TDR For research on diseases of poverty

UNICEF • UNDP • World Bank • WHO

Annual Report 2021

Research for Implementation

Table of contents

List of figures

List of tables

List of abbreviations

ADP	Access and Delivery Partnership (UNDP)
aDSM	anti-TB drug-safety monitoring and management
ADR	adverse drug reaction (reporting)
AMR	antimicrobial resistance
ARV	antiretroviral
CAB	Community Advisory Board
CAD	computer-assisted detection
CARN-TB	Central African Regional Network for TB Control
CBD	Convention on Biodiversity
CDC	Centers for Disease Control and Prevention (for Africa, the US, and China)
COVID-19	coronavirus disease 2019; SARS-CoV-2
CRAs	Community Research Assistants
CRP	C-reactive protein
CRS	Catholic Relief Services
DEC	disease-endemic country
DIAMA	**DIA**gnostics for **M**ultidrug-resistant tuberculosis in **A**frica
DND*i*	Drugs for Neglected Diseases *initiative*
ECOSUR	El Colegio de la Frontera Sur, Mexico
EDCTP	European and Developing Countries Clinical Trials Partnership
ER	expected result
ESPEN	Expanded Special Project for Elimination of NTDs
EWARS	Early Warning and Response System
FAO	Food and Agriculture Organization
FIND	Foundation for Innovative New Diagnostics
GBA	gender-based analysis
GCP	good clinical practice
GDMD	good data management practice
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHGI	Global Health Group International
HIV	human immunodeficiency virus
HORN	One Health Regional Network
IAEA	International Atomic Energy Agency
IDDO	Infectious Diseases Data Observatory
IDRC	International Development Research Centre (Canada)
IGRS	Intersectional Gender Research Strategies

IIR	Intervention and Implementation Research team
IPC	infection prevention and control
IR	implementation research
IRS	indoor residual spraying
ITN	insecticide-treated net
IWP	insecticidal wall painting
JCB	TDR Joint Coordinating Board
JOOUST	Jaramogi Oginga Odinga University of Science and Technology
KEP	Kala-azar Elimination Programme
KNEP	KwaZulu-Natal Ecohealth Programme
LLINs	long-lasting insecticidal nets
LMIC	low- and middle-income country
LSHTM	London School of Hygiene and Tropical Medicine
LTBi	latent TB infection
MABISA	Malaria and Bilharzia in Southern Africa
M&E	monitoring and evaluation
MDA	mass drug administration
MDGH	medicines development for global health
MDR-TB	multidrug-resistant tuberculosis
MMV	Medicines for Malaria Venture
MoH	Ministry of Health
MoU	Memorandum of Understanding
MPH	Master of Public Health
MSA	multisectoral approach
NDC	nationally determined contribution
NDRS	national TB drug resistance survey
NIH	National Institutes of Health (US)
NMP	national malaria programme
NGO	non-governmental organization
NTD	neglected tropical disease
NTP	National Tuberculosis Programme
NTPS	National TB Prevalence Survey
OHA	One Health Approach
OIE	World Organization for Animal Health
OPT–SMC	Optimizing Seasonal Malaria Chemoprevention Project
OR/IR	Operational and/or implementation research

PAMCA	Pan Africa Mosquito Control Association
PHE	Public Health England
PI	Principal investigator
PKDL	Post kala-azar dermal leishmaniasis
PMI	President's Malaria Initiative (USA)
PTLFU	Pre-treatment loss to follow-up
R&D	research and development
RBM	Roll Back Malaria Partnership
RTC	Regional Training Centre
RVF	Rift Valley fever
SAP	Strategic Action Plan to Scale up Health and Environment Interventions in Africa
SDC	Swiss Development Cooperation
SDF	Strategic Development Fund
SDG	Sustainable Development Goals
SESF	socioecological systems framework
ShORRT	**Sh**ort, all-**O**ral **R**egimens for **R**ifampicin-resistant **T**uberculosis
Sida	Swedish International Development Cooperation Agency
SIT	Sterile Insect Technology
SMC	seasonal malaria chemoprevention
SOP	standard operating procedure
SORT IT	Structured Operational Research and Training Initiative
SPCP	Social Practice Creative Placemaking approach
STAC	TDR Scientific and Technical Advisory Committee
STH	soil-transmitted helminth
STPH	Swiss Tropical and Public Health Institute
SUPSI	Scuola Universitaria e Professionnale della Svizzera Italiana
TB-RPC	Tuberculosis Research and Prevention Center (Armenia)
TDR	UNICEF/UNDP/World Bank/WHO Special Programme for Research on Tropical Diseases
TDR–IMP	TDR Research for Implementation Unit
TDR IMP–SWG	TDR Scientific Working Group of the TDR Research for Implementation Unit
TP	WHO Technical Products on norms/standards, data and research for 2022–23
UHC	universal health coverage
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNION, The	International Union Against Tuberculosis and Lung Disease
UON	University of Nairobi

USAID	United States Agency for International Development
US-FDA	United States Food and Drug Administration
VBD	vector-borne disease
VL	Visceral Leishmaniasis
WAHO	West African Health Organization
WARN-TB	West African Regional Network for TB control
WCA	West and Central Africa
WHO	World Health Organization
WHO–AFRO	WHO Regional Office for Africa
WHO–EECA	WHO East European and Central Asia region
WHO–EMRO	WHO Eastern Mediterranean Region
WHO–ERC	WHO Ethics Review Committee
WHO–EURO	WHO Regional Office for Europe
WHO–GMP	WHO Global Malaria Programme
WHO–GTB	WHO Global TB Programme
WHO–HQ	World Health Organization headquarters
WHO–NTD	WHO Control of Neglected Tropical Diseases Department
WHO–PAHO	WHO Regional Office for the Americas
WHO–PHE	WHO Public Health, Environmental and Social Determinants of Health Department
WHO–PQT	WHO Prequalification of Medical Products Department
WHO–PV	WHO Pharmacovigilance Department
WHO–SEARO	WHO Regional Office for South-East Asia
WHO–WASH	WHO's provision of safe water, sanitation and hygiene intervention
WHO–WPRO	WHO Regional Office for the Western Pacific
WMO	World Meteorological Organization

Introduction

Research for Implementation is one of the three strategic priority areas of the UNICEF/UNDP/World Bank/WHO–TDR (Special Programme for Research and Training in Tropical Diseases) within its 2018–2023 strategy. The supported research activities are contributing to achievement of the Sustainable Development Goals (SDGs) by 2030, specifically SDG 3: *Ensure healthy lives and promote well-being for all at all ages* and SDG 10: *Reduce inequalities within and among countries*, as well as supporting universal health coverage (UHC).

The Research for Implementation activities focus mainly, but not exclusively, on research leading to the development of policies and guidelines and their effective implementation in public health programmes. The activities also produce the evidence needed to reduce the burden of infectious diseases of poverty in low- and middle-income countries (LMICs).

Objectives

The Research for Implementation activities focus on finding new solutions to reduce the burden of infectious diseases of poverty and ensure access to health technologies for those in need.

Four main areas of activity are included within TDR's current strategy:

- **RESEARCH FOR POLICIES**: to understand and produce evidence on large-scale performance, acceptability, feasibility, implementation needs and potential impact of available tools as a basis for determining what tools are suitable for guidelines and policies.
- **RESEARCH FOR IMPLEMENTATION**: to understand and address barriers to effective, quality and equitable implementation of health interventions, strategies, guidelines and policies to provide the evidence as to how these can best be implemented for maximum impact.
- **RESEARCH FOR INNOVATION**: to provide directions for the development of improved and adapted new tools and strategies needed and to promote their development and use.
- **RESEARCH FOR INTEGRATED APPROACHES**: to understand the complex interactions between people and their environment that affect disease transmission.

The above-mentioned objectives are being implemented through 12 Expected Results (ERs) that have been developed in coordination with TDR's Scientific Working Groups (SWGs).

Progress in 2021: Key achievements

Research on the burden and causes of residual and persistent malaria

- A *Supplement of the Journal of Infectious Diseases,* including publications from all the research teams supported through the ER on residual and persistent malaria (ER 1.3.6) was released in May 2021: https://academic.oup.com/jid/issue/223/Supplement_2.

Urban health

- In support of a long-term effort to strengthen research on urban health interventions for the control of infectious diseases of poverty, TDR launched a call for proposals to synthesize and consolidate evidence from a series of literature reviews that aims to inform TDR's research agenda on urban health, infectious diseases and gender research, including in COVID-19 and post-COVID-19 scenarios. Multidisciplinary research teams from Bangladesh and India were identified at the end of 2020 and are currently working on the development of literature reviews focusing on gender and other social determinants of health in urban settings. Specifically the review from the research team based in Bangladesh will explore what

community-based interventions are effective in preventing and controlling infectious diseases, including COVID-19, in urban informal settlements; and what implementation strategies are effective in overcoming social, economic and gender inequities in the prevention and control of infectious diseases including COVID-19, in urban informal settlements. The research team based in India will review evidence on gender-related aspects in infectious disease epidemiology, prevention and control, including gender-based violence, under a COVID-19 scenario where infectious diseases prevail and are often exacerbated by compromised access to health care as well as aspects related to community participation and engagement in risk management of infectious diseases, including through housing and water, sanitation and hygiene interventions. Reviews are expected to be published in 2022.

VBDs and climate change

- A ***Master Plan and Guidance document*** for the development of the operational protocol was finalized. It provided an overarching synthesis of the input from the One Health Consultation Meeting (December 2019, Brazzaville), as the basis for developing a standardized approach for the One Health Metrics and Scorecard.
- ***Establishment of an online platform for Operationalizing One Health as a Transdisciplinary Ecosystem Approach*** (https://onehealthscorecard.org/): This web-based collaborative member login platform had proven effective as the primary means of collaborative learning, organizational management and progress tracking.
- ***Publication of a One Health Handbook through a collaborative effort.*** This is a comprehensive reference source of One Health framing and integration of its challenges including the basis for its operationalization [B. A. Wilcox and J. A. Steele. ©The Editors and the World Health Organization, April 2021 R. Haring (ed.), Handbook of Global Health, https://doi.org/10.1007/978-3-030-05325-3_88-1] making it widely available within WHO and other collaborating agencies and organizations (FAO, OIE, UNEP, among others) for their One Health programmes.
- ***A One Health Glossary.*** An A-Z index of terms relevant to One Health.
- ***An online One Health pilot curriculum development component*** was added to the collaborative effort which will build on and extend the fundamentals section of the web-based platform. The Prototype Online Training course (An innovative/interactive virtual classroom for use in an open e-Learning platform) 'Operationalizing One Health as a Transdisciplinary ecosystem approach: Linking health, environment and communities' is a coordinated effort by TDR in collaboration with Global Health Group International (GHGI) and researchers from Tanzania, Kenya, Côte d'Ivoire and South Africa.

Multisectoral approaches

- Case studies (two) for multisectoral approaches for prevention and control of malaria were selected and contracted and will be implemented in the African Region and in the South-East Asia Region.
- Case studies (two) for multisectoral approaches for prevention and control of arboviral diseases were selected and contracted and will be implemented in the American Region.
- An international virtual workshop on multisectoral approaches for prevention and control of vector-borne diseases was organized jointly with the WHO–WASH group and China CDC. This workshop was attended by about 150 people from 23 countries.
- Training material on multisectoral approach with a focus on the collaboration between health and water and sanitation sectors have been developed and are available upon request.
- A new collaboration with the Global Malaria Program (GMP) from WHO was developed on multisectoral approaches against malaria and is financially supported by the UN Peace and Development Sub-Fund (UNPDF).

Innovative vector control technologies

- To improve and enhance the training on medical entomology and innovative vector control tools, a new online Directory of Course on medical entomology was launched through the Global Vector Hub Platform: https://globalvectorhub.lshtm.ac.uk/menu.
- The discussion on the country support for Sterile Insect Technology (SIT) was moved forward through three virtual meetings, first with all interested countries (10 countries) and then with France and Brazil who showed specific interest among these respective countries.

Country preparedness for disease outbreaks: Early warning and response system (EWARS) for arboviruses

- Progress was made in the expansion of the use of EWARS for dengue outbreak preparedness in new countries through collaboration with WHO–PHE and improvement of the tool for integrating an environmental dimension in the model.
- A survey for evaluating country capacities for the surveillance and control of arbovirus diseases was conducted in the 47 countries of the WHO–AFRO region to support the development of a regional plan of action to strengthen country capacities to respond to arbovirus disease outbreak threat.

Gender

- The University of Ghana has institutionalized the gender training course, which is now being offered to students in their Master of Public Health (MPH) programme.
- The Wits School of Public Health has initiated in 2021 a new degree programme– a Bachelor of Health Sciences Honours in Public Health. This is a one-year, full-time programme for students wanting to pursue postgraduate studies in public health. The course Gender-based analysis of infectious diseases and climate change is one of the courses which students can take as part of the new honours programme. The first cohort on the Honours programme was enrolled and began in January 2021. The students undertook the course in April and May 2021. While the original course included concepts and references with a binary gender identity categorization, The University of Witwatersrand in collaboration with TDR is developing an additional module to introduce and sensitize students to a broader spectrum of gender identities. The concept of gender identity is explained as well as its interactions with gender as a social construct and sex assigned at birth.
- Case studies from Nepal and Uganda following the guidance of TDR's toolkit on intersectional gender analysis in research on infectious diseases were completed in 2021 and will be submitted to a peer-reviewed journal. Expected results and research outcomes from the pilot are expected to be published in 2022 after research activities resumed, following delays due to COVID-19.
- The TDR intersectional gender research strategy launched in 2020, is being applied to social innovation for health to consolidate and incorporate an intersectional gender lens across different streams of TDR work, including social innovation and implementation research. Five hubs across different geographical regions will be selected to identify and analyse how gender intersects with other social variables and influences social innovation. New research teams from Bhutan, Kenya, Malawi and South Africa have been selected to conduct intersectional gender research studies to:
    - explore how gender dimensions and other intersecting inequities shape health seeking access to TB and dengue services for transgender men, transgender women, men who have sex with men and women who have sex with women in Bhutan;

- assess gender and other intersecting dimensions of disease exposure, care-seeking behaviour and treatment pathways in malaria prevention and control in Kenya and Malawi, focusing on the case of Migori County and Chikwawa District;
- generate context-specific evidence to understand pre-treatment loss to follow-up (PTLFU) in Eastern Cape province, South Africa, with an intersectional gender lens.

Despite COVID-19 related challenges, country teams are expected to finalize their research protocols by the end of the year.

African subregional networks for TB control and malaria

- Ongoing support was provided to national TB programmes of the West and Central African regional networks (WARN-TB and CARN-TB) to finalize and publish results from TDR-supported IR studies on mitigating the impact of COVID-19 on TB control.
- An external evaluation of the WARN-TB and CARN-TB network was started to assess the progress made to date by the network in strengthening TB control in the West and Central African region.
- Finalization of up to 40 TB research projects is underway to improve case findings and access to TB care for vulnerable populations and a series of scientific manuscripts are being developed to document strategies implemented by countries to mitigate the impact of COVID-19 on TB control.
- Through the conduct of the Optimize the Seasonal Malaria Chemoprevention (OPT–SMC) project[1] countries of West and Central Africa which implement seasonal malaria chemoprevention defined the barriers for an effective seasonal malaria chemoprevention and four of them conducted implementation research to optimize this preventive intervention.

Research in support of TB control

- A generic research package to facilitate the implementation of shorter all-oral DR-TB treatment regimens under operational research conditions was developed and is being used by 26 countries worldwide. This research package, dubbed ShORRT (Short, all-Oral Regimens for Rifampicin-resistant Tuberculosis), through the conduct of these OR projects, is providing access to new, shorter and less toxic DR-TB treatment regimens to patients.
- Following the successful roll out of the English version online site for the Implementation Research Toolkit for Digital Technologies and TB (IR4DTB; https://ir4dtb.org/), translations are underway in both French and Russian to increase the access of IR4DTB to users in Francophone Africa and Eastern European settings. A TB costing tool to facilitate the integration of a health economics component in implementation research projects is completed and its use was piloted with eight countries of the West and Central Africa region for the development of five implementation research projects.
- A generic research package for promoting the calibration of computer-assisted detection software for TB screening has been released.
- A guidance for improving compliance with the good clinical practice (GCP) and good data management practice (GDMP) of population- and facility-based TB surveys is completed and is available in French and in English.
- A new partnership was launched with the Robert Koch Institute, WHO–GTB, the University of Oslo and the WARN-TB/CARN-TB secretariat to strengthen National TB programme capacities for evaluating the impact of public health emergency such as the COVID-19 pandemic on TB control and for triggering the implementation of mitigation strategies.

[1] The OPT–SMC project is implementation research to optimize delivery and effectiveness of seasonal malaria chemoprevention.

Structured Operational Research and Training Initiative (SORT IT)

- *Digital innovation during COVID-19.* To overcome COVID-19 restrictions, the development and deployment of a SORT IT online platform was championed which allowed TDR to restart and propel SORT IT activities. It allows online and "hybrid" training models.
- *Tackling public health emergencies.* In collaboration with the Global Outbreak and Response Network, eight projects of "real-time operational research for real-time action" were pioneered in Bhutan, East Timor, India and Nepal.
- *On the cutting edge of Universal Health Coverage (UHC).* To accelerate UHC progress towards the SDGs, 18 policy-relevant research studies focused on hard-to-reach populations and NTDs (including snake bite) are underway in Africa.
- *Effective communication of research evidence.* A new SORT IT training module was developed on enhancing research communication for policy, practice and behavioural change. With this, SORT IT now catalyses the entire evidence-to-action cycle.
- *Franchising and global partnerships.* TDR leads the SORT IT partnership involving 93 countries and 60 implementing partners, with 70% of research projects delivering outputs influencing policy and practice and 51% of trainees continuing research. In 2021, there were 43 publications and all SORT IT performance targets were achieved.

Antimicrobial resistance – SORT IT programme (AMR-SORT IT)

- *Innovation in COVID-19 times.* The development and deployment of a SORT IT online platform was championed to catch up on COVID-19 delays in implementation. Through online and "hybrid" training models, 35 policy-relevant studies from Ghana, Myanmar, Nepal, Sierra Leone and Uganda were published. Twenty-five new projects were started in Colombia, Ecuador and Sierra Leone and 12 more studies were endorsed in Ghana. A No Cost Extension of the project to December 2022 was negotiated with the UK.
- *Effective communication and dissemination of research evidence.* A new SORT IT training module was developed enhancing research communication for effective uptake. A new mechanism was also pioneered to expedite the research publication process to a record time of 10-12 weeks. SORT IT now catalyses the entire evidence-to-action cycle.
- *Strengthening health systems.* AMR activities are contributing to health system resilience by protecting health workers, keeping health facilities safe, improving laboratory diagnostic capacity and informing communities on preventive measures. This is synergistic with the COVID-19 global response.
- *Expanding global networks to tackle AMR.* The SORT IT network now includes AMR coordinating committees, WHO country/regional offices and 60 implementing partners in 26 countries in Asia, Africa and Latin America.
- *Acquired skills are being applied on the frontlines of the COVID-19 response.* All TDR-supported operational research officers and 73% of the 132 individuals involved with the AMR-SORT IT projects are applying their acquired skills on the frontlines of the COVID-19 response.. These activities have been synergistic with and complementing ongoing AMR activities and further contribute to health system resilience in: protecting health workers, keeping health facilities safe, improving laboratory diagnostic capacity and informing communities on preventive measures.

Research to support visceral leishmaniasis (VL) elimination in the Indian subcontinent

- Six studies are ongoing to investigate reported emergence of new foci in previously non-endemic areas in both Nepal and Bangladesh. Epidemiological, serological and entomological investigations in the new foci will identify driving factors. Treatment follow-up of patients with VL and studies on post kala-azar dermal leishmaniasis (PKDL) will determine potential sources of new infections.

- The impact of implementation research on the course of the VL elimination effort in the Indian subcontinent is being reviewed to distil lessons for other regional foci.
- Stakeholder consultations are in progress in collaboration with WHO–NTD to explore status, needs, mechanisms and platform for implementation research support to control VL in Eastern Africa, the largest regional focus currently.

Research to support onchocerciasis elimination

- The three studies of moxidectin to provide data required to inform decisions on inclusion of moxidectin WHO guidelines and country policies (two in Democratic Republic of the Congo (DRC), one in Ghana) received country and WHO Ethics Committee and Country Regulatory Authority approval and are now ongoing.

Strategic Development Fund (SDF) projects on networks and the plague

- Insecticide Resistance: In Madagascar, the project supporting testing of insecticide resistance of fleas, the vectors of the plague disease, has been completed and shows important and variable resistance of fleas to the commonly used insecticides. This resistance strongly hampers the effect of vector control against fleas and consequently against plague.
- A malaria study in hard-to-reach and vulnerable populations is ongoing. This is an innovative project on new tools for diagnosis and treatment of malaria in hard-to-reach illegal gold miner populations in the Amazon region (using the Malakit) and was started in partnership with the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). The project will estimate the impact of this new tool on malaria control and elimination in Surinam. TDR will support the addition of the glucose-6-phosphate dehydrogenase (G6PD) testing to the Malakit to allow the use of the anti-vivax treatment when necessary.

Maximized utilization of safety information

- Two new studies on approaches to strengthen pharmacovigilance in public health programmes were launched in the Philippines and Uganda.
- The central safety databases were flagged as WHO global public goods for the current biennium, highlighting their added value.

Summary progress description

TDR project support often occurs over several years and in some cases, over different diseases. The following table (Table 1) presents a summary of progress achieved in TDR's ERs and deliverables and their indicators and targets, for the reporting period, within the overall plan of expected results. More details on progress are provided as narrative in subsequent pages below.

Table 1. Research for implementation workplan – Overall progress

Ongoing expected results by outcome	*Indicators and progress against targets*
Research for policy	
1.1.1 Country preparedness for disease outbreaks: i) expanded capacity of countries to use EWARS tool; and ii) regional plan to improve arbovirus disease surveillance and vector control in West Africa.	By 2020, five countries using EWARS tool. By 2021, agreement on the regional plan to improve arbovirus disease surveillance and vector control in West Africa. ***Progress: Completed***
1.1.4 Country resilience to the threat of drug-resistant infections: i) OR/IR strategies for countries to build effective systems for monitoring and responding to emerging drug resistance of all relevant infectious agents; ii) Documentation of practical approaches to improve targeted treatment and reduce drug misuse and risk of resistance; iii) Evaluation of biomarkers to guide management of fever at field level (US$ 50 million scenario budget); and iv) Strategies for monitoring and responding to potential emergence of drug resistance.	By 2021, evidence on potential of at least one biomarker generated (US$ 50 million scenario budget). By 2023, strategies for countries to build effective systems for monitoring and responding to emerging drug resistance endorsed by stakeholders at relevant levels. Progress by 2021: 35 policy-relevant studies from Ghana, Myanmar, Nepal, Sierra Leone and Uganda were completed and published. 25 new projects from Colombia, Ecuador and Sierra Leone were started and 12 more studies were endorsed in Ghana. Tools for effective communication and dissemination of generated evidence provided for all completed studies. ***Progress: On track and ongoing***
1.3.3 Population health vulnerabilities to VBDs: increasing resilience under climate change conditions: i) One Health approaches operationalized for VBD control and prevention in the context of climate change; and ii) broader application of the One Health operationalization to zoonoses and other emerging/re-emerging infections, including COVID-19.	By 2022: • Proof of concept validating the One Health scorecard/metrics. • Proof of concept validating One Health intervention science and risk management components. • Impact of previous TDR-IDRC Research Initiative on VBD management at community and health system levels. • Lessons learned from COVID-19 management. ***Progress in 2021:*** • Validation of the One Health metrics being finalized in 4 projects • Online course developed for broader application • Network sustained despite COVID-19 challenges
Research for implementation	
1.1.7 Maximized utilization of data for public health decision-making: i) Capacity built for effective collection and analysis of data; and ii) Issues and policy briefs suitable for informing evidence-based policies/ practice guidelines.	By 2021, 15 new publications and policy briefs informing evidence-based policies and/or practice documents. ***Progress: On track*** Progress by 2021: A total of 118 publications (75 in 2020 and 43 in 2021) with 69% influencing policy and practice, with a focus on UHC. Eight new studies started on tackling Public Health Emergencies. Tools for effective communication and dissemination of generated evidence developed and in use in 2021.

Ongoing expected results by outcome	*Indicators and progress against targets*
1.1.8 Maximized utilization of safety information for public health decision-making: i) Innovative approaches for safety monitoring piloted that facilitate and improve normative guidance; and ii) Capacity for safety monitoring of new drugs built in target countries.	By 2021, evaluation report on approaches using mobile health (mHealth) tools facilitating safety monitoring in the field. ***Progress: On track*** Two studies were launched in Philippines and Uganda. By 2023, improved reporting rate of adverse events in target countries.
1.2.1 Strategies to achieve and sustain disease elimination: i) Evidence on sustainable strategies for the elimination of VL in the Indian subcontinent; ii) Improved basis for monitoring progress of preventive chemotherapy-based elimination programmes towards elimination and for decisions to stop interventions; and iii) Data to support WHO guidelines and onchocerciasis-endemic country registration and policies on moxidectin for onchocerciasis elimination.	By 2021: • New results on sustainable VL elimination strategies delivered to country control programmes. • Results on improved basis for monitoring progress of preventive chemotherapy-based elimination programmes delivered to control programmes. By 2024: • New results on strategies for consolidation of VL elimination delivered to control programmes in the Indian subcontinent. • Evidence generated to support strategy development for VL control and elimination in the Eastern African focus. By 2024, moxidectin study reports provided to WHO and countries (directly and/or via ESPEN). ***Progress: For VL on track.*** For onchocerciasis delayed due to laboratory and field work not progressing as planned due to COVID-19 lockdown and travel restrictions. Start of moxidectin studies delayed due to need to revise protocols (to adapt) to conduct studies during COVID-19 pandemic – which will also translate into slower recruitment.
1.2.6 Optimized approaches for effective delivery and impact assessment of public health interventions: i) Strengthened regional networks of West African National Tuberculosis Programmes (WARN-TB) and of Central African Tuberculosis Programmes (CARN-TB) capable of identifying research priorities and designing and conducting OR/IR to generate the evidence base for policy decisions to achieve the goals of the End TB Strategy; ii) Extend the WARN-TB approach to other geographical areas and/or other disease burdens; and iii) Approaches to optimized delivery of seasonal malaria chemoprevention evaluated.	By 2021, capacity was built in WARN-TB and CARN-TB countries to generate evidence for policy decisions for End TB Strategy and reported to stakeholders at country, regional and global level. By 2023: • Report on the expansion of WARN-TB to other regions and/or diseases provided to stakeholders at country, regional and global levels. • Report on approaches to optimized delivery of seasonal malaria chemoprevention provided to stakeholders at country, regional and global level. ***Progress: On track*** • Expansion of the WARN-TB model to the Central African Region. An external evaluation of the progress and impact of the WARN-TB and CARN-TB activities should be finalized by the end of Q1 2022.

Ongoing expected results by outcome	*Indicators and progress against targets*
1.3.12 Strategies to promote gender-responsive health interventions on prevention and control of infectious diseases of poverty: i) Piloted and applied intersectional gender analysis guidance toolkit within infectious diseases research projects; ii) Scaled-up training course modules on gender-based analysis in research on VBDs and climate change; iii) TDR Strategy/Strategic Plan on gender and intersectionality on infectious diseases of poverty developed; and iv) New knowledge and evidence on the intersection of sex and gender with other social stratifiers to address power relations, social exclusion, marginalization and disadvantages in access to health services, health impacts.	In June 2020, a TDR Strategy/Strategic Plan on gender and intersectionality was launched and disseminated in regions. By 2021, five to seven case studies developed and/or lessons learned documented on applying an intersectional gender lens in infectious disease research projects. By 2021, two courses included in at least two university curricula or TDR regional training centres' curricula. **Progress: On track** • Intersectional gender analysis guidance toolkit finalized and launched in September 2020. Toolkit was piloted and applied for the generation of case studies in Nepal and Uganda that were developed and finalized in 2021 despite COVID-19 challenges (small delays took place). • Training course on gender-based analysis in research on VBDs and climate change offered at the University of Witwatersrand and at The University of Ghana. In 2021 the University of Witwatersrand and TDR are developing a new additional module which aims to sensitize participants to concepts that include gender identity beyond the binary categorization. • TDR intersectional gender research strategy application to Social Innovation in Health starting in 2021. Following a call for research proposals to generate evidence to strengthen intersectionality and gender research efforts in infectious disease prevention and control research teams from Bhutan, Kenya, Malawi and South Africa were selected and completing their research protocols in 2021, despite COVID-19 challenges.
Research for innovation	
1.1.5 Directions for development and accelerated access to new tools and strategies: i) Outputs of TDR research projects and TDR staff and adviser expertise used to provide directional perspective for R&D for new tools (including advice/support to R&D sponsors) as well as new ways of implementing tools; ii) Optimized methodologies to assess response to case- and population-based interventions; and iii) Strategy development, implementation and monitoring.	By 2023, at least four R&D initiatives informed by TDR research output or TDR staff/adviser expertise. ***Progress: On track*** • In 2021, one R&D initiative for Human African Trypanosomiasis via TDR participation in the NTD Advisory Group. • Compiled lessons from VL elimination research in South East Asia to inform strategy development for efforts in Africa with WHO-NTD and national programmes.

Ongoing expected results by outcome	*Indicators and progress against targets*
1.3.10 Urban health interventions for the prevention and control of vector-borne and other infectious diseases of poverty: i) New knowledge and evidence generated on effectiveness of interventions at household level to prevent and control VBDs by addressing identified socioeconomic determinants of health in urban settings; and ii) Evidence review on human mobility in urban areas and its impact on disease transmission (particularly dengue and Chikungunya).	By 2021: • Evidence published from two different research teams in a selected country in Latin America, addressing urban health issues in tropical diseases. • Evidence generated from two different research teams in a specific location that has experienced demographic increase recently, addressing urban health issues in tropical diseases. ***Progress: On track*** • A call for proposals launched in 2020 to conduct literature reviews and research gap analysis on social determinants of urban health and to explore, to the extent possible, how social and gender dynamics in a COVID-19 context affect the prevention and control of infectious diseases of poverty in urban settings (to the extent possible). Hence, the above-mentioned indicators and targets are slightly modified to reflect the evidence from the research teams in Bangladesh and India selected from the 2020 call for proposals. • Literature reviews are expected to be completed by end of 2021 and published in 2022 in a peer-reviewed journal despite the difficulties due to the pandemic that both the teams in India and Bangladesh have suffered in 2021.
1.3.14 Testing of innovative strategies for vector control: i) Improved methodology available for sexing of mass-reared mosquitoes; ii) Assessment of the impact of an integrated vector control approach that includes SIT technology on vector population density and disease transmission into a controlled field situation; and iii) Monitoring and evaluation (M&E) after experimental SIT deployment of the consequences on target mosquito populations and the environment.	**By 2021:** • Improve SIT technology: The number of females contaminating the batches of sterile males, before release, should be less than 0.1%. • Two multi-country research projects were selected and are ongoing, providing evidence on *Aedes aegypti* adult female densities before and after release, as well as epidemiological endpoints on disease transmission. ***Progress:*** • The guidance document to help countries test this new vector control technology has been developed and released. • The consortia of institutions that field test the SIT have been selected through a call for applications and are in process. • The update of the proposals as well as the contract and the field work have been delayed due to the COVID-19 situation. • The training and capacity building in medical entomology and innovative vector control tool will be improved through an online directory of courses. • A landscape analysis on innovative vector control tools has been launched.

Ongoing expected results by outcome	*Indicators and progress against targets*
Research for integrated approaches	
1.3.11 Multisectoral approach for prevention and control of malaria and emerging arboviral diseases: i) Knowledge and evidence from a multisectoral approach has been generated and made available for stakeholders; and ii) A multisectoral approach for prevention and control of VBDs implemented in some countries.	By 2021: • Five case studies supported and ongoing. • Five countries are implementing multisectoral approaches, with M&E of epidemiological results. ***Progress:*** • The guidance document has been released. • Two proposals for case studies on malaria have been selected and the process of contracting these case studies is completed for one project, already started and on track for the other one. • Two proposals for case studies on arboviral diseases have been selected and the process of contracting these case studies is on track. • The collaboration with a specific sector, the Water and Sanitation Sector, has been developed supported by funds from Sida. • A new collaboration with WHO–GMP has been developed and received financial support from UNPDT.

Progress description in 2021 and plans for 2022–2023

▪ Workstream: Research for policies

ER 1.1.1: Country preparedness for disease outbreaks

TDR is working with countries and researchers to identify signals that can alert country control programmes to an impending dengue outbreak. This has led to a model contingency plan and an Early Warning and Response System (EWARS) for arbovirus outbreaks. Countries can test and potentially customize this to apply to other arboviral diseases, such as Zika, chikungunya, yellow fever and other infectious diseases.

Progress in 2021

Overview of the development of the EWARS:

1. The EWARS programme started in 2012, funded until 2016 by an EU grant together with TDR. After that, it was funded mainly by TDR and supported by WHO–NTD.
2. Analysis of dengue surveillance systems in ten countries: Brazil, Colombia, Dominican Republic, Peru, Venezuela, Indonesia, Malaysia, Sri Lanka, Viet Nam, Maldives.
3. Retrospective study; testing the first version of EWARS in five countries: Brazil, Mexico, Dominican Republic, Malaysia, Viet Nam.
4. Prospective study (comparing ten EWARS municipalities with ten non-EWARS municipalities) in three countries (Brazil, Mexico, Malaysia) using the first generation of EWARS (run with STATA). Training workshops in Brazil, Mexico.
5. Development and testing of the 2nd generation of EWARS (run with open access software "R", dashboard). Testing in Mexico, Dominican Republic and Malaysia. Web publication of the user guide (2017, updated in 2018). Regional training workshops in Cuba and Sri Lanka.

6. Development and testing of the 3rd generation of EWARS (with automatic calibration of thresholds). Dissemination through in-country workshops in Colombia, Mexico, India, Sri Lanka, Thailand, Malaysia (2019). Web publication in Spanish for the PAHO region.
7. Development of risk mapping and inclusion in the EWARS dashboard in 2020. Capacity building in further African and Asian countries.

Current status of EWARS use:

- Full integration of EWARS into the national surveillance platform: Mexico (with 137 disease-endemic municipalities).Countries which started to pilot EWARS for later inclusion into the national surveillance system: Bangladesh, Cambodia, Colombia, Ethiopia, India, Malawi, Malaysia, Mozambique, Myanmar, Nepal, Sri Lanka, Thailand and Timor Leste, (potentially Bolivia, Chile, Ecuador and Peru).
- Countries which had advanced with the widespread use of EWARS but were affected (slowed down) due to political changes and are now coming back: Dominican Republic and Malaysia.

The following activities were conducted in 2021:

- In collaboration with the climate team at the WHO–PHE department, meetings were held to discuss the use of EWARS by the PHE partners in a number of countries concerned with the impact of climate change on health. This resulted in a PHE-WHO led initiative to include country focal points on climate change in EWARS activities; mainly capacity building and ensuring implementation. WHO–PHE implemented the use of the EWARS system developed by TDR for countries they are involved with, in particular, Bangladesh, Cambodia, Myanmar, Nepal, Timor Leste, Ethiopia, Malawi and Mozambique, Oman.
- As suggested by the SWG a call for proposal was prepared for conducting implementation research projects to evaluate application of the EWARS system under different settings and its effectiveness in triggering control activities. The call for proposal has been prepared in 2020 but was posted in August 2021 (due to the COVID-19 pandemic) for a selection of three research projects end of Sept 2021. The three projects are under development in Colombia, Sri Lanka and Thailand.
- A series of webinars with all countries using EWARS was organized by TDR beginning in December 2020 to discuss current challenges and country plans but also for group training on the last added feature of the EWARS (risk mapping).
- One-on-one virtual meetings with countries were also organized every three months to keep contact and provide support/training adapted to each country's needs.

The EWARS tool has been further developed including the option for risk mapping using open access software programs.

A **Global Initiative for Arbovirus Diseases,** led by the WHO health emergency department in collaboration with WHO–NTD was launched in October 2021. TDR participated at the expert technical consultation. The first pillar of this initiative is on improving surveillance system for arbovirus diseases and establishing early warning systems in case of outbreaks. This initiative might build on what was developed so far with the existing EWARS system. Ongoing discussions will occur at the beginning of 2022 to coordinate efforts.

Strengthening arboviral disease surveillance, vector control and outbreak preparedness in Africa

This is a continuation of a project that started at the end of 2018 and was conducted in collaboration with the WHO–NTD department and the West African Health Organization (WAHO).

The emergence of *Aedes*-borne arboviral infections in Africa, including in the West African region, raised the question of the adequacy of health systems to identify, prevent and respond to outbreaks

in a timely, efficient manner. In 2019, a situation analysis was done to understand the capacity of countries for arboviral disease surveillance and vector control and the capacity strengthening needs. It showed that the region has some capacity in epidemiological and entomological surveillance and vector control but requires support to strengthen country capacity to ensure timely detection of arboviral infections and adequate preparedness for epidemics. Countries expressed interest in using the EWARS system but lack capacities to properly collect entomological, epidemiological and meteorological data.

In January 2021, a survey was designed to assess the capacities of countries of the AFRO region for the surveillance and control of Arboviral diseases. The survey was conducted in April. All 47 countries of the WHO– AFRO region contributed to the survey. The report was validated by the countries and is finalized. Results from this evaluation will inform the development of a regional Plan of Action where TDR could support countries willing to implement the use of the EWARS system.

Remaining challenges

The further dissemination of EWARS in WHO regions and countries continues to be important, as well as the incorporation of the tool into national surveillance systems. Surveillance systems (both entomological and epidemiological) need to be strengthened for building context-specific EWARS and implementing its use. With the COVID-19 pandemic, activities had to slow down as countries and partners were busy responding to national epidemic priorities.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

Ministries of health and/or national institutes of health in Brazil, Colombia, Dominican Republic, India, Malaysia, Mexico, Sri Lanka, Thailand.

WHO–AFRO, ministries of health of the 16 West African countries, WAHO, the WHO country offices of all countries in Central, East and southern Africa, the WHO regional office for Africa, the WHO–NTD department, WHO–PHE and the WHO Emerging Diseases and Zoonoses Unit.

Estimated leverage created by this project:

- US$ 75,000 from the WHO–PHE to expand the use of EWARS to new countries they are supporting
- US$ 50,000 from the WHO–NTD to replicate the situation analysis in West Africa for the central and south-eastern African regions

Gender aspects and vulnerable populations:

Target diseases affect the poor population strata more. Activities are conducted with the MoHs of the corresponding countries. Participants in meetings or training are designated by the ministries. TDR cannot interfere in the selection and unfortunately, gender balance is rarely respected.

Training:

Training workshops for the use of the EWARS on *Aedes*-borne arboviral diseases in Colombia, India, Sri Lanka with follow-up activities by electronic media.

Strengthened institutions or networks:

- Surveillance and response teams in partner countries; and
- Strengthening of the West African network of the reference laboratories for arboviral diseases.

Publications:

A manuscript documenting the experience of Mexico with the integration of EWARS in their national surveillance system is under development.

Results dissemination and uptake:

Uptake of the EWARS tool by a number of countries as described above and discussion for building on it as part of the Global Arbovirus Initiative.

Plans for 2021–2023

- Based on the results of the situation analysis on arboviral diseases in Central, East and Southern Africa, to support countries in strengthening their capacities for arboviral disease control and outbreak response.
- Support the countries selected (Colombia, Sri Lanka and Thailand) to conduct research demonstrating the impact of the use of EWARS and to communicate their results.
- Continue collaboration with the WHO–PHE department for the rollout of the use of EWARS in additional countries.
- Contribute to the Global Arbovirus Initiative, especially the pillar one of the initiative, coupled with building on the EWARS system developed by TDR.

ER 1.1.4: COUNTRY RESILIENCE TO THE THREAT OF DRUG-RESISTANT INFECTIONS

The Structured Operational Research and Training IniTiative on tackling antimicrobial resistance in Africa, Asia and Latin America

The **S**tructured **O**perational **R**esearch and **T**raining **I**nitiative (**SORT IT**) is a global partnership-based initiative coordinated by TDR, the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. SORT IT seeks to make countries "data rich, information rich and action rich" thereby building health system resilience, enhancing programme performance and improving public health. The SORT IT model combines *research training* and *research implementation* with a hands-on and learning by doing approach that empowers participants and trainers.

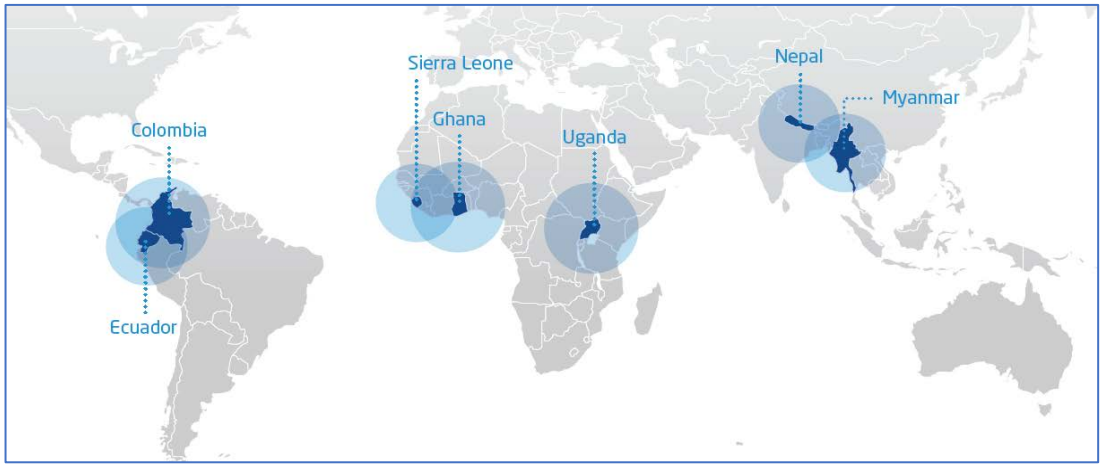
The success. SORT IT has covered twenty-five domains of public health and scaled up to 93 countries and includes over 60 partner institutions with North-South and South-South collaborations. Seventy percent (70%) of completed research has reported an impact on policy and/or practice and 51% of trainees independently conduct research after one training cycle indicating capacity built. More on SORT IT is available at: https://tdr.who.int/activities/SORT IT-operational-research-and-training.

SORT IT for tackling antimicrobial resistance

In January 2019, the Government of the United Kingdom of Great Britain and Northern Ireland, represented by its Department of Health and Social Care, through the National Institute of Health Research (NIHR), contributed designated funding (£8, 212, 943) for a SORT IT project on tackling antimicrobial resistance (AMR). This is now referred to as the **AMR-SORT IT project** (see Fig. 1 and 2).

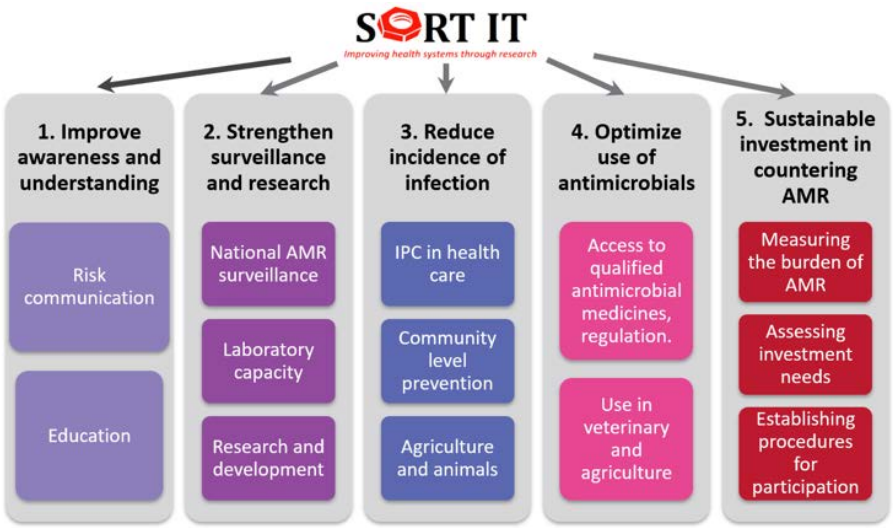
Aim: Build sustainable operational research capacity to generate and utilize evidence on the emergence, spread and health impact of AMR in LMICs.
How? Strong engagement with WHO country offices, AMR committees and SORT IT partners in the evidence-to-action cycle while addressing country priorities. Integrated performance targets and metrics for accountability.
Who: Frontline health workers and decision-makers.
Where: Seven-countries (2019–2022)

Figure 1. SORT IT Countries



Scientific scope: Research priorities are tailored to the national AMR action plans and local needs. Reinforced by country ownership, the SORT IT project aims to make each of the pillars of AMR action plans "data rich, information rich and action rich".

Figure 2. Scientific Scope: Pillars of the AMR Action Plan



More specific details on the SORT ITAMR programme are available at:
https://tdr.who.int/docs/librariesprovider10/flyers/amr_sort_itflyer.pdf?sfvrsn=373811e7_1

Desired impact: Strengthened health systems, better programme performance and improved public health.

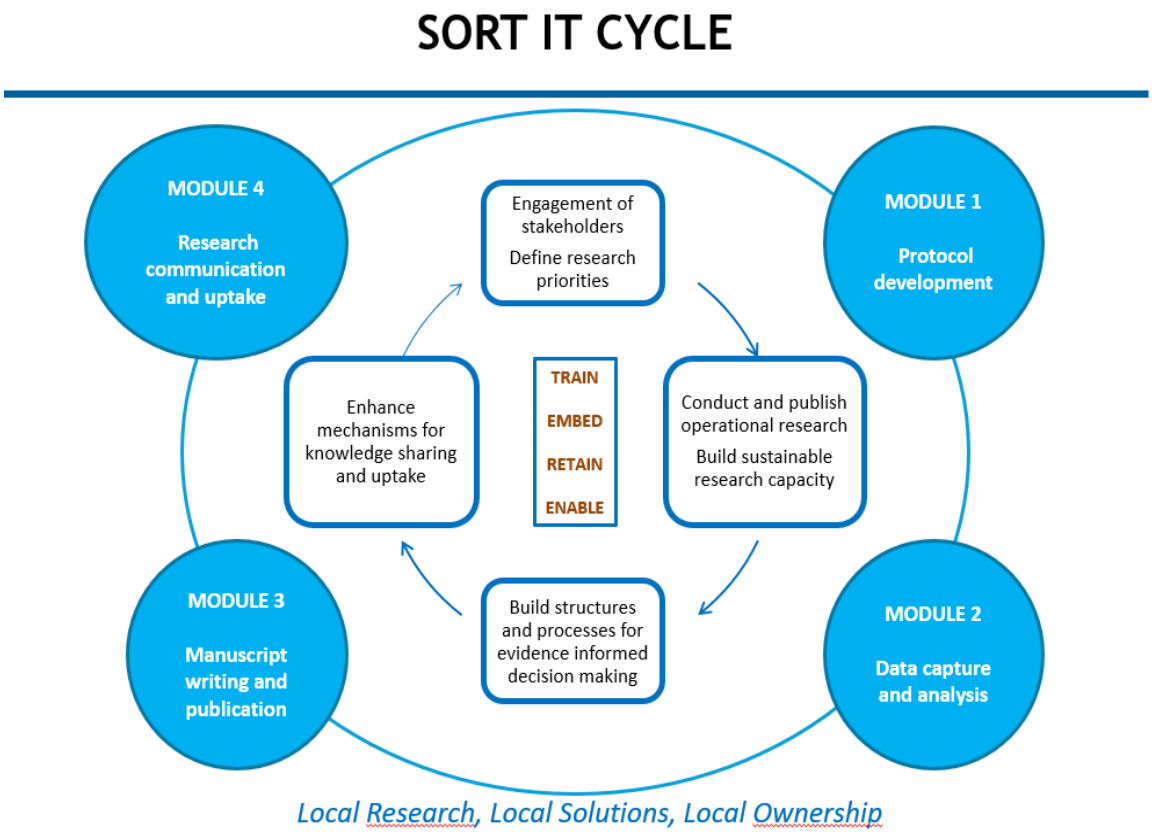
The AMR-SORT IT cycle: The AMR-SORT IT project is geared to catalyse the evidence-to-action cycle from defining the most relevant research to uptake of research findings (see Fig. 3). The buy-in by countries would help catalyse an approach that fosters *embedding* of those trained within institutions, their *retention* and eventual *enablement* in building the structures and processes for informed decision-making. SORT IT thus embraces the "Train, Embed, Retain and Enable" perspective for individuals who work within health systems. This approach is in line with WHO's Thirteenth General Programme of Work, 2019–2023.

Overall summary of progress (2019–2021)

During the first two years of the project (2019–2020), a One Health approach was embraced and comprehensive engagement was established with AMR coordinating committees, WHO country and regional offices and SORT IT partners in Asia, Africa, Europe and the Americas. Thirty-seven research studies (*local research, local solutions, local ownership*) were launched in a synergistic manner with national and global AMR action plans.

During the first half of the third year (2021), we championed the development and deployment of digital technology – a SORT IT online training platform – to overcome COVID-19 restrictions on travel and gatherings. Using this innovative tool, 35 research studies from five countries in Asia and Africa were completed, all of which were published as special journal issues (see Fig 3). Twenty-five new projects were started in Colombia, Ecuador and Sierra Leone and high-level endorsement was established for 12 more studies in Ghana.

Figure 3. The SORT IT research cycle



We also pioneered a new publishing mechanism for timely dissemination of research evidence in a record time of 10–12 weeks of study completion. The thirty-five completed studies from Ghana, Myanmar, Nepal, Sierra Leone and Uganda were published in the Open Access *Tropical Medicine and Infectious Diseases Journal* https://www.mdpi.com/journal/tropicalmed/special_issues/AMR and in the *Public Health Action* journal https://theunion.org/PHA-preprints. Researchers also benefited from a new SORT IT training module on 'effective communication of research findings', maximizing the opportunities for research uptake.

Through continuing engagement, AMR networks were scaled up to include 60 institutions in 26 countries. Finally, 73% of individuals involved with the AMR-SORT IT project (132) continue to apply their acquired skills in a synergistic manner to the COVID-19 response. To date, all SORT IT performance targets were achieved.

During 2021, 35 research projects were published through a novel expedited mechanism for timely evidence generation from Asia and Africa. Twenty-five studies were started in Colombia, Ecuador and Sierra Leone and high-level endorsement established for 12 more studies in Ghana.

Value for money of the AMR-SORT IT project

Good ***value for money*** of SORT IT continues due to TDR's established convening power, global networking capacity and use of SORT IT technical know-how and the trained human resource pool that was built over the past decade. The deployment of an innovative online training platform increased *efficiencies*, by allowing projects to continue and at lower costs, despite being significantly delayed due to COVID-19. We pioneered a novel approach to expedite the research publication process by proactively accelerating the journal processes.
To promote *effectiveness* and *impact*, we have continued to engage with those expected to use the research results such as members of the AMR committees, WHO country offices and disease control programmes and improved effective communication of research findings, maximizing the opportunities for research uptake. Participant selections promote gender and geographic *equity* and *first authorship* from LMICs.

These achievements have reinforced TDRs coordination role, improved TDR partnerships and elevated TDRs position to new levels of strength and international recognition.

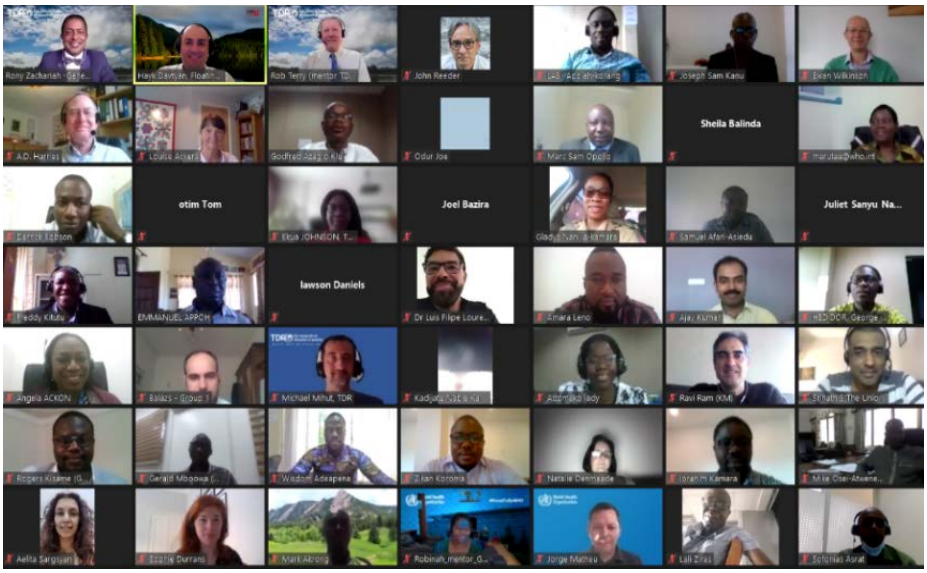
Details of achievements in 2021

The activities and achievements have been categorized into: 1) innovations in digital technology – a SORT IT virtual platform for implementing research during COVID-19; 2) implementing high-quality policy/practice relevant research; 3) research capacity building; 4) strengthening health systems resilience; and 5) building AMR networks and equitable research partnerships (global engagement).

1. Innovations in digital technology – a SORT IT platform for research during COVID-19

In 2021, we championed the development and deployment of a dedicated SORT IT online training platform which allowed us to restart and propel SORT IT research activity and trainings, despite being significantly delayed due to COVID-19 restrictions. Developed with a SORT IT partner in Armenia (TB-RPC), this platform has also allowed us to network with 26 countries and bring subject matter experts to link in for a one- or two-hour sessions that in the past, would have resulted in travel to countries. It has also reduced costs and improved efficiencies.
Using this innovation which allows online and "hybrid" training models, 35 policy-relevant studies from Ghana, Myanmar, Nepal, Sierra Leone and Uganda were published. Twenty-five new projects from Colombia, Ecuador and Sierra Leone were started and 12 more studies were endorsed in Ghana. The SORT IT platform was used to bring together individuals from WHO country offices in six countries and 60 partner institutions.

[Photographs (top to bottom): Screenshot of the virtual SORT IT platform for delivering SORT IT trainings; using the platform (digital technology) to bring together individuals from 60 partner institutions in 26 countries.]



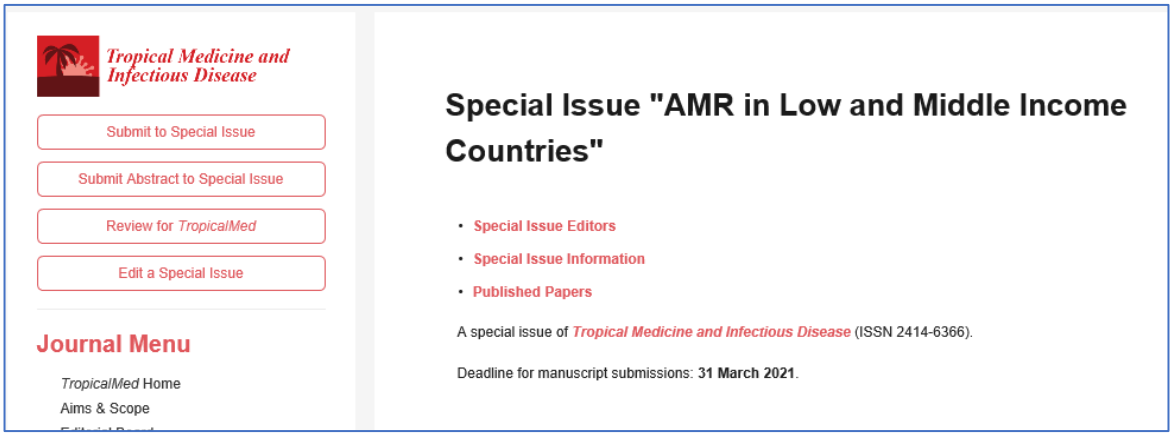
A SORT IT virtual platform was developed and deployed to provide an efficient means of continuing research and training in 2021 despite COVID-19 related restrictions.

2. Implementing high-quality and relevant policy/practice research

Rapid publication to ensure timely evidence for decision-making

During 2021, 36 research projects were completed and propelled through a novel publication mechanism for timely evidence generation for decision-making. These studies were published in a record time of 10–12 weeks by i) proactively accelerating the journal processes; and ii) providing structured support to the researchers. The studies covered priority research areas on One Health in Ghana, Myanmar, Nepal, Sierra Leone and Uganda. Available at:
https://www.mdpi.com/journal/tropicalmed/special_issues/AMR and
https://theunion.org/PHA-preprints

Figure 4. AMR in low- and middle-income countries



a. Improving research communication with a KISS – Keep It Short and Simple

Effective communication of research findings is needed to bridge the gap between researchers and decision-makers and influence individual and community behaviour that improves public health.

To improve research communication, TDR and partners developed a new SORT IT module aimed at providing researchers with the tools and skills needed to effectively communicate their research findings with a KISS – keep the information short and simple. Using SORT IT projects in Ghana, Nepal, Sierra Leone and Uganda this was successfully piloted to produce four outputs.

1. A *communication plan* targeting decision-makers and stakeholders.
2. A *one-page plain language evidence summary* with key messages, the implications and recommendations.
3. A *PowerPoint presentation* of ten minutes for use at conferences and a lightening presentation of three minutes for use with national decision-makers.
4. *An elevator pitch* oral presentation (30–60 seconds) for use in opportunistic one-to-one conversations with stakeholders.

"If research is to have impact and change health outcomes for the better, the research findings should be translated into recommendations that can shape policy and/or practice and SORT IT is invaluable for this purpose." — Dr Thomas Samba, Chief Medical Officer, Ministry of Health and Sanitation, Sierra Leone

"The SORT IT training serves a great need to present research findings in a simple manner, so that we the decision-makers can quickly and easily grasp the key messages and take action to address urgent health issues." — Dr Madan Kumar Updhyaya, Chief, Quality Standards and Regulation Division, Ministry of Health and Population, Nepal

b. Implementation of new research studies in line with national priorities

Twenty-five priority research projects were started in Colombia, Ecuador and Sierra Leone (local research, local ownership, local solutions).

