



TDR Annual Report 2017

Building the science of solutions





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TDR Annual Report 2017

Building the science of solutions

TDR 2017 annual report: Building the science of solutions

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Introduction

Dr Ren Minghui

Assistant Director-General for Communicable Diseases
World Health Organization



As this annual report is being finalized, the World Health Assembly has endorsed a new General Programme of Work for WHO for the period 2019-2023. The Director-General of the Organization, Dr Tedros Adhanom Ghebreyesus, is leading the way with a new vision to “promote health, keep the world safe, and serve the vulnerable.”

The WHO plan is focused on three interconnected strategic priorities to ensure healthy lives and promote well-being for all at all ages. It sets ambitious goals for the next five years: to ensure that one billion more people benefit from universal health coverage, one billion more people are better protected from health emergencies, and one billion more people enjoy better health and well-being.

As part of this strategy, WHO will be engaging with our partners and stakeholders in new ways, further strengthening our collaboration to maximize the impact of our work at country level. TDR is already well aligned with these efforts and provides valuable support. For example, TDR played an important role in co-developing the Global Vector Control Response (GVCR) 2017-2030, which is now being implemented across the globe. Working with WHO’s Global Malaria Programme and the Department of Control of Neglected Tropical Diseases, TDR is a member of the WHO Joint Action Group for the GVCR, working with national disease control programmes to put in place the needed cross-disease and cross-disciplinary approaches.

There are many other networks that TDR has built over the years, which greatly benefit WHO and other TDR co-sponsors. TDR has created strong networks of regional training centres and postgraduate training institutions to help develop a capacity of institutions and researchers in disease endemic countries. The TDR-initiated Worldwide Insecticide Resistance Network (WIN) is documenting levels of insecticide resistance by the *Aedes aegypti* mosquitoes that transmit arboviruses like dengue, chikungunya and Zika. A new TDR-supported network on emerging vector-borne diseases in the Caribbean, launched in August 2017, has developed a framework for data sharing, and is now developing research plans and improving surveillance, diagnosis and control.

The regional model piloted by TDR— the West African Regional Network for TB control (WARN-TB)—is now in place and attracting wide support from international organizations and donors. This is expected to make a major contribution to TB control in the region, and the model is now being replicated in central Africa with the establishment of the Central African Regional Network for TB control (CARN-TB).

As you can see, TDR provides an innovating force within WHO and beyond. It is contributing significantly to the implementation of the 2030 Sustainable Development Agenda, which calls for integrated approaches among the many players. This annual report provides a valuable overview of both their achievements, and just as importantly, shows how they are working on what’s needed next.

Dr Modest Mulenga

Joint Coordinating Board Chair

I am completing my first year as Chair of the Joint Coordinating Board, and it has been an exhilarating and educative experience. Although I have been associated with TDR for many years, starting with the research training grants that I received from TDR as a young scientist, this past year has provided me yet again with a unique overview and valuable insights during the close engagement with the co-sponsors and partners.

Being from Zambia, I greatly appreciate the impact of TDR in my country on research and capacity strengthening and would like to make sure other countries have this same opportunity. The University of Zambia in Lukasa is one of seven universities participating around the world in TDR's postgraduate training scheme. We are exploring how best to engage the TDR Global community of grantees, experts, sponsors and partners to initiate local activities that build capacity for research. I have been discussing with TDR staff how to strategically identify TDR Global coordinators in countries and agreed to have a pilot test in Zambia.

Additionally, what I have learned and appreciated is that this local capacity can also have a global impact. TDR-trained scientists have taken up key positions in research and training institutions in the country and are now providing evidence on matters that are changing policy and practices. Here are just a few interesting examples:

- A TDR-initiated trial of a treatment for river blindness may soon lead to having another tool that can speed up elimination of this disfiguring and disabling disease.
- A West African network for tuberculosis has enthused the Central African region to build their own network to strengthen TB control in that region.
- A life-saving treatment for the early management of severe malaria in young children, initially developed by TDR, has been added to the World Health Organization's prequalification list. This completes the final stage of international oversight to the quality and safety of 100 mg rectal artesunate suppositories (RAS).
- The fellows trained under TDR's clinical research and development fellowship have returned home to play pivotal roles in a wide range of research and development projects, such as clinical trials for new vaccines and medicines.

