from Botswana, Lesotho, Swaziland, Zambia, and Zimbabwe, by providing them with knowledge and skills for the prevention and management of TB, silicosis, and associated occupational lung conditions prevalent in the mining sector. The ultimate goal of this training was to contribute to efforts to reduce the burden of TB and associated occupational lung diseases in the mining sector in the region. During the workshop, nineteen clinicians from the invited countries were trained to be national trainers-of-trainers for their countries on these important topics. This course was accredited for continuous professional development by the South African Medical Association.

One Hundred and Eighty Meters Below


TB CARE II team exploring the mines

In June of 2016, the TB CARE II Project team visited Maloma Colliery accompanied by the Swaziland National Tuberculosis Control Programme, led by Manager Mr. Themba Dlamini. This was particularly exciting as the visit had been planned and the team looked forward to visiting underground to catch a glimpse of miners in action.

Arrival The team was received by the Colliery Health, Safety and Environment Officer, Andile Oostuizen. Each member of the team had an alcohol breath test before being admitted into the facility. This was a standard safety measure for everyone

before they are allowed into the facility. Next, a tour of the colliery clinic commenced to review the facilities available to provide care for miners. Then, blood pressure of the visiting team was measured. This is a company policy to ensure that all guests who visit underground are fit.

Induction Course on Safety The team was given an induction course on mine safety and conduct underground during emergency. Use of basic safety equipment and kit was reviewed and demonstrations were done. The layout of safety features

Induction course

within the mine was reviewed and the team was oriented on safety features within the "Refuge Bay" (a fortified room underground where miners go for safety during emergencies pending evacuation. It has a telephone and a "hole" that communicates with the exterior for dropping food and medical supplies).

Meeting with Colliery Management The TB CARE II project team met with management of the mining company. Speaking for the team, the NTCP manager assured the company of support from USAID TB CARE II and the Ministry of Health in providing quality HIV/TB Care for its staff and host community. In the words of the Colliery Chief Executive Officer this was "a dream come true" as the company has been awaiting an opportunity to partner with the Ministry of Health to improve the quality health services for their staff. He concluded by requesting an MoU that will guide the partnership.

Going Underground Finally! The long awaited

Getting the gear on

time arrived. The TB CARE II Project team were provided with PPE for safety underground. This included a coverall, boot, helmet with head lamp, hand gloves, ear plugs, and standard resuscitation kit tied around the waist. Each team member signed for their kit, ensuring its optimal functionality.

The team was provided with a special transport into the blasting zone where mining operations were ongoing. The blasting area was about 4km long and 182m below the earth's surface. Driving

Transportation to the mine

down was a bit bumpy as we held on tight, going uphill and downhill most of the time. The entrance was muddy and rocky as a

result of water used to wet the ground to reduce dust levels. The drive took about fifteen minutes and we passed several dark tunnels before arriving at the reception area where all miners on duty gather daily for review of basic safety within the mine.

The team was received by the mine supervisor, Mr. Dlamini, who explained the processes. Miners work in teams and in shifts, with each shift lasting about 10 hours. Each team reviews safety measures daily before commencing operations. The team leader checks the methane level daily using the Gas Detector Instrument (GDI) before mining activities commence. This level must be less than 0.1 before mining operations commence. After blasting, the roof is supported before the blasted rock is packed into a conveyor belt which transports the coal to the exterior. Within the mining area, the floor is wet while powerful extraction fans cause a unidirectional flow of air to the exterior.

Testing the phone in the mine

A Mother's Dilemma

"If there is a mother with MDR-TB — she has 3 children at home, no one to take care of them and is begging me to go home, what should I do?" - Healthcare worker from South Africa

This was one of the many ethical dilemmas raised at the TB CARE II-funded Ethics and Human Rights in Prevention Care and Control of Tuberculosis: Challenges and Approaches workshop organized by the Global Tuberculosis Institute at the 47th Union World Conference on Lung Health in Liverpool in October. This workshop brought together a varied mix of presenters and audience members to discuss and explore ethical challenges in TB prevention and care. A patient advocate in the audience also spoke about his seven-year battle with XDR-TB, moving the entire audience. Ethical and human rights issues in TB, though frequently overlooked, often touch a chord with providers, patients, and managers, and this workshop, along with those held at other meetings, provided an opportunity to delve into the topic and raise awareness and understanding. A total of 93% of workshop participants reported having a better understanding of ethics and human rights issues after the workshop and 89% reported that they would make a change to their practice or work because of the information presented. The aim and result of the workshop was perhaps best summarized by a participant who stated that the workshop "addressed the invisible and unmeasurable dilemmas of both patients and providers."

Submitted by:

UNIVERSITY
RESEARCH CO., LLC

University Research Co., LLC

Bethesda, Maryland

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