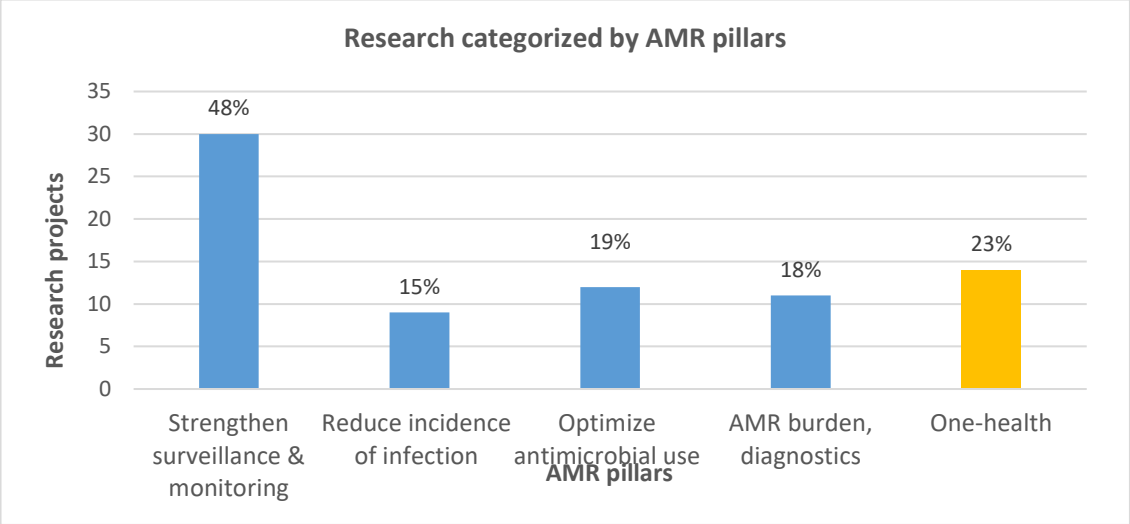
Research priorities were tailored to national AMR action plans through engagement and endorsement of WHO country offices and AMR committees in selecting researchers and their topics. Twenty-five new AMR projects were started in Sierra Leone, Colombia and Ecuador and 12 more studies will be started in Ghana in November 2021.

[Photographs: SORT IT researchers writing manuscripts using a virtual platform (Nepal); researchers from the Ministry of Health, Ministry of Agriculture, Forestry and Environmental Protection working on One Health research subjects for combatting AMR (Sierra Leone).]

c. SORT IT research studies categorized by AMR pillars (January 2019 to Sept 2021)

Research themes include: data quality for AMR surveillance in humans and animals; antibiotic consumption patterns; antibiotic resistance in priority pathogens; infection, prevention and control in health facilities; efficiency of sewage plants in reducing bacterial counts; water safety in hospitals; antibiotic use in animal husbandry; impact of COVID-19 on antibiotic resistance and AMR in ambient air. Fig. 5 below shows the classification of 62 research subjects by AMR pillars (in blue) and the proportion of all studies (n-62) that were One Health (in orange). Forty-eight per cent of the studies are on strengthening surveillance and monitoring data. This is vital to "feel the pulse" of the AMR situation in countries. Without surveillance data, we would be thinking and acting blindly.

Figure 5. Research categorized by AMR pillars



"SORT IT is contributing to the global AMR effort by developing operational research capacity that helps monitor country-level progress in real-time." — Marc Sprenger, Former Director, WHO AMR Secretariat

3. Research capacity building

The AMR-SORT IT model uniquely combines *research training, research implementation* and builds *communities of practice (global engagement)* with an apprenticeship approach that empowers both participants and trainers. Each research project is used to simultaneously implement four layers of

training namely: 1) training of frontline workers and programme staff; 2) training of SORT IT alumni as trainers; 3) training of academia as trainers; and 4) training of WHO country staff as trainers. Table 2 shows the four layers of training and numbers trained between January 2019-Sept 2021. The numbers trained per research study is 3.0, which adds to the *value for money*.

Table 2. Layers of training in AMR-SORT IT in Africa, Asia and Latin America

Layers of training	Number	Training ratio per research study
Total research studies started	**62**	Three persons trained per study
Total individuals in SORT IT training	182	
Training layer 1: **Frontline health workers**	60	
Training layer 2: **SORT IT alumni**	52	
Training layer 3: **Academia/others**	38	
Training layer 4: WHO country staff	32	

"I am certain that participants will benefit from the SORT IT training and mentorship programme which is vital for early-career researchers. This training improves the knowledge, skills and competencies to conduct operational research and generates evidence for reducing the AMR burden."
— Dr Joseph Kanu, National AMR focal person, AMR country coordinating platform, Sierra Leone.

4. Strengthening health system resilience

The AMR project includes additional financial support to WHO country offices and AMR committees to strengthen the AMR response where funding has been lacking, such as for quarterly meetings of technical working groups and human resources (e.g. appointment of SORT IT technical officers and research fellows). This has galvanized the AMR committees in implementing national action plans and boosted WHO leadership in strengthening health system resilience to tackle AMR, COVID-19 and other pandemics.
The involvement of SORT IT technical officers, research fellows and 73% of these involved with the AMR-SORT IT project (132) in the COVID-19 response is synergistic with AMR activities and further contribute to health system resilience by: informing communities on preventive measures, improving laboratory diagnostic capacity, protecting health workers and improving surveillance systems.
Here are some examples:

- *Strengthening community awareness and engagement:* A national network of call centres and media communications was established in Nepal: Over 255,000 community calls were responded to, in relation to COVID-19 management including avoiding irrational antibiotic use.
- *Getting the media on our side:* Media practitioners were trained on factual reporting in Ghana.
- *Scaling up national diagnostic capacity and surveillance:* In Nepal, quality-controlled laboratories for the diagnosis of COVID-19 were scaled up from one laboratory in January 2020 to 95 by March 2021. This network significantly strengthens COVID-19, AMR and pandemic influenza surveillance and resilience for the future.

- *Protecting health workers and communities:* Sierra Leone started local production of alcohol-based hand-rub solutions which is seven times cheaper – cost US$ 3, compared to US$ 14 on the local market. A total of 120,000 litres is now produced yearly. A sustainability plan was endorsed by the Government of Sierra Leone.
- *Felling the pulse of the AMR situation in countries.* All countries are improving data quality on the Global AMR Surveillance System (GLASS). Monitoring of antibiotic resistance in humans, animals and the environment continued – what gets measured gets done.

"The AMR-SORT IT Officer was of great support in strengthening the laboratory network, preparedness and response to COVID-19 in Nepal." — Dr Runa Jha, Director, National Public Health Laboratory, Government of Nepal.

"I commend the valuable technical support provided by the AMR-SORT IT fellow in debunking COVID-19 rumours, misinformation and concerns. The skills acquired through the SORT IT training proved useful for the review and validation of information, data analysis and effective communication, which helped generate simple and transparent messages for public awareness on COVID-19." — Dr Amrit Pokharel, Call center, Chief of Epidemiology and Outbreak Management, Government of Nepal

"Through several operational research studies conducted through SORT IT, the AMR-SORT IT programme has played a vital role in demonstrating gaps in Infection, Prevention and Control in health facilities and providing solutions. Proper implementation of Hand Hygiene and Infection prevention and control is a priority in all our health facilities to reduce infection transmission in our Health Care system and to the community at large." — Madam Christiana Kallon, National IPC Coordinator, Ministry of Health of Sierra Leone.

Support to WHO country offices and "One Health" committees is building health system capacity and resilience. Support to the COVID-19 response has also had a synergistic effect in tackling AMR.

[Photographs (clockwise): Technical AMR working group meeting (Ghana); health staff at a call centre receiving and responding to community calls (Nepal); capacity building of media practitioners (Ghana) and; use of portable RT-polymerase chain reaction (PCR) diagnostic machines in rural Nepal.]

[Photographs: Commemoration of world hand hygiene day by the Director General of Health Emergencies (Sierra Leone); production of local alcohol-based hand-rub production which is about five times cheaper than on the market (Sierra Leone).]

5. Building networks and equitable partnerships

Through TDR's convening power, six WHO country offices and 60 AMR-SORT IT partners from 26 countries, including 40% SORT IT alumni, are engaged with AMR-SORT IT trainings. This boosts North-South and South-South partnerships (global engagement) and demonstrates TDR's capacity to effectively mobilize institutions, expertise and build communities of practice on AMR at a global level ("thinking global, acting local").

Figure 6. North-South and South-South Collaborations

South-South collaboration in AMR (46 institutions): Tuberculosis Research and Prevention Center NGO (Armenia); The Universidade Federal de Ciencias de Saude de Porto Alegre, (Brazil); Universidade de Brasilia, (Brazil); Universidad de Concepcion (Chile); Universidad de los Andes (Colombia); Universidad Pontificia Bolivariana (Colombia); Universidad Pedagógica y Tecnológica (Colombia); The Central University (Ecuador); Bahir Dar University (Ethiopia); University National Centre for Training and Research in Rural Health (Guinea); University of Nairobi (Kenya); Madhira Institute (Kenya); AMPATH (Kenya); Lighthouse Trust (Malawi); Damien Foundation (Nepal); School of Public Health (Nepal); B.P. Koirala Institute of Health Sciences (Nepal); Patan Academy of Health Sciences, (Nepal); National Public Health Laboratory (Nepal); KIST Medical College and Teaching Hospital, (Nepal); Department of Medical Research (Myanmar); National Institute of Epidemiology, Chennai, (India); Bangalore Medical College and Research Institute (India); All India Institute of Medical Sciences (India); International Union Against Tuberculosis and Lung Disease (The Union), South-East Asia office (India); Indian Council of Medical Research- National Institute of Epidemiology (India); Jawaharlal Institute of Postgraduate Medical Education and Research (India); GMERS Medical College Gotri Vadodara Gujarat, (India); Medical College Baroda, Gujarat, (India); Sri Manakula Vinayagar Medical College, (India); Ministries of Health (Colombia Pakistan, Nigeria, Sierra Leone, Uganda, Zimbabwe); Ministry of Agriculture and Livestock (Nepal, Sierra Leone); The Autonomous University of Yucatán, (México); Food and Agriculture Organization (Sierra Leone); Stellenbosch University (South Africa); Sustainable Health Systems (Sierra Leone); Makerere University (Uganda); Lire University (Uganda) and; Zambart (Zambia).

North-South collaboration in AMR: (14 institutions): Institute of Tropical Medicine (Belgium); University of Toronto (Canada); Public Health, Ontario (Canada); International Union Against Tuberculosis and Lung Disease (France); National Public Health Center, (Hungary); Médecins Sans Frontières, (Luxembourg); Public health Agency (Sweden); University of Saint Andrews (Scotland); Public Health England (United Kingdom); University of Salford (United Kingdom); University of Liverpool (United Kingdom); The Quadram Institute Bioscience, Norwich, (United Kingdom); University of Washington (USA). California State University of Fullerton (USA).

WHO country offices: Colombia, Ecuador, Ghana, Nepal, Myanmar, Sierra Leone, Uganda

AMR here, is AMR there, is AMR everywhere! Through TDR engagement, 60 institutions in 26 countries became part of the AMR-SORT IT programme highlighting TDRs global engagement in tackling AMR.

6. Tracking progress in relation to performance (logframe) targets

Table 3 below shows SORT IT performance targets (based on the logframe) from year one to year three. Due to the unprecedented COVID-19 pandemic and embargos on several activities, desired progress could not be achieved in 2020. In January 2021 we moved to full speed and with an extension of the AMR-SORT IT project agreed upon with NIHR until December 2022, we will be able to achieve all deliverables.

Table 3. Progress in relation to targets for years 1 to 3 *(numbers and percentages are cumulative)*

Indicators	2019		2020		2021	
	Target	Progress	Target	Delays due to COVID-19 Catch up in 2021/2022	Target	Progress *(Sept 2021)*
Research projects*						
1. Started	21	36	42		64	62
2. Completed	NA	-	19		38	35
3. Published					19	35
LMIC leadership and equity						
4. First author from LMIC	80%	100%	80%		80%	100%
5. Female first author	30%	47%	35%		40%	48%
6. Government co-authors included	50%	69%	60%		70%	76%
Training performance						
7. Milestones achieved (all completed modules)	80%	97%	80%		80%	98%
8. Participant satisfaction (all completed modules)	80%	90%	80%		80%	93%
Collaborative partnerships						
9. Southern institutions involved	30%	75%	45%		60%	75%
10. SORT IT alumni as mentors	30%	70%	40%		50%	40%
11. Joined the SORT IT network	80%	100%	80%		80%	100%

**The target numbers are cumulative and based on logframe targets*

Challenges and solutions

1. The unprecedented COVID-19 pandemic causing delays

The main challenge was the delay in research implementation in 2020 due to the unprecedented COVID-19 pandemic.

Solution: We developed and deployed a virtual SORT IT platform allowing training activities to restart in January 2021. To catch up with the project deliverables, we have rescheduled SORT IT modules through 2021 and 2022 and a project extension was accepted by NIHR until December 2022.

2. The political situation in Myanmar

The political situation in Myanmar continues to get worse with civil disobedience continuing and many health workers being detained and arrested. The UN guidelines for Myanmar stipulates that we are to avoid having meetings with the de facto authorities including capacity building initiatives. It is thus not feasible to consider a national SORT IT cycle in Myanmar at this time.

Solution: As an alternative and to maximize the overall value for money of the AMR-SORT project, we brought forwards the Ghana National AMR-SORT IT to November 2021. Ghana is one of the agreed target countries for the AMR-SORT IT project and the Ghana WHO country office team, the National AMR coordinating committee and the SORT IT partnership have welcomed this move. NIHR concorded with this decision. If the situation in Myanmar improves, we will consider revamping a new SORT IT cycle there.

3. Delays in the small grants scheme

Research projects using the small grants scheme require additional review and ethics clearances by the WHO regional offices in Africa and Asia. The COVID-19 pandemic resulted in unforeseen delays in fulfilling these formalities at regional level. Some proposals received through the open call for applications also needed quality appraisal. Thirteen projects were accepted including four from Asia, six from Africa and three from the Americas.

Proposed solution: We continue to try to accelerate the process of ethics clearance. To improve the quality of proposals, we have assigned SORT IT mentors to provide technical support which will also serve as a capacity building initiative.

However, for the outstanding amounts in this budget line, we will change the strategy to direct allocation of funds to AMR-SORT IT alumni who will perform further research. This will be managed through WHO country offices.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

SORT IT is a Global partnership-based initiative and building North-South and South-South partnerships is part of the modus-operandi. Collaboration was been established with Seven WHO country offices and 60 institutions which has boosted TDR's global engagement and demonstrates TDR's capacity to effectively mobilize institutions, expertise and build communities of practice on AMR at a global level ("thinking global, act local"). Details covered above.

Estimated leverage created by this project:

The total budget of this project is about US$ 10 million from the Department of Health and Social Care, United Kingdom. Initiatives are under way to try to leverage more funds from the same donor for second phase and also from other donors.

Gender aspects and vulnerable populations:

Of 62 research projects that are under way, 48% of the principal investigators are women. The aim is to reach 50% or more. The SORT IT AMR programme is focused on LMICs where the burden of AMR is high, particularly for the rural poor who have limited access to health facilities and antibiotics. We specifically target vulnerable groups as a priority for research topics with several research projects focused on vulnerable groups such as neonates and women wherever possible. Topics related to "One Health" such as improving water quality, waste management, rational use of antibiotics in animal husbandry will have a wider benefit on the lives of poor communities. Participant selection processes have promoted gender and geographic equity and we promote LMIC first authorship in published outputs. The selection of Sierra Leone was a deliberate choice; the country being a vulnerable and fragile state recovering from decades of civil war. Similarly, focusing on cross-border AMR activities in Colombia and Ecuador target vulnerable populations.

Training:

The AMR-SORT IT model uniquely combines research training, research implementation and builds communities of practice (global engagement) with an apprenticeship approach that empowers both participants and trainers. Each research project is used to simultaneously implement four layers of training namely: 1) Training of frontline workers and programme staff; 2) Training of SORT IT alumni as trainers;

3) Training of academia as trainers; and 4) Training of WHO country staff as trainers. The average numbers trained per research study is 3.0, which adds to the value for money.

Number of advanced degrees:

Twelve operational research officers have started work in 2020 and are reinforcing research activities at country level. They may pursue PhDs through publications.

Strengthened institutions or networks:

Through the AMR project, the SORT IT partnership is strengthened with new funding, new institutional partners, new facilitators and new alumni. Implementing partners include seven WHO country offices and 60 SORT IT partners (disease control programmes, academia and NGOs).

Publications:

Thirty-five recent AMR studies from Ghana, Myanmar, Nepal, Sierra Leone and Uganda were published in the Tropical Medicine and Infectious Diseases and Public Health Action Journal. https://www.mdpi.com/journal/tropicalmed/special_issues/AMR; and https://theunion.org/PHA-preprints

Twenty-five new projects from Colombia, Ecuador and Sierra Leone were started and 12 more studies were endorsed in Ghana and all will hopefully be published.

Related news:

Updated SORT IT website with open access to all publications: https://tdr.who.int/activities/SORT IT-operational-research-and-training

Communicating research findings with a KISS – Keep It Short and Simple: https://tdr.who.int/activities/SORT IT-operational-research-and-training/communicating-research-findings

Operational Research to tackle AMR in Colombia and Ecuador. https://tdr.who.int/newsroom/news/item/27-09-2021-operational-research-to-tackle-antimicrobial-resistance-(amr)-in-colombia-and-ecuador

Results dissemination and uptake:

Roughly 69% of SORT IT studies report an impact on policy and/or practice and it is estimated that the uptake would be similar for AMR. Researchers also benefited from a new SORT IT training module on "effective communication of research findings", maximizing the opportunities for research uptake. Please see evidence summaries of completed AMR research.

Available at https://tdr.who.int/activities/SORT IT-operational-research-and-training/communicating-research-findings

Plans for 2022 and beyond

- Given COVID-19 related delays, the focus is on catching up on the implementation of the AMR - SORT IT programme in Asia, Africa and Latin America and ensure that all deliverables are met.
- Use the gains of the first phase of the AMR-SORT IT to request for a second phase of funding focused on assessing the impact of studies conducted in the first phase and further building "critical masses" of researchers. *(Train, Embed, Retain, Enable)*
- TDR surveys have revealed that SORT IT can now play a vital role in tackling the impact of COVID-19 on AMR. For example, irrational use of antibiotics, over-the-counter sales and use of antibiotics due to lock-downs. If opportunity and funding allow, we plan to tackle this challenge.
- Use the success made to enhance TDR visibility and catalytic funding (see Table 4).

Table 4. Examples of research topics by strategic AMR pillars

Strategic AMR pillars	Research topics
Strengthening surveillance and monitoring	• Data quality from AMR surveillance sites (*Nepal*) • Antibiotic resistance patterns and outcomes in adults and children (*Colombia, Myanmar, Nepal*) • Impact of the COVID-19 on antibiotic resistance (*Colombia)* • Surgical site infections after caesarean section (*Sierra Leone*).
Reducing incidence of infection	• Infection prevention and control in health facilities (*Myanmar, Sierra Leone, Uganda, Colombia*) and border posts (*Sierra Leone*) • Antibiotic resistance in ventilator associated pneumonias *(Ecuador)* • Health care-associated infections with invasive devices and surgery (*Nepal*)
Optimizing antimicrobial use	• Country-wide antibiotic consumption (Colombia, Myanmar, Nepal, Sierra Leone, Uganda) • Surgical antibiotic prophylaxis (Nepal)
Sustaining investments (AMR burden, diagnostics)	• Burden of methicillin resistant Staphylococcus aureus in health facilities (Myanmar, Nepal) • Blood cultures for febrile illnesses at AMR surveillance sites (Colombia, Uganda) • Utilization of culture and sensitivity for meningitis and genital tract infections (Sierra Leone)
One Health	• Data quality for antibiotic use in animal husbandry and livestock (Ghana, Sierra Leone) • Antibiotics in poultry production (Ecuador, Sierra Leone, Nepal) • Antimicrobial pesticide imports (Sierra Leone) • Antibiotic susceptibility in hospital and sewage effluents (Ghana, Sierra Leone, Colombia)

Contributions towards TDR key performance indicators

Publications:

Vuong NL, Le Duyen HT, Lam PK, Tam DTH, Vinh Chau NV, Van Kinh N, Chanpheaktra N, Lum LCS, Pleités E, Jones NK, Simmons CP, Rosenberger K, Jaenisch T, Halleux C, Olliaro PL, Wills B, Yacoub S. C-reactive protein as a potential biomarker for disease progression in dengue: a multi-country observational study. BMC Med. 2020 Feb 17;18(1):35. doi: 10.1186/s12916-020-1496-1. PMID: 32063229; PMCID: PMC7025413.

Althaus T, Lubell Y, Maro VP, Mmbaga BT, Lwezaula B, Halleux C, Biggs HM, Galloway RL, Stoddard RA, Perniciaro JL, Nicholson WL, Doyle K, Olliaro P, Crump JA, Rubach MP. Sensitivity of C-reactive protein for the identification of patients with laboratory-confirmed bacterial infections in northern Tanzania. Trop Med Int Health. 2020 Mar;25(3):291-300. doi: 10.1111/tmi.13358. ePub 2020 Jan 6. PMID: 31808588; PMCID: PMC7265697.

Plans for 2021–2022

Subject to availability of funds: Research to evaluate the use of CRP in decision-making in primary health-care settings (impact of the use on CRP in decisional algorithm in Africa).

ER 1.3.3: POPULATION HEALTH VULNERABILITIES TO VECTOR-BORNE DISEASES (VBDS): INCREASING RESILIENCE UNDER CLIMATE CHANGE CONDITIONS IN AFRICA (OPERATIONALIZING ONE HEALTH AND THE APPLICATION OF A SCORECARD/METRICS-BASED SYSTEM)

The overall goal of this ER is to generate evidence to enable development of innovative strategies to reduce VBD-related human vulnerability and to increase resilience of African populations to VBD-related health threats in the context of climate change.

This project builds on the outputs of the TDR-IDRC Research Initiative on VBDs and climate change as the basis for operationalizing the One Health approach. It addresses an urgent and critical need with the emergence of COVID-19, re-emergence of Ebola and other zoonotic and VBD threats. The social and economic dislocations COVID-19 has catalysed can be expected to increase these health risks by increasing the vulnerability of many already vulnerable populations well beyond the pandemic period.

One Health as a field of research and practice presents challenges for the health and allied fields given its new paradigm centred on understanding and managing health and disease at the *human-animal-environment interface*. Axiomatically, this entails integration of human and animal medical and public health sciences and practices along with those of environmental management including ecology. Associated with this is the imperative to articulate the evidence-basis for One Health including principles and testable postulates toward the development of an implementation science around One Health. These form the basis of the fundamentals of One Health, which are key to the achievement of core competencies; thus, knowledge and skills development for One Health research and practice.

Operationalizing One Health encompasses a set of tools currently under development that combine well-documented, evidence-based principles and practices that specifically address the problem of populations' vulnerability. Yet this requires extending One Health operationalization efforts focused on organizational requirements to date, by elaborating methods including performance metrics that reflect the interdependence of human health and ecosystem health. A significant advance was made toward accomplishing this through the design of a Framework/Draft Plan and associated provisional score card of performance metrics and indicators during the One Health Consultation Meeting held in Brazzaville, Congo, in December 2019. The meeting revealed how the previous TDR-IDRC research initiative on VBDs and Climate Change in Africa (2015–2018) had laid the foundation for more holistic, locally adaptable health systems capable of VBD and climate change risk management as envisioned for the One Health approach. Aligned with the Libreville Strategic Action Plan to Scale Up Health and Environment Interventions in Africa (2019–2029), development of this framework and the scorecard system will greatly assist in mitigating the impacts of these follow-on health consequences on the most vulnerable populations. This system will be implemented on a pilot scale, collaborative effort based on the TDR-IDRC Research Initiative's zoonotic and VBD research projects and research teams in Côte d'Ivoire, Kenya, Tanzania, South Africa and Zimbabwe. The projects aim to improve local health by a guided operationalization of One Health through a transdisciplinarity and adaptive management approach in the context of social-ecological systems.
To illustrate and build toward further articulation of One Health fundamentals, this ER draws and builds on the findings of the previous TDR-IDRC Research Initiative, with a *human-animal-environment* focus. The previous Initiative's more than fifty researchers from multiple disciplines and several countries (Botswana, Côte d'Ivoire, Kenya, Mauritania, South Africa, Tanzania and Zimbabwe) produced new insights and tools linking disease ecology, epidemiology, meteorology and traditional knowledge across a wide range of environments. The current ER is a follow-up phase that was initiated to systematically review and translate the findings generated from the previous Initiative's research into strategies for prevention, preparedness and response for population adaptation and

resilience to VBD threats linked to climate change. The findings include new insights into how to conduct integrative research on the basis of transdisciplinary, a systems approach and its operationalization, which are central to One Health practice. They are essential to its wider adoption and continual improvement on the basis of explicit One Health operational criteria and evaluation metrics. In addition, the One Health scorecard system is a critical component for measuring success and evaluating performance of the One Health plan/framework through performance indicators for collectively developing a metrics standard that incorporates variances of specific settings for a harmonized evaluation.

Progress in 2021

Key achievements:

- **A master plan and guidance document** for the development of the operational protocol was finalized. It provided an overarching synthesis of the input from the One Health Consultation Meeting (December 2019, Brazzaville), as the basis for developing a standardized approach for the One Health Metrics and Scorecard. This Master Plan supported a follow-up consultation process through bi-monthly online meetings (with technical support from TDR and Global Health International Group [GHGI]) that helped the development of actions plans for the country projects and to clarify the expected outputs, collaborative teamwork process, timetable and milestones for the African research teams.

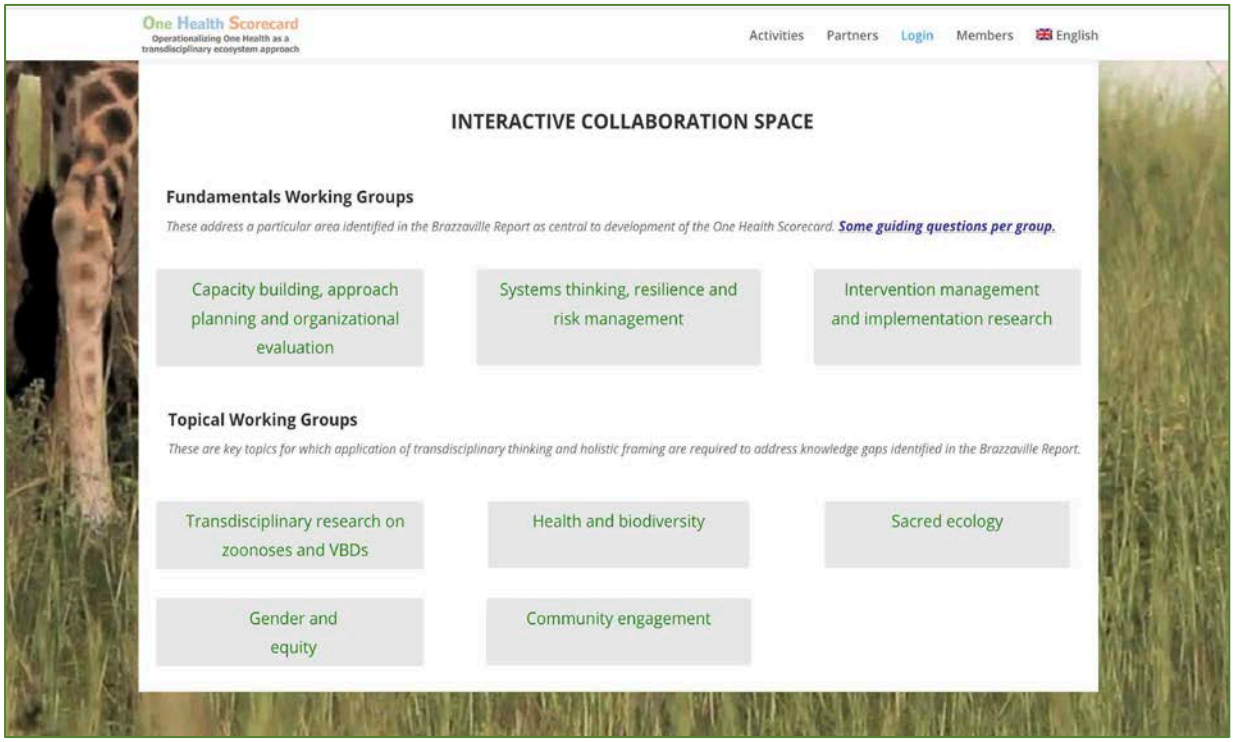
- **Establishment of an online platform** for Operationalizing One Health as a Transdisciplinary Ecosystem Approach (https://onehealthscorecard.org/). This web-based collaborative member login platform was developed and launched in July 2020 and continually upgraded based on feedback from the country teams. It has proven effective as the primary means of collaborative learning, organizational management and progress tracking.

  This online platform also includes an interactive collaborative space for two working groups composed of members from the network of researchers and stakeholders from the country projects, TDR, GHGH and other stakeholders/partners (see Fig. 7).

- **Fundamentals Working Groups**
  - Capacity building, approach planning and organizational evaluation - To integrate knowledge that is both scientific and technical pertaining to zoonotic disease risk mitigation with that of operational theory and management approaches (https://onehealthscorecard.org/login/approach-planning-and-evaluation/)
  - Systems thinking, resilience, risk management
  - Intervention management and implementation research (https://onehealthscorecard.org/login/intervention-science/)

- **Topical Working Groups**
  - Transdisciplinary research on zoonoses and VBDs (https://onehealthscorecard.org/login/transdisciplinary-research-on-zoonoses-and-vbds/)
  - Health and biodiversity (https://onehealthscorecard.org/login/health-and-biodiversity/)
  - Sacred ecology (https://onehealthscorecard.org/login/sacred-ecology/)
  - Gender and equity (https://onehealthscorecard.org/login/gender-and-equity/)
  - Community engagement (https://onehealthscorecard.org/login/community-engagement/)

Figure 7. Interactive collaboration space at onehealthscorecard.org



- **A One Health Handbook.** This is a comprehensive reference source of One Health framing and integration of its challenges including the basis for its operationalization. This cutting edge, One Health fundamentals document was developed and incorporated into the web-based platform, along with key supporting materials, providing the scholarly and evidence-based background on One Health. This document was subsequently published as a chapter in the Springer/WHO *Handbook of Global Health* [B. A. Wilcox and J. A. Steele. ©The Editors and the World Health Organization, April 2021, R. Haring (ed.), *Handbook of Global Health*, https://doi.org/10.1007/978-3-030-05325-3_88-1 (see Fig. 8); making it widely available within WHO and other collaborating agencies and organizations (FAO, OIE, UNEP, among others) for their One Health programmes.

- **Put together a One Health Glossary.** An A-Z index of terms relevant to One Health. (https://onehealthscorecard.org/login/one-health-glossary/).

- An **online One Health pilot curriculum development component** was added to the collaborative effort which will build on and extend the fundamentals section of the web-based platform. Two to three individuals from each of the Country teams have been selected and will participate in the pilot course development from October 2021 through January 2022. The Prototype Online Training course (An innovative/interactive virtual classroom for use in an open e-Learning platform) 'Operationalizing One Health as a Transdisciplinary ecosystem approach: Linking health, environment and communities' is a coordinated effort by TDR in collaboration with GHGI and researchers from Tanzania, Kenya, Côte d'Ivoire and South Africa. Progress towards implementation of this course are as follows: i) modules for the course have been developed; and ii) selection of initial batch of trainees (four per country team) is now finalized. This training course is also one of the proposed WHO Technical Products on norms/standards, data and research for 2022–23 (TP), a collaboration between TDR and NTD.

Figure 8. One Health and Emerging Zoonotic Diseases: Framework, Integration and Challenges

One Health and Emerging Zoonotic Diseases

Framework, Integration and Challenges

Bruce A. Wilcox and Jennifer A. Steele

Contents

Abstract

One Health is a rapidly developing area of integrative research and intervention focused on zoonotic diseases in the context of the human, animal, and environment interface. Its central tenet is the inseparability of the health of humans, animals, and ecosystems. Spawned by the recognition of the need for greater collaboration between veterinary and human medicine, One Health also requires consideration of the social and ecological dimensions of health challenges in order to create an integrative framework beyond biomedicine, including natural and social sciences, as well as local and traditional knowledge and perspectives. One Health offers an opportunity to reconcile disciplinary silos in the health sciences, and its transdisciplinary imperative offers solutions to the limits of conventional thinking in biomedicine and public health. This chapter examines how different sectors address and define zoonoses and points to the need to develop a global prioritization scheme for surveillance, reporting, and assessment of endemic, epidemic, and pandemic zoonoses according to their relative health

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https://doi.org/10.1007/978-3-030-05325-3_88-1

The following narrative describes in more detail the progress and achievements of the different country projects in South Africa (Project One), Kenya (Project Two), Tanzania (Project Three) and Côte d'Ivoire and Mauritania (Project Four).

PROJECT 1. Operationalizing One Health in Ingwavuma Community: Developing Transdisciplinary Methodology (South Africa)

PRINCIPAL INVESTIGATORS: Professor Moses J. CHIMBARI, College of Health Sciences, University of Kwazulu-Natal, Durban, South Africa

This project is a follow-up from an earlier collaboration made possible by the TDR-IDRC Research Initiative on VBDs and Climate Change, with research projects in South Africa, Kenya, Tanzania and Côte d'Ivoire. The collaboration was aimed at reducing population health vulnerabilities and increasing resilience against VBD risks under climate change conditions in Africa. The South African project branded as MABISA (Malaria and Bilharzia in Southern Africa), was implemented in Botswana, Zimbabwe and South Africa. In addressing the overall theme of the TDR-IDRC Research Initiative, the MABISA project identified research gaps that impeded control, prevention and elimination of malaria and schistosomiasis in the three countries, in the context of climate change. The Ecohealth approach was the main approach applied by the collaborating countries.

In 2019 WHO–TDR convened a meeting to discuss possibilities for using a One Health approach to conduct implementation research building on the experiences and outcomes of the initial collaboration referred to above. This approach entailed bridging health and environment, locally as well as globally and brings the perspective of zoonoses. The current project was therefore developed to leverage on the experiences of the MABISA project to contribute towards a One Health Scorecard introduced at the Brazzaville consultation meeting (November 2019).

This current project is located in South Africa and is being implemented in the context of KwaZulu-Natal Ecohealth Programme (KNEP). It draws from lessons of the MABISA project across the three countries (Botswana, Zimbabwe and South Africa). The outcomes of the project will feed into the collaborative overall One Health project involving South Africa, Kenya, Tanzania and Côte d'Ivoire.

To ensure that the knowledge and resources generated during initial TDR-IDRC Research Initiative on VBDs and Climate Change, TDR with Global Health International Group (GHGI) sought to: i) strengthen a network of Transdisciplinary Scientist-practitioners and facilitate production of a series of publications and presentations for research, education and policy forums; and ii) facilitate development of a Standardized One Health Scorecard on the basis of experiences and knowledge generated from the previous programme.

As part of the network, the main goal of the South African project is to address capacity development, knowledge and learning and threat management for operationalizing One Health in South Africa.

Summary of achievements:

1. Local communities were capacitated to routinely collect data and promote the concept of community change makers for prevention and control of VBDs including zoonosis.
2. Local level structures were enhanced to facilitate co-designing of community-based projects by researchers and communities through genuine community engagement and involvement (CEI).
3. Community engagement and involvement process were used to identify persisting or/and new health challenges in the study community.
4. An assessment of current vulnerability and resilience to VBDs in the context of shared country borders, environmental, governance and climate change was done.

[**Photograph:** Research site in a South African community.]

Progress made towards achieving the project objectives:

Main objective: To address capacity development, knowledge, learning and threat management for operationalizing One Health in South Africa.

Specific objective 1. *To enhance and develop capacity at different levels for operationalizing One Health.*

The KwaZulu-Natal Ecohealth Program (KNEP) has been working in Ingwavuma since 2014, when the MABISA (Malaria and Bilharzia in Southern Africa) project was initiated. Key to KNEP success has been the establishment of a governance structure and operations strategy that involves the community. A 12-member Community Advisory Board (CAB) comprising of one headperson, two community leaders, three school board members, three community care givers and three ordinary community members established at the inception of the program is functional to date. KNEP's field operations were carried out by researchers and Community Research Assistants (CRAs). The presence of the CAB and CRAs had been instrumental in promoting the concept of community change makers for prevention and control of vector-borne diseases including zoonosis. In addition, CRAs played a key role in data collection.

Data Collection. Over the years the KNEP team had invested in equipping CRAs with both knowledge and skills to conduct research. The CRAs were trained to attain the required skills for the field work. The periodic training given to CRAs includes ethics, epidemiology of malaria and schistosomiasis, basic research methods, quality control and technical skills for data collection. The CRAs were responsible for assisting KNEP to recruit study participants, obtaining consent and for data collection.

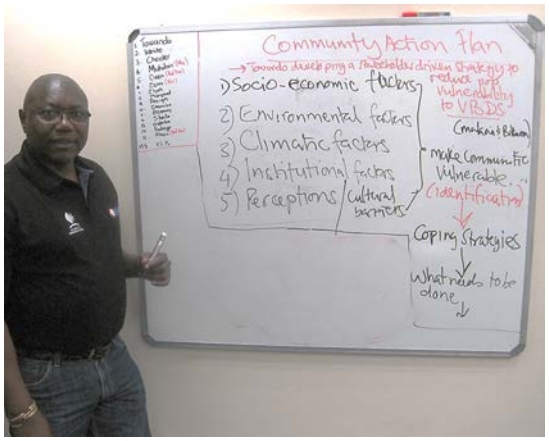
These CRAs were experienced in collecting both qualitative and quantitative data through conducting interviews, administering questionnaires and using KoBo collect, a free open-source tool used to collect data in the field using mobile devices. CRAs also assisted in conducting focus group discussions in the local language. CRAs had also been taught how to conduct sample collection and identify vector snails and mosquito larvae. They are also knowledgeable with parasitology as they are actively involved in specimen collection and screening.

Community change makers. KNEP's community change makers initiative was championed by teachers and primary school learners as well as CRAs. Teachers and learners, through their respective schools were involved in edutainment activities that facilitate health education in the community. Schools were engaged in an annual performance art competition where learners were actively involved in the dissemination of research results through performances. Participating schools integrated indigenous theatrical modes and everyday practices providing a rich source of familiar metaphors that aided in the construction of meaningful facilitating understanding and research uptake.

CRAs helped in developing trust between the community and the researchers, as they were familiar with the local people. Their presence allowed KNEP to stay informed about the community's perception of the project and to remain socially and culturally relevant. CRAs maintained the visibility of KNEP and were the boundary partners between the research team and the community.

Specific objective 2. *To co-develop a theory of change with stakeholders to easily identify priority areas for research and intervention.*

This project engaged with the various community structures and fora in an effort to co-develop a theory of change.



[Photograph: Professor Chimbari from University of Kwazulu-Natal, Principal Investigator and Team Lead for Operationalizing One Health in Ingwavuma Community.**]**

Community Advisory Board. The community advisory board was composed of senior community members and village headpersons selected from the villages where the project operates. There were two representatives from each village. The role of the CAB was to provide advice and guidance on how project activities are done in the community. Before research programs were rolled out in the community, the researchers sat down with the CAB members to discuss key areas where the research can be effective. The CAB members had helped to identify individuals in the community who can be involved in the research work. The CAB also linked the researchers to the community and their main role was to negotiate with the community on behalf of the researchers and provide buy-in from the community. Apart from providing guidance, they mobilized the community on behalf of the researchers. Their role had allowed the project activities to be recognized and accepted by the community.

Engagement with Indunas (local traditional leadership). As part of development of new projects within KNEP, Indunas (local traditional leaders) and representatives of the CAB members (village heads) were often invited to participate in workshops conducted to map out strategies and plan for research activities. These meetings had been critical in helping the leaders to understand the various research projects being implemented in the area, the purpose of the studies and the data to be collected. The presence of the village headpersons and CAB members in the past meetings created an opportunity to involve them in the planning and preparation for the projects currently running in the study area.

Community research assistants. The CRAs had been working with the project since the MABISA initiative. The CRAs were involved in the planning and execution of household surveys, school screening activities and sampling of snails in water bodies. They had also assisted in translating and localizing surveys: by providing guidance on how questions may be asked using the language and context which the local people understand.

Specific objective 3. *To identify hurdles to full empowerment of communities through a co-development of an M&E framework.*

Through community engagement and involvement at the research site, several health challenges that exist in the community were identified as impeding full empowerment of communities. These challenges include the COVID-19 pandemic, mental health issues, malaria incidences, non-communicable diseases, malnutrition and water, sanitation and hygiene challenges.

COVID-19. The COVID-19 pandemic had profoundly affected lives of the research teams and the communities. Isolation, contact restrictions and economic shutdown introduced in the country have affected knowledge and learning processes resulting in threatened mental health of children, youth and adults. Other negative health effects brought by COVID-19 were anxiety and reduced opportunities for stress regulation and management.

Mental health challenges. Mental health issues had been identified in the research community as one of the increasing/persisting health challenges. People living with mental illness or substance use disorders were more exposed to healthy living risks (Marrero et al., 2020). Their immune systems get weaker and usually fail to adhere to medication or treatment of their existing illnesses, e.g., HIV/AIDS. The project had identified a critical need to invest in mental health education and more importantly, making interventions and services accessible at the community research site.

Malaria. From 2014, the MABISA project focused on malaria. One of the studies conducted assessed individual and household malaria risk factors among women in a South African village (Mutegeki, Chimbari & Mukaratirwa, 2017). Post MABISA project, the prevalence of malaria in the community has declined, however, the health challenges associated with malaria still persist in the community posing a risk to resurgence of malaria.

Non-communicable diseases (NCDs). Some work on NCDs focusing on the "Prevalence, awareness, perceptions and burden of cardiovascular disease risk factors in Ingwavuma, KwaZulu-Natal indicated that there is a general need to extend healthcare provision in order to ensure improved access especially for cardiovascular care (Chikafu & Chimbari, 2019). During some feedback sessions/meetings with the community, it became clear that there is also a need to expand studies related to NCDs, e.g. negative effects caused by some common NCDs in the research community, e.g. decreased libido/sexual activity especially by diabetic men in the community.

Malnutrition. Healthy diet consumption continued to be a challenge in the research community resulting in stunting among children which had a negative effect on children's growth and learning processes. There is currently an ongoing study focusing on determinants of malnutrition in a schistosomiasis endemic area within the study site. This study will assess how the impacts of schistosome and STH infections on children are exacerbated by nutritional deficiencies.

Water, sanitation and hygiene (WASH). This project also worked with the community from rural KwaZulu-Natal to conduct studies on WASH practices in the community especially relevant to schistosomiasis prevention (Mulopo & Chimbari, 2021). Most areas/villages in the research community do not have easy access to clean and adequate water. Lack of adequate and clean water supply exposes community members to an increased risk to poor hygiene and sanitation related illnesses. One of the studies conducted indicated low attitudinal factors towards the use of safe water sources (Mulopo, Kalinda & Chimbari, 2020) signifying gaps in knowledge and learning for WASH practices in the research areas.

PROJECT 2. Operationalizing the One Health Approach for Malaria and Rift Valley Fever in Baringo County, Kenya: Building on the TDR-IDRC Research Initiative Project in Africa

PRINCIPAL INVESTIGATOR: Professor Benson B.A. ESTAMBALE, Research, Innovation and Outreach, Jaramogi Oginga Odinga University of Science and Technology, Bondo, Kenya

Jaramogi Oginga Odinga University of Science and Technology (JOOUST) in collaboration with the University of Nairobi (UON) are jointly implementing this research project. This project seeks to lay the foundation for the operationalization of the One Health Approach towards the mitigation of VBDs in communities in Baringo County, Kenya (see photograph below of a typical village house in a community in Baringo County).

[**Photograph**: Typical village house in a community in Baringo County.]

To achieve this, the current project aims to conduct a review and synthesis of previously collected and analysed data to collate evidence on the effects of climate variability, socioecological dynamics on humans, animals and environmental interfaces and the resultant risk of VBD transmission. The synthesis, to be consolidated with those from similar projects in West, East and South Africa, will be used to develop a One Health operationalization approach, including a One Health Scorecard, which can be used in M&E of interventions incorporating One Health approaches for the control and prevention of VBDs in the context of climate change.

Summary of achievements:

- A multidisciplinary team of experts had been constituted to collaborate in this project.
- Two training workshops had been conducted to build the capacity of project team members on the One Health Approach to climate-sensitive VBDs.
- A review and synthesis of previous project data has been completed and aligned to the socioecological systems framework (SESF) tenets.
- Collaboration/partnership with the One Health Regional Network (HORN) project was established.

Progress made towards achieving the project objectives:

Main objective*:* To contribute to the operationalization of a One Health research protocol for Implementation Research

Specific objective 1. To synthesize the existing project data based on a One Health approach and guided by the tenets of socioecological systems framework (SESF).

A review of the project data was done and aligned with the collaborative Working Groups (on the online platform) as described below:

Expanding Infection Prevention and Control (IPC) framings: A review established that there is enough knowledge about malaria drivers and RVF transmission that can inform integrated intervention strategies. Predictive maps depicting malaria and RVF hotspots are available and can be used in planning for intervention against disease outbreaks. For example, vector control exercises, distribution of bed nets, vaccination of animals against RVF and health campaigns on malaria and RVF can be focused on the identified hotspots (see photographs below on livestock statistics inventory in Marigat subcounty, a hotspot for both malaria and Rift Valley fever). The patterns of temporal and spatial variations in climatic factors, hydrology, ecosystems and vector bionomics have been documented and should be incorporated in planning for early interventions against malaria and RVF. The effectiveness of indigenous practices against malaria and RVF should be verified and if effective be mainstreamed and used in control programmes.

The review identified weaknesses in intervention strategies currently in place. First, there is non-compliance in through sharing of medication and failure to complete recommended dosage which should be discouraged. Secondly, the coverage in the distribution of ITNs to expectant women and children aged under five years did not include all hotspots. All hotspots should be covered and distribution expanded to include other community members.

[Photograph: Livestock statistics inventory Marigat subcounty, a hotspot for malaria and Rift Valley fever.]

[Photograph: Baringo County, a hotspot for Rift Valley fever.]

Systems thinking, resilience and risk management. The review established that there is an integration of scientific knowledge on the interaction between human (sociocultural), animal (livestock species, farming systems) and environmental (climate, vegetation, vectors and hydrology), factors leading to disease outbreaks. Rift Valley Fever hotspots were determined to occur in the lowland and riverine zones where suitable habitats for RVF vectors exist. These habitats are characterized by flat topography, poorly drained soils that flood after heavy rainfall. Ecological niche modelling was used to identify VBD transmission hotspots. Habitat suitability is further influenced by rainfall seasonality and isothermality. It was also determined that malaria hotspots occur in the lowland and riverine zones, with the latter having perennial transmission due to presence of year round vector breeding points in the form of slow flowing streams covered with filamentous algae. Currently, RVF prevention is mainly through vaccination of animals. During the last RVF outbreak, the government imposed a ban on livestock markets and imposed animal quarantines. To stem the risk of RVF infection and create awareness on RVF, the current project distributed personal protective equipment (white coats, gloves and boots) to workers in slaughterhouses.

Malaria control is mainly through distribution on bed nets to expectant mothers and children under the age of five. The local communities use both traditional and conventional strategies to keep away mosquito vectors, treat malaria and prevent RVF. The observed impact of house type on the abundance of indoor resting malaria vector can also be useful in designing customized integrated malaria control strategies.

Transdisciplinary research on zoonoses and VBDs. The TDR-IDRC Research Initiative used transdisciplinary research methods with researchers derived from the fields of anthropology, entomology, parasitology, meteorology, mathematical modelling and eco-hydrology. In addition, the research team collaborated with officials from the Ministry of Health, Ministry of Agriculture, Livestock and fisheries, Ministry of Education and environmental authorities like Kenya Marine and Fisheries Research Institute and Water Resource Management Authority. This transdisciplinarity enabled the research team to investigate vulnerabilities to VBDs from a multidimensional perspective that expanded the IPC framing to include sociocultural, climatic and ecological factors influencing human, vector and pathogen interactions. This helped in identifying socioeconomic factors leading to population vulnerabilities to malaria and RVF, as well as at risk populations that can be affected if the projected climate change results in the expansion of vector ranges. The study methodology was also participatory in nature. The local communities were included in focus group discussions and health campaigns during data collection and research dissemination, respectively.

Sacred ecology. The review established that the community was knowledgeable of malaria signs and symptoms but the knowledge co-existed with traditional causes. The community also had knowledge on traditional/herbal medicines used in malaria IPC, specifically to treat malaria and repel mosquitoes. Although the community was not knowledgeable on RVF and could not readily relate it to extreme weather events, specifically, *El-Nino* rains, they had their own traditional ways of predicting weather patterns. These included the observation of certain plant species flowering and fruiting patterns, studying the positioning of stars and planets as well as studying goat intestines.

The role of weather prediction was by tradition ascribed to a specific category of men. The community also utilized traditional methods of determining meat safety for consumption such as observing if the spleen of a slaughtered animal would swell or not if covered with soil. In their use of different plant species for malaria treatment, mosquito repelling, weather prediction and curing meat, the community members not only placed value on fauna in their immediate environment but also used them sustainably by preserving and protecting them as they would be needed for future use. Through this research, we were able to identify the unique ways in which the communities in Baringo utilized their vegetation for disease management. This adds to the knowledge of medicinal plants nationally and globally among communities with similar ecosystems.

Health and biodiversity. The review established a link between biodiversity and health by identifying factors that enhance habitat suitability to vectors and increase vector population. Mosquito larvae abundance was also established to be dependent on the aquatic flora found in the breeding points. In the riverine zone, where malaria transmission was determined to be perennial, slow flowing streams inhabited by filamentous algae which made them suitable for mosquito breeding.

This discovery is key in expanding the IPC framings with respect to vector control. The general distribution of vectors varied across different eco-geographical zones with the greatest vector diversity and abundance occurring in the lowland zone where both malaria and RVF vectors coexist. Disease prediction and vector distribution models were developed by examining the interaction between the environment, vector species composition and climatic conditions.

It was determined that variations in climatic condition can expand the spatial extent of mosquito vector ranges putting new populations at risk. Changes in climatic condition, particularly the decrease in temperature, favours larval survival and the reproductive output of female mosquitoes. The transmission of malaria and RVF is also influenced by the environment. It depends on presence of vectors, the pathogens, susceptible hosts and suitable climatic conditions and habitats within the ecosystem.

Gender and Equity. This review demonstrated that there were gender differences in exposures to malaria and RVF, health seeking behaviour and care giving. In terms of exposure, although every person could get infected with malaria, community members knew that pregnant women and children under five years are the most vulnerable. This finding was in agreement with national policy on malaria prevention which also advocates for these vulnerable categories of persons to be provided with an insecticide-treated bed net free of charge during visits to antenatal or child wellness clinics. Some of the factors that made the community vulnerable to malaria included the practice of living in mud walled houses which tended to have higher numbers of mosquitoes resting indoors; building houses with wide eaves which made it easy for mosquitoes to fly in; women sourcing for water early morning at times when mosquitoes are feeding; women staying outdoors longer in search of water in the drought season; men staying outdoors for grazing purposes especially in the drought period when they have to be away from home; men sitting outdoors in the dark; and inconsistent use of bed nets due to the belief that there are no mosquitoes in the dry season and that bed nets increase the amount of heat in the bed area making sleep uncomfortable.

During an outbreak, exposure to RVF could also be mediated by gender due to differential exposure to infected animal tissues and secretions such as milk, blood, meat, birthing fluids and abortus. The study showed that the communities had a practice of consuming raw and cooked blood but, more men were more likely to consume blood than women. Although the communities boiled milk before consumption, they milked sick animals and consumed this milk, with men more likely to consume milk from sick animals. Animal products such as milk and meat stock are used in administering medicines to children and adults, respectively.

On health-seeking behaviour, women were more likely to seek medical treatment sooner than men when they became ill so that they could quickly go back to conducting their productive and reproductive duties whose labour was not easily substitutable. Men considered the practice of seeking medical care a sign of weakness, and are therefore more likely to present in hospitals with severe illness due to delay in seeking medical attention. Men were also more averse than women to having blood samples taken for fear that the laboratory staff would test them for HIV. This belief was fuelled by the near similarity in how the malaria and HIV test kits work. In terms of caregiving, men as household heads tended to provide finances for health seeking. Women, on the other hand, tended to provide care to sick persons. This included feeding, cleaning, administering medicines and providing emotional support.

Community engagement. The project had interactions with the communities and leadership in Baringo County. This was done during the project's reconnaissance and inception meetings with the Baringo county leadership; data collection; research finding dissemination to County human and veterinary health officers, subcounty leadership; and research dissemination for community members through health campaigns on malaria and Rift Valley Fever.

Specific objective 2. To build the capacity of the project team on the One Health approach to climate-sensitive VBDs research.

The project had conducted two training workshops on OHA conducted by an expert from the HORN project. A total of eight team members have so far undergone training on and applied the knowledge gained to synthesize the project data according to the socioecological systems framework. The trained personnel will in turn train stakeholders in Baringo on the One Health approach.

A review of the capacity of the stakeholders during the previous project was done. The analysis focused on the governance, resource allocation and organizational culture across the stakeholders to identify the strengths and gaps in stakeholder engagement that can contribute to the success of the OHA.

The research team has been working in collaboration with officials from the Ministry of Health, Ministry of Agriculture Livestock and Fisheries, Ministry of Education and the national government representatives in Baringo County. During the previous study, the research team shared research objectives with officials from the said ministries and also incorporated them in data collection. The project team also conducted local public forums during which community knowledge on malaria and RVF was assessed. At the end of the study, community sensitization was achieved through health campaigns on malaria and RVF.

It was also established that the county government departments have no capacity to conduct research on their own, instead they are reliant on collaborations with learning institutions and non-governmental organizations.

Specific objective 3. To publish synthesized research papers based on the One Health approach which incorporates findings from the project.

This project had proposed to publish synthesized research papers on the One Health approach based on evidence from the previous TDR-IDRC Research Initiative. A synthesis of the project data has been accomplished and the team project team members have been tasked with responsibilities for draft manuscript writing.

PROJECT 3. Promoting innovative and inclusive approaches to implementation research for operationalizing the One Health approach in Tanzania

PRINCIPAL INVESTIGATOR: Professor Paul S. GWAKISA, The Genome Science Centre and Department of Veterinary Microbiology and Parasitology, Faculty of Veterinary Medicine, Sokoine University of Agriculture, Morogoro, Tanzania

This project draws on findings of a previous TDR-IDRC Research Initiative on VBDs and Climate Change (2013–2018), entitled *Predicting vulnerability and improving resilience of the Maasai communities to vector-borne infections: an ecohealth approach in the Maasai ecosystem*, in Tanzania. The purpose of the previous project was to improve resilience of the Maasai people to the risks and impacts of VBDs in the context of climate change.

Accordingly, the present project (2020–2021) is a follow-up of the previous initiative; to systematically review and translate the findings generated from the previous research into strategies for prevention, preparedness and response for population adaptation and resilience to zoonotic and VBDs threats. The current project focus is to help Maasai communities adapt to the devastating effects of zoonotic and VBDs, which are endemic in the Maasai steppe through operationalization of the One Health concept (see photographs below).

[**Photographs:** Community engagement as a means to promote innovative and inclusive approaches to implementation research for operationalizing the One Health approach among the Maasai in Emboreet Village in Simanjiro District, Northern Tanzania.]

Implementation of this project involves a collaborative effort of four African research groups in Kenya, Côte d'Ivoire, South Africa and Tanzania. It was designed to employ transdisciplinarity while linking ecology, epidemiology, public and veterinary health sciences, sociology as well as community traditional knowledge and targets to scale up implementation of joint interventions on health and environment using a One Health approach. The approach taken for this study ensures that human and animal health and environmental integrity concerns are addressed in an integrated, multisectoral and holistic manner, providing a more comprehensive understanding of the problems and potential solutions that would not be possible with siloed approaches.

Amidst several other VBDs in the Maasai steppe, this project focused on trypanosomiasis, a disease transmitted by tsetse flies affecting humans and cattle. In humans, the disease is called Human African Trypanosomiasis or sleeping sickness, threatening millions of people in sub-Saharan African countries, including Tanzania, especially in the Maasai steppe. In cattle, the disease causes African Animal Trypanosomiasis or *nagana*, an endemic disease in northern Tanzania. The disease significantly affects livelihoods in Maasai households due to frequent cases of abortion and infertility among infected cows, reduced growth rate and a significant drop in milk production and increased deaths, hence disrupting the production chain and reducing household income.

This project was specifically working with the most vulnerable and marginalized people, the Maasai, in Emboreet village, Simanjiro district in northern Tanzania, who totally depend on the ecosystems they live in for survival. The Maasai people living in northern Tanzania as well as their cattle are severely affected by several endemic zoonotic VBDs. The effects of such diseases are likely to increase, due to socioecological and climatic changes. Furthermore, increased populations of people and livestock, agricultural encroachment into wildlife areas, competition for pastures between livestock and wildlife and water scarcity exacerbate the potential for increased burden of these diseases. Working closely with the Maasai people over the last ten years, resulted in a better understanding and appreciation of zoonotic disease and climate adaptation, specifically applicable in the Maasai steppe and typical of a human-livestock-wildlife interface characterized by abundant flies, cattle and wildlife. The present study explored the best ways to use transdisciplinarity at the human-animal-environment interface in real-life settings in order to reduce vulnerability of the Maasai people to VBDs.