These are the kinds of achievements that are based on supportive partnerships and respect for locally identified priorities and solutions. I encourage you to read more as you turn the pages of this report, a report about a very Special Programme.



Our contributors

Thank you to the TDR contributors providing overall support*



Thank you to the TDR contributors providing specific project support*



*Listed in order of level of contribution

Dr John Reeder

TDR Director

This Annual Report is a bridge between two strategies – one ended in 2017, and a new six-year strategy began in 2018. Our vision is to build the science of solutions—locally-led and driven—and share that knowledge to build a global network of research strength.

This is an important transition, and already well underway. Our flagship projects are providing lasting impact. This includes work to eliminate diseases such as river blindness and malaria, and to prevent infectious disease outbreaks of chikungunya, dengue and Zika, and increasing resiliency in vulnerable African communities to the health impacts of climate change.

I'd like to call your attention to our newest area, called global engagement. We are strengthening partnerships and activities that attract attention and support to important but neglected or under-funded areas.

One of these is implementation and operational research. It is critical that this type of research, that can identify and remove health system bottlenecks, be conducted by local scientists. We are on a mission to increase this capacity in low- and middle-income countries, and to do it in partnership with healthcare providers, policy-makers and community members and researchers. In this report you'll see how we are developing a full suite of training materials and working with partners to attract more funding and use of this important research.

Finally, I'd like to point out our feature on dengue, which provides an excellent insight into the multi-faceted way we approach an issue at TDR. There is no one tool, one training, or one research project that will address a disease sufficiently. We believe that a cross-disease, cross-discipline, cross-sector approach provides long-term strength to the local and global community. I think you will agree when you see the impact.

 Our vision is to build the science of solutions—locally-led and driven—and share that knowledge to build a global network of research strength. 



2017 Key achievements

Research



Supporting preparedness for disease outbreaks and disease elimination

Preparedness for early identification and response to dengue outbreaks

Countries at risk of dengue have new resources and increased capacity to detect and respond to dengue outbreaks, thanks to ongoing TDR support. The Operational Guide: Early Warning and Response System (EWARS) for dengue outbreaks, developed in collaboration with national teams, was published in 2017. It provides programme managers with a user-friendly tool to detect dengue outbreaks in real-time and mount an adequate response. Training is provided through regional workshops and ad-hoc country support. The tool is constantly improved with input from users.

Achieving and sustaining visceral leishmaniasis elimination in the Indian Subcontinent

TDR has a long-term commitment to support country control programmes and researchers to achieve and sustain visceral leishmaniasis elimination. TDR-supported research into effective and feasible approaches has shown in Bangladesh and Nepal that active case detection helps identify infections, and insecticide wall painting and wall lining reduce the transmission potential.

Optimising interventions in support of country disease control programmes

Improving drug safety monitoring in pregnancy and tuberculosis

TDR's initiative with the World Health Organization to pool safety data – on drug exposures during pregnancy and on novel treatments for multidrug resistant tuberculosis – attracted new data contributors. There's keen interest in how this can be used to support the introduction of a new drugs in other diseases.

Environment and climate change

Increasing the resilience to climate change in dryland Africa

With the addition of 40 scientific papers published in 2017, the research on the impact of climate change on vector-borne diseases in Africa has provided significant evidence for policy-makers, now totalling 69 papers since the start of this initiative. Policy briefs were developed and shared with decision-makers from the health and environment ministries in Botswana, Côte d'Ivoire, Kenya, Mauritania, South Africa, Tanzania and Zimbabwe, as well as with WHO, the UN Environment and the African Centre of Meteorological Application for Development (ACMAD).