Summary of achievements:

- Community engagement meetings in Emboreet village, Simanjiro District
- Outcome mapping from previous (2016–2019) research interventions in the Emboreet community
- Engagement with collaborative Working Groups nationally and across the African country-network
- Preparation of scientific manuscripts
- Coordination of country activities and progress reporting to the larger International group via monthly zoom meetings.

Progress made towards achieving the project objectives:

Specific objective 1. To build capacity for transdisciplinary research for operationalizing One Health at different levels (community level/extension workers/postgraduates and young researchers).

The thrust of this objective is to build national capacity for implementation research for operationalization of One Health. With the resources available, activities were initiated to bring together stakeholders of the One Health concept and to build a strong team of OH leaders representing different institutions in Tanzania to enhance individual personal skills and also at institutional and community levels.

Specifically, the following activities were implemented:

- A communication platform using the WhatsApp tool was created to link the team leaders within the country. The platform is used to share relevant knowledge and information between scientists/researchers from different institutions.
- A community engagement activity was conducted (May 2021) in Emboreet village. The community-wide engagement was conducted as a two-way dialogue between a representative group of 25 Maasai elders (who participated in the first phase project of 2014-2018) with eight researchers (team leaders) to update knowledge from both sides on vectors and disease risk in the Emboreet and neighbouring villages, particularly on tsetse fly density and the disease – trypanosomiasis; and how climate change, land use changes, lifestyle and culture may have posed as risk factors to the sustainability of interventions adopted earlier during phase I of this project. A range of topics were discussed, including emerging health risks from new diseases, with the example of COVID-19, for building a “community-researcher viewpoint platform” and creation of awareness of emerging zoonoses.
- One-on-one interviews were done on village market day, involving diverse community members. Each team leader was assigned with a different discussion topic and topics hinged around project-agreed working group themes such as culture, wealth, gender, tribal values, education in the context of health, climate change, ecology, biodiversity, etc.
- Using a participatory approach, outcome mapping of interventions was done to systematize community experiences on implementation of previously adopted research interventions and their outcomes. The community members said clearly that our previous project was a motivating factor for them to implement community-wide vector control interventions. They reported that interventions from our previous project led to a dramatic reduction of tsetse density. This positive result led to increased cattle and human populations into the village. The populations increase in turn, three years post-project ending, pushed the Maasai herders to expand cattle grazing areas towards Tarangire National park. Silently the expansion of grazing areas encroached into the human-wildlife buffer zone with Tarangire National park, hence again exposing the cattle and humans to trypanosome-infected tsetse flies.

- Likewise, the introduction of vector control interventions (traps) during the previous project (2014–2018) over time, silently attracted more human settlements into Emboreet village, resulting into changes of land use patterns. For example, areas close to homesteads, which predominantly were livestock pastures are recently used for cultivation and crop farming. This situation has created shift from traditional land use patterns and is likely to lead to human-animal conflicts as livestock are pushed into wildlife areas.

Specific objective 2. To work closely with all stakeholders and develop a framework for addressing key One Health-based community needs using a theory of change approach (e.g. the human-livestock-wildlife interface and zoonotic diseases).

The researchers in this project had collaborated with TDR, GHGI and project partners in Kenya, Côte d'Ivoire and South Africa to jointly work towards development of a metrics-based assessment using a One Health scorecard. Researchers had contributed to the development of the concept and design through Zoom discussions and meetings. The online platform is operational and has undergone an iterative process of continued improvement and further development. For the 3rd and 4th quarters of 2021, the utility of the scorecard will be further expanded.

PROJECT 4. Vulnerability and resilience to malaria and schistosomiasis at the northern and southern fringes of the Sahel band in the context of climate change: From an EcoHealth research project to operationalizing the One Health approach in West Africa (Côte d'Ivoire and Mauritania)

PRINCIPAL INVESTIGATOR: Dr Brama KONE, Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS), Abidjan, Côte d'Ivoire

Summary of achievements:

- Participated in activities leading to the launch of a functional online One Health operational platform for Africa, including a French language platform for researchers and stakeholders from Côte d'Ivoire
- Completed literature research and synthesis, including synthesis of team-community-stakeholders experience in piloting the Draft Plan for Operationalizing One Health
- Engaged and collaborated with other African country researchers and relevant stakeholders in Working Groups (Fundamentals and Topical Working Groups).

Progress made towards achieving the project objectives:

Main objective of this project: To operationalize a One Health approach through the assessment of capacity-building needs among stakeholders, activities and outcomes of knowledge and learning process and risk management strategies.

Specific objective 1. *To analyse the actors (governance, organizations) and resources, capacity-building activities and their outcomes, employing socioecological systems analytical methods and stakeholder analysis.*

This was done through literature review based on previous knowledge and data generated from the TDR-IDRC Research Initiative (VBDs and Climate Change) and other relevant publications. The analysis was done considering the capacity building component of the One Health conceptual framework. A draft report is currently being prepared for publication and dissemination to stakeholders.

Specific objective 2. *To assess the effectiveness of the principles of an EcoHealth approach in the implementation of One Health intervention science and risk management scorecard components.*

Drawing on the previous TDR-IDRC Research Initiative project results and experience with malaria and schistosomiasis interventions in Côte d'Ivoire and Mauritania and the role of public versus private health facilities, the current project investigated how the research output could guide interventions with better and improved health systems disease risk management capacity using One Health approach and taking as example the COVID-19 pandemic management.

Following the achievement of specific objectives 1 and 2 above, a workshop was organized and conducted from 26 to 28 August 2021 (see photographs below depicting participants from the workshop conducted on 26 to 28 August 2021 in Abidjan). to discuss the results, plan for further data collection and to draft interview questionnaires for additional studies. The main stakeholders for data collection were identified following the One Health scorecard framework. For the **Capacity building component** the Institutional actors in Abidjan (Governance) included the National Malaria Control Programme (Dr Assiénin), National Programme for the Control of Neglected Diseases with Preventive Chemotherapy (PNLMTN-CP; Dr Anoma), Ministry of Environment and Sustainable Development/ Climate Change Programme (Kadjo Ahossan/ N'Goran Edouard), Directorate of Public Hygiene and Environmental Health/ Ministry of Health (Dr Doh Gagne), SODEXAM in Korhogo (Dr Djè Bernard), Departmental Health Directorate (nurses involved in the collection of health data in Korhogo; and nurses involved in the group interviews and ARK (Mr Soro Gaoussou, Director).


[**Photographs**: Participants from the workshop conducted on 26-28 August 2021 in Abidjan.]

The Research actors (researchers) are composed of the following: Parasitology: Professor Silué (Gbalégba); Entomology: Dr Tia, Dr Chouaibou (Gbalégba); Malacology: Professor Yapi, Professor Tian Bi (Gbalégba); Epidemiology/Environment: Professor Koné Brama (N'Krumah/Soro Dramane); Sociology: Dr Fokou, Dr Doumbia, Professor Traoré, Dr Esso (Jeanne d'Arc/Honorate).

For the Community actors, the following were identified: President of a women's association, Korhogo community (President of the Residential district 2; Chief Koko; Chief Natio; Chief Kolokakaha), Social Service of the Town Hall, Interpreter. For the Knowledge and Learning component of the One Health scorecard, the following areas and specific contributors were named: Training courses with researchers' contributions [Parasitology: Professor Silué (Gbalégba) - Entomology: Dr Tia, Dr Chouaibou (Gbalégba) - Malacology: Professor Yapi/ Professor Tian Bi (Gbalégba) - Epidemiology/Environment: Professor Koné Brama (N'Krumah/Soro Dramane) - Sociology: Dr Fokou, Dr Doumbia, Professor Traoré, Dr Esso (Jeanne d'Arc/Honorate)]. For the Intervention component, contributions from the following will be tapped: private Hospitals (capacity building), local radio/broadcast media and community leaders (capacity building), women's associations of Korhogo, specific communities and school groups (teachers).

With these above-named actors/contributors, the plan is to conduct further individual and group interviews to document past and future activities related to the COVID-19 pandemic and the One Health scorecard conceptual framework.

Specific objective 3. *Produce a documentary video on lessons learned from the MTV-CC project for operationalizing the One Health approach*

The documentary video will be launched in September 2021.

Remaining challenges

Project in South Africa. The main challenge faced by this project was the restricted access to the community due to COVID-19 pandemic. While the project had managed to visit the study community occasionally, more frequent engagement was mostly virtual and online. For example, for the youth group, a WhatsApp platform was set up as a means of communication and this had been working very well to keep this sector of the population engaged with the project.

Project in Kenya. The main challenge experienced in the implementation of the project had been the COVID-19 pandemic. Kenya is currently experiencing a fourth wave and the government had imposed a series of containment measures including lock-downs, cessation of movement between regions and bans on social gatherings including closure of institutions. In the wake of all these, normal functioning of academic and research institutions had been adversely affected. The project had been restricted from conducting activities that require face-to-face meetings, for example, travelling to Baringo for stakeholder analysis and training has been postponed repeatedly. The use of virtual meetings has been adopted for some activities that do not require a lot of time input but such virtual means are not suitable for activities that require input from researchers and communities for long hours to a few days. In addition, internet and connectivity challenges had hampered effective communication not only among the team members but also between the team and the Baringo County local leadership. In the wake of increased COVID-19 vaccination coverage, it is hoped that the containment measures will be eased and field activities can continue.

Project in Tanzania. The greatest challenges during this research period (2020–21) were all associated with the COVID-19 pandemic. Accordingly, everything had to change to comply with COVID-19 precautions, while work continued under various lockdown scenario and restrictions. It has been important that we explore new opportunities for different ways of working with partners/stakeholders. Since capacity building is a major component of our work, the current project used the COVID-19 situation as an opportunity for strengthening online activities from planning to execution of research activities. The online Zoom platform had been a vital tool that has enabled networking locally in Tanzania as well as with TDR, GHGI and partner research teams in Africa.

Project in Côte d'Ivoire. The major obstacle encountered by this project was the language barrier with the project partners. To overcome this obstacle the project team, with funding support from WHO–TDR coordination, hired a translator to translate essential elements such as official documents, information on the online platform and translation during online meetings and workshops.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

TDR: Building on previous projects from ER 1.3.3, TDR's unit on IR is best positioned for research and capacity building toward operationalizing an integrated, multisectoral and holistic One Health approach for the control of VBDs in the context of climate change. Through TDR's convening and facilitation role, various partners and stakeholders from different sectors are brought together for the One Health approach which is envisioned as a novel, essential policy and management tool (including a metrics/scorecard system) for the control of VBDs at a time of changing environment/climate conditions in Africa.

TDR is engaged with the following partners: WHO Regional Office in Africa (AFRO); Fondation Mérieux; United Nations Environment Programme (UNEP); OIE-Africa (World Organization for Animal Health); FAO-Africa (Food and Agriculture Organization); PAMCA (Pan Africa Mosquito Control Association) and the Global Health Group International (GHGI).

Project in South Africa:

CAB: This board serves as the boundary partner between the research team and the community. The board members help with planning for meetings and ensure that communities make meaningful in-kind contribution at stakeholder meetings.

CRAs: These cadres assist with data collection and mobilization of communities.

Indunas: The local leadership (Indunas) provide the necessary "political" support for the project because of the power in the community. We have managed to get them interested in the project and that has made project implementation smooth.

Project in Kenya: This project collaborates with the University of Nairobi (UON) and the One Health Regional Network (HORN) project.

Project in Tanzania: This project collaborates with the National Institute of Medical Research (NIMR), University of Dodoma, FAO-Tanzania Office (with Dr Moses Ole Neselle), the Ministry of Livestock and the National One Health Platform of the Tanzanian Prime Minister's Office.

Project in Côte d'Ivoire: This project collaborates with the National Malaria Control Programme, the National Programme for the Control of Neglected Diseases with Preventive Chemotherapy (PNLMTN-CP), the Ministry of Environment and Sustainable Development/Climate Change Programme, the Directorate of Public Hygiene and Environmental Health of the Ministry of Health and the Women's Association in Korhogo.

Estimated leverage created by this project:

Project in South Africa: This project is being implemented in the context of the KwaZulu-Natal Ecohealth Programme (KNEP) which is composed of many projects. Therefore, KNEP is co-funding the activities for community engagement and travel to the research site.

Project in Kenya: Contribution from the HORN project in the form of technical support for training and module development and on the use of the scorecard and metrics.

Project in Tanzania: Salaries and institutional in-kind support for eight researchers in Tanzania.

Project in Côte d'Ivoire: Technical support from PNLP; PNLMTN-CP; and from the Office of the Director of Public Hygiene and Environmental Health of the Ministry of Health.

Gender aspects and vulnerable populations:

Project in South Africa: Through the Social Practice Creative Placemaking (SPCP) approach, this project is able to engage with different stakeholders in the social and community space, e.g., children in schools, women in gardens, in households and churches and Ndunas (and their respective Inkosi heads) during community meetings.

Project in Kenya: This project is supported by a network of nine researchers with expertise spanning the fields of medical microbiology, medical anthropology, geology, virology and meteorology; of these nine researchers, two are women (both are medical anthropologists).

This project conducted a gender analysis of men's and women's risk, vulnerability and resilience to Malaria and Rift Valley Fever. The project showed that gender roles and responsibilities are a risk factor for infection for both diseases through exposure to vectors or infectious materials. It also demonstrated that men's and women's resilience to both diseases is determined by their health seeking behaviours which are influenced by cultural and socioeconomic factors. The project also established that in Baringo County, children under five years of age and expectant mothers were considered most vulnerable to malaria compared to other populations. Consequently, these categories were provided with a bed net when visiting public health facilities seeking antenatal and/or postnatal/well baby care.

The project's findings on men's and women's risk, vulnerability and resilience to Malaria and RVF can be used to inform the County on the most strategic interventions required to improve their adaptation to these

diseases. They can also be used to monitor if existing measures are responding to the needs of various categories of populations in the community such as children under five, expectant (pregnant) women and other local populations.

Project in Tanzania: This project is supported by a network of eight researchers with expertise spanning the fields of immunology, epidemiology, One Health and One Health economics, ecology, veterinary public health and community engagement; of these eight researchers, two are women (One Health economics and ecology).

This project focuses on vulnerable populations, the Maasai people, of northern Tanzania, who live in remote rural areas, usually in human-animal interface areas. Social services such as education and health are generally weak and women and children are particularly most affected. Culturally, the Maasai people uniquely stand-out when it comes to gender issues. While women have pronounced roles in the house, as regards child welfare, the women normally take a 'behind-the-curtain' voice to people coming from outside. This imbalance is rooted in Maasai traditions and culture of roles and responsibility of different gender. Although this has no direct link to the individual's risk and vulnerability to health issues, it however affects decision-making, especially when household resources are to be used in addressing health issues. Some of these issues were directly addressed by this project during community engagement meetings.

Project in Côte d'Ivoire: This project is supported by a network of five researchers with expertise spanning the fields of environmental epidemiology, biology and social science; of these five researchers, 2 are women (both are social scientists).

Training:

Project in South Africa: This project had not funded degree studies directly. However, it has managed to support some students in the KNEP. These include:

Dr Mindu, postdoctoral fellow working on community engagement
Dr Nkeka, postdoctoral fellow working on Water Sanitation and Hygiene
Dr Mutero, postdoctoral fellow facilitating Social Practice Creative Placemaking
Zinhle Mthembu (PhD candidate), working on community empowerment
Dr Mogaka, postdoctoral fellow, working on community vulnerability assessment
Thuli May (Masters candidate), assessing malaria situation in the study area
Herbert Chikafu (PhD candidate), working on NCDs
Onyekachin Nwoko (PhD candidate) working on schistosomiasis

Project in Kenya: No support for students.

Project in Tanzania: This project had not provided direct support to train at advanced degree level, but it incorporated one PhD student (with a separate funding source). The student's PhD objectives relate to the current project.
Project in Côte d'Ivoire: No support for students.

Strengthened institutions or networks:

Project in South Africa: Transdisciplinary approaches and strengthened community structures through establishment of CAB and use of CRAs. These had strengthened the community research/project implementation capacity, including development of a critical mass of early-career researchers on transdisciplinary approaches.

Project in Kenya: Strengthened capacity of Baringo County government in OHA implementation, specifically in the following: improved governance structures for implementation of the OHA, constitution of a transdisciplinary team of experts to run the OHA initiatives, mainstreamed resource allocation towards the OHA, improved capacity for implementing the OHA in VBD risk detection and improved capacity in monitoring and evaluating OHA implementation.

Project in Tanzania: Improved capacity for transdisciplinary approaches for One Health implementation.

Project in Côte d'Ivoire: Improved capacity for transdisciplinary approaches for One Health implementation.

Wilcox BA and JA Steele. One Health and Emerging Zoonotic Diseases: Framework, Integration and Challenges. ©The Editors and the World Health Organization, April 2021 R. Haring (ed.), Handbook of Global Health, https://doi.org/10.1007/978-3-030-05325-3_88-1

Project in South Africa:

Carlos A Faerron Guzmán, A Alonso Aguirre, Barbara Astle, Enrique Barros, Brett Bayles, Moses Chimbari, Naglaa El-Abbadi, Jessica Evert, Finola Hackett, Courtney Howard, Jonathan Jennings, Amy Krzyzek, Jessica LeClair, Filip Maric, Olwenn Martin, Odipo Osano, Jonathan Patz, Teddie Potter, Nicole Redvers, Noortje Trienekens, Sarah Walpole, Lynda Wilson, Chenchen Xu, Matthew Zylstra (2021). A framework to guide planetary health education. The Lancet Planetary Health. Volume 5 (5). e253-e255

Mutero IT, Chimbari MJ (2021). Consulting the Community on Strategies to Strengthen Social Capital for Community Disease Control. Int Q Community Health Educ. 2021 Mar 22:272684X211004939. doi: 10.1177/0272684X211004939.

Tafadzwa Mindu and Moses John Chimbari (2021). The factors affecting uptake of schistosomiasis research findings and recommended methods for dissemination of findings in Ingwavuma area, uMkhanyakude district, KwaZulu-Natal, South Africa. Journal of Public Health in Africa.

Onyekachi Esther Nwoko, John J. O. Mogaka and Moses John Chimbari (2021). Challenges and Opportunities Presented by Current Techniques for Detecting Schistosome Infections in Intermediate Host Snails: A Scoping Review. Int. J. Environ. Res. Public Health 2021, 18.

Innocent T Mutero, Moses J Chimbari (2021). Exploring partnership dynamics in university-community engagement: A case study of TibaSA multidisciplinary research team in uMkhanyakude district, KwaZulu-Natal, South Africa. International Journal of African Higher Education.

Doreen Thembo, Gary Hickey, Cristian Montenegro, David Chandler, Erica Nelson, Katie Porter, Lisa Dikomitis, Mary Chambers, Moses Chimbari, Noni Mumba, Peter Beresford, Peter O Ekiikina, Rosemary Musesengwa, Sophie Staniszewska, Tina Coldham, Una Rennard (2021). Effective engagement and involvement with community stakeholders in the co-production of global health research. BMJ 2021;372:n178 | doi: 10.1136/bmj.n178

Chanelle Mulopo, Moses Chimbari (2021). Water, sanitation and hygiene for schistosomiasis prevention: a qualitative analysis of experiences of stakeholders in rural KwaZulu-Natal. s Journal of Water, Sanitation and Hygiene for Development | in press | 2021

Project in Kenya: None.

Project in Tanzania: Two manuscripts in preparation

Project in Côte d'Ivoire: None.

Plans for the remainder of 2021 until project completion Q1 of 2022

- Continue with planned bi-monthly meetings to facilitate discussion among the country projects concerning progress and challenges in reference to the Master Plan for Operationalizing One Health and the use of the One Health scorecard.
- The online One Health platform will undergo continual upgrades based on feedback from the country projects. The One Health fundamentals pages will be redesigned, with additional scholarly background material and communication features to accommodate the pilot curriculum component for the development of the online training course. This activity will not only provide the basis for launching an online e-learning course, with at least two members from each country project participating, it will also provide each team with more in depth understanding of fundamental principles that underlie transdisciplinary and community participatory research along with the ecosystem approach and their application to VBD control in the context of environmental change including climate change.
- Continue guidance of project participants with the evolving online platform, especially the use of its new features. An informal "Phase II" platform engagement will be undertaken to insure the platform achieves its potential for collaborative work across the One Health network. This will entail working with PI's (Team Leads) and Working Group leaders and co-leaders to optimize member's participation.

- Continue engagement with key TDR-IDRC Initiative researchers, including recruitment of new team members (current census of those registered in the online platform is 50 researchers). During Phase II of platform engagement (September 2021-Februrary 2022), an increased effort will be made to engage more agency representatives (e.g. FAO, OIE and UNEP) and recruit additional experts and stakeholders to strengthen the collaborative network. Facilitation of engagement with technical and policy personnel with WHO–AFRO (and WHO country offices in Africa) had been limited due mainly to COVID-19 pandemic. However, such efforts will be continued and expanded including with UN Environment Programme, OIE-Africa, FAO and Fondation Mérieux, in particular, mainly through online meetings.
- Manuscript writing for publication in peer-reviewed journals.

Plans for 2022–2023

The proposed plans for this biennium include the following:

- A call for proposals to scale up implementation of the One Health metrics/scorecard in Africa.
- Technical and funding support for a portfolio of projects in Africa.
- Mentoring and capacity building through a training course on Operationalizing One Health.

▪ Workstream: Research for Implementation

ER 1.1.7: MAXIMIZED UTILIZATION OF DATA FOR PUBLIC HEALTH DECISION-MAKING

The Structured Operational Research and Training IniTiative (SORT IT) for generating and utilizing data for improving public health

Many public health programmes in LMICs are “data rich but information poor”: too often, data that is relevant for improving public health is left unused on shelves or electronic servers.

The **S**tructured **O**perational **R**esearch and **T**raining **I**nitiative (**SORT IT**) is a global partnership-based initiative coordinated by TDR, the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. SORT IT seeks to make countries “data rich, information rich and action rich” thereby building health system resilience, enhancing programme performance and improving public health.

The SORT IT model combines *research training* and *research implementation* with a learning by doing approach that empowers participants and trainers.

It is well aligned to the SDG-17.18 - generating high-quality, timely and disaggregated data for informed decision-making. More on SORT IT at: https://tdr.who.int/activities/SORT IT-operational-research-and-training.

The success. SORT IT has covered twenty-five public health domains and scaled up to 93 countries and includes over 60 partner institutions with North-South and South-South collaborations. Seventy percent (70%) of completed research has reported an impact on policy and/or practice and 51% of trainees independently conduct research after one training cycle which is an indicator of capacity built.

SORT IT for maximizing data utilization for improving public health

Aim: Build sustainable operational research capacity to generate and utilize data for decision-making and improving public health in low- and middle-income countries.

How? Strong engagement with WHO country offices, national stake holders and SORT IT partners in the evidence-to-action cycle while addressing country priorities. Integrated performance targets and metrics for accountability.

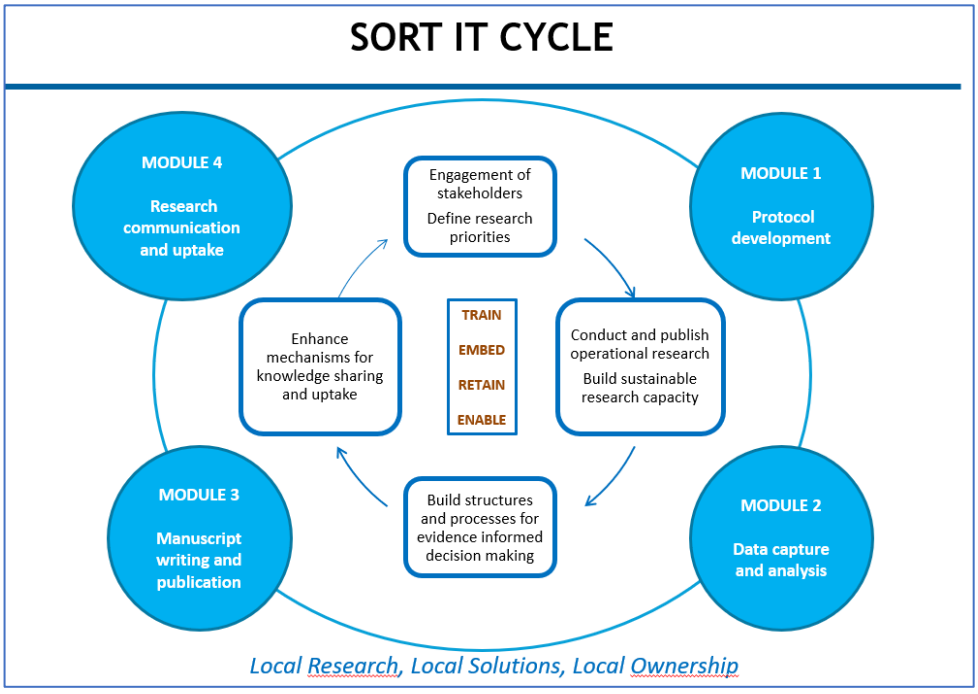
Who: Frontline health workers and decision-makers.

Desired impact: Strengthened health systems, better programme performance and improved public health.

Scientific scope: Research priorities are tailored to country priorities and TDR's focus is on catalytic initiatives in the areas of accelerating progress towards Universal Health Coverage and tackling public health emergencies.

The SORT IT cycle: The SORT IT programme is geared to catalyse the evidence-to-action cycle from defining the most relevant research to uptake of research findings. The buy-in by countries would help catalyse an approach that fosters *embedding* of those trained within institutions, their *retention* and eventual *enablement* in building the structures and processes needed for informed decision-making. SORT IT thus embraces the *Train, Embed, Retain and Enable* perspective for individuals who work within health systems. This approach is in line with WHO's Thirteenth General Programme of Work, 2019–2023. *Fig. 1 depicting the SORT IT cycle from earlier in this report is repeated here*.

The SORT IT research cycle



Overall summary of progress in 2021

We made progress in five key areas: 1) The *deployment of digital innovation* - a SORT IT online platform to restart and propel SORT IT activities; 2) Using "real-time operational research for real-time action" in tackling public health emergencies; 3) accelerating Universal Health Coverage in relation to AMR, hard-to-reach populations and NTDs; 4) Improving research *communication;* and 5) *franchising* the SORT IT model and building *global partnerships.*

Value for money of the SORT IT project

Good ***value for money*** of SORT IT continues due to TDR's established convening power, global networking capacity and use of SORT IT technical know-how and the trained human resource pool that was built over the past decade. The deployment of an innovative online training platform increased *efficiencies*, by allowing projects to continue and at lower costs, despite being significantly delayed due to COVID-19.

A novel approach was pioneered to expedite the research publication process by proactively accelerating the journalistic processes. To promote *effectiveness* and *impact*, we have continued to engage with those expected to use the research results including WHO country offices and disease control programmes.

These achievements have reinforced TDRs coordination role, improved TDR partnerships and elevated TDRs position to new levels of strength and international recognition.

Details of achievements in 2021

The five key areas of progress are elaborated below:

1. Digital innovation – a SORT IT platform for research during COVID-19

In 2021, we championed the development and deployment of a dedicated SORT IT online training platform which allowed us to restart and propel SORT IT research activity and trainings in 2021, despite being significantly delayed due to COVID-19 restrictions. Developed with a SORT IT partner in Armenia (TB-RPC), this platform has also allowed us to network with 26 countries and bring subject matter experts to link in for a one- or two-hour sessions that in the past, would have resulted in travel to countries. It has also reduced costs and improved efficiencies.

Using this innovation, 35 research studies on AMR from five countries in Asia and Africa were completed while 51 more projects on AMR, NTDs and Public Health Emergencies are underway in Bhutan, Colombia, Ecuador, Ethiopia, East Timor, India, Nepal and Sierra Leone. Allowing for online and "hybrid" training models, the SORT IT platform brought together individuals from WHO country offices in six countries and 60 partner institutions.
Available at: https://drive.google.com/file/d/1IpDfzF8_DFHvKP0AFMWxxwv8rUO5lgKG/view?usp=sharing.

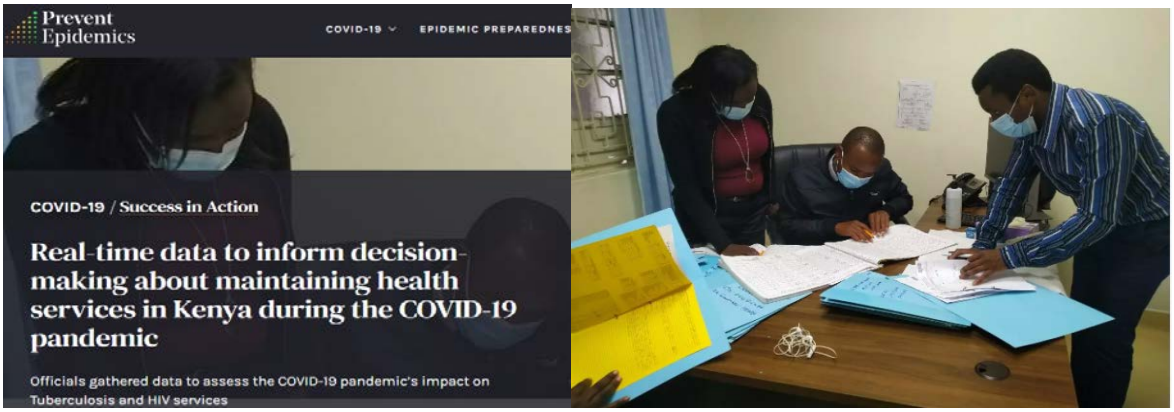
A SORT IT virtual platform was developed and deployed to provide an efficient means of continuing research and training in Africa, Asia and the Americas despite COVID-19 related restrictions

[Photograph: Screenshot of the virtual SORT IT platform.]

2. Tackling public health emergencies with "real-time operational research"

The COVID-19 pandemic has caused enormous disruptions to essential health services. A WHO "pulse" survey revealed that 90% of countries faced continued disruptions to essential services and 42 percent of households missed health services highlighting the need to quickly adapt health services to ensure continued care during a such public health crisis.

WHO–GTB worked with a coalition of partners to monitor monthly changes in TB and HIV services in Kenya, Malawi and Zimbabwe. This real-time data gave decision-makers valuable intel on how to adapt services to the COVID era. This resulted in real-time programme improvements. For example in Kenya following a slump, the number of people with presumptive TB symptoms increased by 58% and HIV testing increased by 23%. More details are available at https://bit.ly/2YMNxaZ.



[Photographs: Health workers collecting data in TB and HIV programmes to get valuable intel on how to adapt services during COVID-19.]

"Through our study, we found that real-time research can provide facilities with useful evidence to act in real-time to respond to the challenges posed by a public health crisis." Irene Mbithi, Kenya country coordinator

In September 2021, in collaboration with the Global Outbreak and Response Network and SEARO, we launched a SORT IT programme which brings us to the forefront for assessing the health system impact of COVID-19 and building health system resilience in Bhutan, East Timor, India and Nepal.

[Photographs: SORT IT online for tackling public health emergencies in Bhutan, East Timor, India and Nepal.]

During public health emergencies, operational research must enhance capacity to provide valuable intel to adapt essential health services through "real-time operational research".

3. High-quality policy/practice relevant research for Universal Health Coverage

SORT IT focuses on niche areas that are on the cutting edge of accelerating efforts towards achieving Universal Health Coverage and progress towards the SDGs. The key areas of TDR involvement include antimicrobial resistance (see E.R.1.1.4), neglected tropical diseases (including snake bites) and hard-to-reach populations.

Besides the main thrust on tackling AMR (US$ 10 million), 18 policy-relevant research studies on tackling neglected tropical diseases and snake bite are underway in Ethiopia and Kenya. This work is done in collaboration with the Moi Teaching and Referral Hospital, Moi University, Eldoret Kenya, Kenya snakebite research and intervention centre, the Ethiopian Public Health Institute in Addis Ababa and WHO country offices. Collaboration with the Africa CDC is in line with trying to develop a hub for SORT IT in the African region.

[Photographs: Data collection team (led by SORT IT alumni) and field data collection to determine health and economic burden of snakebites in endemic counties in Kenya.]

Accelerated publishing of research: During 2021, we piloted an accelerated system for publishing research evidence in a record time of 10-12 weeks by a) proactively accelerating the internal journal review processes and b) providing structured support to the researchers.
https://www.mdpi.com/journal/tropicalmed/special_issues/AMR

4. Communicating research findings with a KISS – Keep It Short and Simple

Effective communication of research findings is needed to bridge the gap between researchers and decision-makers and influence individual and community behaviour that improves public health.

To improve research communication, TDR and partners developed a new SORT IT module aimed at providing researchers with the tools and skills needed to effectively communicate their research findings with a KISS – keep the information short and simple. Using SORT IT projects in Ghana, Nepal, Sierra Leone and Uganda this was successfully piloted to produce four outputs.

1. A *communication plan* targeting decision-makers and stakeholders.
2. A *one-page plain language evidence summary* with key messages, the implications and recommendations.
3. A *PowerPoint presentation* of ten minutes for use at conferences and a lightening presentation of three minutes for use with national decision-makers.
4. *An elevator pitch* oral presentation (30–60 seconds) for use in opportunistic one-to-one conversations with stakeholders.

"If research is to have impact and change health outcomes for the better, the research findings should be translated into recommendations that can shape policy and/or practice and SORT IT is invaluable for this purpose." — Dr Thomas Samba, Chief Medical Officer, Ministry of Health and Sanitation, Sierra Leone

"The SORT IT training serves a great need to present research findings in a simple manner, so that we the decision-makers can quickly and easily grasp the key messages and take action to address urgent health issues." — Dr Madan Kumar Updhyaya, Chief, Quality Standards and Regulation Division, Ministry of Health and Population, Nepal.

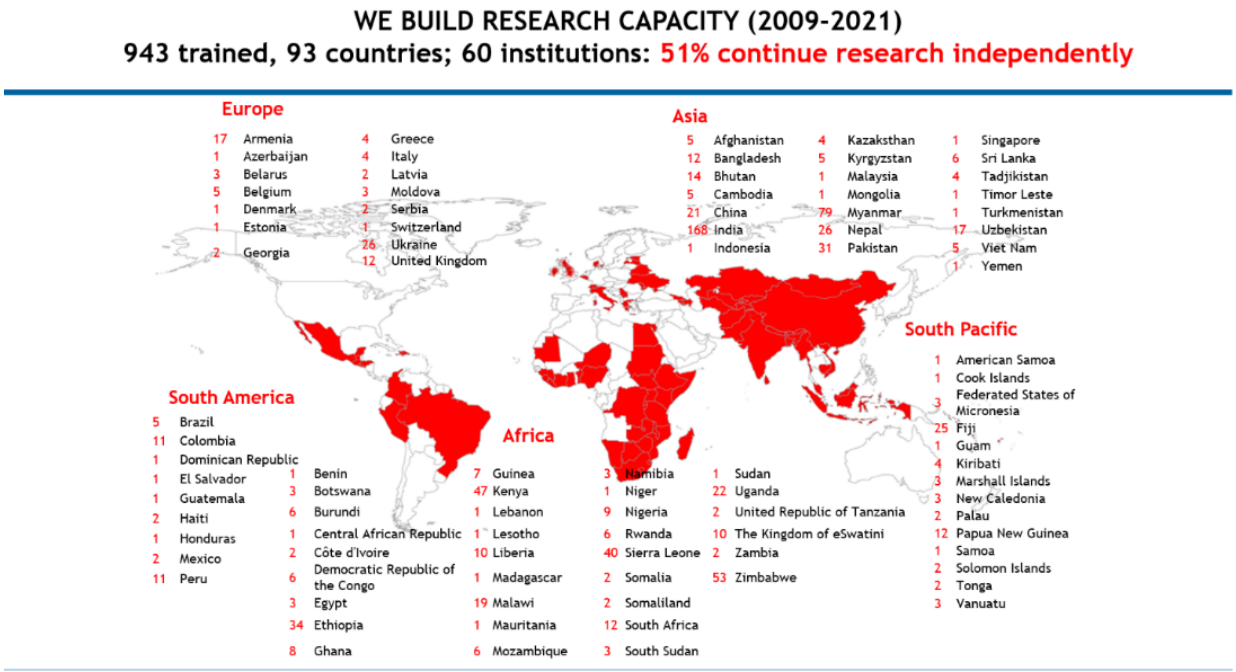
5. Effective SORT IT franchising and building global partnerships

Effective SORT IT franchising was achieved through various tools: Standard Operating Procedures for the organization and conduct of SORT IT courses, online resources (e.g. video lectures), standardized reporting metrics; collaboration with 60 partner institutions within the SORT IT global partnership.

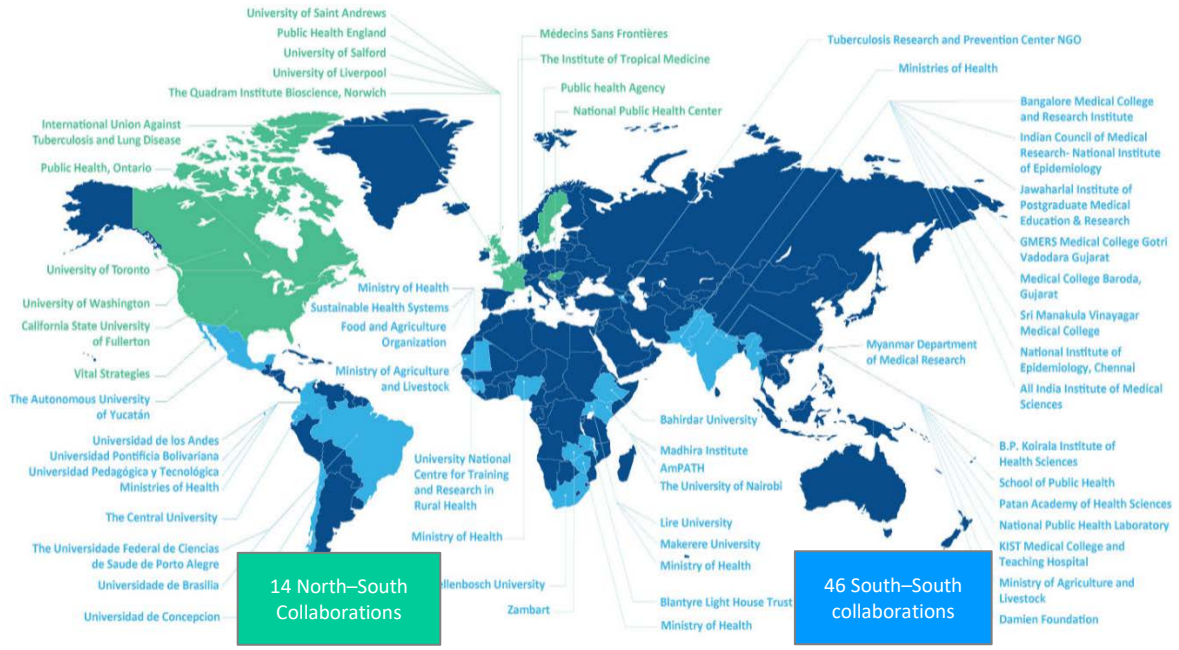
SORT IT expansion. By September 2021, SORT IT was scaled up to 93 countries, with 742 cumulative publications in five languages (English, French, Portuguese, Russian, Spanish). Sixty-nine percent of research report an impact on practice and/or policy. In 2021, there were 43 publications in which LMIC authors constituted 98% of first authors (up from 61% in 2017). Roughly fifty percent of SORT IT alumni continued new research projects independently which is evidence that sustainable capacity is being built. In an impact assessment survey of TDR projects conducted in the EECA region in 2021, 80% of 26 research studies had ground-level influence on policy and practice. These were "locally generated research, to generate local solutions with local ownership".

Building networks and equitable partnerships. Through TDR's convening power, eight WHO country offices and 60 SORT IT partners including 46 from the south and 26 countries, were engaged with SORT IT trainings. This has boosted North-South and South-South partnerships (global engagement) and demonstrated TDR's capacity to effectively mobilize institutions, expertise and build communities of practice at a global level ("think global, act local"). Figures 6 and 9 illustrate these partnerships.

Figure 9 Geographic scale up of SORT IT projects (2009–2021)



[Figure 6 repeated here: North-South and South-South collaborations]



Through TDR engagement, 60 institutions in 26 countries are part of the global SORT IT partnership highlighting TDRs global engagement.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

Through TDR's convening power, eight WHO country offices and 60 SORT IT partners including 46 from the south and 26 countries, were engaged with SORT IT trainings. This has boosted North-South and South-South partnerships (global engagement) and demonstrated TDR's capacity to effectively mobilize institutions, expertise and build communities of practice at a global level ("think global, act local") including academic institutions, non-governmental organizations , various WHO departments and ministries of health. Details covered under achievements above.

Estimated leverage created by this project:

In addition to the AMR budget of about US $10 million, we also received US$ 300,000 from USAID, US$ 140,000 from Australia, US$ 120,000 from Luxembourg and leveraged a further US$ 120,000 through co-financing with partners.

Gender aspects and vulnerable populations:

In 2021, 48% of trainees were women. Besides AMR with 62 projects underway, TDR-supported SORT IT courses involving 26 projects focused on tackling Public Health Emergencies (Bhutan, East Timor, Nepal, India) and on neglected tropical diseases (in Ethiopia and Kenya). These projects are focused on LMIC countries where the burden of diseases and AMR is high, particularly for the rural poor who have limited access to health facilities and antibiotics. We specifically target vulnerable groups as a priority for research topics with several research projects focused on neonates and women wherever possible. Topics related to "One Health" such as improving water quality, waste management, rational use of antibiotics in animal husbandry will have a wider benefit on the lives of poor communities. Participant selection processes have promoted gender and geographic equity and we promote LMIC first authorship in published outputs. The selection of Sierra Leone for AMR-SORT IT was a deliberate choice; the country being a vulnerable and fragile state recovering from decades of civil war. Similarly, focusing on cross-border AMR activities in Colombia and Ecuador target vulnerable populations

Training:

In 2021, besides (AMR with 62 projects) there were three SORT IT trainings with 28 participants. These included projects in Ethiopia, Kenya and online SORT IT was conducted for Bhutan, East Timor, India and Nepal. The SORT IT model uniquely combines research training, research implementation and builds communities of practice (global engagement) with an apprenticeship approach that empowers both participants and trainers. Wherever possible, each research project is used to simultaneously implement four layers of training namely: 1) Training of frontline workers and programme staff; 2) Training of SORT IT alumni as trainers; 3) Training of academia as trainers; and 4) Training of WHO country staff as trainers. The average numbers trained per research study is 3.0, which adds to the value for money.

Number of advanced degrees:

In 2021, 12 operational research officers have started work in 2020 and are reinforcing research activities at country level. They may pursue PhDs through publications

Strengthened institutions or networks:

The SORT IT partnership now includes over 60 implementing partners and a network of close to 1000 alumni and 300 mentors. Partners include WHO country offices, disease control programmes, academia and NGOs.

Publications:

In 2021, there were 43 publications. LMIC authors constituted 98% of first authors (48% women) and 94% of last authors. 35 recent AMR studies from Ghana, Myanmar, Nepal, Sierra Leone and Uganda published in the Tropical Medicine and Infectious Diseases and Public Health Action Journal

- https://www.mdpi.com/journal/tropicalmed/special_issues/AMR
- https://theunion.org/PHA-preprints

Cumulatively since 2009, there has been 742 publications by the SORT IT partnership in 50 journals (impact factor 0.4–19) and in five languages (English, Russian, Spanish, Portuguese and French).

Related news:

Updated SORT IT website with open access to all publications: https://tdr.who.int/activities/SORT IT-operational-research-and-training

Real-time data to inform decision-making about maintaining health services in Kenya during the COVID-19 pandemic. https://bit.ly/2YMNxaZ

Communicating research findings with a KISS – Keep It Short and Simple. https://tdr.who.int/activities/SORT IT-operational-research-and-training/communicating-research-findings

Operational Research to tackle AMR in Colombia and Ecuador. https://tdr.who.int/newsroom/news/item/27-09-2021-operational-research-to-tackle-antimicrobial-resistance-(amr)-in-colombia-and-ecuador

Results dissemination and uptake:

Roughly 69% of SORT IT studies report an impact on policy and/or practice. Researchers also benefited from a new SORT IT training module on 'effective communication of research findings', maximizing the opportunities for research uptake. Please see evidence summaries of completed AMR research at https://tdr.who.int/activities/SORT IT-operational-research-and-training/communicating-research-findings

Plans for 2022–2023

- Given the delays incurred due to the COVID-19 pandemic, the principal focus will be to catch up on the effective implementation of the AMR - SORT IT programme in Asia, Africa and Latin America.
- In close collaboration with WHO country and regional offices, we will support "catalytic initiatives" linked to UHC and enhance TDR leadership, visibility and funding. Our focus would be Public Health Emergencies, hard-to-reach populations and NTDs (including snake bite). We will strengthen existing hubs for operational research on marginalized and key populations in the EECA region, Francophone Africa and Ethiopia (with the Africa CDC).

- We will bridge the Francophone SORT IT gap with the support of WHO country officers and leverage with SORT IT partners and the Francophone regional training centre in Senegal.
- Along with implementing partners, we will continue franchising for expansion of SORT IT for UHC while maintaining quality standards.

ER 1.1.8: MAXIMIZED UTILIZATION OF SAFETY INFORMATION FOR PUBLIC HEALTH DECISION-MAKING

TDR actively promotes safety evaluation, working with countries to improve systems to monitor and effectively use drug safety data to strengthen evidence informing treatment guidelines and improve patient outcomes. A major limitation of current efforts to ramp up access to medicines is the lack of monitoring programmes of similar scale to evaluate potential safety issues. In many disease-endemic countries, safety monitoring systems are still weak and underreporting is a persistent problem.

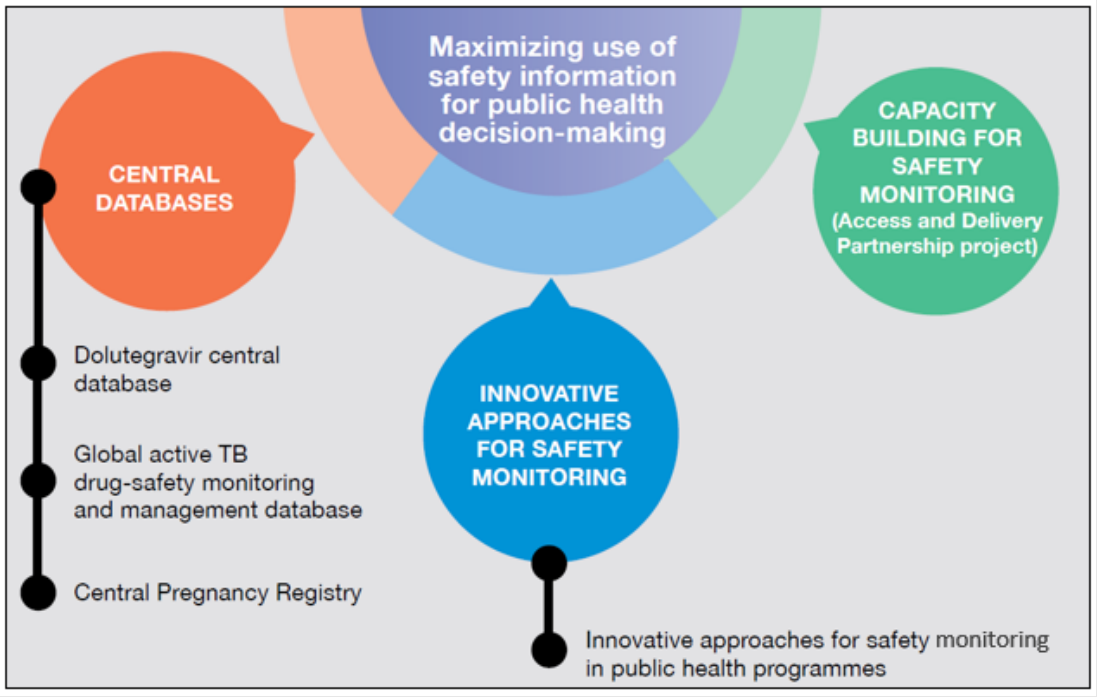
In addition, when existing, the data collected is often not optimally used and sharing and pooling of data needs to be promoted to improve understanding of risks related to medications. This is a multi-pronged programme aimed at piloting ways to generate new evidence on the safety of therapeutic interventions. TDR works with countries to improve country capacity for safety monitoring and to pilot implementation research through new approaches to embed safety monitoring in public health systems.

In parallel, TDR works with other WHO programmes to set up data-sharing initiatives and central databases. In collaboration with WHO HIVAIDS, a pregnancy drug safety database was developed which pools country data issued from national or local pregnancy exposure registries to document risks to mothers and their babies following drug exposures during pregnancy. On a similar project, TDR works with the WHO–GTB to develop a global database to pool and consolidate safety information on medications used to treat MDR-TB in different countries, called the global aDSM database. More recently TDR also collaborated with WHO–HIV/AIDS to set up a new database for antiretroviral (ARV) toxicity monitoring. This ER had three main areas of work in the 2020–21 biennium:

- The central databases for safety data (central database for pregnancy exposure registries, global aDSM database for TB drugs and central ARV database);
- Strategies to improve safety monitoring in public health programmes (Fig. 8) and optimize acquisition and analysis of safety data; and
- Capacity building for safety monitoring in scope of UNDP's Access and Delivery Partnership (ADP) project focusing on building capacity to facilitate access and delivery of new health technologies for TB, malaria and NTDs.

This work is funded by core funding and designated funds from the UNDP for the Access and Delivery Partnership (ADP) project.

Figure 10. Overview of utilization of safety information projects: ER 1.1.8



Progress in 2021

1. Phasing out

It was agreed at SWG meeting in October 2020 that TDR involvement in the management of the safety central databases will end in 2021. The central databases for safety data were implemented as pilot projects, to see feasibility, constraints and benefits of such tools. The prospect was never for TDR to run such databases in the long term. The handover process has started in early 2021, with four meetings organized with TDR and the WHO pharmacovigilance unit, the WHO–HIV department (one meeting), the WHO–GTB (one meeting) and the Uppsala centre (one meeting). The last version of the data-sharing agreements (V3_04062018) and data dictionaries were shared with WHO pharmacovigilance unit (a newer version has been adapted in July 2021 and cleared by TDR and WHO legal officer). It was agreed with the WHO–HIV department who initiated the project (pregnancy registry and ARV (DTG) central database) and the WHO pharmacovigilance unit to conduct a full evaluation of the process of setting up and managing the central databases. The external assessment is expected to be completed by the end of January 2022. The scope of the evaluation was broadened so as to include other data-sharing experiences by TDR and draw lessons learned from these experiences that have different sharing models. Discussions about the handover will resume after the evaluation in early 2022.

2. Central databases for safety data

Central database for pregnancy exposure registries

The central pregnancy registry for epidemiological surveillance of drug safety in pregnancy collects data from pregnancy exposure registries and/or birth outcome surveillance projects, recording data on exposure during pregnancy and pregnancy outcomes, including birth defects.

While the project was initiated in 2015 in view of the need for data on the safety of antimalarials in the 1st trimester and antiretrovirals throughout the pregnancy, the data base can accommodate all drugs/vaccines.

The content of the central pregnancy registry was reviewed (with help from Biomedical firm that hosts the database for an annual fee). As of January 2021, it contains data from 1772 births from four African countries that tested training material developed by WHO (the WHO pregnancy register protocol) during a pilot study in 2010–2012. Although it seems that no WHO department (HIV or maternal health) is actively promoting the use of pregnancy registers in LMIC, TDR followed up with one potential data provider and obtained signed data-sharing agreements for the Central pregnancy registry from: Botswana/Harvard (Tsepamo project) (May 2021). Their dataset was shared in November 2021 (around 119 000 individual datasets) and data is being mapped before upload in the central registry.

TDR continued its efforts to promote the Central pregnancy registry and presented the work at the annual sSCAN (sub-Saharan African Congenital Anomalies Network) webinar on Teratogens and Pharmacovigilance held on 28 November 2021.

Global aDSM database for TB drugs (for active TB drugs safety monitoring and management)

The WHO central database for safety monitoring of anti-TB drugs facilitates data sharing and pooling of safety data issued from national or local databases developed in the scope of aDSM and hence enhances the detection of new signals and informs future updates of global policies on the use of anti-TB drugs. aDSM was expected to provide information about rare and as yet unrecognized adverse effects and drug–drug interactions. This database was designed to pool country data on Serious Adverse Events (SAEs) presented by patients treated with new anti-TB drugs for MDR-TB.

The project was initiated after WHO–GTB identified an urgent need for additional data on the safety of new TB drugs and was being implemented in collaboration with WHO–GTB. TDR provides technical expertise and overview of the project.

Following the analysis of the data from the aDSM central database commissioned by the WHO–GTB and the WHO Pharmacovigilance Department, WHO–GTB decided to discontinue the aDSM central database in early 2021. The implementation of the strengthened pharmacovigilance of MDR-TB regimens in countries should still be continued and aDSM implemented at country level. The national pharmacovigilance center in each country is expected to take over the reporting to Vigibase (the WHO international database for the surveillance of drugs safety). While the access to the data will likely be slower and more limited in some instances, it is felt that the analysis of the current cohort will already provide a good overview of the safety profile of the drugs.

Following the decision to discontinue the database, TDR shared copies of all data-sharing agreements signed by data providers with the WHO pharmacovigilance unit. TDR informed WHO colleagues of the need to seek advice from the WHO legal office before using or transferring the data sets (for example to the Uppsala center).

Central database for safety monitoring of dolutegravir and antiretrovirals in the general population

In the last one to two years, there have been more and more discussions about potential flags that some ARVs taken in the long term could be associated with specific toxicity (in particular, a potential effect of some ARVs on weight gain, metabolism of lipids and carbohydrates). There was a gap in drug toxicity monitoring and TDR led the development of a specific ARV central database, funded by WHO–HIV/AIDS. Discussion and guidance have been provided to different groups to facilitate data sharing. Two additional formal agreements have been signed in 2021. Agreements signed late 2020 and 2021: Eswatini MoH (November 2020); Uganda/Baylor (December 2020); Malawi/Epicentre (May 2021); Botswana/Harvard (Tsepamo project) (July 2021).

In July 2021, only Uganda/Baylor transferred their dataset for the ARV central database. Mapping, transformation and uploading of the data in the central database is ongoing. The process for obtaining the data-sharing agreements has shown to be long. For example, for Epicentre/Médecins Sans Frontières (MSF) (Malawi project), the process took up to nine months with multiple amendments of the agreement which was reviewed by both Epicentre legal officer and WHO legal officer. The version of the data-sharing agreement signed by Epicentre/MSF is compliant with GDPR requirements.

TDR participated in the Working Group "Epidemiological surveillance of drug safety during pregnancy", one of the five groups set up by WHO–HIV department and IMPACT Network for the project "Approaches to enhance and accelerate study of new drugs for HIV and associated infections in pregnant women". The overall objective of this initiative was to redefine the optimal approaches to studying the safety and efficacy of new ARVs during pregnancy and identify the next steps for creating materials and methods to support the implementation of such studies. The specific objective of the working group on epidemiological surveillance, co-moderated by TDR, was to map activities on active surveillance of drug safety during pregnancy, define new approaches in relation to the use of newer ARVs in pregnancy, define contributions by stakeholders from all sectors -- including data sharing in a central database and a roadmap for action. Participants represented academia, regulatory authorities, companies and civil society. TDR's contribution to the working group also included bibliography search, presentation of TDR experience with standardized protocols, preparation of working group sessions and taking minutes of the meetings.

3. Innovative approaches to safety monitoring at community level

Following a TDR call for proposal in September 2019 on Research on challenges and opportunities for pharmacovigilance in LMICs and an extensive internal review process involving the WHO pharmacovigilance unit, four proposals were shortlisted. They were submitted for review to SWG which approved two of them for funding early October 2020, see Table 5. The new proposals for research to strengthen pharmacovigilance in public health programmes were selected with focus on:

- Approaches that have the potential to be sustainable and being scaled up.
- Link with national control pharmacovigilance centre.

New research projects

Table 5. Two proposals selected for funding for ER 1.1.8

Institution	Country	Project title
FDA Philippines	Philippines	Understanding underreporting of adverse drug reactions (ADRs) in the Philippines
Global Health Uganda Ltd (GHU)	Uganda	Development and implementation of a patient-centred peer support intervention to promote the detection, reporting and management of ADRs among people living with HIV in Uganda

The two proposals identified are very promising in terms of identifying strategies and tools that could be applied much more broadly in the future in other LMICs. They intend to test/evaluate new e-health tools that have been developed recently, are supported by WHO, and are likely to be deployed in several countries; so the studies will help make sure the tools are implemented in the best way possible to serve public health needs.

In 2020/2021, TDR provided technical support to the Principal Investigators to develop a full protocol based on the original proposal, data collection tools and informed consent forms. Some changes on the proposal objectives were made as there has been a one-year delay between the submission of the proposal and the clearance from the TDR SWG. After both protocols were approved by their national ERBs, documents were completed and submitted to WHO–ERC.

The Philippines research project is a cross-sectional expanded knowledge, attitudes and practices survey of health workers from a wide range of regions both from public and private sectors. The study will also pilot and evaluate the use of eReporting module for VigiFlow, looking at its use, feasibility and acceptability.

The Uganda research project aims at pilot testing a peer-support intervention to promote the detection, reporting and management of ADRs among people living with AIDS and receiving DTG-containing ART and/or IPT. The effectiveness of peer support will be measured as well as the identification of barriers and facilitators for the peer support.

As of December 2021, the status of the two research projects is:

- ***Philippines.*** Title: Understanding underreporting of ADRs in the Philippines. Status: WHO–ERC clearance received on 4 June 2021 after expedited review. TSA done and project ongoing. Project will be concluded in first semester of 2022.
- ***Uganda.*** Title: Development and implementation of a patient-centred peer support intervention to promote the detection, reporting and management of ADRs among people living with HIV in Uganda. Status: protocol approved by WHO–ERC and project has started. Project will be concluded in first semester of 2022.

4. Capacity building for safety monitoring (UNDP Access and Delivery Partnership project)

Different capacity-building activities were organized or funded under the scope of the ADP project in Burkina Faso, Ghana, Malawi, Indonesia and Senegal.

The activities in each country focus on priorities identified following discussion with the national pharmacovigilance centres and national control programmes (mainly, TB, malaria and NTDs) to ensure that the activities to strengthen capacities will support access to safe drugs.

From August 2020 to December 2021, TDR participated in the ADP scale-up Phases 2, 3 and 4, providing technical support in the following focus countries: Ghana, Malawi, Senegal, Tanzania, Burkina Faso and Indonesia. An ambitious workplan for a scaled-up Phase 4 proposed by TDR in January 2021 was accepted and will run until 31 March 2022.Highlights of the ADP activities related to safety monitoring and led by TDR at regional level include:

- In order to support countries with the deployment of COVID-19 vaccination campaigns, TDR's work in safety monitoring shifted its focus from general pharmacovigilance to vaccine safety monitoring. TDR contributed to the development of an interactive e-learning module on COVID-19 vaccine safety, available in both French and English, which was given in two sessions for French-speaking and English-speaking African countries and Middle East countries; two ADP-focus countries, Senegal and Burkina Faso, received additional country-tailored technical assistance to develop national tools and a training plan [newsletter on TDR website].

[Photographs: Administering COVID-19 vaccines in Guinea. (Credit: WHO/A. Jallanzo; and TDR website screenshot.)]

- TDR conducted a situation analysis of the active TB drug safety management and monitoring (aDSM) implemented by the 27 countries. Results were presented and discussed at a two-day regional hybrid workshop attended by coordinators of national TB programmes from 27 countries from West and Central Africa and Indonesia as well as key partners such as WHO–GTB, WHO–AFRO region, West African Health Organization, The Union, the Damien Foundation and TDR. This was an opportunity for them to share experiences and define the remaining challenges to address to ensure adequate drug safety in patients suffering from drug-resistant TB. Results of the aDSM assessment was accepted as poster communication at the TB Union Conference held in October 2021 [see newsletter on TDR website]. In the second semester of 2021, TDR supported the development of a generic national guide to help countries of the WARN and CARN-TB network to strengthen the implementation of aDSM. TDR has provided technical support for various research projects in ADP-focus countries, such as:

Ghana: TDR initiated work with the National Medicines Programme and provided support for the development of a protocol to assess compliance of health workers to national treatment guidelines (drug audit survey). The research is under way and report should be available by early 2022.

Burkina Faso: TDR provided support to the ANDRP for the development of a research protocol to assess the use of the MedSafety app used to report ADRs. With support from the Rabat WHO CC for pharmacovigilance, Burkina Faso is getting ADP and TDR support to develop a five-year action plan to strengthen pharmacovigilance in the country.

Malawi: TDR supported the Department of Pharmacy of the College of Medicine of Malawi to a conduct a Knowledge, Attitudes and Practices (KAP) survey that provided useful information to the Pharmacy and Medicines Regulatory Authority (PMRA) on the positive impact of past capacity building on ADR reporting practices. Dissemination of results is planned in early 2022.

Senegal: TDR supported the MHSA in the design and development of a study on the effects of the COVID-19 pandemic on the delivery of national disease control programmes for malaria, TB and NTDs. The aim was to quantify the impact on human resources, management, the availability of medicines and diagnostics and patient care. The study is now completed and analysis should be completed in January 2022. Findings will inform policy measures, such as an evidence-based risk mitigation plan for Senegal. The study will enable the piloting of the data collection methodology, which could provide useful lessons and a model to be replicated in other countries. With TDR support, Senegal pharmacovigilance national authorities have completed the revision of all reporting tools in 2021.

[Photographs: COVID-19 vaccine safety monitoring training session in Senegal in June 2021. (Credit: Senegal Directorate of Pharmacy and Medicine).]

Remaining challenges

One remaining challenge relates to the Central databases and the expected end of TDR's involvement. As the results of the external evaluation of the central databases will only be available in early 2022, it is unlikely that TDR will be able to stop its role of facilitator for data acquirement by December 2021. The WHO–HIV department and the WHO Pharmacovigilance department have requested to see the findings of the evaluation to define how to proceed with the handover and taking over all work related to the central databases.

Contributions towards TDR key performance indicators

Partnerships and collaboration:

WHO control programmes at HQ: in particular, the WHO–HIV and WHO's Global TB Programmes.

- Countries involved in safety data collection which are contributing data to the central databases.
- UNDP, WHO (strengthening regulatory capacity) and PATH are partners of ADP projects.

Estimated leverage created by this project:

US$ 100,000 (in-kind from countries and other collaborators participating to projects, in particular for data collection).

Gender aspects and vulnerable populations:

The project on pregnancy exposure registry specifically targets needs and gaps in knowledge with reference to women's health.

Strengthened institutions or networks:

Institutions within the MoHs in target countries were supported with capacity for safety monitoring through the ADP project.

Results dissemination and uptake:

- Two new e-newsletters were published on TDR's website in relation to the following ADP projects: i) one presented the results of an assessment of 27 countries from West and Central Africa on the level of implementation of active TB drug safety monitoring and management; and ii) a second e-newsletter described TDR's contribution to the development of an interactive e-learning module on COVID-19 vaccine safety monitoring.
- Presentation at congresses and conferences, use of evidence generated by the central databases as part of the review of evidence for treatment guidelines.
- Implementation of a peer support intervention to promote the detection, reporting and management of ADRs in people living with HIV in Uganda: a protocol for a quasi-experimental study- submitted for publication in BMJ open.

Plans for 2022–2023

- Finalization of the handover of the Databases
- Support to countries for communicating results of studies on safety improvement in 2021
- Continuation of supporting safety aspects for intervention delivery as a cross-cutting theme for IMP (ER 1.2.6). Concerning the ADP project, the support for safety capacity strengthening in ADP target countries will continue, under the ER 1.2.6, with more emphasis on the use of digital technology for safety surveillance

ER 1.2.1: STRATEGIES TO ACHIEVE AND SUSTAIN DISEASE ELIMINATION

The TDR IMP–SWG identified research for such strategies as big-ticket items for TDR to focus on. Currently, there are two projects within this ER:

- Visceral leishmaniasis (VL) elimination in the Indian subcontinent – aka KEP (kala-azar elimination programme); and
- Onchocerciasis Elimination in Africa.

For both diseases, TDR-managed research was critical to the tools and strategies that have allowed VL in the Indian subcontinent and onchocerciasis in Africa now being considered for elimination.

Visceral leishmaniasis elimination in the Indian subcontinent

This is a country-led, long-term project that aims to generate an evidence base for approaches and interventions to be deployed throughout the different phases of VL elimination programmes and ensures policy uptake and rollout.

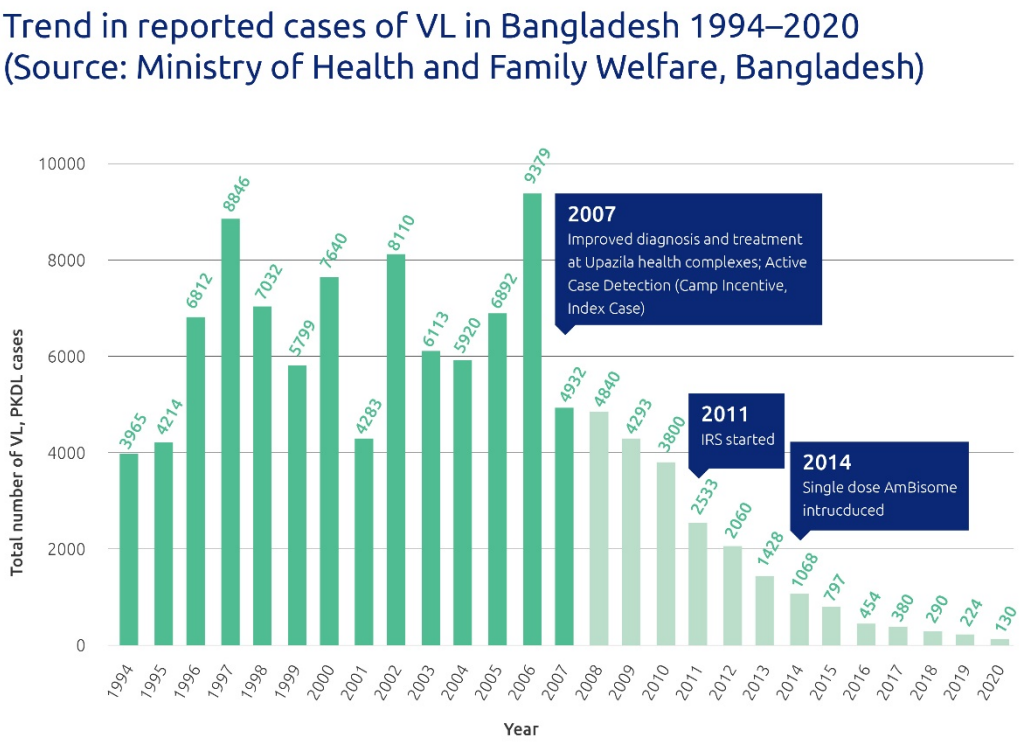
Since 2005, TDR has been working with research institutions and control programmes in the Indian subcontinent to conduct research that informs policy and practice for the elimination target of less than one case of VL per 10,000 inhabitants. One of the longest and most successful implementation research programmes at TDR, these efforts have contributed to a sharp reduction of cases. However, further investments and new approaches are required to ensure elimination is sustained. Resurgence of the disease could mean loss of all the gains and waste of all the efforts made so far to control the spread of the disease.

In Bangladesh and Nepal, the VL elimination initiative is moving from the "attack phase" to the consolidation and maintenance phase as its target of case numbers at district and sub-district level of less than one case per 10,000 population has been reached. TDR, in collaboration with WHO, has

coordinated and financed implementation research as well as clinical trials in support of the VL elimination initiative for more than 15 years. Scientific publications and a large number of documents have been developed in the process. These have largely been adopted by the national authorities and have shaped Regional Technical Advisory Group (RTAG) recommendations. This is currently being documented and a review has been published recently. India has still quite extensive VL-endemic areas but is now receiving large amounts of external funds from different sources (World Bank, DFID, BMGF and others) which will enable the authorities to move faster towards VL elimination. TDR support is therefore more focused on Bangladesh and Nepal, but is keeping the Indian authorities and VL research teams informed.

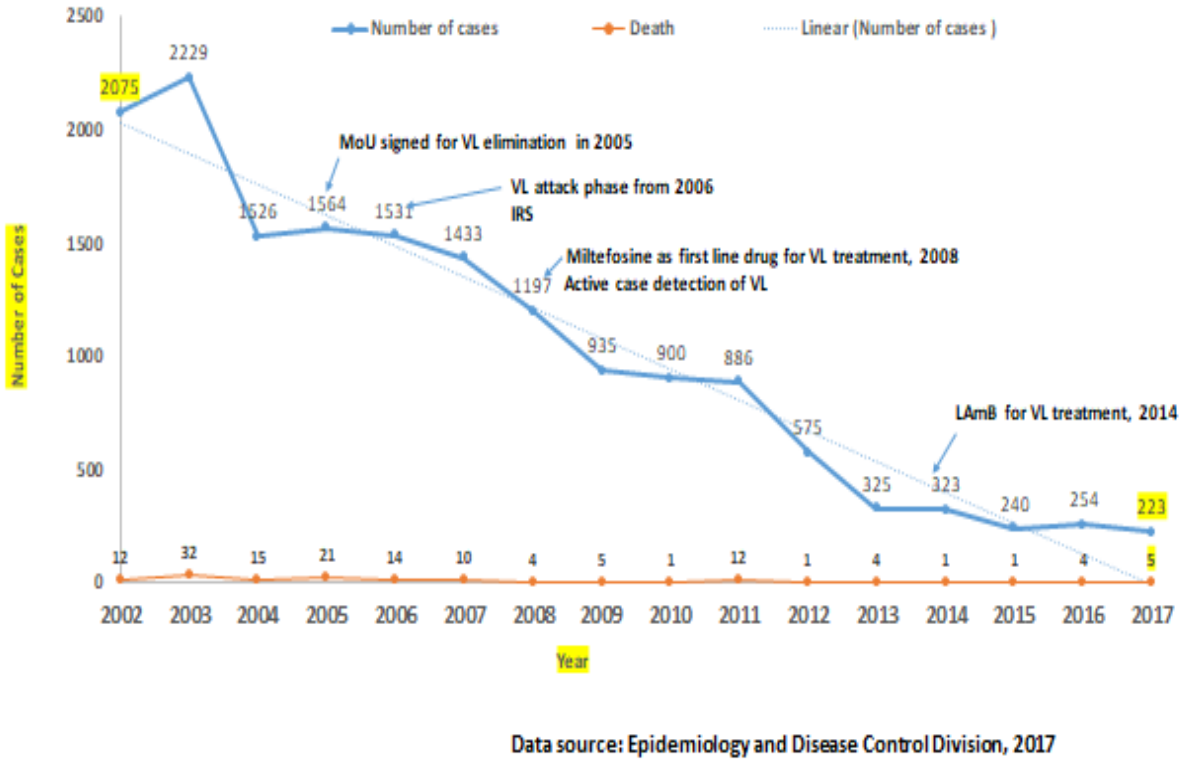
In our target countries of Bangladesh and Nepal, new challenges are coming up. With further advance towards the elimination goal, the epidemiological profile in the countries keeps changing. This will necessitate more efficient and effective methods of active case detection and vector management. In Nepal and Bangladesh, new VL cases and foci are appearing in previously non-endemic/ "non-programme" districts (see Figs. 10 and 11). This is a matter of concern. The challenge is to detect and treat new cases at an early stage before they can infect the local vector population and initiate the spread of the disease in populations with low or no herd immunity.

Figure 11. Trend in reported cases of VL in Bangladesh 1994–2020



Source: MoH, Bangladesh, 2020.

Figure 12. Trend in reported cases in Nepal, 2002–2017



Data source: Epidemiology and Disease Control Division, 2017

Progress in 2021

Several research projects have been completed and findings published (Table 6). Some of the outputs from these studies have led to practical measures. Based on the studies on emerging areas of transmission, the national Kala-azar elimination programme has initiated insecticide spraying in two confirmed new foci (Palpa and Surkhet) in Nepal in 2020. Active case detection of VL through index case based approach is being implemented. The necessary budget has been allocated for active case detection through the index case based approach for 2020 and 2021 in Nepal.

New projects in 2021

Three new studies have been initiated in 2021. These are conducted in both Nepal and Bangladesh

Study 1: *Determination of Prevalence of Post Kala-azar Dermal Leishmaniasis (PKDL) and Assessment of Treatment Seeking Behaviour of PKDL Patients in Nepal and Bangladesh*

The true burden of PKDL is not known in Bangladesh and Nepal. There is no routine active case detection of post kala-azar dermal leishmaniasis (PKDL) by the national programmes. Since both nodular and macular PKDL patients are infectious to sandflies, PKDL could be a challenge for sustaining VL elimination on the Indian subcontinent.

The study will determine the prevalence of PKDL and identify risk factors and the health care seeking behaviour of PKDL patients in these countries. The study findings will inform measures to reduce risk from PKDL as a potential source of infection. Strengthening the programme in PKDL case detection and management will contribute to validation and sustainability of VL elimination in both countries.

Study 2: *Follow-up Assessment of Visceral Leishmaniasis (VL) Treated Patients and Assessment of Impact of COVID-19 in VL Control Services in Nepal and Bangladesh.*

The follow-up assessment of treated VL cases is important to monitor the effectiveness of treatment regimens. Although follow-up of treated VL cases is integrated into the national strategy of VL elimination, compliance appears to be limited. In addition, the ongoing COVID-19 pandemic has negatively impacted provision of and access to health care services. This could have long-term effects on the VL elimination programmes in countries. TDR-supported studies are currently investigating the barriers to effective follow-up of treated VL cases. The studies will monitor treatment outcome and assess the impact of COVID-19 on VL control services and activities. The studies will generate evidence relevant to certification of the elimination of VL in both countries and contribute to strategies for better management of VL in emergency situations so that the progress in VL elimination is sustained.

Photograph: *Field research assistant conducting screening of PKDL in the Kazigram village Trishal sub-district of Bangladesh on 11 August 2021.)*

Table 6. List of publications and manuscripts in 2019–2021

Country	Title	Access	Key relevant findings
Nepal	Younis LG, Kroeger A, Joshi AB, Das ML, Omer M, Singh VK, Gurung CK, Banjara MR. **Housing structure including the surrounding environment as a risk factor for visceral leishmaniasis transmission in Nepal**. PLoS Negl Trop Dis. 2020;14(3):e0008132.	PMID: 32150578	Certain housing and surrounding environmental conditions are risk factors for VL transmission. Educational and development plans should include programmes of improvement in housing.
Nepal	Omer M, Kroeger A, Joshi AB, Das ML, Younis LG, Singh VK, Gurung CK, Banjara MR. **Role of female community health volunteers for visceral leishmaniasis detection and vector surveillance in Nepal**. Health Promotion Perspectives 2020; 10(1): 50-58	PMID: 32104657	Female Community Health Volunteers (FCHV) are playing an important role in VL elimination in Nepal through detection and referral of suspected cases and could contribute to vector surveillance. FCHVs in the VL-endemic region have a good ability to recognize VL suspects and refer to health facilities. With better feedback by the district health office on referred patients FHCVs could play an important role in patient follow-up.
Nepal	Lim D, Banjara MR, Singh VK, Joshi AB, Gurung CK, Das ML, Matlashewski G, Olliaro P, Kroeger A. **Barriers of Visceral Leishmaniasis reporting and surveillance in Nepal: comparison of governmental VL-programme districts with non-programme districts**. Trop Med Int Health. 2019;24(2):192-204. doi: 10.1111/tmi.13189.	PMID: 30565348	The median total delay from onset of symptoms to successful reporting to the Ministry of Health was 68.5 days in the VL-programme and 83 days in non-programme districts. Corrective measures are needed to maintain the achievements of the VL elimination campaign and prevent resurgence of the disease in Nepal. A clear patient referral structure, reinforcement of report notification and validation and direct relay of data by local hospitals and the private sector to the district health offices are needed to ensure prompt treatment and timely and reliable information to facilitate a responsive system of interventions.
Nepal	Banjara MR, Das ML, Gurung CK, Singh VK, Joshi AB, Matlashewski G, Kroeger A, Olliaro P. **Integrating Case Detection of Visceral Leishmaniasis and Other Febrile Illness with Vector Control in the Post-Elimination Phase in Nepal**. *Am J Trop Med Hyg*. 2019;100(1):108-114. doi:10.4269/ajtmh.18-0307	PMID: 30426921	Fever camps and insecticidal wall paint proved to be alternative, sustainable strategies in the VL post-elimination programme in Nepal. The combined camp approach offers the dual advantage of being suitable for detecting new cases at an early stage as well as providing a common platform for febrile illnesses at large, hence, being cost-effective and more sustainable. Insecticidal paint can be a valuable alternative to indoor residual spraying (IRS) for vector control particularly for the VL post-elimination phase in Nepal.

Country	Title	Access	Key relevant findings
Bangladesh	Ghosh D, Alim A, M. Huda M, Halleux C, Almahmud M, Olliaro P, Matlashewski G, Kroeger A, Mondal D. **Comparison of novel sandfly control interventions: A pilot study in Bangladesh.**	Am J Trop Med Hyg (accepted)	Comparison between insecticidal wall painting (IWP), durable wall lining with impregnated insecticide (DWL), ITN and IRS in Bangladesh showed superiority of IWP as an effective tool for VL vector control. Based on study evidence and the current sandfly control method by the National Kala-azar Elimination Programme (NKEP) (IRS in 50-60 HHs around a VL index case), the NKEP may consider IWP for sandfly control for subsequent phases of the programme where a longer duration of efficacy is required.
Nepal	Banjara MR, Joshi AB, Singh VK, Das ML, Gurung CK, Olliaro P, Halleux C, Matlashewski G, Kroeger A**. Response to Visceral Leishmaniasis Cases through Active Case Detection and Vector Control in Low Endemic Hilly Districts of Nepal.**	Am J Trop Med Hyg (under review)	Active case detection combined with vector control through IWP or IRS can support VL elimination in the consolidation and maintenance phase. Both IWP and IRS were well accepted in Nepal and the percentage reductions in sandfly density after one, nine and twelve months of interventions were 90%, 81% and 75% respectively for IWP and 81%, 59% and 63% respectively for IRS. The cost per household protected per year was US $10.3 for IRS and 32.8 for IWP, although over a two-year period, IWP was more cost effective than IRS. (Banjara et al., 2021 submitted to AJTMH).
Bangladesh	Involvement of community people is effective for sandfly density reduction by using the Insecticidal wall paint in Bangladesh	(manuscript in preparation).	Frontline health workers of Bangladesh had good knowledge about IRS and they found that IWP is a promising VL vector control tool. Efficacy of IWP on sandfly density reduction is very much higher than IRS. *P. argentipes* sandfly mortality by WHO cone bioassay test was higher in IWP than IRS intervention.
Bangladesh	Effectiveness of sandfly monitoring using sticky paper by Front Line Public Health Workers (FPHWS) during the consolidation phase of VL elimination in Bangladesh	(manuscripts in preparation)	The study showed that collection of sandflies involving FPHWS using sticky trap is feasible and could be an innovative approach for kala-azar vector survey for the consolidation and maintenance phases of the VL elimination programme.

See Table 7 for Gender and data-sharing aspects on VL and gender.

Table 7. Gender and data-sharing aspects

GENDER-RELATED ITEMS	CURRENT STATUS/ANSWERS
Research projects:	
• Project has data collected and is planning to include sex and age disaggregated data.	• Yes, in all data for VL research projects.
• Project has/is planning to include other social stratifiers/variables such as ethnicity, geographical location, migration status, sexual orientation, etc.	• Only when specifically part of the research question, not as a general rule.
• Number of operational and/or implementation research projects that ensure a gender sensitive approach (i.e. that explicitly acknowledge gender dimensions).	• Some of the research components, in particular when referring to community involvement have specifically considered the role of female community workers (as they are the focal point for VL surveillance in the communities).
Research teams:	
• Project has at least 50% of women within the research teams.	• No. Unfortunately, the gender balance is completely off, there are only males in the research team and VL meeting participants from the Indian subcontinent are usually mainly male. Only one study has a woman as PI (study on HIV seroprevalence in Bangladesh). • We have limited power on this as the only few groups working on VL are male. We keep encouraging them to engage women researchers. We could put it as a requirement that the groups we support include female co-investigators but this may not guarantee effective involvement on its own.
• Specify number of PI that are men/women/other within each project.	• Five men, one woman. (Please see above)

Study 3: *Epidemiological, Serological and Entomological Investigation of New Visceral Leishmaniasis (VL) Foci in Nepal and Bangladesh*

Emergence of new foci of transmission in previously non-endemic sites is a threat to the VL elimination effort. It is critical to verify cases, determine the magnitude, identify the main driving forces and suppress transmission as early as possible. Studies are underway to explore epidemiological, serological and entomological aspects of visceral leishmaniasis in suspected new VL foci. Community awareness of VL will be raised through training sessions and effects will be measured through KAP surveys. The results will ascertain endemicity levels and provide important insights for targeted interventions against emergence of new foci. The findings will contribute to the evidence base to inform an integrated package of strategic interventions which are critical for a post-elimination phase in both Nepal and Bangladesh. [**Photograph:** Health worker collecting blood for rK39 test for serological test in Milche village of Khanikhola rural municipality, Kavre district, 18 July 2021 (Courtesy of Megha Raj Banjara).]

Distilling lessons from the VL elimination effort in the Indian subcontinent for other regional foci:

TDR has been working together with the WHO–NTD/VL team to derive lessons from the VL elimination effort in Nepal, Bangladesh and India that could be applicable to inform strategies in other regional foci. Currently, the largest regional focus of VL in the world is the Eastern African focus (involving countries such as South Sudan, Sudan, Ethiopia, Eritrea, Somalia, Djibouti, Kenya and Uganda).

WHO–TDR has proposed a new set of ambitious NTD roadmap targets for 2021–2030. A new global target for VL elimination (as a public health problem) is proposed with a number of countries validated for elimination, defined as <1% case fatality rate due to primary VL. These new roadmaps offer opportunities to accelerate VL control in East Africa where VL epidemiology is more complex than in Asia.

[**Photograph**: Entomologists workshop for assessment of the implementation research in Dhaka, Bangladesh, 2021.]

In this regard, the success stories and lessons learned from the South-East Asian region are being documented and key implementation research areas identified to create a platform for research that would support VL elimination efforts in East African. Semi-structured interviews have been conducted with WHO regional and country offices, NTD departments of Ministries of Health and with the main partner involved in the KEP, South-East Asia and East Africa regions.

[Photographs: Households made of bamboo contribute to high risk of VL in Nepal; and Female Community Health Volunteers in a training programme in Saptari district, Nepal. (Photo: Courtesy of Megha Raj Banjara).]


[Photographs: IWP for VL vector control in Palpa, Nepal and inspection by District Public Health administrator and district VL focal persons at Saptari, Nepal (Photo: Courtesy of Megha Raj Banjara).]

A preliminary report is addressing: i) history of the KEP, elimination target and its implications; ii) epidemiology of VL in South-East Asia; iii) key drivers of success of the KEP (political commitment, coordination, intersectoral collaboration, donors and funding) and programmatic issues (surveillance, diagnostics and treatment, integrated vector management, implementation issues); and iv) operational research.

The findings will be presented to a consultative forum which will be held in early 2021. In addition, investigators in Nepal and Bangladesh are assessing the impact of implementation research on VL elimination efforts since programme inception in their respective countries. This will include desk review and stakeholder consultations to draw lessons from the past and identify current and emerging challenges. One of the expected outcomes is identification of priority research areas and potential funding sources for the coming years, in close consultation with the national programmes.

A protocol for a study on prevalence of HIV/VL co-infection in Bangladesh has received ethical approval from national ethical review committee and is awaiting WHO–ERC approval.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

WHO–NTD/VL, country offices, MoHs in endemic countries and researchers.

Estimated leverage created by this project:

In-kind contributions and direct investments into research in the three countries are difficult to assess in monetary terms. There has been direct financial support from meeting participants (about 30% of the meeting budgets).

Gender aspects and vulnerable populations:

Data on study participant, sex disaggregated pending

Principal Investigators: Five men, one woman.

Strengthened institutions or networks:

The research generates evidence that helps countries to decide on the best interventions for VL control and elimination.

Publications: Please see above, including summary of findings

Results dissemination and uptake:

Data to be published and presented at conference. MoHs are part of the research priority meetings and are informed regularly of the research in order to facilitate research uptake.

Plans for 2022–2023

- The activities planned for the biennium which have been delayed due to COVID-19 disruptions with late ethical clearance and field work interruptions will be further supported to completion.
- Further relevant research will be supported based on the recommendations from the ongoing consultation of local investigators with the national programmes, the WHO regional and country offices and other stakeholders regarding implementation programme status, progress review and identification of priority questions to sustain elimination.
- Preparatory work will be conducted to explore opportunities for applying the lessons learned in the Indian subcontinent to the Eastern African regional focus,. TDR will explore possibilities and mechanisms to support implementation research that would contribute to VL control in the Eastern African focus, which is the largest globally currently contributing to 50% of the global number of reported cases annually. The reviews of lessons from the Indian subcontinent and recommendations from the stakeholder consultations on the Eastern African focus to be organized in collaboration with WHO–NTD in early 2022 will guide the specific activities.

Onchocerciasis elimination in Africa

Progress in 2021

The focus continues to be on two major elements:

Research on tools for elimination programmes to support decisions to stop ivermectin mass drug administration

- This includes tools to: i) delineate parasite transmission zones and estimate risks of recurrence should the criteria to stop ivermectin mass drug administration be met in only one part of the transmission zone; and ii) monitor the adult worm population by estimating the minimum number of reproductively active females. As a correlate, these tools would also allow to identify the origin of any resurgence (continuing low-level transmission undetected during evaluation for stopping MDA vs. parasites imported via human or vector migration).
- Research funded to apply knowledge and methodologies previously developed for parasites in West Africa (Côte d'Ivoire, Ghana, Mali) and Central Africa (Cameroon, Congo-Brazzaville) to Eastern Africa (Ethiopia, northeast Democratic Republic of the Congo and Sudan) has been expanded to include identification of vector population genetic markers. This expansion was based on pilot data obtained by a student from the Ghanaian collaborators working on his PhD in the laboratory of the Australian collaborator.
- Furthermore, Ghanaian and Australian researchers are now collaborating on testing the utility of combining population genetics with epidemiological and entomological data for delineating transmission zones and supporting country decisions on when and where to stop MDA using a "patch model", a model that allows to estimate the epidemiological consequences of interventions applied in areas with different pre-intervention endemicity/prevalence of infection and different intervention history.
- Progress on all funded projects has been impacted in 2021 again by lock-downs and travel restrictions due to COVID-19. The Australian researchers have compensated for the delay in collection of new samples by the Ghanaian collaborators in Ghana and Cameroon by utilizing their relationships with the Ethiopian control/elimination programme and NGOs supporting onchocerciasis elimination in Ethiopia to obtain samples collected pre-COVID and for the delay in provision of entomological and epidemiological data from Ghana for use in the patch model by developing landscape modelling approaches to be incorporated into the patch model. Collection of entomological and epidemiological data from Ghana has by now been nearly

completed and shows that incorporation of landscape modelling approaches will be needed even after availability of the data from Ghana: even in a country with an exceptionally rich history of epidemiological and entomological surveys, the data national programmes have available are insufficient to support the use of the patch model to inform decisions to stop treatment without a landscape modelling component. The TSA renewals continue to combine a scientific element with a capacity-building element, i.e. a Ghanaian PhD student doing the field research part of her thesis in Ghana with funding from TDR and the second laboratory/sample analytical and population genomics modelling part in Australia, a Ghanaian post-PhD scientist who benefited from a TDR modelling fellowship in the Netherlands will work with the Australian modellers remotely to expand his modelling capacity building.

- The rationale for the need to delineate transmission zones for onchocerciasis (as well as lymphatic filariasis)2 was presented within the Coalition for Operational Research on Neglected Tropical Diseases (COR–NTD) Research links Series under the title *Delineation of transmission zones to improve the evidence base for stop MDA decisions*. The discussions were continued during the (virtual) Annual COR–NTD meeting focusing on three aspects: (a) research required to obtain "within- and across border parasite transmission zone maps", (b) proof-of-concept studies on the value parasite and/or vector genomic epidemiology can provide to National Programme Managers having to make decisions, (c) what are countries options in the meantime (given that e.g. for onchocerciasis WHO guidelines require that recommended activities be implemented in 'transmission zones', but do not provide any guidance on how to delineate transmission zones).

Research to support adoption of moxidectin in onchocerciasis elimination guidelines and policies

The 2018 US-FDA approval of moxidectin for treatment of ≥12 year-old individuals infected with *O. volvulus* is a necessary but insufficient prerequisite for inclusion of moxidectin in onchocerciasis elimination guidelines and policies. Additional data are needed.

TDR is providing technical and scientific advice to MDGH and endemic country investigators for the strategies and studies to acquire the necessary data under a donor agreement between WHO and Medicines Development for Global Health (MDGH), the not-for-profit Australian pharmaceutical company to whom WHO licensed all moxidectin data at its disposal so that MDGH could become the regulatory sponsor of moxidectin. Available at: (https://www.medicinesdevelopment.com/index.htm, and https://www.medicinesdevelopment.com/resources/wp-content/uploads/2021/04/MDGH_2020AnnualReport_FINAL.pdf).

This also covers technical and scientific advice for developing a paediatric formulation of moxidectin. Protocols for three studies, adapted to requirements for conduct during the COVID-19 pandemic, are:

- a pharmacokinetic and safety study to identify a moxidectin dose for aged 4–11 years to be conducted in Ghana (https://clinicaltrials.gov/ct2/show/NCT03962062);
- a 12500 participant double-blind study on the safety of moxidectin compared to ivermectin in individuals with any level of infection (including undetectable levels) in the DRC and other sites under selection (study 3002, https://clinicaltrials.gov/ct2/show/NCT04311671); and
- a 1000-participant double-blind study evaluating the parasitological efficacy and safety of annual or biannual treatment for two years with moxidectin compared to ivermectin in DRC has been completed, including adaptations for COVID-19. (Study 3001, available at: https://clinicaltrials.gov/ct2/show/NCT03876262).

These protocols have received approval from the applicable Ethics Committees (country, WHO) as well as country regulatory agencies and have been initiated. The studies are co-funded by MDGH and

2 The presentation used data available from this project as well as experience with resurgence post-interventions in Burkina Faso. The recording is available at: The recording is available at https://www.youtube.com/watch?v=okvlC0GK2Is

an EDCTP grant. The protocols have been made publicly available (https://mox4oncho-multimox.net/, https://mox4oncho-multimox.net/resources; and https://www.medicinesdevelopment.com/resources/).

With co-funding from MDGH and EDCTP under another grant on paediatric formulation has been initiated. The tablet formulation currently approved by the US-FDA for use in ≥12 year-old individuals was developed with a lower age limit of four years in mind, but smaller children aged 4–5 years may prefer a paediatric formulation. Furthermore, moxidectin is also being developed for scabies (without TDR input) which requires treatment of very small children.

Remaining challenges

Research on tools for elimination programmes to support decisions to stop ivermectin MDA.

- Expansion to parasites and vectors from more areas in Africa to confirm the feasibility of a pan-African panel of genetic markers vs a requirement for regional/subregional panels and establishment of related panels, development and selection of methodologies suitable for increased collaboration of laboratories without specialized equipment, selection of a platform for large-scale use.
- Further adaptation of the patch model to cope with the extent of epidemiological and entomological data available to National Programmes.
- Expanding the collaborator and funding basis for research to support adoption of moxidectin in onchocerciasis elimination guidelines and policies.
- Implementation, completion and analysis of the moxidectin studies described above. The implementation of the two studies in DRC is significantly slower than initially planned, partly because US-FDA regulatory requirements result in significant unanticipated workload for one study and, more importantly, because the prevalence of individuals with skin microfilariae densities meeting the inclusion criteria for study 3001 in the recruitment villages to date is significantly lower than during the conduct of the TDR-managed Phase 3 study in the same Zones de Santé. The nested recruitment strategy developed for study 3001 and 3002 ensures that participants screened and not qualifying for study 3001 can enter study 3002 so that neither participant, nor staff time for screening is 'wasted'. Plans on how to accelerate enrolling the necessary number of participants and where to obtain the necessary funding are being discussed.
- Additional data on the safety of moxidectin in 4-11 year-old children, a study/studies to assess safety of moxidectin in *Loa loa* co-infected individuals (the first one is in preparation by another organization).
- Discussions with WHO–NTD on data requirements for decisions on inclusion of moxidectin in guidelines have been initiated.
- Development of appropriate post-implementation moxidectin safety surveillance approaches. Discussions with countries and NGO interested in moxidectin implementation pilot projects have been initiated. These projects will not only provide the opportunity for national programmes and their collaborating NGOs to test such approaches but also provide information on how best to adapt community mobilization approaches developed for ivermectin to moxidectin.
- Finalization of the approaches being discussed by the WHO prequalification unit for how to incorporate US-FDA Stringent Regulatory Authority approval into prequalification and the Collaborative Procedure for Accelerated Registration in LMICs to support moxidectin registration in African onchocerciasis-endemic countries. Available from: https://extranet.who.int/pqweb/medicines/collaborative-procedure-accelerated-registration.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

Noguchi Memorial Institute for Medical Research, Ghana; Onchocerciasis Elimination Programme Laboratory Ethiopia; La Trobe University, Australia; University of Antwerp, Belgium; Division Provinciale de la Santé, Democratic Republic of the Congo; Medicines Development for Global Health, UK and Australia; Division Provinciale de la Santé, Democratic Republic of the Congo; Eglise du Christ au Congo, Democratic Republic of the Congo; European and Developing Countries Clinical Trials Partnership; Erasmus University, Netherlands; Imperial College, UK; Luxembourg Institute of Health, Luxembourg; Royal Veterinary College, UK; University of Health and Allied Sciences, Ghana; Centre for Research on Filariasis and other Tropical Diseases , Yaoundé, Cameroon; Institut de

Recherche pour le Développement, France.

Estimated leverage created by this project:

An US National Institute of Health (NIH) grant of US$ 3.488 million to La Trobe University, Australia and their US collaborator. The funded work contributes to ER 1.2.1 objective of development of tools for elimination programmes to support decisions to stop ivermectin mass drug administration.

An EDCTP grant of €2.834 million (US$ 3.358 million) for the development of a paediatric formulation of moxidectin to a consortium including: MDGH, UK and Australia; Luxembourg Institute of Health; University of Health and Allied Sciences, Ghana; Centre for Research on Filariasis and other Tropical Diseases, Yaoundé, Cameroon; University Hospital Bonn, Germany; University of Strathclyde, UK.

New in 2021:

Gender aspects and vulnerable populations:

The paediatric pharmacokinetic and safety study in children will also provide the data required as a basis for recommendations regarding treatment of breast-feeding women. Until such data are available, breast-feeding and pregnant women will be excluded from the moxidectin studies. Women becoming pregnant during the studies, despite commitment to contraceptives, will be followed to delivery and their infants followed up to one year of age in Ghana and DRC. Provided they consent, this follow-up will also be performed for women who became pregnant within three months of their partner receiving moxidectin.

The development of a paediatric formulation will expand the paediatric population that can take moxidectin to below four years, the lower age range for which the currently available tablet formulation was designed.

Training: Preparation for one additional student from Ghana to complete her PhD in Australia.

Publications:

TDR's website has been updated with an overview of TDR's long history of capacity building and research for onchocerciasis control: https://tdr.who.int/our-history/onchocerciasis-research-past-work-and-achievements

Related news:

https://www.medicinesdevelopment.com/news/whats-in-a-debossed-code

https://www.medicinesdevelopment.com/news/mdgh-update-june-2021

https://mox4oncho-multimox.net/

Plans for 2022–2023

- Continuation of the ongoing work.
- Creation of a multidisciplinary, multi-national working group to provide a basis for collaborative research with a broad funder base for finalizing the tools for elimination programmes to support decisions to stop ivermectin mass drug administration, specifically: i) research required to obtain "within- and across border parasite transmission zone maps"; ii) proof-of-concept studies on the value parasite and/or vector genomic epidemiology can provide to National Programme Managers having to make decisions; and iii) what are the country options in the meantime.

- Continuation of scientific and technical advice for implementation of studies of moxidectin and other activities required to support inclusion of moxidectin in guidelines and policies, registration in LMIC and implementation pilot projects.
- Publication of work and achievements to date on both aspects of ER 1.2.1 for onchocerciasis.
- Implementation of the succession plan endorsed by the SWG, i.e. preparation of pro-bono consultancy TDR contract for Dr Kuesel after her retirement in February 2023 to ensure that Dr Kuesel can continue to provide scientific and technical advice to the projects MDGH, investigators, non-governmental development organizations and country programmes wanting to pilot moxidectin community-wide use as well as the WHO–NTD department in a way that ensures that TDR gets appropriately credited for its pivotal role in these projects and TDR commitments to MDGH are met.

ER 1.2.6: OPTIMIZED APPROACHES FOR EFFECTIVE DELIVERY AND IMPACT ASSESSMENT OF PUBLIC HEALTH INTERVENTIONS

Collaborative models to create regional dynamics, synergize all partner efforts and enhance the conduct of operational and implementation research addressing national and regional research priorities

In order to improve the delivery of interventions, OR/IR embedded within country disease control programme activities is a key driver for: i) assessing the quality and effectiveness of a control programme intervention; ii) understanding the barriers for a fully effective intervention; iii) developing new strategies to improve effectiveness and cost-effectiveness; and (iv) piloting and implementing at scale successful strategies.

In WHO's End TB Strategy, endorsed by the World Health Assembly in May 2014, the role of research is distinctly recognized as a key driver for improving TB control and is the third pillar of the strategy. Until the arrival of SARS-COV-2, TB was the leading cause of global mortality from a single infectious agent, despite the availability of effective treatments. Embedded operational or implementation TB research within national TB programme activities is needed in countries to identify more efficient ways of using existing tools for controlling TB and facilitating the implementation at scale up of new tools and approaches.

While TB is the original focus, some IR/OR activities are also conducted with the malaria programmes of the West and Central Africa (WCA) region for improving the effectiveness of SMC at national, regional and global levels (see below for more details).

Activities for optimizing TB-related intervention and improving TB control

At regional level: The West and Central African Regional Networks for TB control (WARN-TB and CARN-TB)

A collaborative model was adopted in WCA to create a regional dynamic, synergize all partner efforts and enhance the conduct of operational and implementation research addressing national and regional research priorities. The WCA region is composed of a series of small countries (except Nigeria and the Democratic Republic of the Congo) facing similar challenges and thus amenable to similar solutions. These regions were selected when taking into consideration the TB burden, the country needs and the comparative levels of international support received by these countries compared to those in the eastern and southern African subregions.

It was decided, as an initial starting point, to focus the support on West Africa and, if successful, extend the initiative to Central Africa. The following phases were defined for enhancing TB research:

Phase 1: Creating an enabling environment at regional and national levels with: i) the establishment of a regional network; ii) the establishment of national TB task force for research in each country; and iii) the strengthening of the national TB surveillance systems.

Phase 2: Helping countries develop their TB research plan with the development of standard procedures for the development of this plan and its integration into the national strategic plans of the countries.

Phase 3: Facilitating countries' implementation of their TB research plan through the development and the delivery of a "learning by doing" training programme for strengthening OR/IR research capacity among NTP staff and conducting at least one research project considered as a priority by the NTP of each country.

Phase 4: Sharing the lessons learned through WCA regional workshops, the development of a sharing platform (website) and the use of the social media (Facebook, WhatsApp group).

The West African Regional Network for TB control (WARN-TB) composed of the National TB programmes of the 16 West African countries3 was established with TDR support in June 2015 and regional funding secured for its functioning for 2018–2019 (WAHO and Global Fund funding). The Central African Regional Network for TB control (CARN-TB) was established in March 2018. It is composed of 11 countries.4 The activities of both networks are coordinated by a unique secretariat hosted by the National TB programme of Benin (See activities conducted with the WARN-TB and CARN-TB in the section Progress in 2021).

An external evaluation of the WARN-TB and CARN-TB network was organized in 2021 with results expected in early 2022 (see Fig. 12 for further details).

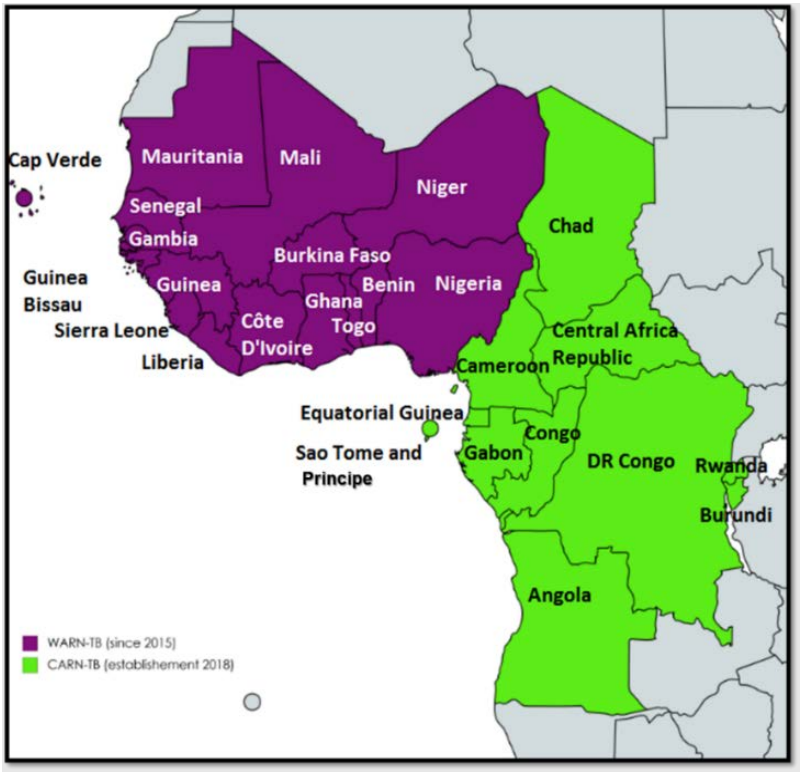
At global level: TDR started new activities to facilitate the conduct of OR/IR projects using generic research tools. Experience of collaboration with national TB programmes has shown that even if country programmes have the capacity to develop high-quality research protocols (either themselves or in partnership with local research institutions), they don't often have enough time and personnel to focus on this work and to develop the study documents in a timely manner. This is a real barrier for the NTPs to conduct more OR/IR projects.

It is therefore proposed to develop research materials (generic protocol, data collection tool, key study procedures) that can be used by the NTPs and can easily be adapted to their country context for conducting OR projects. In addition, for the same problem investigated by several countries, this initiative, if adopted and used by country programmes, will allow them to apply a more standardized methodology. Similar data could be collected (at least for the key variables) and this would ease data sharing if countries were willing to collaborate on this. This can be particularly useful for informing updates of TB guidelines.

[3] Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sierra Leone, Senegal and Togo. This network has two co-chairs (Guinea and Ghana) and an executive secretariat hosted by the NTP of Benin.

[4] Angola, Burundi, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo (DRC), Gabon, Guinea-Bissau, Rwanda, São Tomé and Principe. This network has three co-chairs (NTP Cameroon, NTP Angola and a representative of civil society of DRC) and an executive secretariat hosted by the NTP of Benin.

Figure 13. WARN-TB and CARN-TB countries



Progress made in 2021

The following activities were conducted in 2021.

1. Strengthening the capacities of WCA countries for conducting OR/IR projects addressing TB control priorities

The contact with the NTPs was essentially virtual this year, but nevertheless active support was provided to the countries for the conduct of their OR/IR projects. For the WARN-TB countries, all except Cabo Verde are actively involved in TB research. The following research projects are being conducted and supported by TDR:

- Guinea Bissau, Ghana, Togo, Mali and Burkina Faso: all countries worked together to develop a unique protocol and data collection tool using the methods and results of the RAFAscreen5 project that was conducted in Benin, Guinea and Senegal. This research project aims to assess the feasibility, acceptability and cost of implementing a new TB screening strategy in HIV patients and introducing latent TB infection (LTBi) treatment in HIV patients.
- Nigeria: Assessment of the feasibility, acceptability and cost of implementing TB screening strategy in outpatient clinics.
- Gambia: Assessment of the feasibility, acceptability and cost of implementing TB screening strategy for diabetic patients.
- Mauritania and Niger: Evaluation of TB barriers for screening/managing Nomadic populations.
- Senegal: Assessment of the feasibility, acceptability and cost of implementing TB screening strategy in Children integrated in national nutritional campaigns.

[5] More information on this project is available at https://www.solthis.org/fr/projet/rafascreen/.

- Côte d'Ivoire: Assessment of the feasibility, acceptability and cost of implementing TB screening strategy in children integrated in national vaccination campaigns.
- Guinea: Assessment of the feasibility, acceptability and cost of implementing a TB screening strategy in collaboration with private pharmacist.

All these research projects are finalized or are about to be finalized. For 2021, the objective is to communicate the study results within the WARN-TB/CARN-TB network, in international congresses and in peer-reviewed journals. TDR and The Union are investigating the possibility to have a special series on research projects evaluating TB screening strategies and translation of the papers in French (funded by The Union). All mentors supporting the NTPs are actively involved to get a first draft of the papers by the end of Q1 2021.

For the CARN-TB countries, all countries have defined their TB research priorities. The following research projects are currently being conducted:

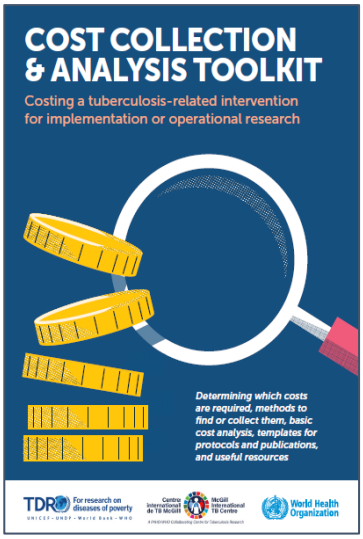
- The NTPs of Chad, Congo, Gabon, Equatorial Guinea and São Tomé and Principe worked together on a similar research protocol to define the patients and health system factors that explain the high percentage of patients lost to follow-up in their respective TB programmes.
- The NTP of the Democratic Republic of the Congo worked on the introduction of a Short all-oral regimen for the treatment of patients suffering from MDR-TB.
- The NTP of Burundi: evaluation of the feasibility, acceptability and effectiveness of an active case finding strategy among contacts of MDR-TB patients.
- The NTP of Angola: OR to understand the factors explaining the low percentage of TB patients screened for HIV in Angola.
- The NTP of Cameroon: OR to understand the gap between the number of patients diagnosed with MDR-TB and the number of patients put on MDR-TB treatment every year and the barriers to the initiation of MDR-TB treatment in Cameroon.
- The NTP of Central African Republic: IR to evaluate the feasibility, acceptability and effectiveness of systematic clinical and bacteriological/molecular TB screening in HIV patients (research protocol similar to the one used by the WARN-TB countries).

WARN-TB/ CARN-TB evaluation: In late 2021, an evaluation of the WARN-TB and CARN-TB network by external evaluators was organized to provide proof of concept that support for operational research can improve TB control and to what extent. The evaluation aims to:

- assess current progress of the network against its stated objectives;
- assess and describe the impact of operational research capacity building on TB control in region; and
- identify and describe strengths and challenges of the network to inform future adaptation/modification as required.

The evaluation methodology includes both process and impact level evaluation: process evaluation will be used to determine if and to what extent, planned activities have been implemented as intended and resulted in certain outputs, while impact evaluation will aim to assess the effectiveness of WARN-TB/CARN-TB in achieving its stated objectives. Document reviews and surveys and interviews will be undertaken with network members and key external stakeholders. The evaluation will be completed in early 2022 and the findings will play an important role in guiding the future activities of the WARN/CARN-TB network and the support provided by TDR and other partners.

In February 2021, the last module of the OR/IR training programme that was started in 2019 with the CARN-TB countries was conducted. This is a one-week module on communicating study results (feedback to the community, oral communication in scientific congress, scientific papers and policy brief). It was successfully conducted virtually.



Since the end of 2019, TDR, in collaboration with McGill University, Action Contre la Faim and WHO–GTB, has been leading the development of a costing toolkit which provides a step-by-step guidance on costing TB-related interventions for implementation or operational research. This was identified by the NTPs as a critical aspect in order to make informed decisions on scaling up TB control strategies. The toolkit will be released in Q4 2021 and it will be available in English and French.

The toolkit was presented and piloted in April 2021 during a virtual one-week workshop with eight countries of the WARN-TB and CARN-TB that were planning to undertake economic evaluation and/or cost assess- ment as part of their current or forthcoming research studies. Representatives from Benin, Cameroon, Chad, Côte D'Ivoire, Mali, Burkina Faso, Guinea and Liberia took part in the workshop and developed their research protocol and data collection tools with support from the TDR and McGill teams. They should finalize data collection by the end of Q2 2022 when a second virtual one-week workshop focusing on the analysis and presentation of the findings from the research projects will be organized.

2. WARN-TB and CARN-TB Secretariat and the COVID-19 response

The secretariat of the two networks is unique and is hosted by the National TB Programme of Benin. Following the hiring of a dedicated staff member to manage the secretariat in 2019, communication and collaboration between the network members was strengthened through initiatives such as the development of WARN-TB/CARN-TB website, regular newsletters and creation of new communication channels through WhatsApp to facilitate more rapid communication between the NTPs. During the COVID epidemic, ties between all NTPs have been strengthened.

These strengthened connections between the network members have been leveraged during the COVID-19 pandemic. Learning from the disruption caused by the Ebola epidemics, the secretariat of the WARN-TB and CARN-TB with support from TDR, have sought to establish a consistent and regional response to mitigate the impact of COVID-19 on TB control in WCA. Various regional activities have been discussed including the need to estimate the impact of the COVID-19 epidemic on TB care and control in the region and to evaluate the implementation of strategies to minimize its impact.

Since the beginning of the pandemic, regular regional webinars (every two weeks from April 2020 until July 2020 and every month since then) have been held to provide an opportunity for NTP coordinators and staff to discuss challenges and share their solutions. NTPs have been sharing their contingency plans designed to mitigate the impact of the pandemic on TB service provision (placed on the intranet of the website) to promote cross-learning among the other NTPs and to encourage a consistent, regional approach.

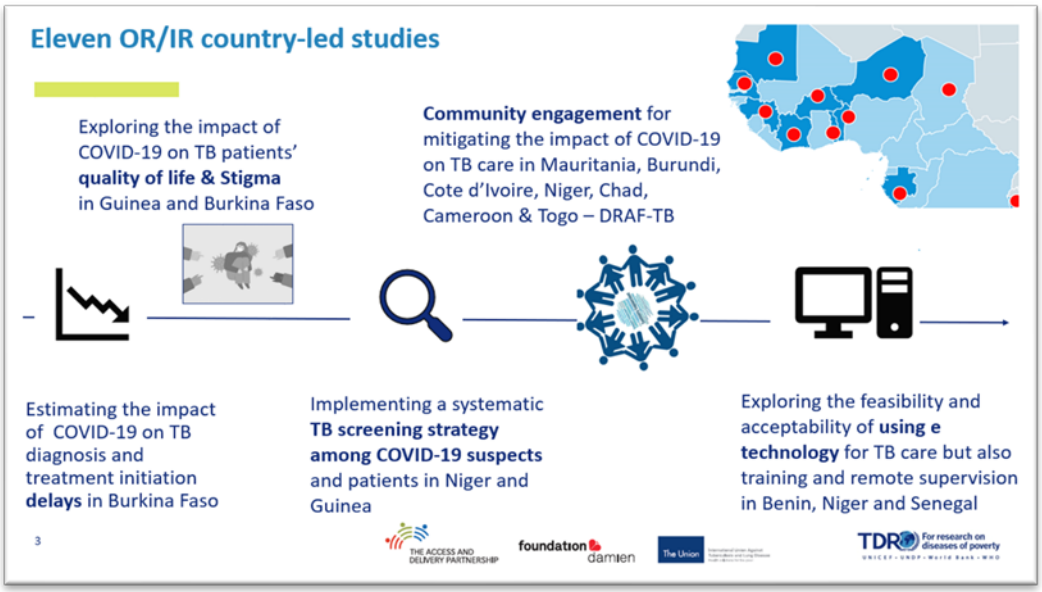
High levels of attendance and participation of the NTP coordinators, their staff and partners has illustrated the perceived value of these meetings and their potential to facilitate the diffusion of information/recommendations and discussions, particularly during periods of significant disruption.

Ensuring continuity of TB care during the COVID-19 pandemic

- The COVID-19 pandemic has created many barriers to TB treatment and care. In Burkina Faso, a study supported by TDR and partners found that the average length of time between the onset of TB symptoms and the first consultation with a health service had increased by 73%, compared with data from 2017/2018
- To further support NTPs in the region during the COVID-19 pandemic, funding from TDR's SDF was secured in 2020, along with co-funding and collaboration and partnership with the Access and Delivery Partnership Project, the Damien Foundation, WHO–GTB and The Union, to meet the following objectives: i) support national TB programmes (NTPs) throughout WCA to conduct implementation research (IR) on strategies to mitigate the impact of COVID-19 on TB control efforts; and ii) measure the impact of COVID-19 in terms of epidemiological and process indicators with using a common mixed method methodology.

Following a call for letters of interest released in May 2020 through the WARN/CARN network, 11 proposals were selected for funding. The selected proposals sought to implement a variety of new and innovative approaches to ensure continuity of TB services during the time of COVID-19 (see Fig. 13).

Figure 14. Scope of the Implementation Research projects



- These studies demonstrate the variety of new strategies being tested to overcome challenges to TB control during the COVID-19 pandemic. The challenges are creating opportunities for innovation to ensure the continuity of TB services.

To date, ongoing technical support and mentorship has been provided to grantees throughout the research process by TDR, ADP, the Union and Damien Foundation. As of December 2021, draft manuscripts have been developed based on seven of the 11 funded studies, with the rest (particularly on community engagement) currently in development and expected by the end of Q2 2022 (Table 8).

***[Photograph:** TB researchers in Mauritania. Credit: National TB programme, Mauritania]*

Table 8. Manuscripts currently in development by SDF grantees based on OR findings

Country	Illustrative paper title
Benin and Niger (joint publication)	1. Feasibility, acceptability and effectiveness of E-supervision and e-formation during the COVID-19 pandemic in Benin and Niger
Burkina Faso	2. Delays in TB diagnosis and treatment initiation in Burkina Faso during the COVID-19 pandemic 3. Evaluation of the quality of life and perceptions of COVID-19 among TB patients
Guinea and Niger (joint publication)	4. Enhanced TB screening among COVID suspects/ negatives: Experience from the National TB programmes of Guinea and Niger
Guinea	5. Quality of life of TB patients in the context of the COVID-19 pandemic in Guinea 6. Impact of COVID-19 on TB notification and treatment outcomes in Guinea
Senegal	7. Feasibility, acceptability and effectiveness of a virtual TB DOTS strategy to overcome COVID-19 barriers in Senegal

Evaluating the impact of COVID-19 on TB services in WCA

- As per the second objective of the SDF project, a guidance document was developed by TDR, in collaboration with WHO–GTB and a pool of M&E NTP staff of the WARN-CARN-TB, to assist NTPs in WCA assess the impact of COVID-19 on TB services through a common impact assessment methodology. Indicators were developed based on a conceptual framework which highlighted the potential impacts of the pandemic on TB service provision and included both epidemiological and process indicators. The indicators were designed to enable users to quickly identify issues or challenges in service delivery in the context of the pandemic and to inform the development and implementation of appropriate mitigation strategies to ensure continued functionality of TB services.
- Together along with the outcomes of the operational research studies conducted in the region (described above) data from the impact assessment framework is intended to inform the development of national and regional contingency plans that can be enacted by NTPs in similar, future public health emergency scenarios.