A new smartphone application was developed that visualizes massive climate and environmental data sets derived from NASA satellites, together with on-the-ground surveillance of animal trypanosomiasis data. Using this mapping platform, members of the Maasai community in Tanzania will be able to identify grazing and drinking areas free from populations of infected tsetse flies. This is especially critical during the dry season, when drinking holes are scarce.



2017 Key achievements. Research

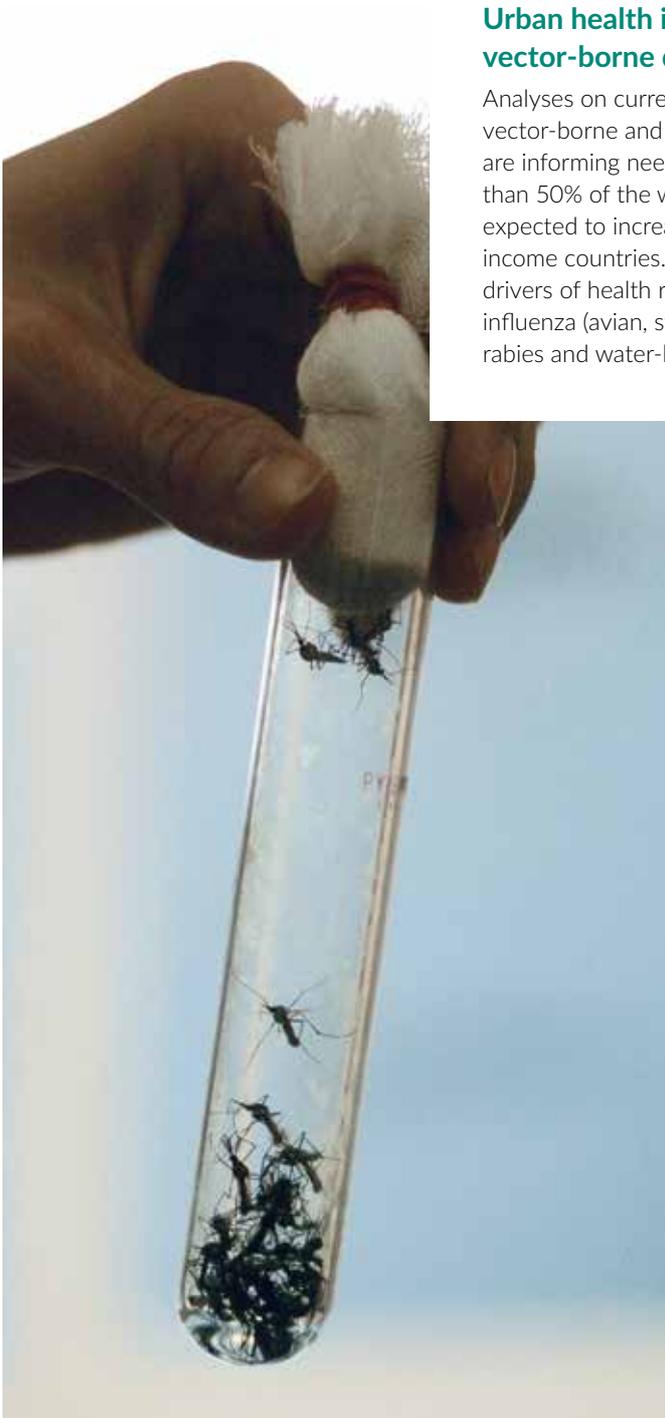
Vector control

***Aedes aegypti* resistance data collected and made available to more than 30 countries**

The TDR-initiated Worldwide Insecticide Resistance Network (WIN) is documenting the levels of insecticide resistance of the *Aedes aegypti* mosquitoes that transmit arboviruses like dengue, chikungunya and Zika. The WHO Department of Control of Neglected Tropical Diseases has appointed the network to conduct ongoing surveillance of resistance mechanisms.