Leveraging TDR's strategic development fund investment to expand our work on the impact of COVID-19 on TB services in WCA

- The successful work undertaken in the WCA region under the SDF grant (described above) provided a platform to expand the scope of the work in partnership with new actors. In early 2021, TDR in conjunction with WHO–GTB, the Robert Koch Institute, the WARN/CARN-TB network and the University of Oslo was awarded a grant for €982.576,00 by the German Federal Ministry of Health. The funded project is entitled " Continuing through crises: strengthening the capacity of NTPs in WCA to monitor and mitigate the impact of COVID-19 and future public health emergencies on TB service provision". The project aims to further strengthen TB surveillance systems in the region to detect and track disruptions in the context of COVID-19 and future public health emergencies and support NTPs to develop preparedness and response plans that can address and mitigate the impact of these disruptions.

  This project leverages the previous work completed under the SDF grant by:

- finalizing and pilot testing the impact assessment framework to monitor essential TB services in the context of the COVID-19 pandemic and other global health emergencies in five countries in WCA;
- developing a comprehensive digital package in DHIS2, that integrates the validated impact assessment indicators into routine national TB surveillance systems to enhance TB surveillance capacity and quality and timeliness of data; and
- using learnings from the implementation of potential impact mitigation strategies to support NTPs in the region to develop data-driven response and preparedness plans to guide future impact mitigation strategies during public health emergency contexts.

  The project will run until early 2023. Table 9 outlines activities commenced in 2021 and those planned for 2022.

Table 9. "Continuing through Crises" project activities for 2021–2022

Activities conducted in 2021	Activities scheduled for 2022
Development of a comprehensive digital environment in DHIS2, that integrates the validated impact assessment indicators into the routine TB surveillance system of the national programmes Identification of existing digital mobile solutions that can meet the need for contract tracing and investigate the possibility of interoperability with DHIS1 Identification of existing platforms and investigate the interoperability with DHIS2 and digital mobile solutions for automated linking of diagnostics results from WHO-approved tests to these platforms	Finalization and implementation of an interoperable platform within DHIS2 that enables automated transfer of laboratory and contact tracing data between the platforms Finalization and implementation of new dashboards for key impact assessment indicators into DHIS2 for routine monitoring of diagnostic and contact tracing data Creation of an a DHIS2 feature which allows the alteration of reporting frequency for enhanced monitoring of TB notifications in the case of emergencies (i.e. to switch from quarterly routine reporting of TB cases to a more frequent monitoring of TB notifications, e.g. monthly reporting) Development of guidance and training to support NTPs with system use as well as interpretation of the data for programmatic action

3. Improving TB diagnostics

The **Diagnosis of Multidrug-resistant tuberculosis in Africa (DIAMA)** project was launched in June 2017. The project is led by the Benin NTP. Collaborators are: TDR; the Institute of Tropical Medicine, Belgium; and the NTPs of eight African countries (Cameroon, the DRC, Ethiopia, Guinea, Mali, Nigeria, Rwanda and Senegal). It is funded by the EDCTP for five years.

The project explores the feasibility and accuracy of diagnosing TB resistance to first- and second-line drugs through a novel molecular multiplex assay developed by GenoScreen (phase 1). The project is also developing and setting up alternative culture-free approaches for the monitoring of patient response to rifampicin-resistant TB treatment (phase 2). Collaboration with FIND was established to contribute to the validation of a second-line drug sensitivity molecular test (Xpert second-line). As part of this project, the Molbio Diagnostics resistance molecular platform is also being tested in Benin and Rwanda.

The recruitment of patients is finished. For all baseline strains, phenotypic tests, Xpert test second-line (on stored samples and fresh samples), *deeplex*® and whole genome sequencing (WGS) (the gold standard) are performed.

Xpert second-line data as well as WGS and phenotypic results were shared end of September 2020 in order to inform WHO–GTB guidelines for the endorsement of Xpert second-line. *Deeplex* results will be shared in 2022 for the same purpose. The project will be ending in 2022 and various publications are expected in 2022.

4. The Implementation Research for Digital Technologies and TB toolkit (IR4DTB) for evaluating the implementation and scale up of digital innovations across the TB continuum of care

Originally started in 2019, this project has been conducted in close collaboration with WHO–GTB and aims to promote the generation of new evidence to bridge the knowledge gaps on the optimal application of digital technologies for TB. The Implementation Research for Digital Technologies and TB (IR4DTB) online toolkit was developed as an adaptation of the original IR toolkit, first

developed by TDR in 2014 with support from ADP, to provide tailored content specific to IR studies which evaluate the use of digital technologies within TB programming. Intended for use by NTP programme managers and other partners working in TB service delivery, the IR4DTB provides guidance on how to design and conduct IR studies to assess implementation research outcomes such as feasibility, acceptability, coverage and implementation cost of digital technology strategies or interventions to enhance TB control efforts.

The toolkit comprises six modules that address the key components of the IR process (Fig. 14). Key learning objectives are reinforced through the inclusion of case studies and published literature to demonstrate their application in real-world settings.

Figure 15. Overview of IR4DTB modules

In 2020, the [Implementation Research Toolkit for Digital Technologies and TB (IR4DTB) online site] was completed and launched during a five-day hybrid workshop in November 2020, organized in collaboration with the Chinese Centre for Disease Control and Prevention and the Chinese Anti-TB Association and joined by participants from China, Malaysia, Pakistan and Uzbekistan. See image of their website below.

Figure 16. Website for IR Digital Technologies and TB (IR4DTB)

*[**Photograph**: Participants from China attending the IR4DTB workshop in Beijing]*

Throughout 2021, ongoing support has been provided to three research teams to support their ongoing work on the research studies developed during the workshop (Table 10). Regular calls with TDR and WHO–GTB staff have been held during the past year with researchers from national and regional centres for TB control and prevention in China.

Table 10. IR studies following the IR4DTB workshop

Implementation research studies on digital technologies for TB currently supported by TDR and GTB
Using digital health tools to support TB medication adherence under programmatic condition in China: current situation investigation and availability technology evaluation
Exploring the acceptability of CAD software for TB detection by primary care providers in Jiangxi province
Scaling up different types of electronic medication monitors to assist TB medication management in China

In 2021, a downloadable PDF version of the IR4DTB was created to better serve low-band with settings. This offline version is also available in a MS word format to enable easy translation by country teams into other languages. At the same time, development of a French and Russian-language version of the IR4DTB site has commenced in order to expand the reach of this tool to partners in West and Central Africa and Eastern Europe, respectively. In 2022, the Russian IR4DTB site will be used as a teaching tool for virtual training workshop on IR for digital technologies with countries from the WHO–EURO region.

5. Facilitating the implementation of all-oral shorter regimens for MDR-TB patients: the ShORRT initiative

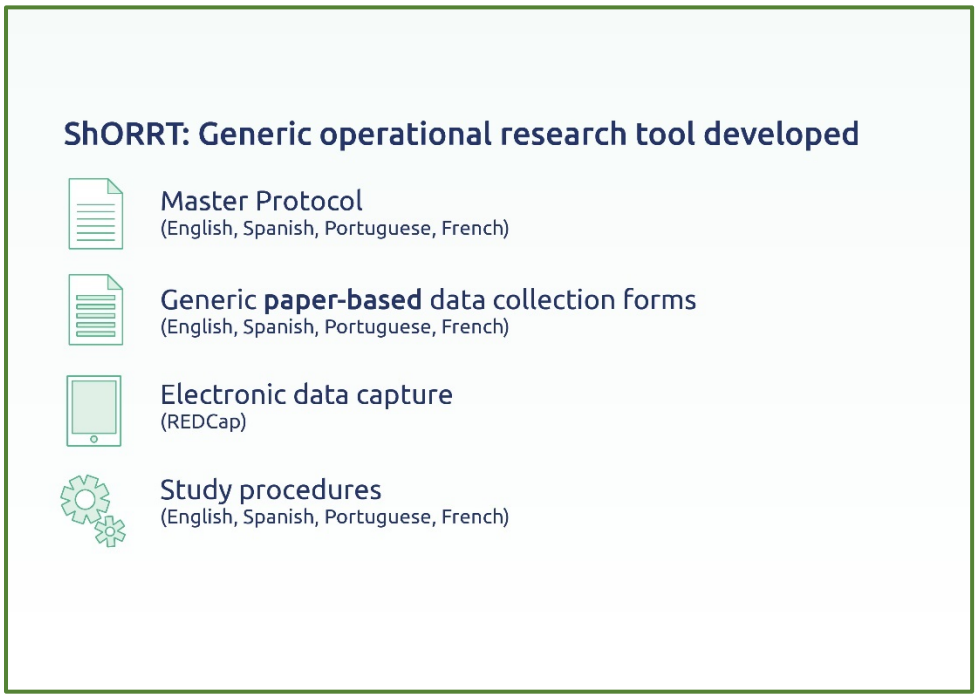
This project started in mid-2019. Following the release of the latest World Health Organization's (WHO's) guidelines on drug-resistant tuberculosis (DR-TB) treatment, where modifications to the recommended all-oral treatments for multidrug- and rifampicin-resistant (MDR/RR) TB and novel regimens for patients with extensively drug-resistant TB are encouraged under operational research conditions, TDR was requested by the WHO Global Tuberculosis Programme to lead the development of an initiative dubbed ShORRT (Short, all-Oral Regimens for Rifampicin-resistant Tuberculosis) to support the implementation of such drug regimens.

In particular, the objectives of this initiative are to:

- develop a generic research package comprising of a template protocol, data collection tools and study procedures to facilitate the conduct of OR led by national TB programmes on the use of all-oral shorter drug regimens for MDR/RR-TB patients; and
- provide technical assistance to a set of national TB programmes in Africa, Latin America and Asia for the implementation of such OR.

A committee was established in May 2019 with the aim to guide the development of the protocol and ensure representation and expertise of key technical partners, funding agencies, country representatives and civil society. The committee comprised of a panel of experts from the following institutions: Damien Foundation; Global Drug-Resistant TB Initiative (GDI) – Stop TB Partnership; International Union Against Tuberculosis and Lung Disease (The Union); KNCV Tuberculosis Foundation; MSF; Partners in Health; The Sentinel Project on Pediatric Drug-Resistant Tuberculosis; the GFATM; United States Agency for International Development (USAID); Karolinska Institutet; Harvard University; Liverpool School of Tropical Medicine (LSTM); London School of Hygiene and Tropical Medicine (LSHTM); McGill University; National TB Control Programme of Benin, Democratic Republic of the Congo, Lao PDR, Nigeria, Public Health Centre of the Ministry of Health of Ukraine; WHO Regional Offices, Regional Green Light Committee (WHO–SEARO).

Following several rounds of comments and input from the expert group over the subsequent months, the protocol was eventually launched in early November 2019 and approved by the WHO's Ethics Review Committee shortly afterwards.



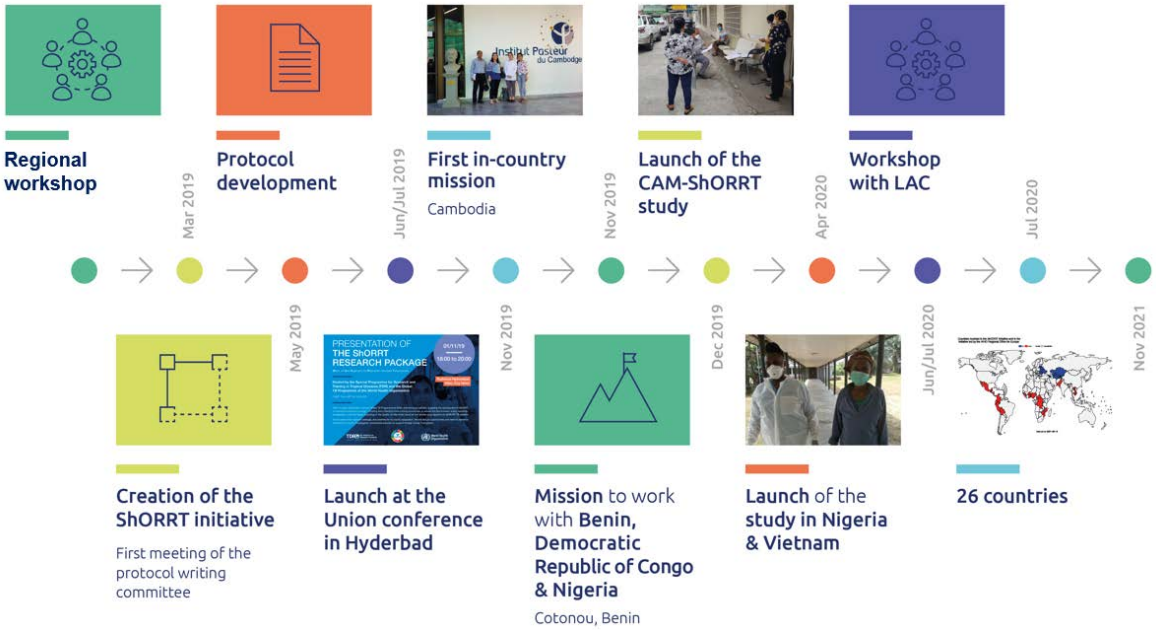
As part of the ShORRT research package, three additional documents were developed to aid country investigators: a country preliminary assessment checklist with key areas to consider before embarking on operational research on shorter all-oral drug regimens for MDR/RR-TB (Country Preliminary Assessment checklist) a pre-study launch checklist (ShORRT Study Initiation checklist) to plan for all the essential components of the study and a Readiness assessment checklist to verify that the study sites are ready to commence the study. All these documents are available in Spanish, Portuguese and French in addition to English.

As part of the ShORRT research package, generic case report forms were developed and translated into an electronic platform developed using the REDCap software and hosted on the WHO web server. This platform underwent user acceptance testing, which also involved the team from Lao PDR to ensure the needs from end users are fully accommodated. A REDCap licence covering the three levels of the organization was fully executed in March 2020 in collaboration with the Legal team at WHO. Currently, the platform hosts the database for all the countries involved in the ShORRT initiative as well as the research projects conducted by different departments at WHO–HQ, regional and country offices that are now also using REDCap (see Fig. 16).

TDR and the software development company which was contracted jointly provide technical assistance to country teams for the adaptation of the generic data collection to the specific needs of their study and ongoing remote support is in place during implementation.

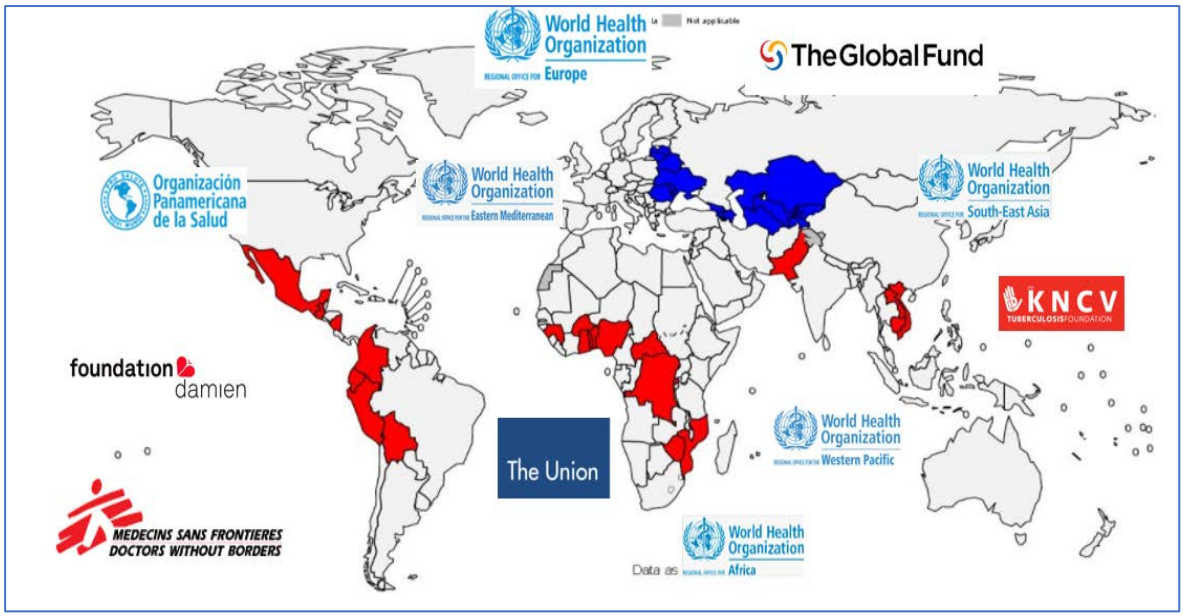
Finally, a generic protocol and tools for the collection of cost data to assess the cost and cost-effectiveness of the implementation of shorter all-oral MDR/RR-TB drug regimens were also developed in collaboration with McGill University. The costing study protocol and data collection tool are currently being piloted with the team in Pakistan.

Figure 17. Timelines in the development and progress of the ShORRT initiative



The ShORRT initiative currently involves 26 countries that are launching or conducting their OR project, see Figure 18.

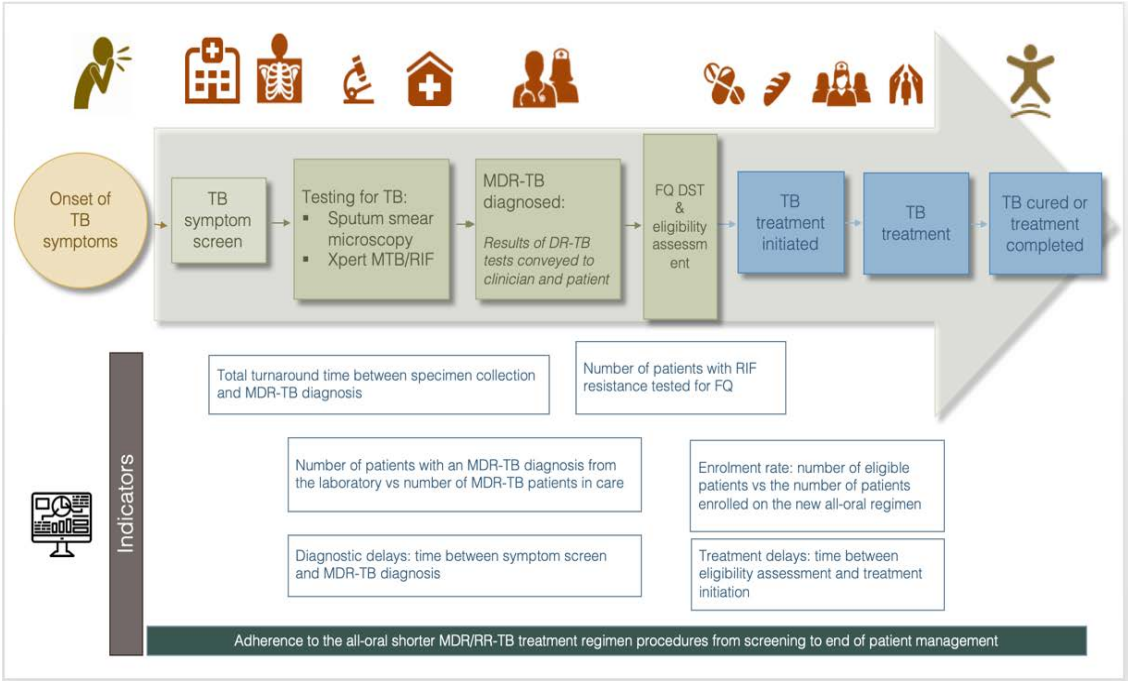
Figure 18. Countries and collaborating partners involved in the ShORRT initiative



While it is premature to demonstrate the impact of this initiative given its inception just over two years ago, some preliminary observations about its expected impact can be suggested. First, a key strength of the ShORRT project is that data are being gathered from a variety of settings. A wealth of data is expected to be generated by these studies for pooled analyses. The inclusion in many of these studies of a comparator group contributes further valuable evidence. Countries that started their research project during Q1 2020, such as Cambodia, are already planning to share their data to inform the upcoming review of the DR-TB treatment guidelines.

Second, while the programmatic use of all-oral shorter MDR/RR-TB treatment regimens under operational research conditions can provide important data to the global TB community about their effectiveness and safety, they can also provide information about other important outcomes, such as health-related quality of life and socioeconomic impact for patients and households, as well as programmatic implementation, including feasibility (Fig. 18). Such data are not often collected in clinical trials but can be collected as part of operational research studies in a relatively inexpensive way. Indicators in Fig. 16 aim to assess the feasibility of the implementation of novel all-oral shorter MDR/RR-TB treatment regimens.

Figure 19. Example of complementary data that investigators can collect as part of ShORRT



Finally, it is evident that the ShORRT initiative is giving TDR further visibility both within and outside WHO and it has positioned it as key player in the field of MDR-TB care, with a strong coordination and leadership role of operational research on treatment of MDR-TB.

6. Development of guidance on social protection for people living with TB

A key element of the WHO's End TB strategy for 2015–2035 is the need to design and implement comprehensive strategies to achieve TB elimination through universal health coverage and interventions to address the underlying social determinants of TB, including social protection.

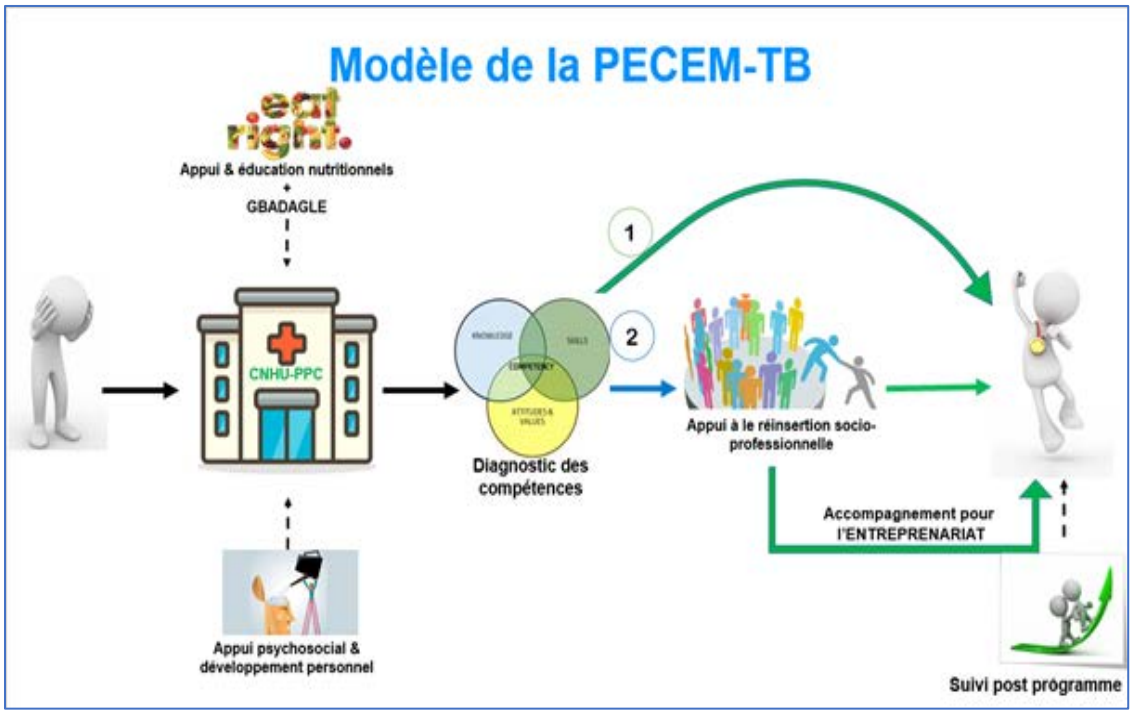
GTB has recently initiated the development of a guidance for national TB programmes, technical partners and funding agencies on social protection strategies to prevent and mitigate the financial and social impact of the disease. In mid-2020, TDR joined WHO–GTB in this effort. Specifically, TDR is leading the collection of case studies from other UN agencies (i.e., IOM, UNHCR, FAO, UNICEF,

WFP) and from national TB control programmes on the implementation of social protection policies and interventions that have been designed for TB patients and/or that could be extended to include people living with TB. In addition, TDR is contributing to the identification of research gaps and to the subsequent definition of a research agenda in this area.

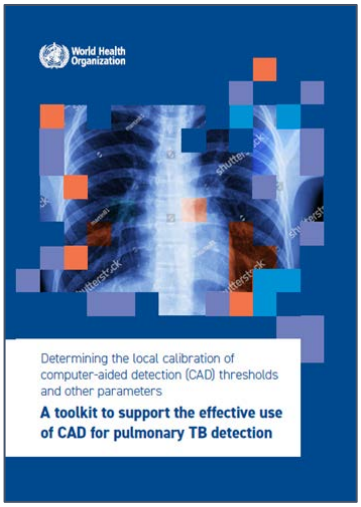
This project is also linked to the activities of the WARN/CARN-TB. During two recent meetings the GTB's Multisectoral Accountability Framework (MAF-TB) was presented to the country representatives and progress on the implementation of national surveys to assess the costs incurred by TB patients due to their disease was discussed. Three countries that have already conducted a national TB patient cost survey (Benin, DRC, Ghana) have expressed an interest in assessing and documenting the impact of social protection interventions they have put in place to mitigate the financial burden caused by the disease. TDR will provide funding and work alongside these countries for this impact evaluation in Q4 2021 and during 2022.

In Benin, this work builds on the ETAP (Empower TB Patients Against Poverty) project conducted by the NTP of Benin in collaboration with TDR. The project consisted of two phases: Phase 1, conducted in 2018–2019, aimed at measuring patients' poverty level as well as understanding the multiple dimensions of deprivation including stigma and social exclusion. At the end of phase 1, in December 2019 a two-day workshop was convened by the NTP of Benin in collaboration with TDR and SIHI, the Social Innovation in Health Initiative, which involved former TB patients, representatives from various ministries (Health, Agriculture, Sports, Social Affairs and microfinances), NGOs, researchers, local social innovators and entrepreneurs. During the workshop findings from phase 1 were collectively discussed and strategies (including social innovations) that can be implemented and rigorously evaluated to address the social, human and financial vulnerability of TB patients while ensuring their physical recovery from the disease were defined. Selected interventions were implemented in Phase 2 of the project. In 2020, a plan for action was discussed during multisectoral meetings and a pilot model for the health and social recovery of TB patients was developed. The model, illustrated in Fig. 19, combines a patient-centred approach for all diagnosed TB patients with a package of interventions that aim to i) provide nutritional support and nutritional education; ii) provide a psychosocial support to improve self-esteem; and iii) for the patients unemployed or who have lost their job an assessment of the competencies and support from a local NGO to receive vocational training to develop new skills that can facilitate employment or self-employment (see Fig. 19).

Figure 20. Model of the patient-centred care approach



The feasibility, acceptability (by the patients and Health care workers) and effectiveness of this new model of care is currently evaluated through the conduct of an implementation research project funded by TDR. The results of this evaluation should be available by the end of 2022. Finally, we need also to mention in this section of the report, an implementation research project developed with the NTP of Vietnam to better handle mental health disorders in TB patients. TDR in collaboration with the WHO Mental Health department provided technical support in the development of the research proposal for integrating Mental Health disorder screening in TB patients and reference for appropriate psychiatric support when needed. The NTP of Vietnam raised funding from the Global Fund to conduct the study. It should have started in Q4 2021 but with the 2nd wave of COVID-19 that hit Vietnam in June 2021, the start of the project was postponed to early 2022.



7. Supporting the implementation of computer-assisted detection (CAD) technology within the context of TB screening: the CAD calibration toolkit

In 2021, the toolkit Determining the local calibration of CAD thresholds and other parameters: a toolkit to support the effective use of CAD for TB screening was released (Fig. 20). This toolkit was developed by TDR in collaboration with WHO–GTB, partners and experts working on CAD and TB screening. The goal of the toolkit is to support the implementation of CAD in new settings, following updated WHO guidelines for active TB screening which recommended, for the first time, the use of CAD technologies to enhance TB screening efforts among individuals aged over 15.

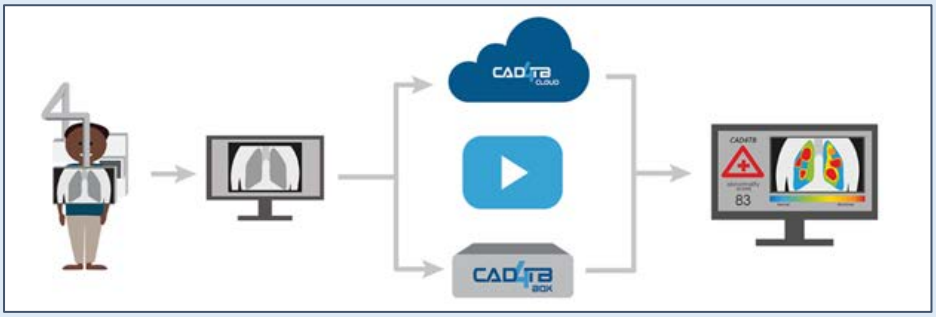
The toolkit is a practical guide intended for use by NTPs and other implementers who have decided to use CAD and aims to:

- Support new CAD users to understand threshold scores and their programmatic implications within the context of a TB screening or triage programme;
- Describe a simplified operational research protocol that can be used to conduct CAD calibration studies by estimating the diagnostic accuracy of CAD against a bacteriological reference standard; and
- Support users to analyse, interpret and apply the results of the CAD calibration study based on local context and use case.

Figure 21. What is CAD?

What is CAD?

Computer-assisted detected products use artificial intelligence to analyse digital chest X-rays for the presence of abnormalities suggestive of TB. CAD products are designed to produce an abnormality score (typically out of 1–100) which, when referenced against a set threshold, can be used to signal probable TB cases and trigger further TB testing. CAD thresholds must be calibrated to local contexts and intended use cases, as well as some decision-making around acceptable costs and losses.



These objectives are addressed through the following three components that make up the toolkit:

- **Part A:** a background document that introduces CAD calibration studies, including an overview of proposed study designs, procedures and outcomes of interest.
- **Part B**: a generic protocol for the CAD calibration study which can be adapted by users and used to seek ethics approval.
- **Part C**: a user guide to support analysis and interpretation of CAD calibration study data, which is supported by an online data analysis tool where CAD calibration data can be uploaded and analysed.

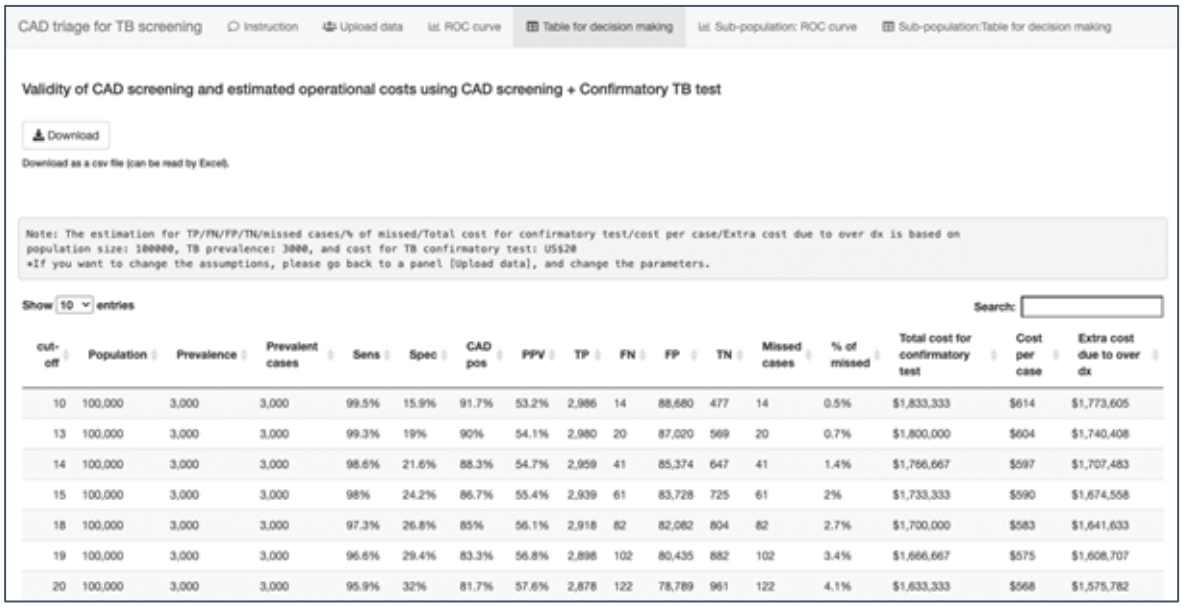
The online tool allows users of CAD to simulate the programmatic implications of different abnormality thresholds within the context of TB screening or triage. After uploading the final data set, the online tool estimates the diagnostic performance (such as sensitivity, specificity and positive predictive values) of CAD across a range of possible threshold values and demonstrates the cost and programmatic implications of these thresholds, such as the number of over- and under-diagnosed TB cases and costs incurred related to follow-up confirmatory testing. Results are used to produce the following outputs:

1. A table which illustrates the sensitivity and specificity of CAD at various thresholds along with the corresponding estimates of yield (e.g., positive and negative predictive values, number and % of missed cases) and costs implications (e.g., cost per case, total costs due to unnecessary follow-up testing for false positive TB cases (see Fig. 21 for information on that produced by the online CAD

calibration tool); and

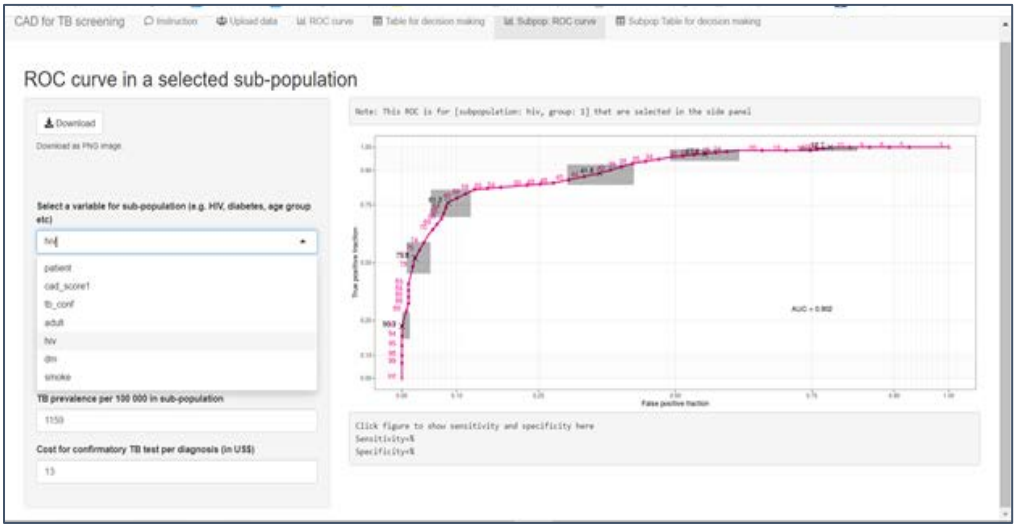
2. A ROC (receiver operating characteristic) curve which plots the true positive rate against the false positive rate to show the possible trade-offs between sensitivity and specificity at various thresholds levels. The ROC curve allows users to click along the curve to display sensitivity and specificity, along with 95% CI (Fig. 22).

Figure 22: Tabular output of diagnostic accuracy and cost outcomes of CAD produced by the online CAD calibration tool



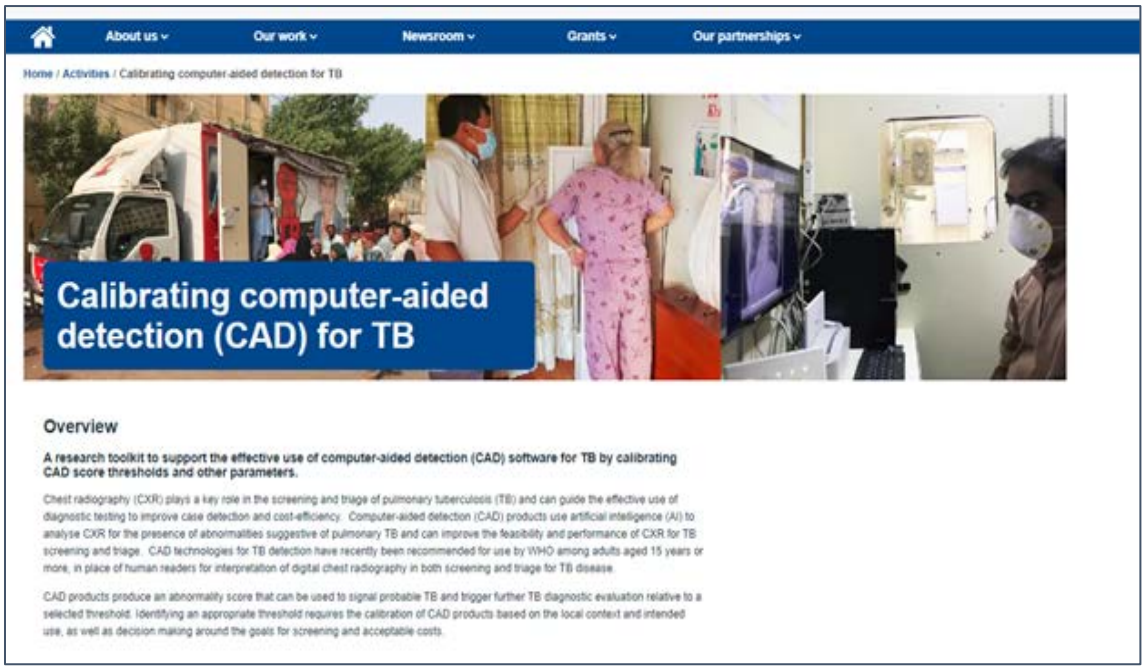
cut-off	Population	Prevalence	Prevalent cases	Sens	Spec	CAD pos	PPV	TP	FN	FP	TN	Missed cases	% of missed	Total cost for confirmatory test	Cost per case	Extra cost due to over dx
10	100,000	3,000	3,000	99.5%	15.9%	91.7%	53.2%	2,986	14	88,680	477	14	0.5%	$1,833,333	$614	$1,773,605
13	100,000	3,000	3,000	99.3%	19%	90%	54.1%	2,980	20	87,020	569	20	0.7%	$1,800,000	$604	$1,740,408
14	100,000	3,000	3,000	98.6%	21.6%	88.3%	54.7%	2,959	41	85,374	647	41	1.4%	$1,766,667	$597	$1,707,483
15	100,000	3,000	3,000	98%	24.2%	86.7%	55.4%	2,939	61	83,728	725	61	2%	$1,733,333	$590	$1,674,558
18	100,000	3,000	3,000	97.3%	26.8%	85%	56.1%	2,918	82	82,082	804	82	2.7%	$1,700,000	$583	$1,641,633
19	100,000	3,000	3,000	96.6%	29.4%	83.3%	56.8%	2,898	102	80,435	882	102	3.4%	$1,666,667	$575	$1,608,707
20	100,000	3,000	3,000	95.9%	32%	81.7%	57.6%	2,878	122	78,789	961	122	4.1%	$1,633,333	$568	$1,575,782

Figure 23. Screen grab of a ROC curve produced by the online CAD calibration tool



A [dedicated space was created on the TDR website] to house the toolkit in addition to the accessories and tools created to support the conduct of the CAD calibration studies (such as a data collection form, data entry spreadsheet and a downloadable version of the generic research protocol in MS Word; Fig. 23).

Figure 24. CAD homepage on the TDR website



The CAD research package was presented at various WHO regional meetings and during a workshop organized during the World TB conference of the UNION (November 2021).

Various countries expressed interest to use the research package for calibrating their CAD and optimizing their TB screening algorithms. The NTP of Ghana is currently supported for documenting the piloting of the use of this new research package.

8. Ensuring the compliance of TB surveys with the Good Clinical Practice principles

National population-based surveys of the prevalence of pulmonary TB disease in adults are the best way to directly measure the burden of TB disease in countries that do not yet have routine surveillance data that meet quality and coverage standards. In a meeting of the Task Force in April 2016, progress to date and the future direction of NTPS were discussed. In several surveys, the quality of laboratory work (culture testing) and data management (for tens of thousands of participants interviewed and screened in the community) were the two major challenges faced. To address and mitigate such challenges in future surveys, one of the major recommendations was to develop guidance on how to apply Good Clinical Practices (GCP) and Good Data Management Practices (GDMPs) in the context of NTPS.

TDR was asked by WHO–GTB to help them develop guidance for the implementation of TB surveys (population and facility-based TB surveys) in compliance with GCPs in order to ensure the right of the participants and survey data credibility (i.e., proof that surveys are conducted in an ethical manner and that the outcomes reported are comprehensive and accurate).

This project is funded by WHO–GTB and has three objectives that correspond to three steps over a one-year period:

- Step 1: To provide training on GCP and GDMP to a core group of consultants who are providing technical assistance for the design, implementation, analysis and reporting of NTPS, NDRS and NPCS.

- Step 2: To develop a Guide on how to apply GCP/GDMP principles in the context of NTPS, NDRS and NPCS, including i) standard procedures; ii) checklists to assess compliance with relevant GCP/GDMP principles; and iii) specific training material that can be used (and integrated into a broader training package if appropriate) at the beginning of each type of survey.
- Step 3: To train a pool of consultants on the content of the Guide.

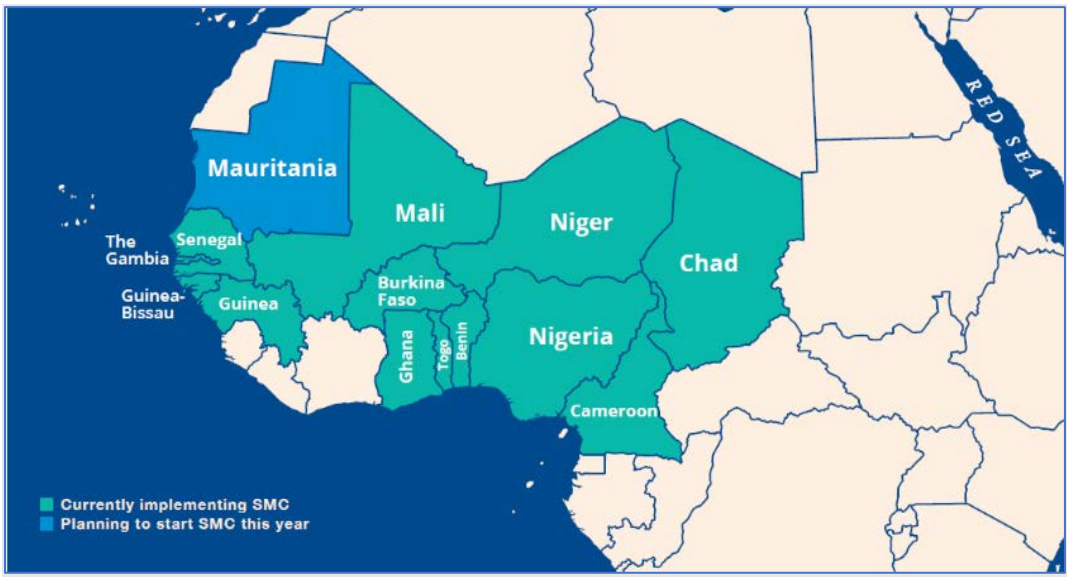
The training (step 1) was conducted in September 2019. A guidance document and all SOPs/tools were developed in 2020 and finalized early 2021. A two-day virtual training of a pool of consultants to use these guidance documents and the SOPs/tools was organized in April 2021. The French and English version guidance is under publication and should be made available on TDR and WHO–GTB website beginning of 2022.

9. Activities for optimizing malaria related intervention and improving malaria control

General overall objectives and scope of the OPT–SMC project

Malaria remains a major public health problem in sub-Saharan Africa. WHO announced that the gains made in malaria control efforts in the 15 years prior to 2015 have not been sustained since 2015. The previous steady decline in the global number of malaria deaths has reached a plateau and the number of cases is increasing. The majority of malaria deaths occur in ten sub-Saharan African countries, many of these are countries where malaria is highly seasonal (see Fig. 24).

Figure 25. Eleven sub-Saharan countries with highly seasonal malaria



Following a 2012 WHO recommendation, 13 sub-Saharan African countries6 with high seasonal malaria transmission have adopted and integrated SMC into their policy documents and strategic plans. The total number of children who received SMC (at least one treatment) was estimated to be 15.7 million in 2018. SMC has been shown to substantially reduce cases and deaths due to malaria. However, although countries were quick to adopt SMC, fewer than 50% of eligible children had access to it in 2018. There is a need to optimize delivery of SMC in order to close these gaps.

In 2019, funding from EDCTP was leveraged (€2.5 million) to conduct the OPT–SMC project in collaboration with Medicines for Malaria Venture (MMV), LSHTM, the University of Thies (leading the project) and the 13 NMPs implementing SMC.

[6] Burkina Faso, Cameroon, Chad, The Gambia, Ghana, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Nigeria, Senegal and Togo.

The approach that is followed is similar to one used with the national TB programme in the West African region as part of the WARN-TB activities:

- Strengthening of the West and Central African SMC malaria network (WARN-SMC).
- Strengthening the malaria surveillance system to monitor SMC activities (with WHO–GMP).
- Strengthening the capacities of the NMPs to understand their programmatic data and define malaria control gaps and research priorities for optimizing SMC effectiveness.
- Strengthening of NMP capacities for conducting IR/OR projects addressing research priorities for improving SMC effectiveness.

Early 2021, all information will be summarized to inform an SMC meeting with NMPs and partners to discuss the lessons learned. In March 2021, a summary report per country and an overall assessment will be completed and circulated among OPT–SMC partners.

In early 2021, this summary will be discussed in an OPT–SMC meeting as well as the lessons learned in order to get better prepared if similar events were to occur in the future. In 2021, four countries developed and conducted OR projects for optimizing their SMC strategies.

10. Response to COVID-19 pandemic

Guidance for assessing COVID-19 impact on SMC

During OPT–SMC meeting (virtual), the disruption in SMC planning and SMC Delivery was discussed with the countries and partners. Documenting these disruptions and measuring their impact on SMC delivery and performance was identified as a need in order to learn from this episode and inform future contingency plans for similar global health emergency.

TDR led the development of a tool to assess the impact of COVID-19 on SMC delivery (process indicators) and SMC impact (effectiveness indicators: e.g. Coverage indicators). This was done in collaboration with OPT SMC partners and GMP. It was also shared with all SMC partners during SMC working group meeting.

We used a systematic approach with (1) looking at all SMC activities7 and conducting of a risk assessment and (ii) based on this, defining the indicators and the methods that could be followed for measuring the consequences of COVID-19 pandemic on SMC delivery.

All countries were supported for using this assessment tool. In April 2021, the survey report was circulated and discussed with the NMPs in a virtual OPT–SMC meeting to get better prepared for 2021 SMC that started in August 2021.

Measure to mitigate the impact of COVID-19 on SMC

SMC involves door-to-door distribution once a month to over 20 million children in 13 countries, by thousands of drug distributors in each country. Training and supervision of SMC delivery on this scale is a huge undertaking and ensuring quality of drug administration on such a scale is a major challenge. In March 2020, in discussion with NMPs, it was felt that because of COVID-19 and travel restrictions there will be problems for delivering face-to-face training as was done usually previously.

With the involvement of a couple of NMPs, training videos were developed to serve as training material for the drug distributors. These videos were put on YouTube to be fully accessible and translated into French, Portuguese and local languages (e.g. Hausa, Wolof, etc). See TDR's malaria research website.

[7] As listed in the *WHO Seasonal Malaria Chemoprevention with Sulfadoxine-Pyrimetamine plus Amodiaquine in children – A Field Guide* (2013); and in the RBM document, *Adapting Seasonal Malaria Chemoprevention in the Context of COVID-19: Operational Guidance* (2020).

Finally, as part of OPT–SMC, TDR led the development of a research package with research protocols for the conduct of SMC coverage surveys, SMC impact assessment, SMC safety monitoring, SMC drug resistance surveys using all the materials that were used by countries in different research projects (such as ACCESS) and that are made available for all in a generic format. This is under development and should be available mid-2022.

11. Activities for optimizing NTD-related interventions and improving NTD control

Through the conduct of the ADP project (mentioned earlier ER section 1.1.8), two projects were launched in 2021. They are the following:

Ghana: TDR initiated work with the NTD national programme of Ghana in 2021. It first supported training of NTD programme staff and health workers at national and regional levels on key aspects of implementation research to look at gender influences on access to health services and the perception and experience of stigma in women suffering from skin-NTDs. ADP is pursuing its support to the NTD programme which will conduct research on this topic.

Tanzania: TDR, with ADP-support, collaborated with the National Institute of Medical Research (NIMR) of Tanzania to strengthen the capacity and preparedness of the health system and of communities to adopt, deliver and promote the uptake of paediatric praziquantel formulation in the treatment of schistosomiasis in children aged under five years. The project was completed and involved the assessment of institutional capacities to introduce the paediatric praziquantel formulation and to raise awareness and knowledge on the uptake of paediatric praziquantel formulation from national to community level, through workshops and focus groups and key-person interviews.

Remaining challenges

For both TB and malaria research activities, the COVID-19 pandemic has slowed down the conduct of some activities, but measures were taken to mitigate the impact relatively quickly. Face-to-face regional meetings were converted into virtual ones but one-on-one interactions that were occurring in parallel of these regional meetings and technical support occurring during working group activities had to be replaced by one-to-one Zoom calls. With 27 countries supported in the WARN/CARN-TB project, 23 countries with ShORRT, 13 countries with OPT–SMC, one-to-one Zoom calls were and are time consuming.

The volume of activities for this Expected Result has grown compared to previous years and even more so in 2020 due to the COVID-19 pandemic. Two full-time consultants were hired to provide support for the two new projects mentioned above (MDR-TB ShORRT all-oral treatment OR project and the IR toolkit for TB digital health solutions). The two consultants are also involved in other projects of this Expected Result (support to countries for the conduct of TB research project aiming at mitigating the impact of COVID-19, development of CAD protocol and the GCP guidance for TB survey). Funding will need to be sought to maintain TDR contribution/support for all these activities in 2022.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

WHO Global TB programme; WHO regional offices; WHO—WCA; WHO Health Information Systems; GFTAM; The Union; the Damien Foundation; West African Health Organization (WAHO); Expertise France; Agency for International Development (USAID); LSHTM; McGill University; Action contre la Faim, France; Institut de Recherche pour le Développement, France; Université de Reims, Faculté de Médecine, France; Université Abomey Calavi, Benin; Université Cheikh Anta Diop and Université of Thies, Senegal; Institut de Santé Publique et Centre Muraz, Burkina Faso; Université Gamal Abdel Nasse, Faculté de Médecine, Guinea Conakry; NTPs of the WARN and CARN-TB countries; NTPs of Bolivia, Cambodia, Colombia, Ecuador, Guatemala, Haiti, Lao, Mexico, Mozambique, Nicaragua, Pakistan, Peru, Vietnam, Zimbabwe; FIND (DIAMA project); Genoscreen, France; MOLBIO Diagnostics, India; Institute of Tropical Medicine of Antwerp, Belgium; National Reference Laboratory, Rwanda; Jimma University, Ethiopia, Robert Koch Institute, University of Oslo

Estimated leverage created by this project:

Raised: MDR-TB (GTB US$ 700 000); USAID (US$ 700 000), e-health (GTB US$ 100 000), TB survey and GCPs (GTB US$ 200 000) German Federal Ministry of Health (€982 576,00)

Gender aspects and vulnerable populations: All TB patients are vulnerable.

Training:

One key component of WARN/CARN-TB activities is to strengthen research capacities of the National TB programmes of these two networks through the conduct of the OR/IR project: a “learning by doing” activities with guidance of mentors/experts in research methods, statistics, social science and health economics and short courses on key aspects of operational or implementation research (protocol development, conduct, analysis and translation of the research findings into policy).

Strengthened institutions or networks:

Strengthening of the national TB programmes of the West and Central African regions and south-south collaborations beyond research activities. Strengthening of OR of all NTPs supported for the conduct of the ShORRT research protocol.

Publications and related news:

ShORRT research package (who.int)

Cambodia launches operational research on all-oral shorter drug regimens for patients with drug-resistant TB (CAM-ShORRT) (who.int)

Facilitating operational research to improve access to new treatment regimens for drug-resistant TB (who.int)

TDR and WHO launch ShORRT, an operational research package to assess all-oral shorter MDR/RR-TB treatment regimens

The ShORRT operational research initiative a year on: spotlight on Nigeria (who.int)

Calibrating computer-aided detection for TB (https://tdr.who.int/activities/calibrating-computer-aided-detection-for-tb)

TDR Determining the local calibration of CAD thresholds and other parameters: a toolkit to support the effective use of CAD for TB screening (toolkit)

The ShORRT initiative in the Mekong region: spotlight on Lao PDR

The ShORRT initiative on TB research: Spotlight on Pakistan

Implementation research for digital technologies and TB (IR4DTB) TDR | Research for scale-up of digital technologies to End TB (who.int) and WHO–TDR Fact Sheet N01 FINAL v2

OPT–SMC: Implementation research to optimize delivery and effectiveness of Seasonal Malaria Chemoprevention – TDR | Malaria research (who.int) and WHO–TDR | Fact Sheet N02 v3-LOW

Plans for 2021–2023

At regional level

For TB control

- Publication of all TB screening studies results (special issue in discussion with the UNION).
- Piloting of the TB costing tool (WS in collaboration with McGill – WHO collaborative centre).
- Evaluation of the impact of the WARN-TB and CARN-TB activities on TB control in the region.
- Support the development and publication of research papers based on findings from IR studies conducted in West and Central Africa on mitigation strategies against the impact of COVID-19 of TB services.
- Finalize Russian and French translation of IR4DTB website and PDF toolkit and prepare to deliver IR4DTB-based workshop to countries from the WHO–EURO and the WHO–AFRO regions.
- Support the implementation and use of the updated DHIS2 packages for improved TB surveillance capacity during periods of disruption/ future public health emergencies.
- Support to NTPs for piloting innovative strategies for introducing a patient-centred approach and improving social protection.

For malaria control

- To continue to support the WCA countries through the OPT–SMC project.
- To finalize the research tool with research protocols for the conduct of SMC coverage surveys , SMC impact assessment, SMC safety monitoring, SMC drug resistance surveys using all the materials that were used by countries in different research projects (such as ACCESS) and that could be made available for all in a generic format.
- Organization of regional workshop for the use of RTS,S malaria vaccine alone or in combination with SMC activities. This activity will be conducted in collaboration with WHO control programmes, WHO colleagues from the WHO African Region and OPT–SMC partners.

For NTD control

- Finalize the two projects that are currently ongoing, communicate results in peer-reviewed papers and build on them for developing innovative strategies for addressing barriers identified by these two projects.

At global level

- Support to countries to implement ShORRT (WHO–AFRO, WHO–SEARO, WHO–WPRO and WHO–PAHO regions) and use the research package developed such as CAD or the IR4DTB tool kit. These activities will be conducted in collaboration with WHO control programmes, the global funds and other partners.

  If funding permits it, further development of generic research protocols: implementation of LTBi new recommendations.

ER 1.3.12: STRATEGIES TO PROMOTE GENDER-RESPONSIVE HEALTH INTERVENTIONS ON PREVENTION AND CONTROL OF INFECTIOUS DISEASES OF POVERTY

Main goals and ERs include:

- **Strengthening research capacities and providing innovative tools** to generate evidence that informs the design and implementation of gender-responsive health interventions to control and prevent VBDs. In addition, it will result in knowledge, strengthened research capacity, policy advice and research products that can be used within and beyond the broad research community. This portfolio is also expected to contribute to WHO's Thirteenth General Programme of Work 2019−2023, WHO's Global Vector Control Response (2017–2030) and the SDGs (2015–2030).
- **Strengthening capacity of researchers working on infectious diseases of poverty** on incorporating an intersectional gender approach. TDR has developed a toolkit to incorporate intersectional gender analysis into research on infectious diseases of poverty to: i) strengthen the research capacity of disease-affected countries in intersectional gender approaches; ii) understand and address barriers to effective and quality implementation of health interventions oriented to prevent and control infectious diseases; and iii) explore solutions for equal access to quality health care.

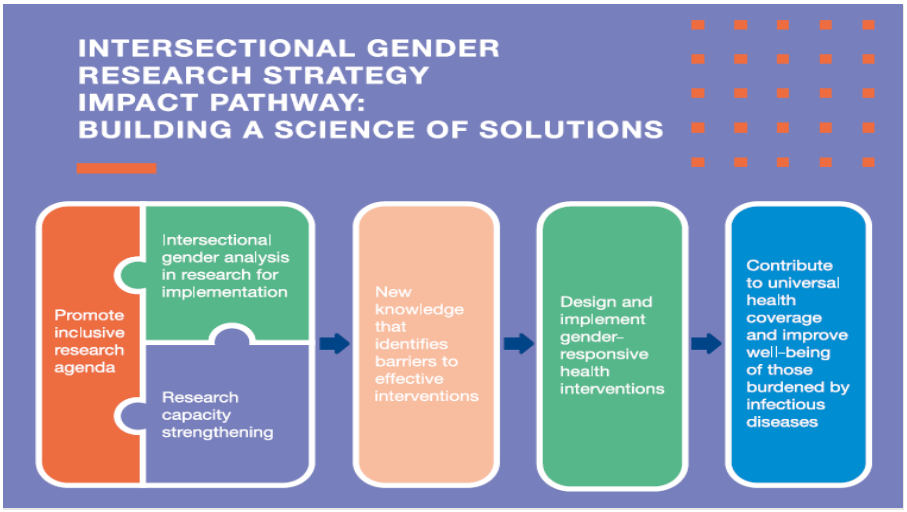
Great progress has been made towards combatting infectious diseases of poverty. However, considerable public health challenges remain, including gender and intersecting inequalities that affect health conditions associated with infectious diseases. This ER focuses on gender-intersecting inequalities that influence differentials in vulnerability to and the impact of, health conditions associated with infectious diseases in LMICs.

It defines, promotes and recognizes the importance of intersectional gender analysis as the process of analysing how gender power relations intersect with other social stratifiers to affect people s lives, to create differences in needs and experiences and to understand how policies, services and programmes can help to address these differences. Through this Expected Result, research teams in LMICs use an intersectional gender lens. This approach enables to better understand and consequently more effectively intervene in the prevention and control of infectious diseases, as it enhances insights into vulnerability to disease(s), exposures to disease(s), experiences of disease, health-related decision-making, responses to treatment and discrimination and unequal access to health care. It also allows insight on how these factors are experienced differently by different groups of men/boys, women/ girls and people with non-binary identities and where these differences might be the result of inequities.

Progress in 2021

TDR Intersectional Gender Research Strategy implementation: TDR launched in June 2020 its strategy on intersectional gender research (see Fig. 25), as a pathway to more inclusive and effective response to infectious diseases.

Figure 26. Intersectional Gender Research Strategy (IGRS) Impact Pathway



The strategy has four key pillars for its implementation:

1. Build research capacities on intersectional gender analysis in research on infectious diseases to make intersectional gender analysis a more regular part of research. This includes increasing research capacity in implementation research through training and technical guidance.
2. Generate evidence on gender-intersecting inequalities in access to health services and those that influence differentials in vulnerability to and the impact of, health conditions associated with infectious diseases in LMICs. This evidence contributes to informing the design of gender transformative health interventions.
3. Support intersectional gender analysis in research for implementation to generate new evidence and knowledge on the intersections of gender and other social variables that influence the way implementation strategies work.
4. Promote an inclusive infectious disease research agenda that recognizes the health needs of women, girls, men, boys and people in all their diversity, including those with non-binary identities. This agenda explores whether health and/or disease experiences (including vulnerability to and experience of disease, health-seeking behaviour, responses to treatment, discrimination and unequal access to health care) may differ as a result of inequities.

Drawing on the four pillars above, the implementation of TDR's IGRS across projects will focus on two main areas: i) research for implementation; and ii) social innovation in health. The overall objective is to contribute to create gender transformative responses through the incorporation of an intersectional gender lens in research and social innovation to address inequities in access to healthcare. Currently, TDR is working with SIHI country hubs to understand and explore the gendered aspects and dimensions of social innovation in health at community level, to understand what works in community-based social innovations that incorporate a gender lens to contribute to addressing gender-intersecting inequalities in access to and delivery of healthcare and to unpack social innovation potential to address gender-intersecting inequalities in access to healthcare and treatment.

The resulting work will:

- Draw evidence-based lessons learned and good practices (resulting from the research projects and processes that identified gendered dimensions of social innovations in health at community level) to sustain, replicate or scale up gender transformative social innovations in health.
- Foster capacity strengthening within existing and new community engagement learning

packages to ensure that countries in the global south take the lead in the promotion of and research on, social innovation to address gender-intersecting inequalities in access to healthcare and treatment.

This project also aims to help address implementation bottlenecks that impact the delivery of health interventions, by generating evidence on how gender intersects with other social variables, influencing access to healthcare and treatment through implementation research.

The document advocates and promotes a research agenda and an organizational culture guided by the principles of diversity, inclusivity and equality and explicitly encourages researchers to apply irrespective of their gender identity, sexual orientation, social background or (dis)ability status, among other. This strategy has also been disseminated globally across WHO regions and Regional Training Centres. In this sense and to systematically institutionalize and foster gender sensitive research, TDR calls for proposals also formalize requirements to ensure disaggregated data at least by sex and age (other social stratifiers wherever possible as appropriate) in upcoming calls for proposals.

TDR's intersectional gender analysis toolkit

Scientists, including those focusing on implementation research, would benefit from adequately considering sex and gender-intersecting social dimensions within their research programmes by strengthening both the practice and science of implementation and by contributing to improved health outcomes and reduction of gender and health inequalities. For this purpose, the toolkit, *Incorporating intersectional gender analysis into research on infectious diseases of Poverty: A toolkit for researchers,* was launched in 2021. Following the guidance of this toolkit, four case studies, described below, were undertaken with an intersectional lens and are expected to be submitted to a peer review journal by end of 2022.

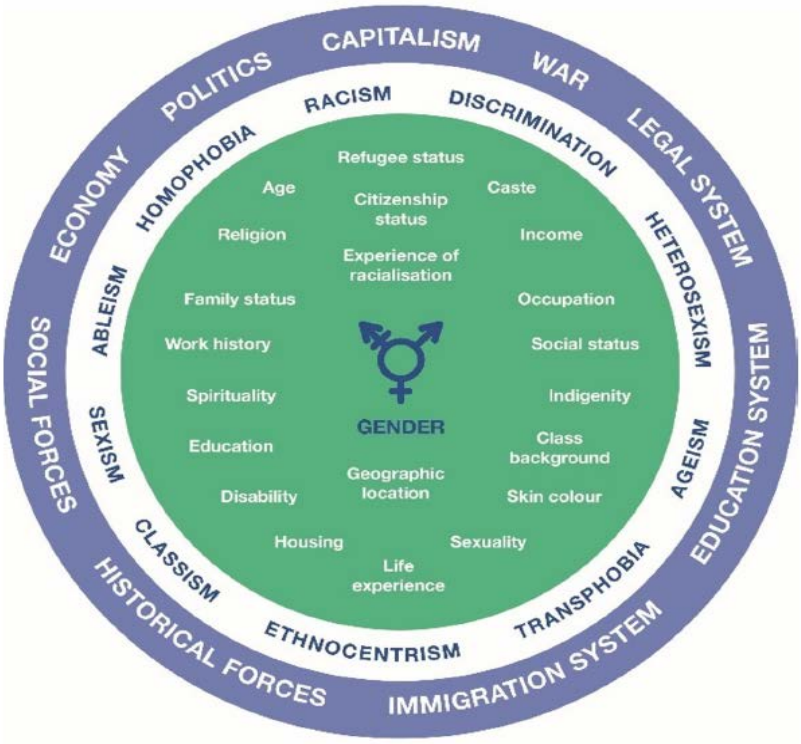
The four research case studies were completed and are expected to be published in 2022 Three infectious diseases, namely schistosomiasis, LF and TB, were studied with an intersectional gender lens. Research teams explored how gender intersects with other social stratifiers to influence vulnerability to illness, exposure to pathogens, response to illness, treatment received and discrimination and/or unequal access to health care. The research generated from the case studies in Nepal and Uganda will now allow a path to be set for strengthened evidence on how gender intersects with other social stratifiers in patient treatment, insights on access and care and how these influence infectious disease perception and understanding and awareness, among others.

Expansion of this ER aims to generate evidence to strengthen intersectionality and gender research efforts in infectious disease prevention and control

In addition, and in line with the TDR IMP–SWG recommendations and vision included in TDR's IGRS, this ER aims to generate evidence on gender-intersecting inequalities in infectious disease epidemiology, prevention and control, as well as gender and intersectionality applied in infectious disease implementation research processes (see Fig. 26). For this purpose, TDR launched a call for research proposals from single or multiple contexts that span the translational research spectrum with methodological underpinning. Teams were requested to address gender, sex and their intersections with associated inequities in infectious diseases. The evidence generated will inform TDR's research and programmes, which in turn should also influence future research, policy and practice.

A multi-country consortium with research teams from Bhutan, Kenya, Malawi and South Africa were selected and are finalizing four research protocols.. A research study in Bhutan will explore the intersections of sex and gender dimensions with other social stratifiers in accessing TB and dengue fever health-care services by transgender men and women; men who have sex with men; and women who have sex with women. The study will employ both qualitative and quantitative designs, and will generate evidence collected in the Thimphu, Mongar, Gele and Phuntsholing areas. This study aims to identify barriers and enablers to access health care by the target population and inform the design of future gender-responsive interventions that promote equity in access to health-care services, particularly focusing on TB and dengue fever.

Figure 27. Gender intersectionality, socioeconomic characteristics and health services



Source: Adapted from Intersectionality Wheel (Simpson, 2009); and *Incorporating intersectional gender analysis into research on infectious diseases of Poverty: A toolkit for researchers*, WHO, 2021.

A multi-country consortium with teams from Kenya, Malawi and South Africa will work collaboratively to assess disease exposure, care-seeking and treatment pathways in Malaria prevention and control applying an intersectional gender lens (Migori County, Kenya and Chikwawa district in southern Malawi).

Research studies in Kenya and Malawi will:

1. Assess the intersection of gender and other social determinants (sex, age, occupation, level of education/class, place of residence (urban/rural) and religion) of malaria in Migori, Kenya and Chikwawa District in Malawi and how this influences the risk of disease exposure.
2. Explore how gender power relations, the prevailing gendered social inequalities and the culturally dominant constructions of masculinity and femininity, intersect with each other in shaping people's understanding of ill-health and influence malaria health-seeking behaviours in Malawi and Kenya.
3. Use an intersectional gender lens to assess Malaria programme delivery and Malaria control interventions including research and access to malaria and disease management services in Kenya and Malawi.

4. Determine the gender dimensions of malaria programme delivery and control interventions in the emerging COVID-19 pandemic context in Kenya and Malawi.

The research consortium will also work with a team based in South Africa. This country falls among the 30 high TB burden countries globally for TB, HIV-associated TB and multidrug-resistant TB (MDR-TB).8 PTLFU can diminish TB control efforts. Recognizing that in South Africa men have been showed to be less adherent to TB treatment and TB control efforts require greater attention to men, through research and interventions that address, in context and relationally, the range and complexity of their TB and general health-care engagement determinants. The study team in South Africa will: i) generate context-specific evidence to help understand PLTFU in Eastern Cape province, South Africa, from an intersectional gender perspective; ii) contribute to generate contextualised insights of intersectional drivers of PTLFU and, more broadly, infectious diseases; and iii) inform, in the longer term, the design of a multi-domain, multi-approach, gender sensitive and locally relevant and practical, candidate intervention for reducing PTLFU in Eastern Cape province, South Africa.

Strengthened research capacities in intersectional gender analysis and institutionalizing gender-based analysis of VBD training

The gender-based analysis (GBA) course at the University of the Witwatersrand in Johannesburg ran from 1 September to 18 October 2020. Sixty-four participants met eligibility criteria from West Africa, East Africa, Southern Africa and Central Africa, following a call for applications with over 250 applicants expressing interest. A total of 76 letters were sent to successful applicants with a request to complete a biographical data form so that they could be enrolled on the course. Sixty-nine participants completed the forms and were enrolled onto the course; five of which never started the course. Fifty-four participants successfully completed the course, representing a 78% completion rate.

The majority were men (63%) and over a third had a master's degree (38.9%). A third were currently working as researchers, 22.2% were academics and 13% worked in laboratories as medical scientists. In addition, the course was part of the Bachelor of Health Sciences Honours in Public Health Honours programme. The Wits School of Public Health initiated a new degree programme starting in 2021 which is a one-year full-time programme for students wanting to pursue postgraduate studies in public health. The "Gender-based analysis of infectious diseases and climate change" is one of the courses available to students as part of the new Honours 2021 programme. The first cohort was enrolled and began in January 2021, courses start in May.

Developing a module on gender for TDR's implementation Research Toolkit

In line with TDR's IGRS that promotes building the science of solutions, TDR is currently updating the existing online version of the IR toolkit with a module on gender considerations in IR as a pathway for a more inclusive and effective response to infectious diseases. This Toolkit is being designed to guide the researcher and health practitioner to develop an implementation research proposal incorporating an intersectional gender lens.

This Toolkit Module will be also aligned with the Massive Open Online Course on Implementation Research, whose Module on Gender and Intersectionality is under development and planned to be finalized and launched in 2022. The IR MOOC module will allow students to learn:

- how intersectional gender analysis can be integrated into the needs assessment phase of implementation research;
- The ways in which the strategy development phase of implementation research can be

[8] Naidoo, P., et al., The South African Tuberculosis Care Cascade: Estimated Losses and Methodological Challenges. J Infect Dis, 2017. 216(suppl_7) S702-s713; WHO, *Global tuberculosis report*. 2021.

informed by the results of intersectional gender analyses;

- How intersectional gender analysis can be used to formulate implementation research questions; and
- How Integrated Knowledge Translation can be applied to implementation research that has used an intersectional gender lens.

Remaining challenges

Obtaining local ethics approvals for research studies at country level and WHO headquarters takes time and may delay the research process. Due the COVID-19 pandemic, delays in obtaining local ethics approvals have been considerable. Therefore, the start of the research activities implementation took longer than initially planned. However, research protocols are being finalized to resume research activities early in 2022. Adequate planning has been ensured to minimize this risk as much as possible. Apart from this and in relation to other TDR projects beyond the gender research portfolio, conducting a deep retroactive gender analysis may not be possible for existing projects that: i) did not budget for it; ii) which do not have the adequate human resources; and iii) did not consider gender dimensions at the initial stages of their research design.

The COVID-19 pandemic slightly delayed data collection activities at country level; however, projects in Nepal and Uganda are finalized within this biennium and research findings will be published next year.

Contributions toward TDR key performance indicators

Partnerships and collaborations:

Makerere University, HERD International, University of Nairobi, Kenya Medical Research Institute, University of Malawi, University of Ghana, University of The Witwatersrand, South African Human Sciences Research Council, ICDDRB (Bangladesh), Faculty of Public Health (Bhutan), MoH (Bhutan), Institute of Health Partners (Thimphu, Bhutan).

Gender aspects and vulnerable populations:

The project description above highlights the specific focus on gender and other intersecting axes of inequality. PI's of both Institutions are women.

Publications:

Ozano K, Dean L, Yoshimura M, MacPherson E, Linou N, Otmani Del Barrio M, Halleux CM, Ogundahunsi O, Theobald S. A call to action for universal health coverage: Why we need to address gender inequities in the neglected tropical diseases community. PLoS Negl Trop Dis. 2020 Mar 12;14(3):e0007786. doi: 10.1371/journal.pntd.0007786. PMID: 32163416; PMCID: PMC7067373.

Results dissemination and uptake:

The research findings from the above-mentioned studies under development will be published in peer-reviewed journals and will be disseminated widely across countries and research institutions in LMICs.

Plans for 2021–2023

Plans continue to expand this area of work in 2021–2023 and generate further evidence on how gender intersects with other axes of inequality that shape health conditions and access to treatment and care. Research teams have been selected for this purpose to conduct studies in Kenya, Malawi, South Africa and Bhutan as specified above. In addition, social innovation hubs will be engaged to apply and incorporate an intersectional gender lens within social innovation for health activities.

▪ Workstream: Research for innovation

ER 1.1.5: DIRECTIONS FOR DEVELOPMENT AND ACCELERATED ACCESS TO NEW TOOLS AND STRATEGIES

TDR, through its convening power and expertise, provides a directional perspective and adapted methodologies for the development and assessment of new interventions and tools to achieve programme objectives for poverty-related diseases, including technical advice to external organizations, as well as to WHO programmes and departments.

Progress in 2021

Onchocerciasis:

- Drug development for onchocerciasis (Drugs for Neglected Diseases *initiative*, DND*i*): TDR staff continue to provide expertise and network in support of DND*i* activities as and when requested.
- The objectives of onchocerciasis-endemic countries have been expanded from control as a public health problem to elimination of transmission of the parasite. This has been noted in the WHO–NTD Roadmap 2021–2030. Understanding the role of the Simulium vector in transmission and appropriate approaches to entomological surveillance are becoming critically important to ensure that countries continue interventions as long as but not longer than needed. While the strategy of the African Programme for Onchocerciasis Control (APOC, 1995–2015) and the Onchocerciasis Elimination Programme for the Americas (OEPA, 1991 to date) was based on MDA of ivermectin, the strategy of the Onchocerciasis Control Programme in West Africa (OCP, 1974–2002) was based on vector control. Consequently, a significant amount of understanding of the role of the vector for parasite transmission and entomological surveys was accumulated in the OCP that will be valuable to inform onchocerciasis elimination efforts across Africa. The vast majority of this work was never published in peer-reviewed journals and the results, conclusions and lessons learned are thus not available to be taken into account by countries, to train new generations of entomologists or for systematic reviews informing WHO guidelines. Recently, documents generated by the OCP have become publicly available in the WHO Institutional Repository for Information Sharing (WHO iris) in the APOC collection. A search of WHO IRIS for ”OCP” shows 2675 documents. The fact that many OCP documents cover numerous topics in combination with incomplete metadata in WHO iris and the limitations of the WHO iris search engine and export features, make identification and retrieval of documents addressing specific topics very time consuming. This restricts the extent to which the documented and expert-reviewed OCP experience can inform today’s onchocerciasis elimination efforts. TDR has asked Dr Daniel Boakye, an entomologist from Ghana who worked in the OCP (as well as later in APOC), to lead a team of next-generation Simulium entomologists from numerous African countries he recently trained to review all documents and extract OCP experience and lessons for publication in peer-reviewed journals. This will make them easily accessible to researchers and country control/elimination programme staff, as well as for systematic review informing future WHO guidelines.

Exploring innovative directions and methodologies:

- As part of a call issued by TDR to systematically analyse best practices in implementation research, a project on community engagement to improve access to health services for Chagas disease control has been initiated in Guatemala. It aims to identify scalable, effective stakeholder engagement strategies implemented over the last ten years through the analysis of qualitative and quantitative data collected through participatory interventions for vector and congenital Chagas disease prevention and control in the country. It will identify enabling

factors and barriers for the implementation and sustainability of previous participatory interventions, including a gender intersectional approach to enhance community health participatory interventions.

- When determining the programmatic effectiveness of a treatment, trial methodology – notably eligibility criteria – should be adapted to reflect the full range of patients seen in clinical practice. It is important to assess whether clinical trials also provide a comprehensive picture of the efficacy and safety of treatments across the range of patients routinely seen in the clinics. A scoping review of the literature is being conducted to investigate malaria patient spectrum representation in therapeutic clinical trials. The review will assess the representativeness of the study participants enrolled in malaria clinical trials vis-à-vis the general population by extracting information on eligibility criteria and reasons for exclusion of patients who had tested malaria-positive from the published literature.

TDR collaborations with individual WHO departments:

WHO–NTD:

- Onchocerciasis subgroup of the NTD Diagnostic Technical Advisory Group for development of Target Product Profiles (WHO–NTD); advice to NTD staff on discussions for preparation for evaluation of moxidectin for inclusions in WHO guidelines for onchocerciasis control and elimination;
- Member of the Steering group for the development of the WHO standard guidelines on the treatment of VL in HIV co-infected persons;
- Member of WHO Task Force on Criteria for the Elimination of Leprosy (TFCEL);
- WHO network for HAT Elimination – Human African Trypanosomiasis Elimination Technical Advisory Group, Ad hoc working group on widened use of acoziborole;
- represented Science Division in the Global polio eradication initiative strategy development consultation; and
- WHO–NTD led collaboration between WHO (multiple departments) and the US-FDA on 'CURE ID', an application to collect real-life experience on treatment of infectious diseases lacking adequate treatment to support approaches to repurposing drugs.

WHO–GTB and WHO regional office for TB:

- Development of various TB research tools in collaboration with WHO–GTB:
  - Development of guidance on implementation of Good Clinical Practices (GCPs) and Good Data Management Practices (GDMPs) in the context of national surveys of the burden of TB disease;
  - Development of a research package for calibrating CAD for TB detection. TDR contributed also to WHO Regional webinar (WHO–EURO, WHO–EMRO, WHO– PAHO) to promote the use of this research package. It was also presented during a symposium on TB screening at the Union conference, attended by more than 500 participants;
  - Development of the ShORRT research package (see ER 1.2.6) with WHO and contribution to various regional webinar to promote the use of this research package (WHO–EURO, WHO–EMRO, WHO–WPRO, WHO–SEARO, WHO–PAHO), during the training of WHO–GTB consultant; and
  - Development of the IR4DTB toolkit (see 1.2.6) and promotion of this tools at various meeting organized by WHO–GTB or WHO regions (WHO–PAHO, WHO–WPRO, WHO–EURO).
- **TDR participation in webinars:** panellist/technical consultation organized by WHO–GTB:
  - Contribution of OR for informing policy;
  - EndTB Webinar on strengthening TB surveillance;
  - Technical consultation for Innovative clinical trial designs for the evaluation of new TB preventive treatment; and

  - Stakeholder Consultation on Target Product Profiles for Next-Generation Drug Susceptibility Testing for M. tuberculosis at Peripheral Centres, 10-12 March 2021.
- **TDR Contribution to WHO secretariat** for the development and conduct of various Guideline Development Group (GDG) meeting:
  - GDG meeting on WHO consolidated guidelines on the treatment of drug susceptible tuberculosis, 2021; and

GDG meeting on the management of TB in children and adolescents.

***WHO emergency* for COVID-19 related activities**:

- Member of the trial management team for the development and conduct of the WHO drug and vaccine solidarity trials with special focus for TDR which is to provide support for ensuring the conduct of the trial in compliance with Good Clinical Practices. TDR activities entail: i) development of training material for the investigators and monitors on GCP principals and how they have to be applied in the context of the solidarity trials; and ii) technical support for overviewing clinical monitors activities.
- Participation to WHO consultation on COVID-19:
  - Global consultation on an R&D Agenda in response to the variants of SARS-CoV-2; and
  - COVID-19 Vaccines- methodological approaches to assess variants effect on vaccine efficacy.

WHO IT department:

- Support to the IT team for the management and use of the REDCap platform.

WHO HIV department:

- Co-chair for IMPAACT/WHO working group on surveillance of the safety of ARVs during pregnancy and lactating.

External partners:

- *Wellcome trust international committee:* member of the selection panel of the Wellcome Trust (biannual meetings) for the selection of intermediate and senior fellowship;
- *Global fund:* contribution for the conduct of global fund webinars on TB screening for catalytic countries;
- *Médecins sans Frontières* members of the DSMB committee for the conduct of RCT on MDR-TB in Afghanistan;
- *Seasonal Malaria Chemoprevention Alliance:* Technical support, in particular for M&E and research related activities; and
- Activities related to external partners includes a collaboration on a database for case reporting and clinical trial data and a discussion forum on off-label use of drugs for indications with either no or insufficient approved treatments (CURE ID). CURE ID was initiated by the US-FDA and the US NIH. TDR is also working with WHO–NTD, WHO–GTB, WHO–GMP, WHO–PQT and other departments to obtain global expert input into the deployment of this tool. The original across indications expert meeting was replaced by virtual meetings for selected indications. The CURE ID application was adapted for COVID-19.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

DND*i*, US-FDA, NIH (USA)

Publications:

Olliaro PL, Coulibaly JT, Garba A, Halleux C, Keiser J, King CH, Mutapi F, N'Goran EK, Raso G, Scherrer AU, Sousa-Figueiredo JC, Stete K, Utzinger J, Vaillant MT. Efficacy and safety of single-dose 40 mg/kg oral praziquantel in the treatment of schistosomiasis in preschool-age versus school-age children: An individual participant data meta-analysis. PLoS Negl Trop Dis. 2020 Jun 22;14(6):e0008277. doi: 10.1371/journal.pntd.0008277. PMID: 32569275; PMCID: PMC7360067.

Plans for 2022–2023

Continue collaborations and development of generic protocol where needed.

ER 1.3.10: URBAN HEALTH INTERVENTIONS FOR THE PREVENTION AND CONTROL OF VECTOR-BORNE AND OTHER INFECTIOUS DISEASES OF POVERTY

In 2020, a new call for proposals was launched inviting institutions working on public health, urban health, implementation research and infectious disease prevention and control, to submit individual or collaborative proposals where two or more institutions are forming a consortium, to explore social and gender dynamics in urban health contexts.

The call responds to the need to recognize that urban health is influenced by several factors, including governance, population features, urban planning, socioeconomic development and health services, among others. All of these factors in turn have major implications for social and environmental determinants of health. The growth of urban slums – including non-notified slums that often lack reliable and safe piped water, adequate solid waste management and other basic services – can render large populations at risk of infectious diseases, a condition which can be exacerbated further by environmental threats such as climate variability and change.

Vector-borne diseases (VBD)s alone cause more than one million deaths each year. The risk of infection is particularly high in towns and cities where vectors proliferate and human contact is high. The incidence and distribution of infectious diseases is consequently influenced by social, demographic and environmental factors that interact under a changing climate and affect pathogen transmission patterns. Accurate, consistent and evidence-based interventions for prevention and control of infectious diseases of poverty in urban settings are urgently needed to implement cost-effective public policies and to promote inclusive, equitable and sustainable urban health services. Understanding the social dynamics, including the gender dynamics that take place in the urban context, is needed to address bottlenecks in the implementation of effective interventions and strategies, to better understand the differentiated impacts of infectious diseases on various population subgroups and how gender intersects with other social stratifiers to better understand different experiences of disease.

The overall objective of this work is to synthesize and consolidate evidence from a series of literature reviews and state-of-the-art scoping reviews that will inform TDR's research agenda on urban health, infectious disease and gender research, including in COVID-19 and post-COVID-19 scenarios to the extent possible.

Progress in 2021

In 2021, following the TDR IMP–SWG recommendations and the current COVID-19 pandemic, this ER supported work on social and gender dynamics influencing urban health and prevention and control of infectious diseases. The call for proposals was launched inviting institutions to conduct literature reviews and/or research gap analyses on social determinants of urban health and, to the extent possible, also explore evidence on how social and gender dynamics in a COVID-19 context affect the prevention and control of infectious diseases of poverty. TDR is working with research teams in India and Bangladesh for this purpose and the literature reviews were conducted in 2021. Multidisciplinary research teams from Bangladesh and India 9 were identified at the end of 2020 and they worked on the development of literature reviews focusing on gender and other social determinants of health in urban settings.

Specifically, the review from the Bangladesh research team explored what community-based interventions are effective in preventing and controlling infectious diseases, including COVID-19, in urban informal settlements; and what implementation strategies are effective in overcoming social, economic and gender inequities in this environment. The research team based in India reviewed evidence on gender-related aspects in infectious disease epidemiology, prevention and control, including gender-based violence. Their research included COVID-19 scenarios where infectious diseases prevail and are often exacerbated by compromised access to health care, as well as aspects related to community participation and engagement in risk management of infectious diseases, including through housing, water, sanitation and hygiene interventions. Reviews are expected to be published in 2022.

Plans for 2022–2023

The findings from this ER will continue to inform the planning of future TDR research projects and research calls in this area of work for this and next biennium.

ER 1.3.14: TESTING OF INNOVATIVE STRATEGIES FOR VECTOR CONTROL

Background

VBDs such as malaria, dengue fever, Zika, chikungunya, yellow fever and others account for 17% of the total morbidity from infectious diseases, causing more than one million deaths per year, with few new drugs or strategies to combat these emerging infectious pathogens. The incidence of some VBDs has grown dramatically in recent decades, with about one third of the world population now at risk from *Aedes*-borne epidemics. This increase is due to global changes and has prompted WHO to state the urgent need for alternative vector control methods in its *Global Vector Control Response (GVCR) 2017–2030*, which was approved at the World Health Assembly in 2017 by more than 190 Member States. The rationale of this ER is to work with all partners to test innovative vector control technologies.

Although the main focus of this ER is to support field testing of the SIT, other related activities were also developed, such as a landscape analysis, to better understand how and where the new vector control technologies fit in the current integrated vector control approach. Additional tools and capacity building could improve entomological surveillance.

Among the current alternatives for new vector control technologies, the SIT (Fig. 27) is a method of pest control using area-wide releases of sterile males to mate with wild females which will thus

[9] These are based in the following two institutions: International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDRB), Health System and Population Studies Division; and Indian Council of Medical Research (ICMR), Regional Medical Research Centre, Bhubaneswar, India.

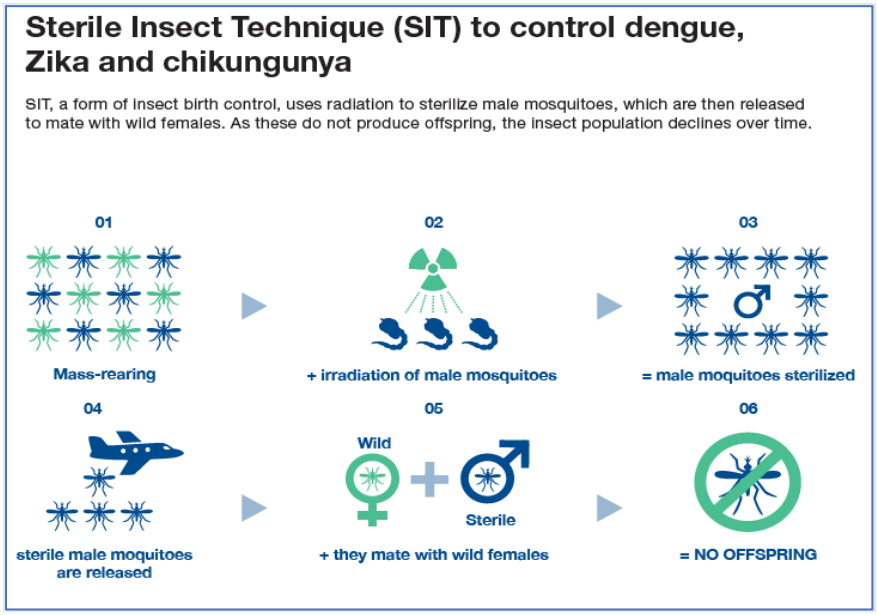
produce no offspring causing a gradual reduction of the overall mosquito population. This technique has been successfully implemented in agriculture against numerous insects since about 60 years, with no side effects and an environmentally safe impact. To test this innovative technology against the diseases, a collaboration was established between the Department of Nuclear Sciences and Applications (NA), the Department of Technical Cooperation (TC) of the International Atomic Energy Agency (IAEA), the UNICEF/UNDP/World Bank/WHO–TDR) and the Vector Management and Ecology Unit (VEM) of the WHO Neglected Tropical Diseases Department (WHO–NTD). A Memorandum of Understanding (MoU) was signed between IAEA and TDR in July 2019 to develop activities on providing guidance to countries and testing SIT against *Aedes* mosquitoes, vectors of arboviral diseases.

Objectives

This ER aims to provide countries and stakeholders up-to-date guidance on how to test new vector control technologies through different materials such as a guidance document, training materials, a workshop and in-site evaluations. Research activities under the best standards of quality and ethics will also be implemented through to test into field conditions the entomological outcomes and the epidemiological outcomes of new vector control technologies. The importance of developing necessary and adequate indicators to evaluate the impact of the new technologies on vector populations, human health and health systems has been emphasized strongly and the subject will be included in the outputs from this activity.

Specific objectives within this ER have been added such as the development on innovative tool(s) for improving the entomological surveillance, the production of a landscape analysis to better understand how the new vector control tools can/will be integrated into the existing ones and a specific activity on capacity building. The final objective is to provide the required support to the countries, the WHO–NTD and other WHO operational programmes, and the Global Malaria Programme, among others, to make new recommendations and policies on innovative vector control technologies and allow full deployment of new validated vector control tools.

Figure 28. Sterile Insect Technique



Outputs and outcomes

SIT testing: The preparation phase for field testing of SIT, including the raising of funds, have been delayed for about one year because of the COVID-19 pandemic and the restrictions for organizing meetings with Member States. If their commitment can be confirmed, Phase 3 could start in January 2022.

- **Phase 1 –** January 2019 to February 2020: Development and production of a guidance document for countries on how to test SIT against *Aedes* mosquitoes, vectors of arboviral diseases.
- **Phase 2** – July 2019 to December 2021: Resource mobilization and release of an open call for proposals to select consortiums to test SIT against *Aedes* in different countries, including LMICs. Establishment of an ad hoc review committee and selection of the best scored research consortium(s).
- **Phase 3** – January 2022 to June 2022: Update of proposals to align them with the guidance framework and harmonize between the consortiums; building of a Special Project Team to help and follow the projects and raising of contracts. Start of the projects in the field.
- **Phase 4** – July 2022 to December 2023: Continuation of field tests;, epidemiological evaluation; and if satisfactory, implementation of the results and policy recommendations and deployment of this new vector control technology at the country level.

Capacity building on medical entomology: A directory of courses on medical entomology developed previously by TDR through an SDF will be made available online to reach the global community. This directory has the objective to help countries to build up capacity on this specific discipline and for all level, from the basic technical level to PhD students.

Landscape analysis on innovative vector control tools: Since several new vector control tools are currently under development, at different stages of testing, the need was expressed by the countries to better understand the potential place of these new tools within the current landscape of vector control. To answer the request a landscape analysis will be produced.

Innovative tool for surveillance of vector control: In order to perform the most significant field testing for innovative vector control tool, the entomological surveillance must be improved with regard to the surveillance of the two most important vector species of arboviral diseases, namely *Aedes aegypti* and *Aedes albopictus*. These two species are breeding in the same environment and domestic containers and the classical recommended WHO ovitraps collect eggs which cannot be distinguished easily (see Fig. 28 available at (https://prvectorcontrol.org/home/). A specific objective will then be to develop and validate an innovative tool allowing the improved surveillance of both species.

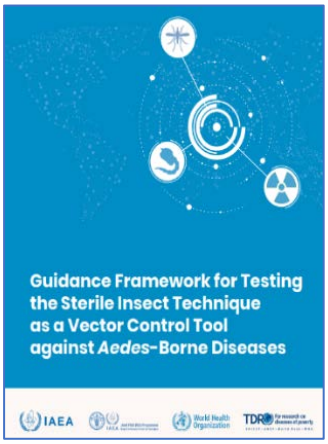
Figure 29. Ovitrap for mosquito eggs surveillance

Progress in 2021

For SIT Testing

Phase 1 – The Guidance Framework Document

A joint AIEA/TDR/WHO document, entitled *Guidance Framework for Testing the Sterile Insect Technique as a Vector Control Tool against Aedes-Borne Diseases* was released in April 2020.



Phase 2a – Open call for proposals for testing SIT against Aedes *mosquitoes*

In July 2019, an open call was released to select consortiums of institutions, vector control agencies and public health systems working on innovative vector control approaches, for proposals on testing the SIT. Four multi-country proposals were selected based on an open transparent selection process (Table 11).

Research consortiums selected following the IAEA/TDR call for field testing of SIT

WHO Region(s)	Countries Included	Research Institutions
Europe, the Americas	Italy, Mexico, Switzerland	Centro Agricultura Ambiente, Centro Regional de Investigación en Salud Pública / Instituto Nacional de Salud Pública, University of Applied Sciences and Arts of Southern Switzerland
Western Pacific	French Polynesia, Cook Islands, Chile (Easter Island)	Institut Louis Malardé, Te Marae Ora – Cook Islands Ministry of Health, Secretariat of Public Health at Chile Ministry of Health
South-East Asia, Western Pacific	Thailand, Philippines, Indonesia	Centre of Excellence for Vectors and Vector-Borne Diseases at Mahidol University, Research Institute for Tropical Medicine, Centre for Isotopes and Radiation Application at National Nuclear Energy Agency
The Americas	Brazil, Cuba, Guadeloupe	Biofabrica Moscamed Brasil, Institute of Tropical Medicine Pedro Kourí, Institut Pasteur de Guadeloupe

Phase 2b – Meeting with countries for fund raising

Due to the COVID pandemic, the fund-raising activities to support the SIT testing were put on hold from March 2020 to February 2021. A first virtual meeting was organized with the countries interested in supporting the testing of the SIT technology and held in February 2021, with nine countries attending (Australia, Brazil, France, India, Italy, Japan, Switzerland, United Kingdom, United States). A follow-up meeting was then organized on 22 April 2021, with France and with Brazil on 27 April 2021. Other follow-up meetings were organized with US–CDC and its Division of VBDs in Fort Collins, from July to end of 2021.

From these discussions, The Chief of the CDC's VBD division officially informed TDR in October 2021 of their willingness to support the SIT testing for the Pacific Region and the process to establish an agreement and transfer the required funding from CDC to TDR has started. In early September 2021, France renewed its interest to support another Consortium and the discussion is still ongoing.

Phase 3 – Update of the proposals to align them with the guidance framework, building up of a Special Project and start of the projects in the field

The activities related to Phase 3 of the project have started with the building up of the Special Project Team (SPT) to manage this activity and organize the independent and external reviews. The planned SPT will include four to six external experts on epidemiology, entomology, social sciences,

cost-effectiveness and the SIT technology and four focal points from the partnership (IAEA, CDC, NTD and TDR). The list of names for the SPT experts and focal persons will be available as soon as all partners have given their feedback.

Phase 3 will also include the update of the proposal from the Consortium from the Pacific Region since the funding to support the SIT testing is this region is in process for being transferred to TDR. As other funding is eventually found for other consortiums, the updates of proposals will follow.

Finally, the start of the first field trials after contracting the consortium is expected to initiate in the first half of 2022.

Phase 4 – Continuation of field tests, epidemiological evaluation and, if satisfactory, implementation of the results and policy recommendations and deployment of this new vector control technology at the country level.

Phase 4 of the project will not start until the second half of 2022.

For capacity building in medical entomology

The Directory on courses of medical entomology was released online January 2021, and on 25 January through the Global Vector Hub platform, hosted by the LSTMH (UK). This directory can be accessed freely after free registration at the following link: https://globalvectorhub.lshtm.ac.uk/.

For the landscape analysis on innovative vector control tools

A consultant was recruited in June 2021 to perform this landscape analysis and the deliverable is expected by end of 2021. The Table of Contents from this Landscape analysis will be as follows:

TITLE: ***Landscape analysis on the potential integration of new vector control technologies including the sterile insect technique and those under development into the existing vector control activities.***

CHAPTER 1: Introduction
- *1.1: Burden of VBD*
- *1.2: Standard measures deployed worldwide to control VBD*
- *1.3: Focus on standard vector control interventions*
- *1.4: Success gained through the deployment of vector control interventions*
- *1.5: Limits of standard vector control interventions (ITNs, IRS, LSM): insecticide resistance etc.*
- *1.6: GVCR' recommendation to promote innovative vector control interventions as part of the control of VBD*
- *1.7: Objectives of the landscape analysis and justification*

CHAPTER 2: Vectors and standard vector control interventions
- *2.1: Mosquitoes and standard vector control interventions*
- *2.2: Diptera and standard vector control interventions - Flies: black flies, culicoides, stomoxys, louse flies, Tsetse flies, sandflies/midges*
- *2.3: Other vectors and standard vector control interventions - Ticks, lice (poux), fleas (puces), triatome bugs*

CHAPTER 3: Vectors and new vector control interventions under development or testing phases
- *3.1: Systemic insecticides and endectocides - Endectocides (Ivermectin)*
- *3.2: Attractive targeted baits*
- *3.3: Peri domestic combined repel and lure devices - Push-pull strategy*
- *3.4: Vector traps for disease management*
- *3.4.1: Adulticidal oviposition and larvicide traps*
- *3.4.2: Autodissemination devices*
- *3.5: Housing modification*
- *3.6: Genetic manipulation*
- *3.6.1: Gene-drive approach: population reduction*
- *3.6.2: Gene-drive approach: population alteration*
- *3.6.3: Daughter killing approach - GM OX5034*
- *3.7: Microbial control of human pathogens in vectors - Wolbachia-based population alteration*
- *3.8: Sterile insect technique*
- *3.8.1: Sterilization by irradiation*
- *3.8.2: Sterilization by cytoplasmic incompatibility (Wolbachia)*

CHAPTER 4: Integration of sterile insect technic and new vector control technologies into standard vector control interventions
- *4.1: Integrated vector management approach*
- *4.2: Sterile insect technique combined with incompatible insect technique (SIT-IIT)*
- *4.3: Sterile insect technique combined with juvenile hormone analog (Boosted SIT)*
  (will just mention the combination as well as the ongoing trials)
- *4.4: Challenges to integrate standard and new vector control technologies*

CHAPTER 5: Challenges related to the measure of entomological and epidemiological impacts of a sterile insect technic component in integrated vector management approach.
- *5.1: Challenges to measure the impacts of SIT component in an integrated vector control strategy*
- *5.2: Possible ways forward: additive, synergistic, or antagonist interactions between SIT and other vector control interventions*

CHAPTER 6: Make the right decision on the deployment of vector control interventions
- *6.1: Malaria eradication prior to the advent of insecticide-treated nets*
- *6.2: Unsuccessful control of VBDs despite the deployment of vector control interventions*
- *6.3: Contextualised rollout of vector control interventions*

CONCLUSION
REFERENCES
ANNEXES

Innovative tools for surveillance of Aedes *vectors*

A collaboration has been established with WHO–NTD to support the development of innovative surveillance tools for *Aedes* mosquitoes. In 2020–21, the vector ecology department of the Scuola Universitaria e Professionnale della Svizzera Italiana (SUPSI) has validated an optical determination method for the distinction of eggs of *Ae. albopictus* from *Ae. japonicus* and *Ae. koreicus*. The surface structure of the chorion (outer surface of the egg) was examined using a high-resolution ZEISS Axio Zoom.V16 microscope. The species were identified optically and the identifications were confirmed via MALDI-TOF mass spectrometry. With this optical identification technique, the operator can reliably distinguish eggs of *Ae. albopictus* from other *Aedes* eggs with an accuracy of about 95%.

The advantages of the optical identification technique are that even eggs in bad condition or already hatched can be identified, more or even all the eggs on a sample can be identified and the eggs do not need to be destroyed and can be reused for further analyses and that it is much less time consuming.

Following discussion between TDR, WHO–NTD, SUPSI and ECOSUR, this proposal of work will apply this methodology to distinguish eggs of *Ae. albopictus* from eggs of *Ae. aegypti*. The working group of the ECOSUR laboratory in Mexico will provide *Ae. aegypti* and *Ae. albopictus* eggs collected in the field from at least 20 different sites. After highlighting morphological differences, the species will be confirmed by a PCR test.

Plans for 2022–2023

For SIT Testing

Phase 3 *- Update of the proposals to align them with the guidance framework, building up of a SPT and start of the projects in the field.*

Follow and support the field testing of SIT and organize a workshop with the research teams to harmonize the proposals and discuss testing of the technology within the different contexts.

Phase 4 *- Continuation of field tests, epidemiological evaluation and if satisfactory implementation of the results and policy recommendations and deployment of this new vector control technology at the country level.*

For capacity building in medical entomology

Continue supporting the addition of courses in medical entomology into the Directory hosted by the Global Vector Hub, with special consideration of the courses held and available in the LMICs, in particular from the African Region, from which only a few courses have been found.

For the Landscape Analysis on innovative vector control tools

Publish the landscape analysis.

For the innovative tools for surveillance of Aedes *vectors*

Release the methodology for using the new tool on *Aedes* eggs surveillance after the results have been validated and published. The methodology will also be made available with a Standard Operating Procedures document.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

Collaboration and an MoU (MoU) were developed and signed with the IAEA and with the joint IAEA/FAO Team. The activities will be undertaken in partnership with WHO–NTD and the WHO Regional Offices, as well as several countries.

A new partnership will be established with the Arboviral Diseases Division of the US–CDC in Fort Collins through a funding agreement and an MoU.

A partnership was established with the ARCTEC Innovation company managing the Global Vector Hub Platform, where the directory of courses on medical entomology is currently online.

A partnership has been established with SUPSI in Switzerland and ECOSUR in Mexico for the surveillance tool on *Aedes* eggs.

Estimated leverage created by this project:

The countries involved in the projects have already committed to co-support the field testing through their own Vector Control Agencies funding, through staff and materials for an amount which has been estimated to be at least equivalent to the funding received. Further leverage will be made through the direct support to the sterile mosquito production facilities through technical cooperation received from IAEA once the contracts with the respective countries are finalized.

Gender aspects and vulnerable populations:

Gender aspects were taken into account in the selection process since all consortiums are showing parity among the investigators. The parity in gender will also be respected within the SPT including two women and two men in the proposed external experts and two women and two men in the focal persons for the respective partners. This new vector control technology will be deployed in priority areas where the most affected populations are the poorest and the most vulnerable.

Training:

A first training material was produced with the guidance document. Several training workshops and activities are planned through this activity and an evaluation of capacity building and strengthening of the participating institutions is already planned with the partners.

Publications:

Guidance Framework for Testing the Sterile Insect Technique as a Vector Control Tool against *Aedes*-borne Diseases is available at

https://www.who.int/tdr/publications/year/2020/guidance-framework-for-testing-SIT/en/.

Other publications are on track.

Recommendations from 2020 SWG meeting and how they have been addressed

ITEM 1: *How best to engage with countries, regarding the new vector control technologies?*

- *Answer from SWG*: Work very closely with national programme managers and multiply communication on the low risks attached to the technology.

Response from IMP Manager: Several meetings were held in partnership with WHO–NTD and IAEA to inform the countries about the details and safety of the technology.

ITEM 2*: What topics must be included into the indicators to assess the impact of the new vector control technologies?*

- *Answer from SWG:* Change in perception of stakeholders and eventual barriers. What are the number of capacities developed to sustain the implementation of such activities in the countries.

Response from IMP Manager: These items are well included into the selected proposals.

ITEM 3*: Any other item?*

- *Answer from SWG:* How far is this technology covered in academic courses and professional training sessions related to vectors control (e.g. schools and universities)? What about limitations, such as costs? If the technology has been known for 60 years, why is it still at testing stage for some species?

Response from IMP Manager: This technology is well covered in academic courses in entomology and agricultural entomology. The cost limitations have been by far eliminated by the benefits in crop pest control using this technology. This technology is in use for about 30 years in plant protection (agricultural entomology) but because of the competition with other technologies and the limited funds available in medical entomology, the delay in development is important. However, agricultural entomology has always been in advance of medical entomology because of the need to feed the population.

- *Answer from SWG:* Uncertainties with IAEA funding: What about alternative funders (e.g. private foundations)?

Response from IMP Manager: Other funding opportunities have been explored and recently the US–CDC at Fort Collins has taken the decision to financially support the Consortium from the Pacific Region. Other funding sources are currently being explored to support other consortiums.

Recommendations from SWG:

There had been an informal commitment from the IAEA for field testing of SIT. The funding situation has been adversely affected by the COVID-19 pandemic and other fund-raising efforts have not yet been successful. There was some discussion about the potential to seed this work through undesignated funding.

Given the new WHO guidance on Ethics and Vector-Borne Diseases and other global investments in vector control, including Gene Drive, the value of investing in a SIT alternative intervention was not clear. Continued consideration could be given to the implementation implications of vector control strategies, particularly community engagement.

Summary of Recommendations from SWG:

Further funding opportunities are worth pursuing

Response from IMP Manager: Pursuing other funding opportunity has been partly successful for at least one consortium and a total budget of US $600,000. Other opportunities are currently being explored.

The ER needs to explore internal synergies for opportunities to advance this work

Response from IMP Manager: Internal synergies for opportunities to advance this work were explored but not found yet.

▪ Workstream: Research for integrated approaches

ER 1.3.11: MULTISECTORAL APPROACH TO PREVENTION AND CONTROL OF MALARIA AND EMERGING ARBOVIRAL DISEASES

Background

VBDs, including malaria and emerging arboviral diseases, account for about one quarter of all infectious diseases. Although there has been significant progress for malaria, with a recent decrease in malaria morbidity and mortality rates, other diseases, such as those caused by arboviruses like dengue fever, chikungunya, yellow fever, and more recently Zika, are expanding, with an increased number of cases and fatalities. It has become evident that the prevention and control of these diseases must include more than a single oriented approach, since the transmission patterns are driven by vector host-pathogen relationships where natural conditions, human societies and vector parameters are dynamically interacting. Further, the Global Vector Control Response (GVCR) 2017–2030, which was approved at the World Health Assembly in 2017 by more than 190 Member States (WHO 2017) considers the intra- and intersectoral approach as one of the four pillars to achieve efficient vector and VBDs control.

Objectives

The rationale of this ER is to work with all partners to better understand how to implement an efficient multisectoral approach (MSA) for preventing and controlling VBDs since although MSA has been widely used and recommended, the theoretical baselines and the "*how to*" are missing. This ER will also work on developing tools, a framework and guidance on MSA, as well as test the approaches with case studies in field conditions.

This activity is building on the 2013 Multisectoral Action Framework for Malaria developed by the Roll Back Malaria (RBM) Partnership and the United Nations Development Programme (UNDP), followed by a concept note issued by the Swiss Tropical Public Health (STPH) institute and the Swiss Development Cooperation (SDC) entitled: *Leveraging the Sustainable Development Goals to intensify transdisciplinary and multisectoral collaboration in the global malaria response*. In this context, a collaboration on MSA for the prevention and control of malaria and emerging arboviral diseases was started between the SDC, IDRC, STPH and TDR–VES, with the aim to build a multidisciplinary approach with supporting commissioned reviews on specific items related to MSA against VBDs and the development of a guidance document.

Following these first steps, a collaboration was established with the WHO Water and Sanitation (WASH) group and supported by funding from the Swedish International Development Agency (Sida) to strengthen countries' capacity on MSA against VBDs with a focus on the WASH sector. The overall objectives of the collaboration are to reduce WASH-related diseases of poverty as per WHO–WASH Group strategy, with a primary focus on VBDs in LMICs, as per TDR Strategy. This project will also be relevant for other issues related to universal health care and human well-being as well, thus the capacity built from this work will benefit further a much broader spectrum of health-related topics.

The relevance of the MSA against the deadliest VBD, namely malaria, was also recognized and a new collaboration was started on this activity with the WHO–GMP to test MSA and the Chinese 1-3-7 approach against malaria through funding from the UNPDF to test these approaches in four African countries (Burkina Faso, Senegal, Tanzania and Zambia).

This project benefits from the unique positioning of TDR as a global programme of scientific collaboration that helps facilitate, support and influence efforts to combat diseases of poverty and co-sponsored by UNICEF, the UNDP, the World Bank and WHO. This position helps to develop collaboration between different partners arising from internal and external organizations such as the WHO–WASH Group, WHO–GMP, the UNDP, the RBM Partnership, as well country agencies for

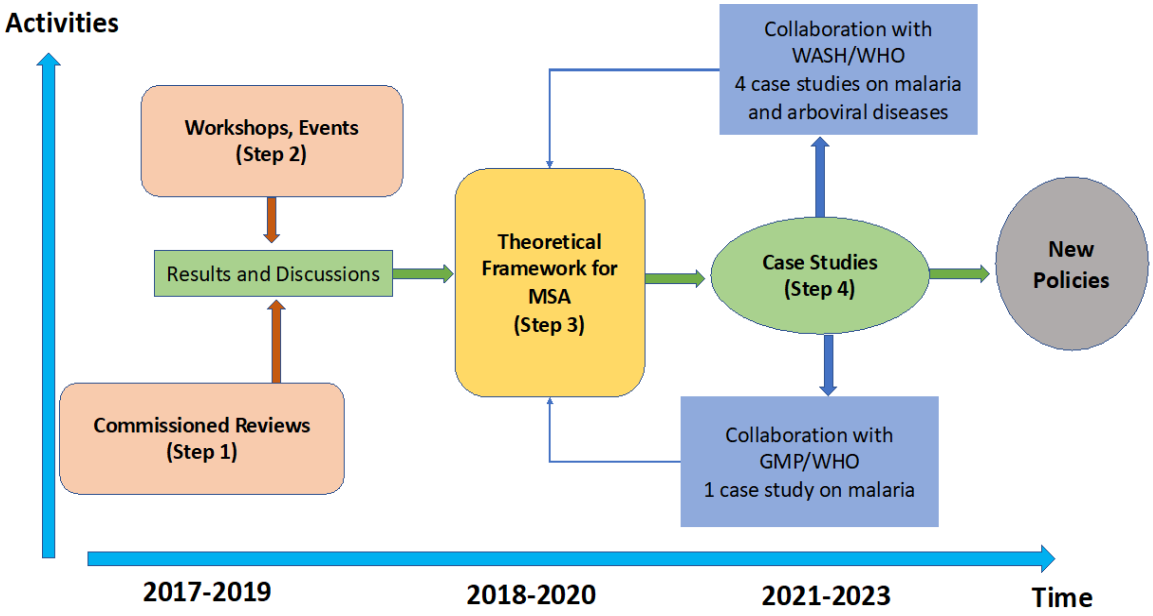
cooperation such as IDRC (Canada), SDC (Switzerland) and Sida (Sweden), and UN Funds such as the UNPDF. Further, TDR has the unique opportunity to support within its core strategy different types of activities including commissioned reviews, publications, development of documents and training tools and research case studies that combined allow for the development, testing and advocacy of an integrated and efficient multisectoral strategy to prevent and control VBDs.

This uniqueness has been recognized by our supporting partners and funders and this ER has been possible with the support of designated funds from different Agencies (SDC, IDRC, Sida and UNPDF) for about **80% of the total amount** of funding implemented through this ER.

Output

The different steps of the ERs of the project are shown below as multisectoral approaches for prevention and control of VBDs with timelines and steps (see Fig. 29). Steps 1 to 3 have already been completed and Step 4 started during the 2020–2021 biennium.

Figure 30. Multisectoral approaches for prevention and control of VBDs with timelines and steps



The indicators for uptake of the findings from this ER are listed in Table 12.

To ensure this uptake, the different activities performed through this ER involve, since the planning stages, all the relevant stakeholders. The collaborating partners will also use their own channels to provide recommendations to countries based on the findings. A target number of countries, possibly more than ten have expressed interest, to work on a multisectoral approach for preventing and controlling VBDs, based on the TDR framework, to be finalized by end of the next biennium (2023).

The publication plan includes guidance documents that will be updated regularly, thematic briefs, scientific publications in open access peer review journals (with special issues) and other materials such as training materials and briefs for stakeholders (communities and technical staff from both health and non-health sectors).

Table 11. List of indicators for impact from ER 1.3.11

Expected Result	Indicators *(Current status)*	Progress against targets
1.3.11 Multisectoral approach for prevention and control of malaria and emerging arboviral diseases: i) Knowledge and evidence from a multisectoral approach has been generated and made available for stakeholders; and ii) A multisectoral approach for prevention and control of VBDs implemented in some countries.	**Number of documents released for knowledge and training** *(one Framework and two training packages)* **Number of countries participating to case studies and developing their capacity on MSA** *(12 countries involved in case studies)* **Number of countries implementing MSA for VBDs prevention and control** *(two countries already implementing MSA)*	**By 2020,** A guidance framework document published. **By 2021:** • Two to three case studies supported and ongoing. • Five countries are implementing multisectoral approaches, with M&E of epidemiological results. *Progress*: • The guidance document has been released. • Two proposals for case studies on malaria have been selected and the process of contracting these case studies is completed for one project, already started and on track for the other one. • Two proposals for case studies on arboviral diseases have been selected and the process of contracting these case studies is on track. • A new collaboration with a specific sector, the Water and Sanitation Sector, has been developed and supported by funds from Sida. • A new collaboration with WHO–GMP has been developed and received financial support from UNPDTF Funds.

Progress in 2021

Step 1 – The commissioned reviews

A call was launched in January 2017 to support five commissioned reviews on specific topics related to multisectoral approaches for the prevention and control of VBDs. The overall objective of the call was to support a landscape analysis that would identify the knowledge gaps in the understanding of transmission patterns and the ecology of the mosquito vectors of VBDs. The commissioned reviews were mandated to investigate current knowledge and experiences on the different topics. The following reviews were completed:

***Review 1*:** Impact of the industrial sector on VBDs, with the example of the gold mining activities that are disrupting the malaria ecosystems in Africa and the Americas.

***Review 2*:** Using dengue virus as a proxy to describe and assess the individual and combined impact of vector control strategies including within the eco-bio-social approach.

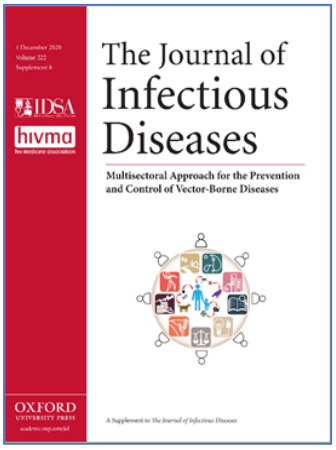
***Review* 3:** Impact of human mobility (either individual or population) caused by economic, civil unrest or war reasons, displacement of temporary workers and other population movements, on the emergence of arboviral outbreaks.

***Review 4*:** Roles of the different stakeholders in a multisectoral intervention on insecticide-treated mosquito nets distribution on mobile populations in South-East Asia.

***Review 5*:** Examine how stakeholders are working together to achieve the implementation of a global multisectoral strategy.

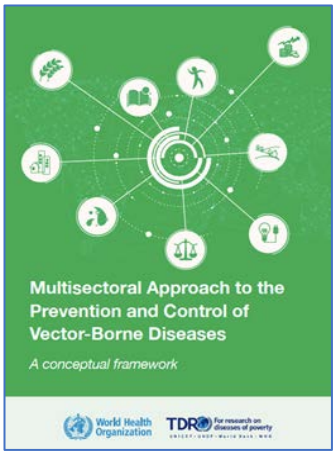
***Review 6*:** Scoping review of intersectoral collaborations for the prevention and control of VBDs.

Results of four of the reviews (Review 1, 3, 4 and 6) were published in a *Supplement of the Journal of Infectious Diseases* released in October 2020 (https://academic.oup.com/jid/issue/222/Supplement_8), while Reviews 1 and five yielded two separate publications which were published previously.



Step 2 – Workshops and events

- *TDR-SDC-IDRC-STPH Workshop* on Multisectoral Approaches for Prevention and Control of VBDs: Current knowledge and Research Gaps and Priorities, Starling Hotel, Geneva, Switzerland, 26–28 June 2017.
- *Geneva Health Forum 2018*: Parallel Session on "Global health security – Towards multisectoral collaborations to confront the increasing threat of VBDs", 11 April 2018.
- *67th annual meeting of the American Society of Tropical Medicine & Hygiene (ASTMH)*, New Orleans, Louisiana, USA 2018. Poster presentation on "Multisectoral approaches to prevent and control malaria and arboviral diseases", 31 October 2018.
- *TDR-CARPHA-IPK Workshop on Multisectoral Approaches for Prevention and Control of VBDs in the Caribbean: Current Practices and Future Development*. Pedro Kourí Institute (IPK) side event of 16th International Dengue, Zika and Current Emergent Arboviruses Course, Havana, Cuba, 16 August 2019.
- *NIPD-TDR-WSH workshop on multisectoral approaches to the prevention and control of VBDs with a focus on the joint activities between Health and WASH sector*, held virtually 7–10 June 2021. The workshop participation is shown is represented in Fig. 30. Asian and African participants joined in the morning, section 2A) and the American session took the afternoon (section 2B). Roughly 150 people in total from 23 countries joined the two sessions.