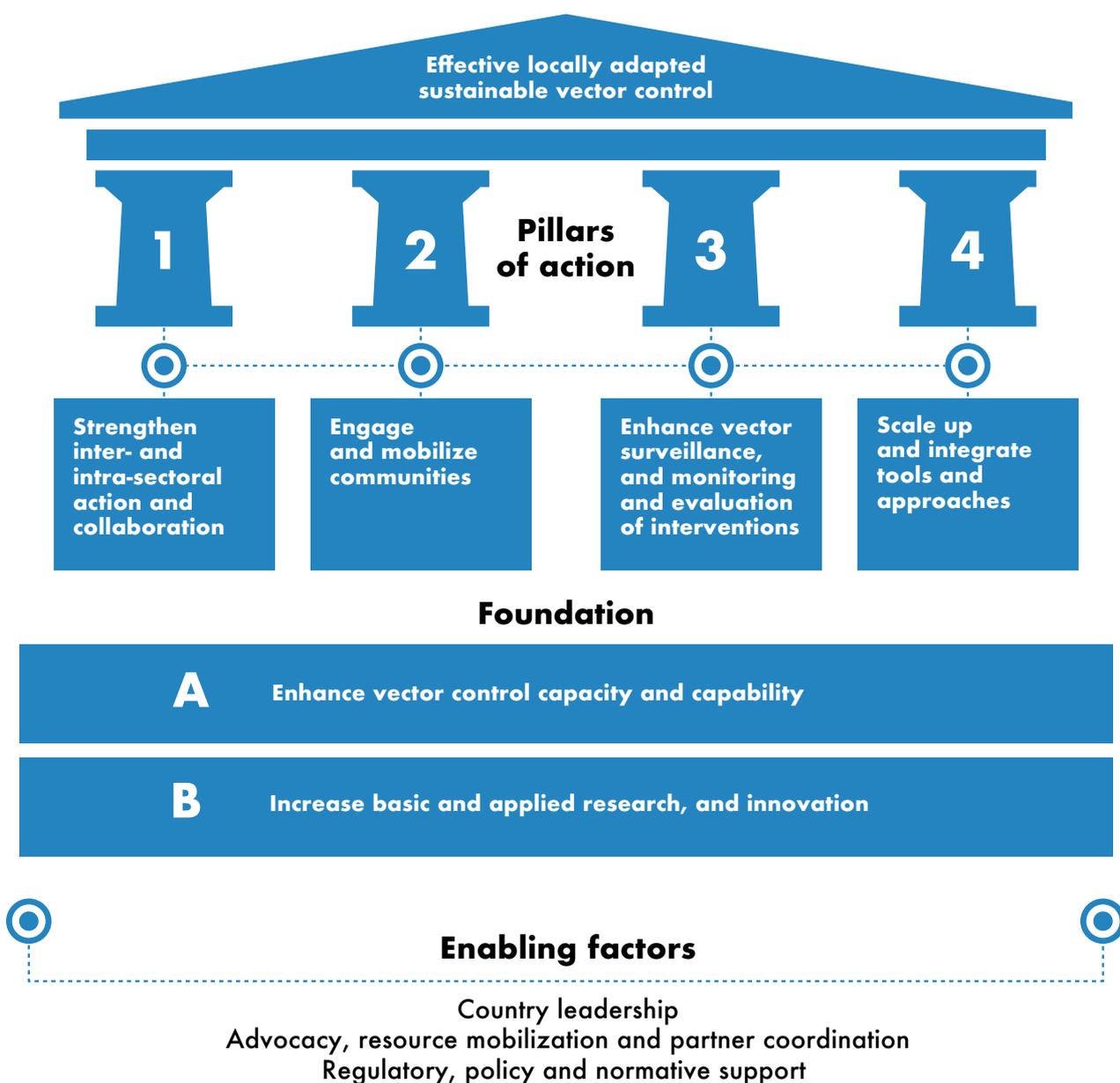
Urban health interventions to prevent and control vector-borne diseases

Analyses on current urban health interventions for the prevention and control of vector-borne and other diseases of poverty were completed in 2017. These analyses are informing needed future research plans, and policy and practice guidelines. More than 50% of the world's population currently lives in cities, and that percentage is expected to increase to 75% by 2050, with most of this population in low- and middle-income countries. Mobility, poverty, inequality and climate change are some of the drivers of health risks in urban settings, including infectious diseases such as dengue, influenza (avian, swine flu), tuberculosis-AIDS, malaria, leishmaniasis, lymphatic filariasis, rabies and water-borne diseases.