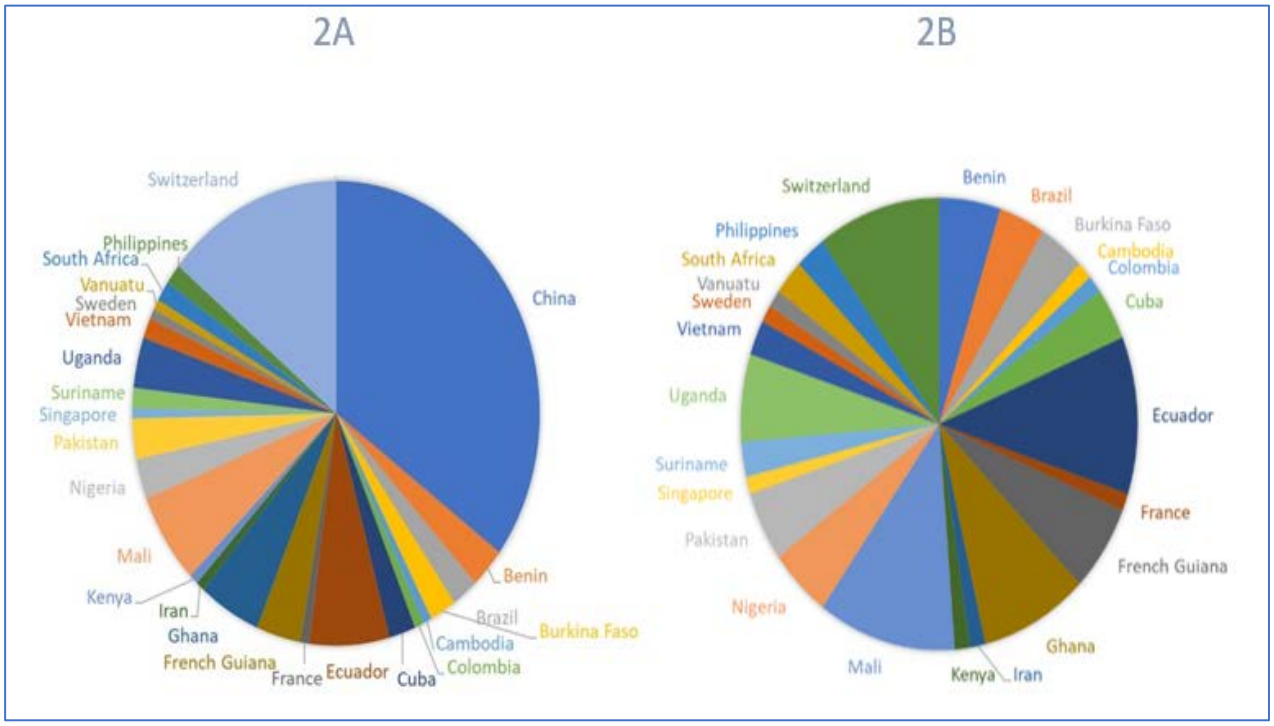


Step 3 – Development of a framework for implementation of multisectoral approaches

This document was produced following one of the main recommendations from the reviews and the exchanges with the stakeholders. The document starts with two introductory chapters on VBD basics and multisectoral approaches. The determinants of VBDs are described and grouped into four categories: pathogen- and vector-related, environmental and agroecological, economic and social and health system-related determinants. Chapters 3 and 4 present the conceptual framework and its components.

The conceptual framework is named "BET" – Base, Energy and Technical elements. It includes seven components: pillars, dimensions, levels, resources, sectors, domains and enablers.

Figure 31. Countries attending the MSA virtual workshop, June 2021



These components envelope the ingredients to include in a customized and tailored MSA. Chapter 5 outlines the coordination pathway from step 1 to step 6. In Chapter 6 Sectoral Guidance, a sectoral pathway is intended to assist government ministries to plan and initiate their work according to an MSA from defining the vision to sectoral monitoring and evaluation, including important steps such as aligning MSA activities with the sector's existing activities. A non-exhaustive list of key sectors is included, along with health: environment, water and sanitation, agriculture and aquaculture, energy, housing, education and research, finance and legislature. The last conclusive chapter of the guidance document highlight the necessity to have a monitoring and evaluation system of these approaches and of the interventions.

The Multisectoral Approach for the Prevention and Control of Vector-Borne Diseases: A conceptual framework was released online in April 2020, after passing through the standards of internal and external review processes, as well as editing and WHO clearance.

Revision of the TDR framework is planned, with the addition of a specific chapter for collaboration between WASH and Health sectors (for VBDs) and an updated chapter on monitoring and evaluation of MSA implementation.

Step 4 – Case studies within specific partnerships with the Water and Sanitation Sector (WHO–WASH) and the Global Malaria Programme (WHO–GMP)

The objectives of the case studies are:

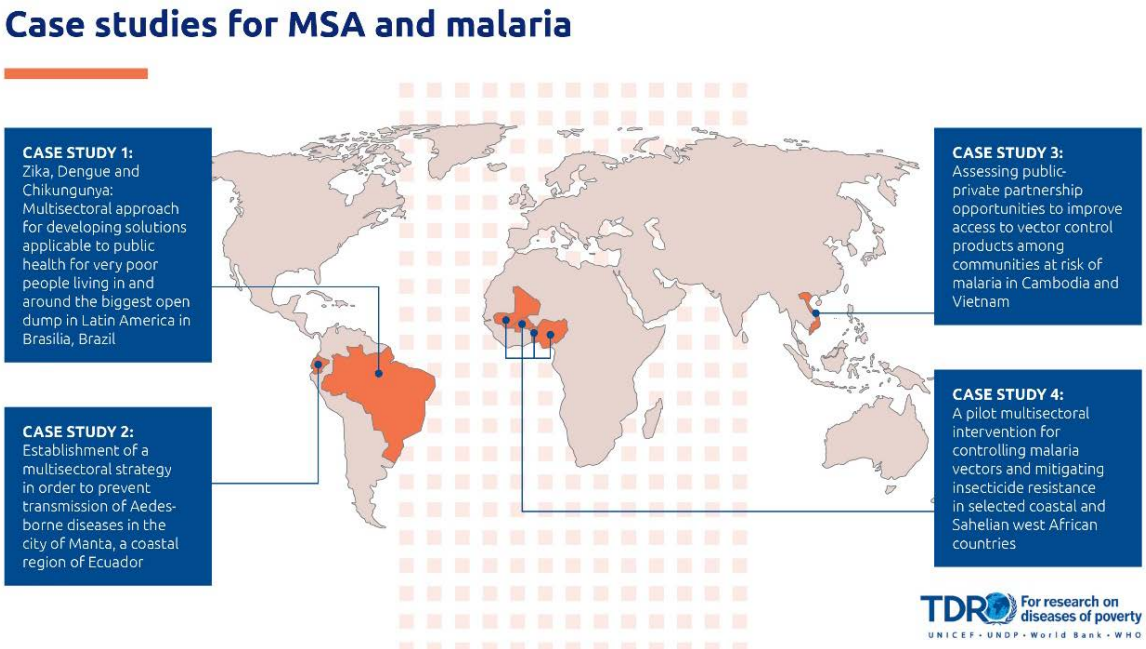
- to help countries to deploy MSA through capacity building activities, guidance documents, networking and workshops;
- to refine and promote TDR's research for impact on multisectoral action for health with a focus on priority research relevant to WASH through harnessing TDR's comparative advantage in research and training on diseases of poverty increasing the impact of WHO's WASH work through joint convening of WASH and health sectors; and
- to support and strengthen health systems to better address infectious diseases of poverty in general, and VBDs in particular, by joint WHO–WASH efforts focused specifically on WASH services in health-care facilities and building capacity of health and WASH workers.

Plans for 2022–2023

Partnerships with the WHO Water, Sanitation and Hygiene Group (WHO–WASH)

Two work packages with several deliverables were proposed and approved into a concept note in order to achieve the objectives of a collaboration with the WHO–WASH group, and financially supported by Sida.

The activities have well started and are on track. A consultant has been recruited to develop the specific WASH chapter, in collaboration with WHO–WASH, with a planned completion date of end of 2021. Training packages were developed and used in the virtual MSA workshop held in June 2021, as well as in other WASH workshops. Additionally, an ad hoc review committee was established and four proposals for case studies were approved and are in the process of being contracted.



The titles of the proposed case studies are:

- A pilot multisectoral intervention for controlling malaria vectors, mitigating insecticide resistance and assessing WASH facilities at health-care units in selected coastal and Sahelian West African countries (Mali, Benin, Burkina Faso and Nigeria)
- Improving Access to Vector Control Products among Communities at Risk of Malaria in Cambodia and Vietnam
- Establishment of a multisectoral strategy in order to prevent transmission of *Aedes*-borne diseases, in the city of Manta, at the coastal region of Ecuador
- Zika, dengue and chikungunya: Multisectoral approach for developing solutions applicable in public health in Brasilia

A new case study on arboviral diseases is currently under discussion with the countries of Bangladesh and Nepal.

Partnerships with the Global Malaria Programme (WHO–GMP) Project

The overall goal of the project is to explore and validate the application of innovative surveillance and response, as well as multisectoral approaches, to reduce malaria burden in different settings of Africa. The project has two components, both of which fit well to the national strategic plans (NSPs) for malaria of the countries covered by the project: i) innovative surveillance, namely "malaria Reactive Community-based Testing and Response approach (1-7 mRCT))", adopted from the Chinese 1-3-7 surveillance and response experience; and ii) multisectoral approach in coordination and implementation to reduce malaria burden.

The project will be implemented in selected districts and villages of four countries (Burkina Faso, Senegal, Tanzania and Zambia). The NMCPs will coordinate the execution of the project with technical support from local institutions. Upon successful verification of the approaches, the NMCPs could incorporate the approach into their national policies for wider scaling-up in their high-burden districts. The NMCPs will also identify local institutions that can help and partner in implementing the project. WHO–TDR and the National Institute of Parasitic Diseases (NIPD) of China will support the countries in training, designing, implementation and monitoring and evaluation of the project. To achieve these objectives two work packages have been developed. This collaboration with WHO–GMP is supported by the UNPDF (US$ 375,000 is allocated to Outcome 2, WHO–TDR).

Innovative multisectoral approaches for malaria control: These will be evaluated in one country and the evidence of this research documented for wider country adaptation to maximize impact. Some activities have started in 2021 (see Table 13).

- **Activity 2.1:** Update TDR's guidance document on the multisectoral approaches for prevention and control of VBDs with a special focus on malaria. Produce short brochures for key events.
- **Activity 2.2:** Organize a regional training workshop for national malaria programme and local research institute staff on how to conduct IR; set up one operational research activity on surveillance and response of malaria, and document findings on multisectoral approaches.
- **Activity 2.3:** Integrate activity into existing relevant committees/task forces led by the Ministry of Health to manage malaria data collected in one country with strengthened malaria control through an innovative multisectoral approach.
- **Activity 2.4:** Surveillance/response to malaria with multisectoral approaches in one country.
- **Activity 2.5:** Identify the most suitable multisectoral collaboration mechanism in each context.

Table 12. Objective and activities under TDR within the UNPDF

Logic Intervention	Activities	Indicators	Means of Verification
Objective 2. To explore and implement innovative multisectoral approaches for malaria control in Africa			
Outcome 2.			*Project assessment report*
Innovative multisectoral approaches for malaria control evaluated in one country and the evidence of this research documented for wider country adaptation to maximize impact.	**Activity 2.1**: Update TDR's guidance document on the multisectoral approaches for prevention and control of VBDs with a special focus on malaria. Short brochures can be produced on this special focus and disseminated through key events.	**IA 2.1** *Indicators on multisectoral approaches activities and impact collected in one country with strengthened malaria control through innovative multisectoral approach* (cf.*)	
	Activity 2.3: Integrate activity into existing relevant committee/task force led by the Ministry of Health to manage malaria **Activity 2.4**: Surveillance and response of malaria (including multisectoral approach) in one country **Activity 2.5**: Identify the most suitable multisectoral collaboration mechanism in each context	***IA 2.2*** *Number of operational research outputs (documentations) on multisectoral approach for malaria control adapted to other contexts and countries*	*Project assessment report and publication*

* Input indicators reflect resources mobilized to support the approach, SOPs, guidelines and policies. Process Indicators reflect all elements that are related to the processes of the multisectoral approach such as the numbers of activities, the timeline for their deployment, how the deployment was effective, the number of meetings and others. Output indicators are the indicators related strictly to the activities, such as number of events for communication, number of coordination meetings, data related to joined activities such reduction in number of breeding sites through joined health and WASH activities and many others. Outcome indicators are the tangible direct results such as coverage, use, vector reduction, incidence reduction. Impact indicators are the final objectives of the programme in terms of impact on the disease burden.

Contributions towards TDR key performance indicators

Partnerships and collaborations:

The initial partnership was with the SDC, IDRC and STPH. A new partnership was established in 2019 with the WHO–WASH group and Sida. A supplementary partnership was established on MSA in Malaria with WHO–GMP and China CDC.

Estimated leverage created by this project:

This ER has been and remains funded essentially through designated funds, which represent about 80% of the funding received for this ER. The DFs also have different origins for activities and collaborations.

Sida is funding the activities under the collaboration with the WHO–WASH Group for a total budget of about US $ 700,000.

The UNPDF is funding activities under WHO–GMP collaboration with for a total budget of US $ 390,000.The leverage created through the case studies within the countries are also estimated to represent about the same amount of the funds released for each project, for a total amount of US $ 700,000.

Gender aspects and vulnerable populations:

Gender aspects were taken into account in the selection process of the commissioned reviews, as well in the case studies, with currently three out five (about 37%) of the principal investigators being women. Further, these MSA approaches will be deployed in priority areas where the most affected populations are the poorest and the more vulnerable.

Publications:

Herdiana H, Sari JFK, Whittaker M. 2018. Intersectoral collaboration for the prevention and control of vector-borne diseases to support the implementation of a global strategy: A systematic review. PLoS One, 2018, Oct 10;13(10): e0204659. doi: 10.1371/journal.pone.0204659. eCollection.

Jones RT, Tusting LS, Smith HMP, Segbaya S, Macdonald MB, Bangs MJ, Logan JG. The impact of industrial activities on vector-borne disease transmission. Acta Trop, Dec;188:142–151. doi: 10.1016/j.actatropica.2018.08.033. ePub, 2018, Aug 27.

Naing C, Whittaker MA, Tanner M. Inter-sectoral approaches for the prevention and control of malaria among the mobile and migrant populations: a scoping review. Malar J. 2018 Nov 16;17(1):430. doi: 10.1186/s12936-018-2562-4.

Abdul-Ghani R, Mahdy MAK, Al-Eryani SMA, Fouque F, Lenhart AE, Alkwri A, Al-Mikhlafi AM, Wilke ABB, Thabet AAQ, Beier JC. Acta Trop. Impact of population displacement and forced movements on the transmission and outbreaks of Aedes-borne viral diseases: Dengue as a model. 2019 Sep;197:105066. doi: 10.1016/j.actatropica.2019.105066. ePub 2019 Jun 18.

Results dissemination and uptake:

Uptake of commissioned reviews output has already started with publications and new research projects supported in 2020–2021. Uptake of research outputs is on a very good track since this ER is implemented with stakeholders and countries, as well as other operational departments from WHO and other agencies/programmes such as UNDP, the RBM Partnership and national development agencies**.**

Supplement articles:

Florence Fouque, Karin Gross, Zee Leung, Konstantina Boutsika, Introduction to a Landscape Analysis of Multisectoral Approaches for Prevention and Control of Infectious and Vector-Borne Diseases, Journal of Infectious Diseases*,* Vol. 222, Issue Supp. 8, 1 Dec 2020, pp. S695–S700, https://doi.org/10.1093/infdis/jiaa489Robert T Jones, Lucy S Tusting, Hugh M P Smith, Sylvester Segbaya, Michael B Macdonald, Michael J Bangs, James G Logan, The Role of the Private Sector in Supporting Malaria Control in Resource Development Settings, Journal of Infectious Diseases, Volume 222, Issue Supplement_8, 1 December 2020, Pages S701–S708, https://doi.org/10.1093/infdis/jiaa488

Rashad Abdul-Ghani, Florence Fouque, Mohammed A K Mahdy, Qingxia Zhong, Samira M A Al-Eryani, Abdulsamad Alkwri, John C Beier, Multisectoral Approach to Address Chikungunya Outbreaks Driven by Human Mobility: A Systematic Review and Meta-Analysis, Journal of Infectious Diseases, Volume 222, Issue Supplement_8, 1 December 2020, Pages S709–S716, https://doi.org/10.1093/infdis/jiaa500

Cho Naing, Maxine A Whittaker, Marcel Tanner, Multisectoral Approach to Support Use of Insecticide-Treated Net for Malaria Prevention Among Mobile and Migrant Populations in Myanmar: A Systematic Review, Journal of Infectious Diseases, Volume 222, Issue Supplement_8, 1 December 2020, pp. S717–S725, https://doi.org/10.1093/infdis/jiaa335

Carl Abelardo T Antonio, Amiel Nazer C Bermudez, Kim L Cochon, Ma Sophia Graciela L Reyes, Chelseah Denise H Torres, Sophia Anne S P Liao, Dorothy Jean N Ortega, Abegail Visia Marie C Silang, Deinzel R Uezono, Evalyn A Roxas, Maria Sonia S Salamat, Recommendations for Intersectoral Collaboration for the Prevention and Control of VBDs: Results From a Modified Delphi Process, Journal of Infectious Diseases, Volume 222, Issue Supplement_8, 1 December 2020, Pages S726–S731, https://doi.org/10.1093/infdis/jiaa404

Qingxia Zhong, Florence Fouque, Break Down the Silos: A Conceptual Framework on Multisectoral Approaches to the Prevention and Control of Vector-Borne Diseases, Journal of Infectious Diseases, Volume 222, Issue Supplement 8, 1 December 2020, Pages S732–S737. https://doi.org/10.1093/infdis/jiaa344

Recommendations from 2020 SWG meeting and how they have been addressed

The SWG remarked that this ER is a good example of designated funds obtained from external funding and resulting in a good partnership with a WHO team. Response to questions posed by the manager are as follows:

ITEM 1*: What could be the criteria/preferences for choosing between partners?*

- *Answer from SWG:* Consider the potential for topping up other ER activities with partners in regions and countries. Think strategically about the potential of synergies between expected results on VBDs, giving weight to those criteria in the partner selection process.

  Response from IMP Manager: The advice was followed in selecting supplementary case studies with a criteria looking at potential synergies with other ER, such the ER 1.3.3 on One Health and ER 1.3.12 on Gender.

ITEM 2*: Could other VBDs (other than malaria and arboviral diseases) be added?*

- *Answer from SWG*: Yes, they can. The key principle is to go for integrated approaches and actions as much as possible.

  Response from IMP Manager: The discussion is engaged with WASH colleagues to support a case study for other VBDs.

ITEM 3*: What must be updated, changed or adapted?*

- *Answer from SWG:* Undertake internal discussions to get concrete and mutually beneficial ideas of synergies with the other VBD ERs (1.3.3, 1.3.10 and 1.3.14). Further collaboration and synergies with other ERs on VBDs. Consider also proposing activities of this ER to the teams identified by the selection process of other ERs and vice-versa.

  Response from IMP Manager: Internal discussions were engaged with other ERs and as an outcome a new Strategic Development Fund was requested and approved to work with colleagues on an integration of the Multisectoral Approach, One Health Approach, the Urban Health and the Gender Approach to support a common case study, within the investigation of links between VBDs transmission and Pockets of Poverty.

***Conclusion from SWG*:** It is a very good project, in a good financial situation and SWG recommends continuation while ensuring synergy within TDR.

Strategic Development Fund (SDF) proposals on VBDs

Proposal One: Evaluation of the impact and the potential for further development of an intervention using kits (Malakit) to self-diagnose and self-treat malaria in remote and hard-to-reach populations, with dissemination of the results to enhance future subregional discussions

Abstract: The self-diagnosis and self-treatment kit for malaria, called Malakit, was introduced in 2018 as a tri-national pilot intervention in Suriname and Brazil for distribution among cross-border, and mobile gold miner populations who are working in French Guyana. The kit was developed to address a situation in which the French authorities are not in a position to provide health services to mobile migrant miners active in the illegal mining sites in the forests of the Interior of the French Department. Evaluation of the pilot shows this may be a promising tool to address malaria in hard-to-reach populations. This encouraging result has prompted the teams/countries to seek more data to enable sustainable implementation. There is a need to complete the evaluation of the impact of the pilot intervention on the target populations and its potential for further deployment, as well as to disseminate the results to enhance future subregional discussions about malaria control in mobile and hard-to-reach populations. Specifically, this proposal aims to address the following as shown in Tables 14 and 15: i) to improve knowledge and tools about the drug resistance concept in the populations in order to have a better impact; ii) to identify and address challenges in deploying this new intervention (especially establishing an implementation basis for future project optimization for targeting *P. vivax* transmission); and iii) to boost the subregional discussion on management of residual malaria in mobile and hard-to-reach populations and on the objective of subregional malaria elimination.

Table 13. SDF Proposals on VBDs: Objectives and outcomes

Objectives and outcomes of the SDF proposals on VBDs	
Objectives (in SMART format)	**Expected outcomes**
1. To improve knowledge and tools about the drug resistance concept in the populations in order to have a better impact, especially: i) to better understand the representation of the drug resistance concept by gold miners; and ii) to adapt training tools (drawings, videos…) according to the results, in a community-health-based way.	Operational data available on the impact of the malaria kits on hard-to-reach populations in the selected pilot sites (data on level of malaria knowledge, data on access to diagnosis and treatment, data on use/understanding of tools, etc). Ultimately the data will be used to improve/adapt the (adherence to) the intervention, especially the training tools used in the pursuit of Malakit distribution.
2. Establish an implementation basis for future project optimization for targeting P. vivax transmission in remote populations.	Quantitative G6PD test devices integrated in Malakit intervention on all Malakit implementation sites in Suriname.
3. To boost the subregional discussion on management of residual malaria in remote and hard-to-reach populations and on the objective of (sub)regional malaria elimination.	Establishing international input that can serve as a basis for future development of a "guideline" on management of residual malaria in remote and hard-to-reach populations, in accordance with the experiences in the Guyana Shield.

Key deliverables and success indicators	
Deliverables list	**Deadlines**
Deliverable 1:	
Milestone 1.1 – Elaboration of a qualitative questionnaire for interviews with gold miners in two different distribution sites by an experienced sociologist. Coding and data analysis.	By: September 2021
Milestone 1.2 – Elaboration of new tools according to the results of Milestone 1.1 directly with the gold miners population on distribution sites, with a community-based approach	By: October 2021
Success indicator 1: Evaluation of the comprehension of the tool by gold miners and behavioural change.	By: November 2021
Deliverable 2:	
Milestone 2.1 – Quantitative G6PD rapid tests validated in Suriname	By: June 2021
Milestone 2.2 – All facilitators have been trained in the use and implementation of the rapid tests	By: July 2021
Milestone 2.3 – Use of quantitative G6PD test devices integrated in Malakit project on all sites in Suriname	By: December 2021
Success indicator 2*:* G6PD deficient patients effectively identified within the Malakit implementation system	By: End of study
Deliverable 3:	
Milestone 3.1 – Interest for meeting participation obtained from countries with similar malaria transmission challenges	By: August 2021
Milestone 3.2 – International meeting organized	By April 2022
Milestone 3.3 – Preliminary Study Result prepared and presented in the meeting	By: April 2022
Milestone 3.3 – Recommendations/input obtained that may serve as a basis for guideline development	By: April 2022
Success indicator 3: Wide range of participants from countries/entities (majority of invited persons)	By: April 2022

Table 14. Project budget for the VBD project

Project budget by deliverable

Deliverable #	Year 1 (US$)	Year 2 (US$)	Year 3 (US$)	Year 4 (US$)	Year 5 (US$)	TOTAL (US$)
Deliverable 1	24,800	9,600				34,400
Deliverable 2	8,825	6,225				15,050
Deliverable 3		40,550				40,550
Deliverable 4						
TOTAL	33,625	56,375				90,000

Proposal Two: VBDs among vulnerable communities experiencing extreme poverty conditions through multisectoral, One Health and intersectional gender approaches

Abstract: Although there has been tremendous progress in the control of VBDs, these diseases, together with other infectious diseases, are still causing enormous burden, especially to vulnerable populations already facing the challenges of extensive poverty. The complex interconnection between different socioeconomic aspects and the determinants of health and vulnerability to VBDs require further extensive attention. The proposed activity would thus address the challenges in VBD prevention and control linked to pockets of poverty (see "background" section below for additional details). A landscape analysis would be conducted in selected settings to seek and scrutinize evidence on these intricate links and help to identify knowledge gaps and research needs. Central to this landscape analysis is a better understanding of "who", "where", "why" and "how" VBDs are linked to poverty in a vicious cycle. The scope of this landscape analysis will include, but may not be limited to, interconnected factors such as gender, socioeconomic inequalities, and prevention and control approaches. Based on the research questions prioritized from this landscape analysis, a limited research activity would be conducted to generate additional preliminary evidence in a community. A consultation meeting would be organized at the end for exchanges and recommendations for future TDR work through a new ER.

Background

At the recent World Health Assembly 73 (2020), Member States acknowledged the health challenges within *pockets of poverty* and have pointed out that specific programmes have not received adequate attention and funding. *Pockets of poverty* is not a new concept. At the national level, such population and communities are widely considered as the socioeconomically weakest population (the poorest of the poor) and they are often well delineated by the government for social welfare measures. These populations live far below average poverty levels, which further tends to exacerbate their vulnerabilities. For example, in the context of TB, it is suggested to explore associations with VBDs prevention and control, which is also linked to "poverty traps", and hence another rationale for focusing on these. Evidence shows that poverty increases the risk of dengue transmission by promoting exposure to risk factors. Both the UN and World Bank have focused on this and expressed the need for further exploration (a clear association already exists in the case of TB).

The information collected and evidence generated would shed light on entry points to tackle diseases of poverty in the poorest populations. Further investigation could eventually answer questions such as "whether and how a multisectoral One Health approach would work in such a setting to address the gaps identified". The aim is to strengthen prevention and control of VBDs in such populations with better targeted strategies and adequate inclusion of gender intersectionality. The activities eventually generated from this SDF would thus reinforce and contribute to TDR's commitment to the fight against diseases of poverty through an equitable, holistic and multisectoral approach addressing multiple SDGs.

Objectives:

- Obtain an overview of evidence on the importance of targeting poverty pockets in the prevention and control of VBDs, taking into account the documented associations between poverty, these diseases and the associated economic rationale.
- Identify gaps, as well as research and capacity-building needs and subsequently prioritize research questions.
- Support a research component on VBDs among vulnerable communities experiencing extreme poverty.
- Plan for the next steps where TDR might want to direct future work on VBDs and pockets of poverty.

Expected results

ER numbers where the project belongs: synergies between ERs 1.3.3, 1.3.11, 1.3.12 and 2.3.4 (see info box below for additional details).

Expected outcomes

- Research and capacity building gap analysis, and needs identified through a landscape analysis on the intersection between pockets of poverty and VBDs; research questions prioritized.
- New evidence generated through a research activity focusing on specific aspects of poverty pockets and VBDs.
- Recommendations generated for the development of a future ER on targeting poverty pockets and VBDs.

Expected outputs

- Technical reports from the landscape analysis
- Research publications from the research activity
- Information briefs based on the analysis and research results
- Strategic plan for a new ER on VBDs and pocket of poverty

Info note

This proposed SDF project is in response to and directly addresses one of the high-level recommendations from SWG (2020), in which the "SWG noted opportunities to further optimize resources and enhance the impact of the TDR–IMP outputs, particularly as it relates to the broader activities under One Health and gender".

Key activities and timelines

The key activities are outlined below. The workplan and how these activities will be carried out will form the project management plan for the VBD team working on this SDF.

- Landscape analysis: recruitment of a consultant by June 2021, to work on the analysis between July and November 2021 (completed)
- Research activity: Agreement for Performance of Work (APW) with one of the team contracted for ERs 1.3.3/1.3.11/1.3.12, from August to December 2021 (moved to Q1 2022)
- Planning for next steps: January 2022

Budget and financial implementation

Table 15. Approved Programme Budget 2020–2021 and funds utilized

Expected result	Research for Implementation	$40m scenario			Revised planned costs (September 2021)			Implementation at 31 December 2021			Implementation rate*		
		UD	DF	Total	UD	DF	Total	UD	DF	Total	UD	DF	Total
	Research for policy												
1.1.1	Country preparedness for disease outbreaks	150 000		150 000	150 000	0	150 000	130 349	0	130 349	87%		87%
1.1.4	Country resilience to the threat of drug-resistant infections		3 500 000	3 500 000	0	3 200 000	3 200 000	0	2 657 513	2 657 513		83%	83%
1.3.3	Vector-borne diseases and increasing resilience under climate change conditions	400 000	300 000	700 000	500 000	0	500 000	407 051	0	407 051	81%		81%
	Research for implementation				0	0		0	0				
1.1.7	Maximized utilization of data for public health decision-making	210 000		210 000	210 000	430 000	640 000	141 191	328 671	469 862	67%	76%	73%
1.1.8	Maximized utilization of safety information for public health decision-making	220 000	200 000	420 000	220 000	864 500	1 084 500	199 493	820 146	1 019 638	91%	95%	94%
1.2.1	Strategies to achieve and sustain disease elimination	760 000		760 000	790 000	3 500	793 500	747 207	3 000	750 207	95%	86%	95%
1.2.6	Optimized approaches for effective delivery and impact assessment of public health interventions	550 000	300 000	850 000	917 500	1 379 000	2 296 500	822 498	1 360 258	2 182 755	90%	99%	95%
1.3.12	Strategies to promote gender-responsive health interventions on prevention and control of infectious diseases of poverty	300 000	300 000	600 000	252 000	0	252 000	246 107	0	246 107	98%		98%
	Research for innovation				0	0		0	0				
1.1.5	Directions for development and accelerated access to new tools and strategies	110 000		110 000	110 000	0	110 000	138 499	0	138 499	126%		126%
1.3.10	Urban health interventions for vector-borne and other infectious diseases of poverty	150 000		150 000	142 000	0	142 000	141 884	0	141 884	100%		100%
1.3.14	Testing of innovative strategies for vector control	100 000	800 000	900 000	150 000	0	150 000	140 747	0	140 747	94%		94%
	Research for integrated approaches				0	0		0	0				
1.3.11	Multisectoral approach for malaria and emerging arboviral diseases	400 000		400 000	400 000	800 000	1 200 000	335 647	295 726	631 373	84%	37%	53%
	Delays from prior biennium				249 000		249 000	184 151		184 151	74%		74%
	Total	**3 350 000**	**5 400 000**	**8 750 000**	**4 090 500**	**6 677 000**	**10 767 500**	**3 634 823**	**5 465 313**	**9 100 136**	**89%**	**82%**	**85%**

* **Implementation against revised planned costs**

Table 16 Approved Programme Budget 2022–2023

Expected result	Research for Implementation	2022-2023					
		$40m scenario			$50m scenario		
		UD	DF	Total	UD	DF	Total
	Research for policy						
1.1.1	Country preparedness for disease outbreaks	150 000	0	150 000	200 000	0	200 000
1.1.4	Country resilience to the threat of drug-resistant infections	200 000	3 400 000	3 600 000	400 000	4 500 000	4 900 000
1.3.3	Vector-borne diseases and increasing resilience under climate change conditions	400 000	0	400 000	600 000	0	600 000
	Research for implementation						
1.1.7	Maximized utilization of data for public health decision-making	250 000	400 000	650 000	600 000	600 000	1 200 000
1.1.8	Maximized utilization of safety information for public health decision-making	0	0	0	0	0	0
1.2.1	Strategies to achieve and sustain disease elimination	740 000	200 000	940 000	1 200 000	300 000	1 500 000
1.2.6	Optimized approaches for effective delivery and impact assessment of public health interventions	600 000	500 000	1 100 000	1 100 000	700 000	1 800 000
1.3.12	Strategies to promote gender-responsive health interventions on prevention and control of infectious diseases of poverty	300 000	100 000	400 000	500 000	100 000	600 000
	Research for innovation						
1.1.5	Directions for development and accelerated access to new tools and strategies	160 000	0	160 000	280 000	0	280 000
1.3.10	Urban health interventions for vector-borne and other infectious diseases of poverty	150 000	0	150 000	250 000	0	250 000
1.3.14	Testing of innovative strategies for vector control	100 000	600 000	700 000	300 000	800 000	1 100 000
	Research for integrated approaches						
1.3.11	Multisectoral approach for malaria and emerging arboviral	200 000	200 000	400 000	300 000	300 000	600 000
	Total	**3 250 000**	**5 400 000**	**8 650 000**	**5 730 000**	**7 300 000**	**13 030 000**

Projects and activities funded

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00209	Thomas Scalway	Lushomo	Situation analysis concerning surveillance and arboviral diseases control in West Africa	7 011	Arboviral diseases	South Africa
P21-00351	Laith Hussain	Hussain, Mr Laith Naser	Advancing the EWARS temporal and spatial prediction model: towards more adapted, accurate and operationally practical tool	5 000	Arboviral diseases	Sweden
P21-00490	Apinya Niramitsantipong	Department of Disease Control	Thailand – Better Documenting EWARS Effectiveness on Dengue Control	20 000	Arboviral diseases	Thailand
P21-00524	Thomas Scalway	Lushomo	Design and layout of the country analysis report on surveillance and control of arboviral disease in Africa	6 493	Arboviral diseases	South Africa
P21-00525	Hasitha Tissera	Remediumone (Private) Limited	Sri-Lanka – better documenting EWARS effectiveness on Dengue control	20 000	Arboviral diseases	Sri Lanka
P21-00527	Milena Borbon Ramos	Instituto Nacional de Salud	Columbia – better documenting EWARS effectiveness on Dengue control	11 000	Arboviral diseases	Colombia
P21-00528	Milena Borbon Ramos	Instituto Nacional de Salud	Support to Columbia for the evaluation of EWARS	9 000	Arboviral diseases	Colombia
P21-00538	Toussaint Rouamba	Rouamba, Doctor Toussaint	Statistical support to estimate the burden of arboviral disease in Burkina Faso and evaluate the feasibility of using measles/rubella surveillance specimens for sentinel surveillance of Zika and other AVD	5 400	Arboviral diseases	Burkina Faso
C00017	Selma Dar Berger	The Union	Databases, metrics and archives on the Global SORT IT activities and performance standards: courses, participants, facilitators, milestones, outcomes, publications, impact and other relevant materials	33 440	Infectious diseases	France
DSE	Win Win Lwin	Absolute Win Business Services Co., Ltd.	Hiring supplier for provision of virtual training allowances to the training of module-3 Asia Regional SORT IT training on antimicrobial resistance"	650	AMR	Myanmar
HEG	Andreas Alois Reis	Ethics Review Committee	Protocol Submission cost recovery for ERC	1 040	AMR	Switzerland
HEG	Andreas Alois Reis	Ethics Review Committee	Protocol Submission cost recovery for ERC	600	AMR	Switzerland

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
HSE/EPR	Ibrahim F. Kamara	Eimprest - Afro	Funds to support training of One Health Personnel on AMR	12 224	AMR	Sierra Leone
HSE/EPR	Ibrahim Kamara	Eimprest - Afro	Request for funds to support data collection for two AMR operational Research	490	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for funds to support payment of Ethical Application Fees for national fees for National SORT IT Protocols	1 273	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	National SORT IT Training Workshop of Module 1 & 2 in Bo	11 634	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for funds to support AMR Stakeholders Meeting	364	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for funds to support Africa Regional SORT IT Dissemination and Pre-SORT IT Module Three Meetings	3 672	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Africa SORT IT Module 4 Virtual Training in Freetown	2 741	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for funds to support AMR Scientific Meeting during the commemoration of the World Antimicrobial Awareness Week, 18-24 November 2021	1 297	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for funds to support Sierra Leone National SORT IT Module Three Training	6 076	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for Funds to Support Sierra Leone SORT IT data Collection	3 679	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	support the World Hand Hygiene Day Celebration in the districts	3 270	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for funds to Support Regional SORT IT Module Three Training	3 166	AMR	Sierra Leone
HSE/IPC	Ibrahim Kamara	Eimprest - Afro	Request for funds to Support Sierra Leone National SORT IT Pre-training workshop	2 036	AMR	Sierra Leone

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
HSE/IPC	Ibrahim Kamara	Kamara, Doctor Ibrahim Franklin	Purchase Order for AMR Operational Research Fellow NOC - Dr Ibrahim F Kamara for the 17th March to November 2021	24 607	AMR	Sierra Leone
HSS/UGA	AFRO	Eimprest - Afro	Support strengthening one health platform for effective coordination of the implementation of the antimicrobial resistance -national action plan	7 661	AMR	Uganda
HSS/UGA	Charles Omara	Ziras William Lali	SSA Contract for Mr William ZIRAS LALI for the period: 03022021 to 02082021 (6 months)	23 919	AMR	Uganda
HSS/UGA	Grace Besiime	New Vision Printing & Publishing Company Limited	Printing of AMR Awareness Materials	9 227	AMR	Uganda
HSS/UGANDA	Eoc/Moh Uganda	Eimprest - Afro	DI PO to cater for Data Bundles SORT IT Regional Workshop, Module 4	113	AMR	Uganda
HSS/UGANDA	Moh/Uganda	Eimprest - Afro	SORT IT regional workshop on AMR 24 February to 3 March 2021	4 461	AMR	Uganda
HSS/UGANDA	Alice Saula	Best Western Premier Garden Hotel Entebbe	Procurement of conference facilities for the regional SORT IT workshop on Antimicrobial Resistance: 24 February - 3 March 2021	8 380	AMR	Uganda
IDSR	Iye Kowa	Atlantic Lumley Hotel	PO for the provision of venue and refreshment for Africa Regional SORT IT Dissemination Meeting and National SORT IT Module Three Pre training Workshop in Freetown	3 987	AMR	Sierra Leone
IDSR/IPC	Kultumi Minah	Lintel Sierra Leone Limited (Africell)	APW for the provision of 4G MIFI Unlimited 4G Pkg (2 Mbps) for 12 Months (Jan - Dec 2021) for IPC and AMR activities This APW Contract shall be read together with UNDP/SLE/LTA/2019/01 - Internet Communication services	8 937	AMR	Sierra Leone

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
IPC	Bo Inn	Bo Inn	Purchase Order for the provision of Accommodation, conference hall rental and refreshment for National SORT IT Training in Bo City	15 789	AMR	Sierra Leone
IPC	Christiana Williams	Derick Dixon T/A Deuce Investment	PO for the printing of materials for the celebration of World Antimicrobial Awareness Week (WAAW)	5 168	AMR	Sierra Leone
IPC	Hazira Malik	Sweet Salone Resorts (Sl)	PO for the provision of venue, refreshment and accommodation for SORT IT regional workshop Module 3, from the 23rd February -4th March 2021 IPC Unit Request	17 462	AMR	Sierra Leone
IPC	Iye Kowa	Atlantic Lumley Hotel	PO for the provision of venue and refreshment for AMR Stakeholders Meeting for Journalist media and AMR Scientific Meeting in Freetown	5 301	AMR	Sierra Leone
IPC	David Church	Golden Tulip Essential Kimbima	Purchase Order for Conference Hall Rental and Refreshment for Sierra Leone SORT IT Pre-Training workshop in Freetown	947	AMR	Sierra Leone
IPC	David Church	Golden Tulip Essential Kimbima	Purchase Order for Residential, Conference Hall Rental and Refreshment for residential, conference hall and refreshment for SORT IT (Module 2) meeting in Freetown	14 651	AMR	Sierra Leone
IPC	Slimpr03	Eimprest - Afro	Purchase Order for the provision of internet Connectivity for SORT IT Africa Regional workshop Module 4	235	AMR	Sierra Leone
NEP - WHE	Priyanka Shrestha	Shrestha, Doctor Priyanka	Support on small Grant TDR activities - Dr Priyanka Shrestha, 22 March to 30 June 2021	1 356	AMR	Nepal
NEP - WHE	Meika Bhattachan	Bhattachan, Doctor Meika	Technical support to strengthen risk communication and community engagement activities and SORT IT Training - Dr Meika Bhattachan, Consultant, 08 April to 07 July 2021	3 332	AMR	Nepal

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
NEP - WHE	Dharmaraj Aryal	Park Village Hotel Pvt. Ltd	Full board accommodation and conference cost for the National SORT IT (Structured Operational Research & Training Initiative) Training Module 3: Scientific Paper Writing Duration (16 to 31 March 2021)	12 311	AMR	Nepal
NEP - WHE	Shital Baniya	Radisson Hotel	Full board accommodation for National SORT IT, Module-4 Training on Antimicrobial Resistance, Kathmandu, Nepal (Duration: 08 to 15 Sep 2021)	14 611	AMR	Nepal
NEP - WHE	Shital Baniya	Radisson Hotel	Full board accommodation for Regional SORT IT, Module-3 Training on Antimicrobial Resistance, Kathmandu, Nepal (Duration: 26 Jan to 04 Feb 2021)	15 671	AMR	Nepal
NEP - WHE unit	Ananta Koirala	Koirala,Doctor Ananta **Trl215815	Antibiotic use and resistance pattern in Broiler Poultry Farms in Kaski, Gandaki; 12 Aug 2021 - 31 December,2021	8 424	AMR	Nepal
NEP - WHE unit	Puskar Bahadur Pal	Pal, Mr Puskar Bdr	Implementation of TDR Small Grant Study, 16 August to 31 December 2021	14 085	AMR	Nepal
NEP WHE	Norbu Wangchuk	Eimprest - Searo	Printing and Stationery items for National SORT IT Module-4 Training on Antimicrobial Resistance, Radisson Hotel, Kathmandu Nepal 08 to 30 Sep 2021	1 000	AMR	Nepal
NEP WHE	Norbu Wangchuk	Eimprest - Searo	Printing and Stationery items for Regional SORT IT Module-3 Training on Antimicrobial Resistance, Radisson Hotel, Kathmandu Nepal 26 Jan to 04 Feb 2021	944	AMR	Nepal
NEP WHE	Norbu Wangchuk	Eimprest - Searo	Printing and Stationery items for the National SORT IT (Structured Operational Research & Training Initiative) Training Module 3: Scientific Paper Writing, 16 March to 30 April 2021	999	AMR	Nepal
NEP WHE Unit	Norbu Wangchuk	Eimprest - Searo	COVID-19: Technical Assistance (Field Medical Officer and Information Management Assistant for SORT IT) for WHO Health Emergency Programme, SALARY, DSA and TRAVEL, Leave encashment and other Misc Cost, 01 January to 30 September 2021	44 974	AMR	Nepal

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
NEP WHE Unit	Norbu Wangchuk	Eimprest - Searo	Funding support to the six participants who had participated in modules 1 & 2 of the first Regional Asia Structured Operational Research Training Initiative (SORT IT), and National SORT IT program, 10 February to 30 Aug 2021	3 166	AMR	Nepal
P21-00168	Selma Dar Berger	The Union	AMENDMENT: Technical assistance to support implementation of 4 operational research studies (3 from Nepal and 1 from Myanmar) under the small grants scheme for tackling antimicrobial resistance (AMR)	22 000	AMR	France
P21-00186	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Writing a user manual and training video for the virtual SORT IT platform (e-SORT IT), upgrade the platform to be used for dissemination of the SORT IT research findings and providing tech support to the implementation of module 3	4 000	Public Health	Armenia
P21-00197	Holley Russel	Artifex Creative Webnet Ltd - Acw	GES Payment (Invoice No 10930) for "Design and artwork a 16-20pp document on AMR"	4 862	AMR	United Kingdom
P21-00220	Evelina Chapman	Chapman,Doctor Evelina Gracia Maria**S210297	SORT IT module 4 development of training material – how to develop a plain language summary to communicate operational research findings	7 500	AMR	Chile
P21-00221	Anthony Harries	Harries, Dr Anthony	Providing senior (second line) operational research and subject matter expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	22 500	AMR	United Kingdom
P21-00224	Jacklyne Ashubwe	Ashubwe,Doctor Jacklyne Doris Ambunya**Trl226290	SORT IT module 4 development of training material – how to develop an effective PowerPoint presentation to communicate operational research findings	7 500	AMR	Kenya
P21-00225	Ravi Ram	Ram,Mr Ravi **Trl49343	SORT IT module 4 development of training material – how to develop an effective PowerPoint presentation to communicate operational research findings	7 500	AMR	Kenya

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00226	Holley Russel	Artifex Creative Webnet Ltd - Acw	SORT IT module 4 development of training material – delivering an elevator pitch and communicating research findings through the media	9 000	AMR	United Kingdom
P21-00227	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Providing technical support for the implementation of i) module 1 (protocol writing) and module 2 (quality assured data capture an analysis) of the Sierra Leone national SORT IT on tackling antimicrobial resistance (AMR) and ii) module 3 of	6 000	AMR	Armenia
P21-00236	Hugh Blackbourn	Union Internationale Contrela Tuberculose Et Les Maladies Respiratoires	Publication (on-line and in print) of an open-access supplement of the Public Health Action journal featuring the research outputs of the AMR-SORT IT Programme on tackling antimicrobial resistance in Nepal	30 024	AMR	France
P21-00242	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1149928 titled "Antibiotic use and treatment outcomes among children with community-acquired pneumonia admitted to a tertiary care public hospital in Nepal"	1 861	AMR	Switzerland
P21-00243	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1151137 titled "Bacterial profile and antibiotic resistance among cancer patients with urinary tract infection in a National Tertiary Cancer Hospital of Nepal"	1 861	AMR	Switzerland
P21-00246	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of invoice tropicalmed 1149966 titled "Antimicrobial resistance among neonates with bacterial sepsis and their clinical outcomes in a tertiary hospital in Kathmandu Valley, Nepal"	1 827	AMR	Switzerland
P21-00247	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1150351 titled "Decreasing trends in antibiotic consumption in public hospitals from 2014 to 2017 following the decentralisation of drug procurement in Myanmar"	1 697	AMR	Switzerland

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00253	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1150350 article titled "High resistance of Salmonella and Shigella spp in blood and stool culture from Sukraraj Tropical and Infectious Disease Hospital, Kathmandu, Nepal, 2015-2019"	1 697	AMR	Switzerland
P21-00254	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1149515 article titled "Quality Assessment of an Antimicrobial Resistance Surveillance System in a Province of Nepal"	1 697	AMR	Switzerland
P21-00255	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1141241 article titled "Antibiotic use in broiler poultry farms in Kathmandu valley of Nepal: which antibiotics and why"	1 697	AMR	Switzerland
P21-00268	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1159848 article titled "Neonatal sepsis, antibiotic susceptibility pattern and treatment outcomes among neonates treated in two tertiary care hospitals of Yangon, Myanmar from 2017-2019"	1 697	AMR	Switzerland
P21-00273	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1150765 article titled "High prevalence of methicillin-resistant Staphylococcus aureus among health care facilities and factors associated with it in Myanmar (2018-2019)"	1 697	AMR	Switzerland
P21-00276	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1193769 article titled "Blood culture testing outcomes among non-malarial febrile children at antimicrobial resistance surveillance sites in Uganda, 2017-2018"	1 697	AMR	Switzerland
P21-00283	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1192778 article titled "Infection Prevention and Control at Lira University Hospital, Uganda: More needs to be done"	1 697	AMR	Switzerland
P21-00288	Lady Asantewa Boamah Adomako	Adomako,Mrs Lady Asantewa Boamah**Trl235480	GES Payment for Invoice No 001 for Study Area Map	61	AMR	Ghana

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00290	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1173676 article titled "Increasing Antimicrobial Resistance in Surgical Wards at Mulago National Referral Hospital, Uganda, from 2014-2018 - Cause for Concern?"	1 756	AMR	Switzerland
P21-00291	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1189336 article titled "Reduced bacterial counts from a sewage treatment plant but increased counts and antibiotic resistance in the recipient stream in Accra, Ghana – a cross-sectional study"	1 756	AMR	Switzerland
P21-00292	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1151949 article titled "Wounds, antimicrobial resistance and challenges of implementing a surveillance system in Myanmar: a mixed-methods study"	1 756	AMR	Switzerland
P21-00293	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1192511 article titled "National Antimicrobial Consumption: Analysis of Central Warehouses Supplies to In-patient Care Health Facilities from 2017 to 2019 in Uganda"	1 756	AMR	Switzerland
P21-00294	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1193718 article titled "National Antibiotic Consumption for Human Use in Sierra Leone (2017–2019): A Cross-Sectional Study"	1 756	AMR	Switzerland
P21-00295	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1193422 article titled "Quality of reported data on antimicrobial use in the treatment of livestock in Sierra Leone, 2016-2019"	1 756	AMR	Switzerland
P21-00297	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1179724 article titled "Gaps in Infection Prevention and Control in public health facilities of Sierra Leone after the 2014–2015 Ebola outbreak"	1 756	AMR	Switzerland
P21-00298	Louise Ackers	Ackers, Professor Helen Louise	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	4 000	AMR	United Kingdom

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00299	Javier Burgos	Burgos, Mr Javier	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	4 000	AMR	Spain
P21-00300	Katrina Hann	Hann, Ms Katrina	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	4 000	AMR	Sierra Leone
P21-00302	Samuel Sieber	Sieber,Doctor Samuel **Trl224810	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	4 000	AMR	Luxembourg
P21-00303	Ravi Ram	Madhira Institute Limited	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	4 000	AMR	Kenya
P21-00308	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Providing technical support for the virtual implementation of i) Module 4 of the Asia Regional AMR SORT IT, ii) Module 4 of the Africa Regional AMR SORT and iii) Module 1 (protocol writing) and Module 2 (quality assured data capture an analysis	11 000	AMR	Armenia
P21-00315	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1193307 article titled "High Levels of Antibiotic Resistance Patterns in Two Referral Hospitals during the Post-Ebola Era in Free-town, Sierra Leone"	1 780	AMR	Switzerland
P21-00327	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1191277 article titled "Bacteria and their antibiotic resistance profiles in ambient air in Accra, Ghana, February 2020: a cross-sectional study"	1 780	AMR	Switzerland

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00329	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1265294 article titled "Extended Spectrum Beta-Lactamase Escherichia coli in river water collected from two cities in Ghana, 2018-2020"	1 780	AMR	Switzerland
P21-00331	Ravi Ram	Ram,Mr Ravi **Trl49343	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries _ Uganda, 24-30 June 2021	3 680	AMR	Kenya
P21-00332	Wilber Sabiti	Sabiti,Doctor Wilber **Trl226263	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries _ Uganda, 24-30 June 2021	3 500	AMR	United Kingdom
P21-00333	Louise Ackers	Ackers, Professor Helen Louise	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries _ Uganda, 24-30 June 2021	3 500	AMR	United Kingdom
P21-00335	Balazs Babarczy	Babarczy,Mr Balazs **Trl159531	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries _ Uganda, 24-30 June 2021	3 500	AMR	Hungary
P21-00336	Rhona Mijumbi	Mijumbi, Doctor Rhona	Providing senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries _ Uganda, 24-30 June 2021	3 500	AMR	Uganda
P21-00355	Timothy France	Inis Communication Ltd	Payment of Invoice No TDR-3019 for "Update three maps"	362	AMR	United Kingdom

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00356	Hayk Davtyan	Tuberkulozi Hetazotutyunneri Yev Kankhargelman Kentron	Payment of Invoice N01/21 for OR network hosting	600	AMR	Armenia
P21-00367	Jamie Hernan Rodriguez Moreno	Rodriguez Moreno,Mr Jaime Hernan**Trl226264	Provision of senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on AMR in Low- and Middle Income Countries Colombia-Ecuador Workshop	3 000	AMR	Colombia
P21-00368	Gloria Christina Cordoba Currea	Cordoba Currea,Doctor Gloria Christina **Trl226269	Provision of senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on AMR in Low- and Middle Income Countries Colombia-Ecuador Workshop	3 000	AMR	Denmark
P21-00369	Emily Maria Vargas Riano	Vargas Riaño, Ms Emily Maria	Provision of senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on AMR in Low- and Middle Income Countries Colombia-Ecuador Workshop	3 000	AMR	Mexico
P21-00376	Olivia Biermann	Biermann, Ms Olivia	Providing senior knowledge management expertise for implementing the SORT IT on antimicrobial resistance in Low- and Middle Income Countries AMR SORT IT Module 1 Workshop – Colombia / Ecuador	4 000	AMR	Sweden
P21-00380	Katrina Hann	Hann, Ms Katrina	Providing senior knowledge management expertise for implementing the SORT IT on AMR in Low- and Middle Income Countries (SORT IT Workshop – Colombia Module 2	4 000	AMR	Sierra Leone
P21-00384	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1297800 article titled ""Antibiotic use in a Municipal Veterinary Clinic in Ghana: a Case Study for Improvement"	1 741	AMR	Switzerland
P21-00402	Jacklyne Ashubwe	Ashubwe,Doctor Jacklyne Doris Ambunya**Trl226290	Providing senior knowledge management expertise for implementing the SORT IT on antimicrobial resistance in Low- and Middle Income Countries	3 500	AMR	Kenya

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00404	Balazs Babarczy	Babarczy,Mr Balazs **Trl159531	Providing senior knowledge management expertise for implementing the SORT IT on antimicrobial resistance in Low- and Middle Income Countries	3 500	AMR	Hungary
P21-00405	Javier Burgos	Burgos, Mr Javier	Providing senior knowledge management expertise for implementing the SORT IT on antimicrobial resistance in Low- and Middle Income Countries	3 500	AMR	Spain
P21-00406	Katrina Hann	Hann, Ms Katrina	Providing senior knowledge management expertise for implementing the SORT IT on antimicrobial resistance in Low- and Middle Income Countries	3 500	AMR	Sierra Leone
P21-00407	Jamie Guth	Jamie Ann Guth	Providing senior knowledge management expertise for implementing the SORT IT on antimicrobial resistance in Low- and Middle Income Countries	3 500	AMR	Switzerland
P21-00408	Samuel Sieber	Sieber,Doctor Samuel **Trl224810	Providing senior knowledge management expertise for implementing the SORT IT on antimicrobial resistance in Low- and Middle Income Countries	3 500	AMR	Luxembourg
P21-00410	Selma Dar Berger	The Union	Providing senior technical expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on tackling antimicrobial resistance in Nepal	5 000	AMR	France
P21-00411	Anthony Harries	Harries, Dr Anthony	Providing senior technical expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on tackling antimicrobial resistance in Ghana	5 000	AMR	United Kingdom
P21-00412	Hayk Davtyan	Tuberkulozi Hetazotutyunneri Yev Kankhargelman Kentron	Providing technical expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on tackling antimicrobial resistance in Ghana	11 500	AMR	Armenia
P21-00413	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Providing technical support for the virtual implementation of three workshops on tackling antimicrobial resistance in Nepal and Ghana	9 600	AMR	Armenia

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00423	Aleksandra Cuculovic	Multidisciplinary Digital Publishing Institute (Mdpi Ag)	Payment of Invoice tropicalmed-1365809 article titled "Uganda Situation Report on Antimicrobial Resistance Surveillance Program Design and Performance in Human Health Sector Report 2019-2020"	1 564	AMR	Switzerland
P21-00430	Timothy France	Inis Communication Ltd	Payment of Invoice No 2021/060 for "Update TDR SORT IT map"	311	AMR	United Kingdom
P21-00462	Selma Dar Berger	The Union	Providing senior technical expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on tackling antimicrobial resistance in Ghana	4 500	AMR	France
P21-00464	Selma Dar Berger	The Union	Technical assistance to support implementation of an operational research study from Sierra Leone for tackling antimicrobial resistance (AMR)	5 500	AMR	France
P21-00469	Jacklyne Ashubwe	Ashubwe,Doctor Jacklyne Doris Ambunya**Trl226290	AMR SORT IT module 1 Ghana: Provision of senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	3 000	AMR	Kenya
P21-00470	Ama Pokuaa Fenny	Fenny, Miss Ama Pokuaa	AMR SORT IT module 1 Ghana: Provision of senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	3 000	AMR	Ghana
P21-00471	Chigozie Jesse Uneke	Uneke, Doctor Chigozie Jesse	AMR SORT IT module 1 Ghana: Provision of senior knowledge management expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on antimicrobial resistance in Low- and Middle-Income Countries	3 000	AMR	Nigeria
P21-00474	Jamie Guth	Jamie Ann Guth	SORT IT module 4 development of training material – revision material related to delivering an elevator pitch	1 000	AMR	Switzerland