New strategy for vector control approved at the 2017 World Health Assembly

The Global Vector Control Response 2017-2030, developed jointly with two departments of the World Health Organization – for the Control of Neglected Tropical Diseases and the Global Malaria Programme – tackles multiple vectors and diseases with more integrated approaches. This includes not only the health sector but environment, urban planning, and education as well. The plan outlines approaches to reduce the incidence of these diseases by at least 60% and cut mortality rates by at least 75% by 2030.



2017 Key achievements

Research capacity strengthening and knowledge management

The Ebola Emergency Medical Unit
ELWA 3 in Monrovia.



Clinical research training

A new, online curriculum to conduct clinical research during outbreaks

To support teams in low- and middle-income countries build capacity to generate clinical evidence during outbreaks of infectious diseases, TDR developed the Clinical Research During Outbreaks (CREDO) training curriculum. This was done in collaboration with ISARIC (the International Severe Acute Respiratory and Emerging Infection Consortium), and has been granted accreditation status by the African Academy of Sciences. Multidisciplinary teams from four African countries attended two workshops and contributed to developing the course modules, which are available online. CREDO was developed in response to the needs identified during the 2015 Ebola outbreak in West Africa.

Clinical product development training programme increases national capacity

The advanced training in clinical product development, called the Clinical Research and Development Fellowship, funded an additional 36 fellows in the past year. They worked in pharmaceutical companies and product development partnerships on new treatments for malaria, human African trypanosomiasis, and tuberculosis, and the new malaria vaccine. This brings three-year total of the recipients of the co-funded agreement with the European and Developing Countries Clinical Trials Partnership (EDCTP) to 89 grantees from 35 low- and middle-income countries. Fellows are supported to go back to their home countries to increase clinical research capacity in national institutions.

Framework for core competencies in clinical research now available

A new framework for core competencies in clinical research has been tested and is now available for wide use. This came out of the Clinical Research and Development Fellowship scheme, to document the full set of competencies necessary in low-resource settings, and to provide a means for assessing training gaps in research personnel. Fifty key competencies were identified which are adaptable to studies that differ in design, geographical location and diseases, and are now used by the Fellows as part of their reintegration plans in their home countries.

Implementation and operational research training

Postgraduate training fully embedded in 7 universities

The reoriented postgraduate training scheme is now fully established to support students from low- and middle-income countries to obtain master's degrees and PhDs in implementation research. At the end of 2017, 136 students had been enrolled. TDR has contracts with seven universities worldwide. A framework for monitoring and evaluation was developed and pilot tested to track results, and to be used for ongoing learning about how best to support the students and universities. In 2017, TDR conducted what is believed to be the first mapping of external grant funding for health researchers from countries in sub-Saharan Africa to undertake international postgraduate degree training at institutions in sub-Saharan Africa. There is concentrated support for grantees at institutions in eastern and southern Africa, with less support in west and central Africa, and in countries with less developed research capacity. The complete findings are being shared and discussed with funders and stakeholders and used for future grant planning.

Suite of implementation research tools developed

Researchers around the world now have access to a full range of implementation research training resources. A revised online toolkit was made available at the end of 2017, and an introductory Massive Open Online Course (MOOC) was prepared for launch in 2018. These training resources complement courses provided by the global network of regional training centres supported by TDR.