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00477	Martin Eigbike	Eigbike, Mr Martin	Scoping research on international clinical trials infrastructure	15 000	AMR	Nigeria
P21-00511	Katherine Tayler-Smith	Tayler-Smith, Mrs Katherine Jayne	Literature search, categorization and archiving of scientific publications for supporting module 3 (manuscript writing) of Sierra Leone national and Colombia/Ecuador SORT IT programs to tackle antimicrobial resistance (AMR)	10 800	AMR	South Africa
RDI/ARD	Lakoh	University of Sierra Leone	Surveillance of healthcare associated infections and antibiotic resistance in urban and rural secondary hospitals in Sierra Leone	14 846	AMR	Sierra Leone
RMNCAH	Shareif Hashim	Sierra Palms Resort	Purchase Order for Conference hall rental, refreshment and accommodation for Africa Module 4 SORT IT Training	8 708	AMR	Sierra Leone
WCO	Sony Shakya Shrestha	Shakya Shrestha, Doctor Sony	Implementation of TDR Small Grant Study, Dr Sony Shakya Shrestha23 August to 31 December 2021	11 591	AMR	Nepal
(blank)	Albert Antrobre-Boateng	Regional Director of Health Services	World Antimicrobial Awareness Week Celebration 2021	27 196	AMR	Ghana
(blank)	Appiah-Korang Labi	Labi, Doctor Appiah-Korang	Special Services Agreement (SSA) - Technical Assistance AMR Fellowship activities 30 November - 31 December 2021	3 286	AMR	Ghana
(blank)	Ebo Derban	Total House Clinic	Payment of Medical Examinations	69	AMR	Ghana
(blank)	Ebo Derban	Total House Clinic	Payment of Medical Examinations	69	AMR	Ghana
(blank)	George Hedidor	Hedidor, Mr George Kwesi	Special Services Agreement (SSA) Recruitment - Technical Assistance AMR SORT IT, 29 November - 31 December 2021	3 434	AMR	Ghana
(blank)	Ghana Supply Company	Ghana Supply Company Ltd	Payment of port clearing charges	316	AMR	Ghana
(blank)	Kofi Larbi	Buck Press Limited	Printing of copies of the policy briefs and posters of SORT IT research for dissemination	395	AMR	Ghana

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
(blank)	Lawrenda	Peduase Valley Resort	Payment for Accommodation and Conference package	14 954	AMR	Ghana
(blank)	Michael Boadi	Akosombo Hotels Limited (Volta Hotel)	Payment of Accommodation and Conference package for Meeting Participants	35 093	AMR	Ghana
(blank)	Dannis Okyere	City Escape Hotel	Accommodation and Conference Package to build capacity	6 088	AMR	Ghana
(blank)	Dannis Okyere	City Escape Hotel	Additional Cost for Conference Package	124	AMR	Ghana
(blank)	Forster Gardemor	Mensvic Hotels Ltd	Payment for conference facilities for dissemination forum on SORT IT research findings	1 932	AMR	Ghana
(blank)	Ofori Sarkwa	Ghana Oil Company Limited	Payment for fuel	45	AMR	Ghana
(blank)	Phillip Kennedy Yaro	Eimprest - Afro	Payment of T&T and incidentals	8 734	AMR	Ghana
(blank)	Phillip Kennedy Yaro	Eimprest - Afro	Per diem, t&t and fuel for dissemination forum of sort it research findings	2 752	AMR	Ghana
(blank)	Tove Granum	Norwegian Institute of Public Health	Participation fee for course in the ATC/DDD Methodology – webinar	1 437	AMR	Norway
P21-00272	Godfrey Tangwa	Tangwa, Mr Godfrey Banyuy	Translation into French of the protocol and study instruments for the project entitled “Surveying the Asian and African Research Ethics Committee Response to the Covid-19 Pandemic”	1 562	COVID-19	Cameroon
P21-00343	Pamela Pennington	Universidad Del Valle De Guatemala	Best practices for community engagement to improve access to health services for Chagas disease control	29 913	AMR	Guatemala
P21-00377	Bridget Midwinter	University of Oxford	Malaria patient spectrum representation in therapeutic clinical trials: A scoping review of the literature	24 555	Malaria	United Kingdom
P21-00481	Shannon Hedtke	La Trobe University	Population genetic tools for onchocerciasis control programmes to determine transmission zones: Utility of vector nuclear vs mitochondrial DNA and testing of different methods for single microfilariae analysis	39 714	Onchocerciasis	Australia

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C00017	Selma Dar Berger	The Union	Databases, metrics and archives on the Global SORT IT activities and performance standards: courses, participants, facilitators, milestones, outcomes, publications, impact and other relevant materials	1 760	AMR	France
P21-00162	Hayk Davtyan	Tuberkulozi Hetazotutyunneri Yev Kankhargelman Kentron	Payment of Invoice N01/12 for Introductory video for the e SORT IT	2 300	Infectious diseases	Armenia
P21-00175	Hayk Davtyan	Tuberkulozi Hetazotutyunneri Yev Kankhargelman Kentron	Translating SORT IT curriculum and videos from English language to Russian language for Eastern Europe and Central Asia (EECA)	22 880	Tuberculosis	Armenia
P21-00176	Olga Denisiuk	Denisiuk, Doctor Olga	Conducting a survey to assess the impact of all research articles produced through the SORT IT programme in Eastern Europe and Central Asia (EECA) region on policy and or practice	6 800	Tuberculosis	Ukraine
P21-00186	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Writing a user manual and training video for the virtual SORT IT platform (e-SORT IT), upgrade the platform to be used for dissemination of the SORT IT research findings and providing tech support to the implementation of module 3	6 624	Infectious diseases	Armenia
P21-00186	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Writing a user manual and training video for the virtual SORT IT platform (e-SORT IT), upgrade the platform to be used for dissemination of the SORT IT research findings and providing tech support to the implementation of module 3	8 976	Infectious diseases	Armenia
P21-00227	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Providing technical support for the implementation of i) module 1 (protocol writing) and module 2 (quality assured data capture an analysis) of the Sierra Leone national SORT IT on tackling antimicrobial resistance (AMR) and ii) module 3	4 000	AMR	Armenia

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P21-00252	Liz Allen	F1000 Research Ltd	Payment of Invoice No 6686124819 for article titled "TDR 27349 Characteristics, utilisation and influence of viewpoint articles from"	1 350	Infectious diseases	United Kingdom
P21-00311	Seni Kouanda	Institut Africain De Sante Publique	Structured Operational Research and Training Initiative (SORT IT) on Neglected Tropical Diseases (NTDs) including snakebite in West Africa (Burkina Faso, Mali, Niger and Senegal)	86 017	AMR	Burkina Faso
P21-00347	Hayk Davtyan	Davtyan,Mr Hayk **Trl72390	Providing technical support for the implementation of module 3 of the SORT IT programme on neglected tropical diseases (NTDs) in Kenya	3 500	AMR	Armenia
P21-00414	Selma Dar Berger	The Union	AMENDED APW: Public Health Emergency- Independent review of ethics considerations for analysis of routine programme data from SORT IT training courses	6 000	AMR	France
P21-00415	Hayk Davtyan	Tuberkulozi Hetazotutyunneri Yev Kankhargelman Kentron	Providing technical support for the virtual implementation of modules 1 to 3 of the SORT IT on public health emergency in South East Asia Region – Modules to be conducted using the virtual SORT IT platform	10 000	AMR	Armenia
P21-00416	Hayk Davtyan	Tuberkulozi Hetazotutyunneri Yev Kankhargelman Kentron	Providing senior technical expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on public health emergencies in the South East Asia Region	22 500	AMR	Armenia
P21-00418	Selma Dar Berger	The Union	Providing senior technical expertise for implementing the Structured Operational Research and Training Initiative (SORT IT) on public health emergencies in the South East Asia Region	35 500	AMR	France
P21-00463	Alexandre Delamou	Centre D'excellence Africain Pour La Prevention Et Le Contrôle De Maladies Transmissible (Cea-Pcmt/Fsts/Uganc)	Structured Operational Research and Training Initiative (SORT IT) on Neglected Tropical Diseases (NTDs) including snakebite in Guinea	83 012	NTD	Guinea

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P21-00478	Pruthu Thekkur Kalasappa	Kalasappa,Doctor Pruthu Thekkur**Trl215755	Technical support for preparing a database for assessing the reporting quality of all qualitative and mixed methods SORT IT publications (2009 to 2020)	2 800	Infectious diseases	India
P21-00491	Tshokey Tshokey	Doctor Tshokey **Trl233093	Providing technical support for field data collection for the implementation of the operational research study	2 837	Public Health Emergencies	Bhutan
P21-00499	Arpine Abrahamyan	Abrahamyan,Ms Arpine **Trl235441	Providing technical support for the review of reporting quality of all qualitative and mixed methods publications emerging from SORT IT between (2009-2020)	8 000	Infectious diseases	Armenia
P21-00500	Stefanie Rust	Rust, Ms Stefanie	Providing second level technical control for the review of reporting quality of all qualitative and mixed methods publications emerging from SORT IT between (2009-2020)	3 600	Infectious diseases	Germany
P21-00501	Hayk Davtyan	Tuberkulozi Hetazotutyunneri Yev Kankhargelman Kentron	Providing continued technical and IT support for maintenance of the virtual SORT IT platform (e-SORT IT)	12 000	Infectious diseases	Armenia
HEG	Andreas Alois Reis	Ethics Review Committee	Protocol submission	3 000	Ethics Review	Switzerland
P20-00103	Marie Eve Raguenaud	Raguenaud,Doctor Marie-Eve **Trl18693	Support to projects and activities of the Research for Implementation Unit (IMP)	40 500	IR for Safety	France
P20-00157	Managesther Ssebyala	Global Health Uganda Limited	Detection, reporting and management of adverse drug reactions among people living with HIV in Uganda	14 527	Safety	Uganda
P20-00546	Aminata Nacoulma	Agence Nationale De Regulation Pharmaceutique (Anrp)	Workshops to develop a plan of action to strengthen the pharmacovigilance system of Burkina Faso	13 336	Safety	Burkina Faso
P21-00164	Nana Konama Kotey	Ghana Health Service - Public Health Division	Support for strengthening the capacity in implementation research related to Neglected Tropical Diseases and with a focus on gender-based issues in Ghana	16 999	NTD	Ghana
P21-00165	George Sabblah	Food and Drugs Authority, Ghana	Decentralization of safety monitoring of medicines and vaccines to the lowest level of healthcare system in Ghana	23 005	Safety	Ghana

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P21-00173	Vanessa Veronese	Veronese, Ms Vanessa Clare	Finalise the development of a model implementation research frameworks for digital innovations using the already existing version of the IR toolkit	20 578	Tuberculosis	France
P21-00181	Paul Erasto Kazyoba	National Institute for Medical Research	Strengthening Capacity for Delivery and Uptake of Pediatric praziquantel formulation for Schistosomiasis in Tanzania (STEPPS)	29 678	NTD	Tanzania, United Republic of
P21-00199	Geraldine Hill	Hill,Doctor Geraldine Rosa**Trl29330	Development of National Action Plan to strengthen implementation of aDSM for drug-resistant tuberculosis in Indonesia	500	Tuberculosis	New Zealand
P21-00199	Geraldine Hill	Hill,Doctor Geraldine Rosa**Trl29330	Development of National Action Plan to strengthen implementation of aDSM for drug-resistant tuberculosis in Indonesia	9 500	Tuberculosis	New Zealand
P21-00200	Youssoupha Ndiaye	Direction De La Planification De La Recherche Et Des Statistiques (Dprs)	Evaluation of the impact of COVID-19 on the performance and functioning of Malaria, TB and NTD programmes	3 806	COVID-19	Senegal
P21-00200	Youssoupha Ndiaye	Direction De La Planification De La Recherche Et Des Statistiques (Dprs)	Evaluation of the impact of COVID-19 on the performance and functioning of Malaria, TB and NTD programmes	34 255	COVID-19	Senegal
P21-00207	Dissou Affolabi	Programme National Contre La Tuberculose	Implementation of aDSM in West and Central Africa and meeting of the WARN_TB and CARN-TB Networks	41 967	Safety	Benin
P21-00212	Cecilia Sambakunsi	Pharmacy and Medicines Regulatory Authority	Support for assessment of impact of training and remodeling of adverse drug reaction reporting systems on the practice of pharmacovigilance in Malawi	1 195	Safety	Malawi
P21-00212	Cecilia Sambakunsi	Pharmacy and Medicines Regulatory Authority	Support for assessment of impact of training and remodeling of adverse drug reaction reporting systems on the practice of pharmacovigilance in Malawi	22 700	Safety	Malawi
P21-00214	Rachida Soulaymani Bencheikh	Rabat Who Collaborating Centre for Strengthening	Development of a training program in the scope of strengthening Covid19 vaccine safety monitoring	18 600	COVID-19	Morocco

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00215	Grace Wangge	Wangge, Ms Grace	On-site support for the development of National Action Plan to strengthen implementation of aDSM for drug-resistant tuberculosis in Indonesia	450	Tuberculosis	Indonesia
P21-00215	Grace Wangge	Wangge, Ms Grace	On-site support for the development of National Action Plan to strengthen implementation of aDSM for drug-resistant tuberculosis in Indonesia	4 050	Tuberculosis	Indonesia
P21-00216	Nana Konama Kotey	Ghana Health Service - Public Health Division	Technical assistance for protocol development for an implementation research related to Neglected Tropical Diseases and with a focus on gender-based issues in Ghana	4 800	NTD	Ghana
P21-00219	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	Senegal: Strengthening safety monitoring system of country through on-line Training on pharmacovigilance	1 836	Safety	Morocco
P21-00219	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	Senegal: Strengthening safety monitoring system of country through on-line Training on pharmacovigilance	16 524	Safety	Morocco
P21-00231	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	Burkina Faso: Strengthening safety monitoring system of country through on-line training in Pharmacovigilance	1 254	Safety	Morocco
P21-00231	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	Burkina Faso: Strengthening safety monitoring system of country through on-line training in Pharmacovigilance	11 290	Safety	Morocco
P21-00296	James Densem	Biomedical Computing Limited	Payment of Invoice No 20201216 for Hosting of the central registry for the epidemiological surveillance of drug safety in pregnancy and support for database management SSL certificate 2021	1 490	Safety	United Kingdom
P21-00313	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	Delivery of the training module on Covid19 vaccine safety monitoring with technical assistance to ADP focus francophones countries	26 125	COVID-19	Morocco
P21-00325	Mark Ryann Lirasan	Food and Drugs Administration	Understanding underreporting of adverse drug reactions in the Philippines	50 000	Safety	Philippines
P21-00354	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	English translation of the training module on Covid19 vaccine safety monitoring	6 098	COVID-19	Morocco

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00362	Edith Gavor	Ministry of Health, Ghana	Support to the Ministry of Health, Ghana to evaluate adherence to treatment guidelines by health professionals in Ghana	24 205	Safety	Ghana
P21-00365	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	Delivery of the training module on Covid19 vaccine safety monitoring with technical assistance to ADP focus English-speaking countries	16 268	COVID-19	Morocco
P21-00378	Cecilia Sambakunsi	Pharmacy and Medicines Regulatory Authority	Support for field evaluation of impact of training of adverse drug reaction reporting systems on the practice of pharmacovigilance in Malawi	2 528	Safety	Malawi
P21-00379	Ratchanekorn Wutirat	Inis Communication Ltd	Design and development of French version of the Implementation Research for Digital technologies and TB toolkit website and offline, PDF versions in French and English	3 314	Tuberculosis	United Kingdom
P21-00403	Louis, Doctor Valerie Renee	Louis, Doctor Valerie Renee	IR4DTB French translation	5 000	Tuberculosis	Germany
P21-00443	Managesther Ssebyala	Global Health Uganda Limited	Pilot-testing a mobile application for reporting adverse drug reactions and receiving medication-safety information by patients in Uganda	35 473	Safety	Uganda
P21-00465	Mahamadou Bassirou Souleymane	Souleymane, Doctor Mahamadou Bassirou	Technical assistance to support National TB Programs of West and Central African countries in implementing aDSM	10 800	Safety	Niger
P21-00465	Mahamadou Bassirou Souleymane	Souleymane, Doctor Mahamadou Bassirou	Technical assistance to support National TB Programs of West and Central African countries in implementing aDSM	3 600	Safety	Niger
P21-00496	Neil Derridj	Derridj,Doctor Neil **Trl238925	Translation of the pediatric cardiology content and Quality control of the French version of the Global Birth Defect App	2 500	Safety	France
P21-00497	Charlotte Dubucs	Dubucs,Ms Charlotte **Trl239253	Translation of the congenital syndromes and Quality control of the French version of the Global Birth Defect App	3 000	Safety	France

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P21-00498	Ali Sie	Centre De Recherche En Sante De Nouna	Support the evaluation of the feasibility and acceptability of the French version of the Global Birth Defect App in Burkina Faso for surveillance and research	22 445	Safety	Burkina Faso
P21-00517	Edith Gavor	Ministry of Health, Ghana	Support to the Ministry of Health to analyse and disseminate results from evaluation of adherence to treatment guidelines by health professionals in Ghana	3 333	Safety	Ghana
P21-00539	Nana Konama Kotey	Ghana Health Service - Public Health Division	Support to the National Buruli Ulcer and Yaws Eradication Program to evaluate gender-related factors affecting care of skin-neglected tropical diseases in three districts of Ghana	24 542	NTD	Ghana
P21-00542	Rachida Soulaymani	Rabat Who Collaborating Centre for Strengthening	Support for the development of a five-year plan of action to strengthen the national pharmacovigilance system of Burkina Faso	21 284	Safety	Morocco
B80269	Daniel A Boakye	Noguchi Memorial Institute for Medical Research	Utility of Vector Population Genetics for Delineating O volvulus transmission transmission: Entomological Component	119 701	Onchocerciasis	Ghana
B80297	Kwadwo Frempong	Noguchi Memorial Institute for Medical Research	Population genetic simulations for tools for onchocerciasis control programmes to determine transmission zones: Part 2 Ghana Epidemiological and entomological data	39 941	Onchocerciasis	Ghana
C00049	Megha Raj Banjara	Banjara, Mr Megha Raj	Management of implementation research projects in the scope of research in support of visceral leishmaniasis elimination in Indian subcontinent	26 600	Visceral leishmaniasis	Nepal
GHE	Andreas Alois Reis	Ethics Review Committee	Protocol submission cost recovery	1 000	Visceral leishmaniasis	Switzerland
HEG	Andreas Alois Reis	Ethics Review Committee	Protocol Submission cost recovery for ERC	13 850	Visceral leishmaniasis	Switzerland
P20-00140	Debashis Ghosh	Icddr,B (International Centre For Diarrhoeal Disease Research)	Epidemiological, Serological and Entomological Investigation of New Visceral Leishmaniasis (VL) Foci in Bangladesh	50 000	Visceral leishmaniasis	Bangladesh

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P20-00141	Shomik Maruf	Icddr,B (International Centre For Diarrhoeal Disease Research)	Follow up Assessment of Visceral Leishmaniasis (VL) Treated Patients and Assessment of Impact of COVID-19 in VL Control Services in Bangladesh	45 000	Visceral leishmaniasis	Bangladesh
P20-00142	Debashis Ghosh	Icddr,B (International Centre For Diarrhoeal Disease Research)	Determination of Prevalence of Post Kala-azar Dermal Leishmaniasis (PKDL) and Assessment of Treatment Seeking Behaviour of PKDL Patients in Bangladesh	55 000	Visceral leishmaniasis	Bangladesh
P20-00143	Anand Ballabh Joshi	Public Health and Infectious Disease Research Centre (Phidrc)	Epidemiological, Serological and Entomological Investigation of New Visceral Leishmaniasis (VL) Foci in Nepal	50 828	Visceral leishmaniasis	Nepal
P20-00144	Anand Ballabh Joshi	Public Health and Infectious Disease Research Centre (Phidrc)	Follow up Assessment of Visceral Leishmaniasis (VL) Treated Patients and Assessment of Impact of COVID-19 in VL Control Services in Nepal	32 004	Visceral leishmaniasis	Nepal
P20-00145	Anand Ballabh Joshi	Public Health and Infectious Disease Research Centre (Phidrc)	Determination of Prevalence of Post Kala-azar Dermal Leishmaniasis (PKDL) and Assessment of Treatment Seeking Behaviour of PKDL Patients in Nepal	54 405	Visceral leishmaniasis	Nepal
P21-00287	Cho Naing	James Cook University	A systematic review of good practices used to engage communities in health services research in neglected tropical diseases in low and middle income countries of South-East Asia and the Pacific	14 738	Community engagement	Australia
P21-00341	Cho Naing	International Medical University	A systematic review of good practices used to engage communities in health services research in neglected tropical diseases in low and middle income countries of South-East Asia and the Pacific	29 476	Community engagement	Malaysia
P21-00344	Sunita Bandewar	Forum for Medical Ethics Society	Part 1 Non-ERC: A collaborative research initiative cataloguing key community engagement practices embedded in Implementation Research Public Health Projects Involving Disadvantaged (rural/indigenous) Communities in India	15 000	Community engagement	India

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P21-00349	Winfried Kern	University of Freiburg	Support to research for Improved VL Surveillance, Case Detection and Vector Control in the scope of VL elimination Initiative in Bangladesh and Nepal	8 340	Visceral leishmaniasis	Germany
P21-00357	Anand Ballabh Joshi	Public Health and Infectious Disease Research Centre (Phidrc)	Assessment of the Impact of Implementation Research on the Visceral Leishmaniasis (VL) Elimination Efforts in Nepal: The National Perspective	24 500	Visceral leishmaniasis	Nepal
P21-00358	Dinesh Mondal	Icddr,B (International Centre For Diarrhoeal Disease Research)	Assessment of the Impact of Implementation Research on the Visceral Leishmaniasis (VL) Elimina-tion Efforts in Bangladesh: the National Perspective	24 500	Visceral leishmaniasis	Bangladesh
P21-00374	Daniel A. Boakye	Noguchi Memorial Institute for Medical Research	Review, compilation & publication of unpublished data and experience of the Onchocerciasis Control Programme in West Africa and peer-reviewed literature on the role of the vector in transmission of O volvulus, vector-related consideration	30 000	Onchocerciasis	Ghana
P21-00395	Andreas Alois Reis	Ethics Review Committee	Payment for ERC review fees for Moxidectin Protocols MDGH-MOX-1006, MDGH-MOX-3001, MDGH-Mox-3002	3 000	Onchocerciasis	Switzerland
P21-00397	Billing Department	Dartmouth Journal Services	Payment for Publication fee with invoice no TROP55350	5 245	Visceral leishmaniasis	United States
P21-00481	Shannon Hedtke	La Trobe University	Population genetic tools for onchocerciasis control programmes to determine transmission zones: Utility of vector nuclear vs mitochondrial DNA and testing of different methods for single microfilariae analysis	68 286	Onchocerciasis	Australia
P21-00504	Lauren Maxwell	Klinikum Der Universitat Heidelberg	Evaluation of TDR data sharing activities conducted since 2015	22 400	Data sharing	Germany
(blank)	Mercedes Hererro	Herrero, Doctor Mercedes	Concept note for implementation research platform for VL elimination as a PH problem in East Africa and documentation of success and lessons learnt from VL elimination initiative from South-East Asia region	4 400	Visceral leishmaniasis	Spain

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
(blank)	Mercedes Hererro	Herrero, Doctor Mercedes	Development of a concept note for implementation research platform for VL elimination as a public health problem in East Africa and documentation of success and lessons learnt from VL elimination initiative from South-East Asia region	10 257	Visceral leishmaniasis	Spain
P21-00171	Debora Pedrazzoli	Pedrazzoli, Ms Debora	To finalise the development of generic tools (protocol, data collection tools, study procedures) for enhancing the conduct of implementation TB research led by National TB programmes aiming at implementing MDR/RR-TB	30 855	Tuberculosis	United Kingdom
P21-00171	Debora Pedrazzoli	Pedrazzoli, Ms Debora	To finalise the development of generic tools (protocol, data collection tools, study procedures) for enhancing the conduct of implementation TB research led by National TB programmes aiming at implementing MDR/RR-TB	23 145	Tuberculosis	United Kingdom
P21-00173	Vanessa Veronese	Veronese, Ms Vanessa Clare	) to finalise the development of a model implementation research frameworks for digital innovations using the already existing version of the IR toolkit	27 422	Tuberculosis	France
P21-00174	Valerie Renee Louis	Louis, Doctor Valerie Renee	French translation of research for TB documents	5 600	Tuberculosis	Germany
P21-00174	Valerie Renee Louis	Louis, Doctor Valerie Renee	French translation of research for TB documents	8 400	Tuberculosis	Germany
P21-00180	Adebola Lawanson	National Tuberculosis and Leprosy Control Programme	ShORRT: the Bedaquiline-based all-oral Shorter Treatment regimen for DR-TB patients (BESTREAM) study: a modified approach	12 030	Tuberculosis	Nigeria
P21-00180	Adebola Lawanson	National Tuberculosis and Leprosy Control Programme	ShORRT: the Bedaquiline-based all-oral Shorter Treatment regimen for DR-TB patients (BESTREAM) study: a modified approach	108 264	Tuberculosis	Nigeria

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P21-00184	Muhammad Amir Khan	Association for Social Development Gfatm - Acsm	ShORRT: All-oral shorter treatment regiments for multidrug and rifampicin-resistant tuberculosis (MDR/PR/TB): Evaluating their effectiveness, safety, feasibility, cost-effectiveness and impact on the quality of life of patients in Pakistan	30 043	Tuberculosis	Pakistan
P21-00189	Michel Kaswa	Ministère De La Sante / Programme National De Lutte Contre La Tuberculose	ShORRT: All-oral shorter treatment regimens for multidrug-and rifampicin-resistant tuberculosis (MDR/RR-TB): Evaluating their effectiveness, safety and impact on the quality of life of patients in the Democratic Republic of the Congo	17 471	Tuberculosis	Congo, The Democratic Republic of the
P21-00189	Michel Kaswa	Ministère De La Sante / Programme National De Lutte Contre La Tuberculose	ShORRT: All-oral shorter treatment regimens for multidrug-and rifampicin-resistant tuberculosis (MDR/RR-TB): Evaluating their effectiveness, safety and impact on the quality of life of patients in the Democratic Republic of the Congo	157 237	Tuberculosis	Congo, The Democratic Republic of the
P21-00190	Dissou Affolabi	Programme National Contre La Tuberculose	ShORRT: All-oral shorter treatment regimens for multidrug-and rifampicin-resistant tuberculosis (MDR/RR-TB): Evaluating their effectiveness, safety and impact on the quality of life of patients in Benin	10 266	Tuberculosis	Benin
P21-00190	Dissou Affolabi	Programme National Contre La Tuberculose	ShORRT: All-oral shorter treatment regimens for multidrug-and rifampicin-resistant tuberculosis (MDR/RR-TB): Evaluating their effectiveness, safety and impact on the quality of life of patients in Benin	92 390	Tuberculosis	Benin
P21-00201	Mohammed Fall Dogo	Pnlt-Togo	Research capacity strengthening (ShORRT) - TOGO	1 436	Tuberculosis	Togo
P21-00201	Mohammed Fall Dogo	Pnlt-Togo	Research capacity strengthening (ShORRT) - TOGO	12 928	Tuberculosis	Togo
P21-00202	Adjima Combary	Programme National De Lutte Contre La Tuberculose (Plnt)	Research capacity strengthening (ShORRT) - Burkina Faso	2 185	Tuberculosis	Burkina Faso
P21-00202	Adjima Combary	Programme National De Lutte Contre La Tuberculose (Plnt)	Research capacity strengthening (ShORRT) - Burkina Faso	19 667	Tuberculosis	Burkina Faso

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00203	Nadia M. L. Fanou	Fanou Kloubou, Doctor Nadia M.L.	Strengthening of the CARN-TB capacities for Qualitative studies & sub studies	7 200	Tuberculosis	Benin
P21-00203	Nadia M. L. Fanou	Fanou Kloubou, Doctor Nadia M.L.	Strengthening of the CARN-TB capacities for Qualitative studies & sub studies	7 200	Tuberculosis	Benin
P21-00204	Adama Marie Bangoura	Programme National De Lutte Antituberculeuse (Pnlat)	Research capacity strengthening (ShORRT) - Guinea	2 048	Tuberculosis	Guinea
P21-00204	Adama Marie Bangoura	Programme National De Lutte Antituberculeuse (Pnlat)	Research capacity strengthening (ShORRT) - Guinea	18 436	Tuberculosis	Guinea
P21-00208	James Kamanzi	Rwanda Biomedical Center	Research capacity strengthening (ShORRT), Rwanda	1 630	Tuberculosis	Rwanda
P21-00208	James Kamanzi	Rwanda Biomedical Center	Research capacity strengthening (ShORRT), Rwanda	14 670	Tuberculosis	Rwanda
P21-00228	Amadou Seck	Gie West and Centre African Bioinformatics (Gie Wca Bioinf)	ShORRT research package: support for implementing and supporting data collection	18 281	Tuberculosis	Senegal
P21-00228	Amadou Seck	Gie West and Centre African Bioinformatics (Gie Wca Bioinf)	ShORRT research package: support for implementing and supporting data collection	6 094	Tuberculosis	Senegal
P21-00232	Dissou Affolabi	Programme National Contre La Tuberculose	Coordination of the activities of the West and Central Africa networks for TB control	12 300	Tuberculosis	Benin
P21-00232	Dissou Affolabi	Programme National Contre La Tuberculose	Coordination of the activities of the West and Central Africa networks for TB control	12 300	Tuberculosis	Benin
P21-00233	Jennifer Ann Kealy	Kealy, Ms Jennifer Ann	Training on how to implement GCP principles for TB surveys	200	Tuberculosis	Switzerland
P21-00233	Jennifer Ann Kealy	Kealy, Ms Jennifer Ann	Training on how to implement GCP principles for TB surveys	3 800	Tuberculosis	Switzerland
P21-00234	Varalakshmi Elango	Elango, Doctor Varalakshmi	Training on how to implement GCP principles for TB surveys	200	Tuberculosis	India

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00234	Varalakshmi Elango	Elango, Doctor Varalakshmi	Training on how to implement GCP principles for TB surveys	3 800	Tuberculosis	India
P21-00237	Dissou Affolabi	Programme National Contre La Tuberculose	Support to the WARN-TB & CARN-TB for scientific written communication	12 400	Tuberculosis	Benin
P21-00237	Dissou Affolabi	Programme National Contre La Tuberculose	Support to the WARN-TB & CARN-TB for scientific written communication	12 400	Tuberculosis	Benin
P21-00271	Thomas Scalway	Lushomo	Design and layout of the CAD toolkit	2 675	Tuberculosis	South Africa
P21-00275	Amadou Seck	Seck, Mr Amadou	Support for the development of the database of REDCap for the DIAMA project	2 000	Tuberculosis	Senegal
P21-00289	Federico Carroli	Ocean Translations S.R.L.	Spanish/Portuguese translation - ShORRT readiness assessment checklist; data dictionary; interpretation services	732	Tuberculosis	Argentina
P21-00337	Elhadji Konco Cire Ba	Ba, Mr Elhadji Konco Cire	Evaluation of the impact of the Good Data management practice training programme conducted in 5 west African countries	20 000	Good datamanagement practices	Senegal
P21-00361	Ratchanekorn Wutirat	Inis Communication Ltd	IR4DTB: renewal domain name, hosting and SSL certificate	556	Tuberculosis	United Kingdom
P21-00368	Maria Hoole	Because Stories	WARN-TB & CARN-TB - Short video in French	323	Tuberculosis	South Africa
P21-00370	Thomas Scalway	Lushomo	Design and development of a two-page fact sheet on the CAD toolkit	1 182	Tuberculosis	South Africa
P21-00371	Dieynaba Sophie N'diaye	N'diaye, Doctor Dieynaba Sophie	Support for the development and use of the TB costing tool research package	16 400	Tuberculosis	France
P21-00372	Check Asken Hugues Traore	Traore,Doctor Check Asken Hugues**Trl193373	Support to the WARN-TB and CARN-TB for strengthening NTP Capacities for conducting OR/IR projects	12 000	Tuberculosis	Burkina Faso
P21-00373	Jonathon Campbell	Campbell,Doctor Jonathon **Trl195145	Support for the development and use of the TB costing tool research package	12 000	Tuberculosis	Canada

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00375	Muhammad Amir Khan	Association for Social Development Gfatm - Acsm	Pakistan – Health Economics Research Capacity Strengthening	12 240	Tuberculosis	Pakistan
P21-00375	Muhammad Amir Khan	Association for Social Development Gfatm - Acsm	Pakistan – Health Economics Research Capacity Strengthening	11 760	Tuberculosis	Pakistan
P21-00379	Ratchanekorn Wutirat	Inis Communication Ltd	Design and development of French version of the Implementation Research for Digital technologies and TB toolkit website and offline, PDF versions in French and English	9 942	Tuberculosis	United Kingdom
P21-00385	Nadia M. L. Fanou	Fanou Kloubou, Doctor Nadia M.L.	Support the National TB programme of Burkina Faso in the analysis and reporting of the qualitative data that was collected for reporting study results in a scientific paper	10 000	Tuberculosis	Benin
P21-00387	Gando Herve Gildas	Programme National De Lutte Contre La Tuberculose En République Centrafricaine	Research capacity strengthening (ShORRT) - CAR	6 640	Tuberculosis	Central African Republic
P21-00387	Gando Herve Gildas	Programme National De Lutte Contre La Tuberculose En République Centrafricaine	Research capacity strengthening (ShORRT) - CAR	6 379	Tuberculosis	Central African Republic
P21-00388	Adama Marie Bangoura	Programme National De Lutte Antituberculeuse (Pnlat)	Support for reporting OR study results in scientific papers - Guinea	5 691	Tuberculosis	Guinea
P21-00396	Vanessa Veronese	Veronese, Ms Vanessa Clare	Strengthening monitoring and preparedness of TB services to avert disruptions caused by COVID-19 and future global health emergencies	4 000	Tuberculosis	France
P21-00403	Doctor Valerie Renee Louis	Louis, Doctor Valerie Renee	IR4DTB French translation	5 000	Tuberculosis	Germany

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00417	Vanessa Veronese	Veronese, Ms Vanessa Clare	Supporting the writing of WARNTB and CARN-TB papers and for the conduct of evaluation on the impact of COVID-19 on TB control	4 500	Tuberculosis	France
P21-00422	Thomas Scalway	Lushomo	French TB cost collection toolkit and finalisation of the English version	5 256	Tuberculosis	South Africa
P21-00428	Tatiana Polunina	Polunina, Ms Tatiana Andreevna	Russian translation of Implementation Research for Digital Technologies in TB (IR4DTB) toolkit	10 600	Tuberculosis	Russian Federation
P21-00433	Schadrac Christin Agbla	Agbla, Doctor Schadrac Christin	ShORRT data management and analysis	18 000	Tuberculosis	United Kingdom
P21-00433	Schadrac Christin Agbla	Agbla, Doctor Schadrac Christin	ShORRT data management and analysis	6 000	Tuberculosis	United Kingdom
P21-00440	Vanessa Veronese	Veronese, Ms Vanessa Clare	Project Title: Follow-up activities for the use of the framework for evaluating the impact of COVID-19 on TB control and for the WARN-TB & CARN-TB communication activities	12 500	Tuberculosis	France
P21-00445	Yaw Adusi-Poku	National Tuberculosis Programme	ShORRT Research capacity strengthening in Ghana	20 000	Tuberculosis	Ghana
P21-00447	Iem Vibol	National Tuberculosis Control Center of Lao Pdr	ShORRT research capacity strengthening in Lao PDR	19 650	Tuberculosis	Lao People's Democratic Republic
P21-00467	Barnabé Gning	Programme National De Lutte Contre La Tuberculose (Plnt)	Qualitative aspect - Senegal – support for data collection activities for IR study on impact of COVID – 19 on TB services	887	Tuberculosis	Senegal
P21-00479	Kobto Koura	The Union	The UNION - support for the use of the TB costing toolkit	24 563	Tuberculosis	France
P21-00480	Thomas Scalway	Lushomo	Design and layout of the OPT-SMC research package	6 621	Malaria	South Africa

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00483	Dissou Affolabi	Programme National Contre La Tuberculose	Support to Programme National contre la Tuberculose (PNT), Benin for pilot testing of the Impact assessment framework to evaluate the impact of COVID-19 pandemic on TB service provision in West and Central Africa	4 932	Tuberculosis	Benin
P21-00485	Adama Marie Bangoura	Programme National De Lutte Antituberculeuse (Pnlat)	Support to Programme National de Lutte Antituberculeuse (PNLAT), Guinea for pilot testing of the Impact assessment framework to evaluate the impact of COVID-19 pandemic on TB service provision in West and Central Africa and use of TB costing	7 832	Tuberculosis	Guinea
P21-00486	Abdelhadi Oumar	Programme National De Lutte Contre La Tuberculose	Support to Programme National de lutte contre la Tuberculose, Chad for pilot testing of the Impact assessment framework to evaluate the impact of COVID-19 pandemic on TB service provision in West and Central Africa	5 154	Tuberculosis	Chad
P21-00487	Adjima Combary	Programme National De Lutte Contre La Tuberculose (Plnt)	Support to Programme National Tuberculose, Burkina Faso for pilot testing of the Impact assessment framework to evaluate the impact of COVID-19 pandemic on TB service provision in West and Central Africa	5 206	Tuberculosis	Burkina Faso
P21-00492	Muhammad Amir Khan	Association for Social Development Gfatm - Acsm	Support for the development of a research protocol for operationalizing “symptom-CXR” screening of Household TB contacts and LTBi preventive treatment	24 850	Tuberculosis	Pakistan
P21-00493	Natasha Waschewsky	Eurominds Linguistics Agentur Für Sprachendienste Ltd	French translation of OPT-SMC document	1 366	Malaria	Germany
P21-00494	Vanessa Veronese	Veronese, Ms Vanessa Clare	Follow-up activities for the WARN-TB & CARN-TB and the piloting of the framework for evaluating the impact of COVID-19 on TB control	7 000	Tuberculosis	France
P21-00495	Martha Mcguire	Logical Outcomes	Evaluation of the West and Central African network for TB Research (WARN/CARN TB)	17 500	Tuberculosis	Canada

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00505	Dissou Affolabi	Programme National Contre La Tuberculose	Face to face training on Good Datamanagement practices and REDCap	10 001	Good datamanagement practices	Benin
P21-00506	Benjamin Sombie	Groupe De Recherche Action En Sante (Gras)	Burkina Faso- Face to face training on Good Datamanagement practices and REDCap	10 001	Good datamanagement practices	Burkina Faso
P21-00507	Jean Louis Ndiaye	Ufr Santé / University De Thies	Senegal- Face to face training on Good Datamanagement practices and REDCap	9 214	Good datamanagement practices	Senegal
P21-00512	Dissou Affolabi	Programme National Contre La Tuberculose	2021 - Annual meeting of the West and Central Africa for TB control Networks (WARN-TB & CARN-TB)	39 230	Tuberculosis	Benin
P21-00514	Dissou Affolabi	Programme National Contre La Tuberculose	Implementating social protection for TB patients – the PECEM-TB project in Benin	24 466	Tuberculosis	Benin
P21-00516	Adjima Combary	Programme National De Lutte Contre La Tuberculose (Plnt)	Burkina Faso - support for the use of the TB costing toolkit	14 883	Tuberculosis	Burkina Faso
P21-00518	Amadou Seck	Gie West and Centre African Bioinformatics (Gie Wca Bioinf)	Online training on Good Datamanagement practices and REDCap	24 472	Tuberculosis	Senegal
P21-00519	Manuel De Jesus Bravo Reyes	Damian Fundation Nicaragua	Nicaragua – research capacity strengthening (ShORRT)	20 789	Tuberculosis	Nicaragua
P21-00522	Nadia M. L. Fanou	Fanou Kloubou, Doctor Nadia M.L.	Support to the National Malaria Programme of the OPT-SMC project for the qualitative aspects of their OR/IR projects	12 500	Tuberculosis	Benin
P21-00529	Annie Bisso	Programme National De Lutte Contre La Tuberculose	Programme National de lutte contre la Tuberculose, Cameroon	10 183	Tuberculosis	Cameroon
P21-00530	Melanea Encarnación Casanova	Asociacion Dominicana De Planification Familiar	Research capacity strengthening (ShORRT) in the Dominican Republic	15 267	Tuberculosis	Dominican Republic

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00532	Claudia Mutaquiha	Ministerio De Saude	ShORRT Research capacity strengthening in Mozambique	20 000	Tuberculosis	Mozambique
P21-00534	Dissou Affolabi	Programme National Contre La Tuberculose	To support the dissemination and communication of research findings on COVID-19 and impact mitigation strategies among the WARN-TB & CARN-TB regional network	10 562	Tuberculosis	Benin
P21-00536	Fatima Leticia Luna Lopez	Centro Nacional De Programas Preventivos Y Control De Enfermedades	Research capacity strengthening (ShORRT) in Mexico	15 000	Tuberculosis	Mexico
P21-00537	Yaw Adusi-Poku	National Tuberculosis Programme	To support NTP activities in Ghana to calibrate computer aided detection (CAD) software for TB detection	6 120	Tuberculosis	Ghana
P21-00544	Gloria Mercedes Puerto Castro	Instituto Nacional De Salud	Research capacity strengthening (ShORRT) in Colombia	15 000	Tuberculosis	Colombia
P21-00545	Ernest W. Cholopray	National Leprosy and Tuberculosis Control Program	Liberia - support for the use of the TB costing toolkit	10 992	Tuberculosis	Liberia
WHE/WCO	Avognon Partrick Marie	Eimprest - Afro	Allowances: Support to implement activities for modified shorter treatment regimens for DR-TB operations research	13 470	Tuberculosis	Zimbabwe
WHE/WCO	Avognon Partrick Marie	Eimprest - Afro	Expenses for Ethical approval, Stationery and tablets for the modified shorter treatment regimens for DR-TB operations research	2 900	Tuberculosis	Zimbabwe
P20-00115	Sohana Shafique	Icddr,B (International Centre For Diarrhoeal Disease Research)	To conduct literature reviews	65 000	Gender	Bangladesh
P20-00116	Sanghamitra Pati	Indian Council of Medical Research	To conduct literature reviews	74 384	Gender	India
HEG	Andreas Alois Reis	Ethics Review Committee	protocol submission	18 900	Ethics Review	Switzerland

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P21-00170	Nafomon Sogoba	Malaria Research Training Center	A pilot multisectoral intervention for controlling malaria vectors, mitigating insecticides resistance and assessing WaSH facilities at health care units in selected costal and sahelian west African countries	120 000	Malaria	Mali
P21-00196	Qingxia Zhong	Zhong,Ms Qingxia **Trl186559	Management of collaborative activities on multisectoral approaches (MSA) for the prevention and control of infectious diseases within 2 activities as outlined on the attached Terms of Reference	53 933	Vector-borne diseases	Switzerland
P21-00401	Qingxia Zhong	Zhong,Ms Qingxia **Trl186559	Management of collaborative activities on multisectoral approaches (MSA) for the prevention and control of infectious diseases	6 615	Vector-borne diseases	Switzerland
P21-00401	Qingxia Zhong	Zhong,Ms Qingxia **Trl186559	Management of collaborative activities on multisectoral approaches (MSA) for the prevention and control of infectious diseases	2 205	Vector-borne diseases	Switzerland
P21-00448	Qingxia Zhong	Zhong,Ms Qingxia **Trl186559	Technical deliverables related to multisectoral approaches (MSA) for the prevention and control of infectious diseases	2 375	Vector-borne diseases	Switzerland
P21-00448	Qingxia Zhong	Zhong,Ms Qingxia **Trl186559	Technical deliverables related to multisectoral approaches (MSA) for the prevention and control of infectious diseases	7 125	Vector-borne diseases	Switzerland
P21-00454	Marcos Takashi Obara	University of Brasilia - Unb	Zika, Dengue and Chikungunya: multisectoral approach for developing solutions applicable in public health	103 800	Vector-borne diseases	Brazil
P21-00508	Diego Omar Morales Viteri	Instituto Nacional De Investigacion En Salud Publica - Insp	Establishment of a multisectoral strategy integrating Health, Environment, Education, Sanitation and Water sectors to control and reduce mosquito populations in order to prevent transmission of Aedes-borne diseases, in the city of Manta	18 000	Vector-borne diseases	Ecuador
GHE	Andreas Alois Reis	Ethics Review Committee	Protocol submission cost recovery	3 993	Ethics Review	Switzerland
HEG	Andreas Alois Reis	Ethics Review Committee	Protocol submission cost recovery for ERC	4 000	Ethics Review	Switzerland

Project ID	Principal investigator	Supplier name (Institution)	Project title	Funding in US$	Disease or topic	Countries involved
P20-00105	Tashi Tobgay	Institute of Health Partners	Development and implementation of preparatory project activities	30 000	Gender	Bhutan
P20-00105	Tashi Tobgay	Institute of Health Partners	Develop research protocol	35 000	Gender	Bhutan
P20-00106	Salome Bukachi	University of Nairobi	Develop research protocol	50 000	Gender	Kenya
P20-00106	Salome Bukachi	University of Nairobi	Development and implementation of preparatory project activities	45 000	Gender	Kenya
P21-00435	Russell Holley	Artifex Creative Webnet Ltd - Acw	Development of web-version of TDR Tookit for incorporating intersectional gender analysis into research on infectious diseases of poverty: a toolkit for health researchers	15 000	Service	United Kingdom
P21-00241	James Logan	Chariot Innovations Ltd	Maintenance and further development of the Global Atlas of Medical Entomology Schooling (GAMES) on the Global Vector Hub, developed through a TDR activity	10 384	Vector borne diseases	United Kingdom
P21-00284	Gildas Yahouedo	Yahouedo, Doctor Gildas	Development of a landscape analysis of the potential innovative vector control tools which are still at the development or testing phases with analysis of benefit/risks and comparative advantages and challenges	60 000	Vector borne diseases	France
P21-00432	Scott C. Edmunds	Bgi Hong Kong Tech Col, Limited	Special issue of data papers on biodiversity data related to vectors of human diseases to support the development of innovative vector control tools	4 563	Vector borne diseases	China
P21-00488	Eleonora Flacio	Scuola Universitaria Professionale Della Svizzer A I Taliana	Proposal for the development of a high- resolution optical tool for the identification of the eggs of two Aedes species, namely Aedes aegypti and Aedes albopictus, to improve the surveillance of arboviral diseases such as dengue, chikunguny	36 500	Arboviral diseases	Switzerland

TDR funding in 2021

Core contributions	Amount (US$)
Sweden	4 804 002
Switzerland	1 925 255
United Kingdom of Great Britain and Northern Ireland	1 662 159
Germany	1 659 850
Luxembourg	1 331 719
Nigeria [1]	1 097 398
Belgium	675 676
Norway	349 365
China [2]	165 000
Spain	112 613
India	55 000
Japan	50 000
Thailand	49 751
Malaysia	25 000
Panama	14 000
Mexico	10 000
Miscellaneous	518
World Health Organization [3]	
Subtotal	13 987 305
Contributors providing project-specific funding	**Amount (US$)**
National Institute of Health Research (NIHR), United Kingdom	2 546 199
United Nations Development Programme (UNDP)	1 352 000
Sweden	1 190 970
Bill & Melinda Gates Foundation	1 133 360
United States Agency for International Development (USAID)	987 274
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) [4]	814 387
World Health Organization [5]	706 895
Luxembourg	404 030
Medicines Development for Global Health Limited (MDGH)	93 041
Robert Koch Institute (RKI)	58 048
Subtotal	9 286 203
Total contributions	**23 273 508**

1. *The contribution from the Government of Nigeria for the period 2015 to 2020 will be reported in the certified financial statement in 2022 due to the timing of its receipt in TDR.*
2. *The 2020 contribution from the Government of the People's Republic of China will be reported in the certified financial statement in 2021. The contribution for the year 2021 will be reported in 2022. This is a result of timing of receipt in TDR.*
3. *The 2020-2021 core contribution from WHO was received in full in 2020.*
4. *The 2021 designated contribution from GIZ includes funding from BMBF.*
5. *The 2021 designated contribution from WHO includes funding from UNPDF (the United Nations Peace and Development Trust Fund) for joint TDR/Global Malaria Programme activities.*

Scientific Working Group recommendations from 2020 and actions taken

The Scientific Working Group (SWG) for Research for Implementation met on 12–16 October 2020. Specific recommendations were made for the different projects and summarized in brief here together with the actions taken:

High-level recommendations

Recommendations	Actions taken in response
SWG noted opportunities to further optimize resources and enhance the impact of the IMP outputs, particularly as it relates to the broader activities under One Health and gender. SWG strongly recommends greater synergy between the teams, both conceptually and operationally, to optimize impact and leverage limited resources.	The recommendation is being implemented. An example is initiation of a project on "*links between transmission of VBDs in extreme poverty conditions and exploring the integrated application of multisectoral, One Health and intersectional gender approaches for enhanced prevention and control*" The Research capacity Strengthening and IMP units work in synergy in the ADP and SORT IT projects
SWG outlined the importance of TDR compiling and profiling the critical mass of evidence generated on gender and infectious diseases of poverty, as well as beginning to develop the evidence on gender transformative solutions.	This is work in progress

Expected Result specific recommendations:

ER Short Title	Recommendations	Actions taken in response
1.1.1 Arboviruses – surveillance and preparedness	To continue the project as planned.	Being implemented as described in briefing document and annual report
1.3.10 Urban Health and VBD	1. To undertake internal discussions and benefit from further synergies with other VBD ERs. 2. To give particular attention to: i) which region/part the LMIC consortia (reviews) selected is from; ii) how many women researchers will be leading these reviews; and iii) seek for further strategic collaboration with key	Being implemented as described in briefing document and annual report

ER Short Title	Recommendations	Actions taken in response
	research institutions in LMICs already involved in urban health and poverty research.	
1.1.7 SORT IT	3. To continue with current franchising model while developing an understanding of whether this is a long-term project or if developing an exit strategy is more appropriate. 4. Critical and objective analysis and dissemination of the impact of the initiative will enhance its generalisability. 5. To better articulate women's empowerment and gender equality in reporting and to engage more meaningfully with gender mainstreaming.	- We have continued with effective franchising with over 60 implementing partners included in the Global SORT IT partnership in 2021. All franchising tools are now freely available online or on request from TDR. - SORT IT should not be seen as a project needing an exit strategy. Strictly speaking, it is simply an approach which is structured and adaptable. It can thus be applied widely to improve effective use of programme data, build research capacity and enhance global engagement. - In terms of strategic longer-term direction, the SORT IT approach is already being applied dynamically to accelerate progress towards UHC and improve the management of public health emergencies. We have the know-how and are also confident that SORT IT can help to achieve other SDGs in areas such as sustainable management of water and sanitation, agriculture and the environment. In this vein, the SORT IT approach remains relevant until 2030.
1.3.3 Climate change and VBDs	Continue as planned with focus on operationalizing a One Health approach. Training manual should be developed after completing the four research projects.	In progress as described in briefing document and annual report
1.3.14 Innovative vector control tools	1. To pursue other funding opportunities due to uncertainties with IAEA funding. 2. To explore internal synergies for opportunities to advance this work.	In progress as described in briefing document and annual report: (Note: Further response to follow-up discussions with SWG reviewers on the ER after 2021 SWG meeting: Funding opportunities are looked for in strong partnership with the IAEA and the WHO–NTD Department. Discussion is still ongoing with some Member States such as Brazil, France, Switzerland and Japan. Internal synergies for opportunities to advance this work have been discussed in a separate meeting held on 13th January 2022 and further recommendations are expected from the SWG. The process of engagement with VCAG for recommending the technology has already started and the testing proposal will be presented at the second VCAG of 2022. The plan of the overall project with

ER Short Title	Recommendations	Actions taken in response
		specific objectives and milestones for the SWG to track and assess progress toward the desired outcomes is under development and will be made available before the TDR Portfolio Review in February 2022).
1.2.6 Effective delivery of interventions	• To continue implementation research for TB control and to report on intersectional gender analysis in the TB patient cost survey data analysis, sustainability plan and exit strategy. • To support the work with current partner countries to optimize delivery of Seasonal Malaria Chemoprevention.	In progress as described in briefing document and annual report
1.1.4 SORT IT to tackle antimicrobial resistance	• The success of this programme can contribute to learning in terms of both content and structure to broader discourses in global health – particularly within the context of increasing capacity and contribution of evidence from the Global South. The critical and objective analysis and dissemination of the impact of the initiative will enhance its generalisability. • Contributions to women's empowerment and gender equality need to be better articulated to improve the quality of reporting. There remain missed opportunities here to engage more meaningfully with gender mainstreaming and, at the very least, gender awareness in the projects.	• We concur and will continue to document the evolution of the AMR-SORT IT approach (content, structure and outcomes) and how it increases capacity and contributions to the evidence from the global south. This is an ongoing and dynamic process. • The SORT IT approach per-se (which has been applied to AMR), is well-documented with already over 25 publications covering content, structure and outputs. These are available on the TDR website o (https://tdr.who.int/activities/SORT IT-operational-research-and-training) under publications, sub-heading 'capacity building' o https://tdr.who.int/docs/librariesprovider10/SORT IT/table-with-SORT IT-publications-july2021.pdf?sfvrsn=3bb1fd63_5 • In terms of impact, this is already an integral part of the logframe of the project as agreed upon with the donor (UK-DHSC), WHO country offices and all implementing partners. Assessment of outputs and impact are done along the pillars of a) capacity building b) research implementation and c) global engagement and partnerships. • In each of the seven AMR target countries, we also plan to assess and disseminate the impact of specific research studies on policy and/or practice. • SORT IT operates according to country-specific priorities. Thus, the research topics and participants are determined by the countries. While we have introduced various elements of gender equity in participant selection and training, we remain open to promoting further opportunities on gender mainstreaming and gender awareness, as and when they arise.

ER Short Title	Recommendations	Actions taken in response
1.2.1 Onchocerciasis elimination	• To continue as planned, with expansion, if possible, to address concerns (e.g. moxidectin resistance). • Succession planning for the project and review in 2021.	- Parasitological efficacy data as well as parasite samples to address parasite response/susceptibility to moxidectin and ivermectin are being collected in the ongoing multi-year blinded trial in DRC. Parasite samples are being shipped on an ongoing basis to Australia for genetic analysis. Both parasitological efficacy and genetic data will not be available for many years. Succession planning for Dr Kuesel's retirement at the end of February 2023 • **Research to support adoption of moxidectin in onchocerciasis elimination guidelines and policies:** Dr Kuesel will continue to provide scientific and technical advice to sponsors, investigators and the WHO–NTD department, preferably as an unpaid consultant to TDR, else to MDGH. Consultancy with TDR is preferable from a TDR perspective since this will (a) ensure that TDR's name will remain associated with completion of the activities moving moxidectin (hopefully) into WHO guidelines (credit tends to go to the organizations involved in 'the last mile', even if the whole path was marathon length) and (b) facilitate TDR meeting its commitments under the WHO–MDGH donor agreement. • **Research on tools for elimination programmes to support decisions to stop ivermectin mass drug administration:** Dr Kuesel has been working for several years to broaden the funding and sponsor base for this project. This includes supporting investigators in applications to other organizations (e.g. NIH grant to Dr W. Grant) and advocacy during specialized research meetings (e.g. COR–NTD Research Links Series and virtual booth at the COR–NTD 2021 annual meeting).
1.2.1 Visceral Leishmaniasis elimination	6. To develop a detailed SMART plan to sunset the activity on the Indian subcontinent before the end of 2025, with the exit to be achieved without a loss in the gains made from TDR's long-term investment and including negotiation with programmes in Bangladesh and Nepal. 7. To distil lessons from the Indian subcontinent for the Eastern Africa region, given the notable differences between the two contexts and to consider including a synthesis of existing evidence to be conducted during the "preparatory phase" (first two years).	• A review of the impact of implementation research on the VL elimination effort, with particular focus on TDR-supported work, is being undertaken in both Nepal and Bangladesh. A draft report of the desk review demonstrates the critical role TDR has played so far. Stakeholder consultations will identify research priority areas for the next ten years as well as funding needs, prospects and potential sources, including country contributions. The outcome of these consultations with programmes in Nepal and Bangladesh will form the basis for the formulation of an exit strategy for TDR. The consultations have been largely completed at the end of 2021. • A review of lessons from the Indian subcontinent is being compiled and this will be presented to an international consultative meeting

ER Short Title	Recommendations	Actions taken in response
	8. To include a timeline that delineates and includes preparation, implementation and development of an advance exit or transition strategy before further development into the Eastern African context.	• Stakeholder consultations (expert interviews) have been undertaken in collaboration with WHO–NTD/VL to review current status of VL control in the Eastern African focus to identify how and which lessons from the experience of VL elimination in the Indian subcontinent could be applied in the region as part of the implementation of the new WHO–NTD Roadmap. Reports are being drafted. • A Consultative meeting will be convened by WHO and TDR in early 2022 to produce consensus recommendations, advocacy materials for fund raising and a collaborative platform to support implementation research • A full package of relevant validated training materials and standard operating procedures used in the Indian subcontinent will be compiled for potential adaptation and use or testing in the Eastern African focus • The extent and nature of TDR investment in support of implementation research in the Eastern African focus from its undesignated funds in the coming biennium will be limited to exploratory catalytic activities that can help country investigators leverage resources from international (and where possible national) funders. • TDR will continue to explore for designated funds to support VL research in the Eastern African focus. A SMART plan will define timelines for preparation, implementation and exit.
1.1.8 Use of safety data	9. To develop a carefully structured and articulated transition that ensures that the safety databases will yield the greatest public health benefit. 10. To document the lessons learned from setting up the three databases to inform future similar efforts. 11. To maintain safety as a cross-cutting theme across the implementation research portfolio.	• As the WHO Pharmacovigilance department has gained more capacity and interest in conducting research in this area as well as take more responsibility to set up/oversee effort to centralize safety data, it was felt that this area of work may not be a priority for TDR in the future. • The year 2021 has been used to phase out and transfer the central databases that are seen collectively by WHO of key priority. • The work under the ADP project could continue with DF funding placed under the scope of 1.2.6 as effort contributing to support public health programmes.

ER Short Title	Recommendations	Actions taken in response
1.3.11 Multisectoral approaches	12. To undertake internal discussions to get concrete and mutually beneficial ideas of synergies with the other VBD ERs (1.3.3, 1.3.10 and 1.3.14).	• A joint project on "links between transmission of vector-borne diseases in extreme poverty conditions and exploring the integrated application of multisectoral, One Health and intersectional gender approaches for enhanced prevention and control" is currently running.
1.3.12 Gender and infectious diseases	13. To explicitly articulate the institutional approach to mainstreaming gender in line with TDR's programmatic outputs. 14. To network with a number of the key global health gender initiatives to enhance dissemination and impact of TDR activities. 15. To undertake internal discussions and benefit from further synergies with other VBD expected results.	• In progress as described in briefing document and annual report