Seven of the TDR-supported master's degree students with WHO Director-General, Dr Tedros Adhanom Ghebreyesus, who told the students he was fortunate to receive TDR support early in his career, too.



2017 Key achievements. Research capacity strengthening and knowledge management

Country-led capacity for operational research

The well-established Structured Operational Research and Training Initiative (SORT IT) programme, coordinated by TDR and implemented with partners since 2009, held a total of 53 courses in 87 countries. Alumni led eight of 11 courses, and in some countries, secured independent funds, which could be a model for expansion to other countries. Of the 64 papers published in 2017, 90% have a first author from a low- or middle-income country (46% are women). SORT IT embraced different thematic areas (disease-specific and health-systems oriented), including Ebola and health systems recovery in West Africa, and added more complex study designs (including mixed methods and qualitative research).

Strengthened capacity to identify and address system bottlenecks

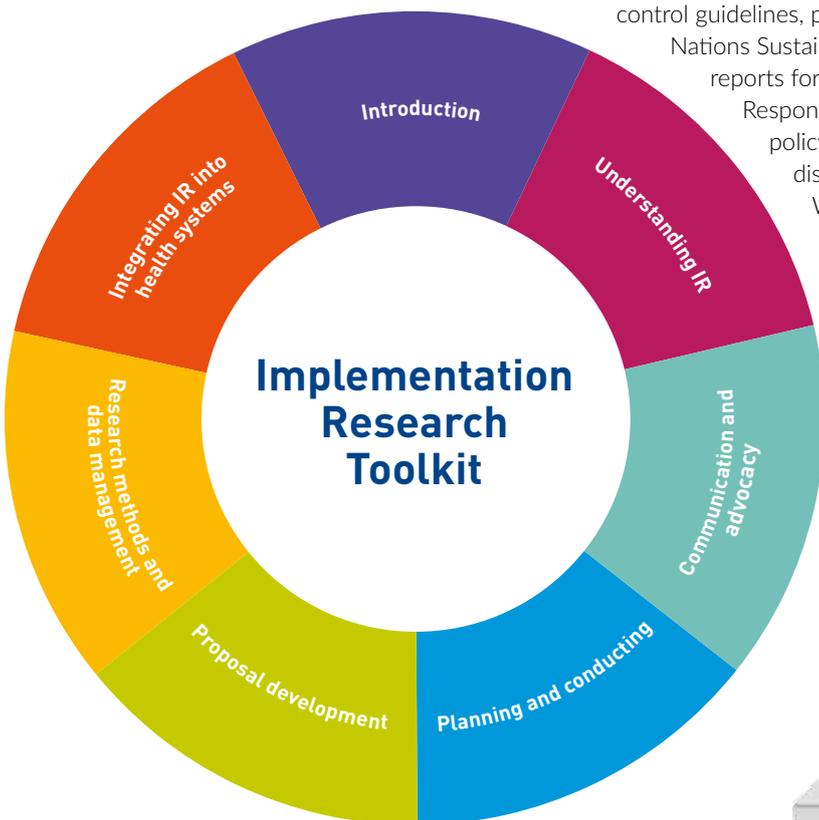
The Access and Delivery Partnership (ADP) project has successfully strengthened the capacity of national stakeholders in Ghana, Indonesia and Tanzania to systematically identify and address bottlenecks to implementing new health technologies for effective disease control. Training led to seven study protocols being developed, with funding secured for two projects in tuberculosis and two in neglected tropical diseases.

Small grants to researchers in collaboration with WHO regional offices supported locally set implementation research priorities

The ongoing TDR small grants scheme funded 54 researchers to conduct implementation research on issues prioritized within each of the World Health Organization’s regions. The research covered a range of infectious diseases and types of research that supported disease elimination programmes and identified new solutions to pressing health issues.

Implementation research promoted through strategic engagement

TDR worked closely with communicable disease departments of the World Health Organization to promote the use of implementation research in planning and control guidelines, particularly as they relate to helping support the United Nations Sustainable Development Goals. This work included the reports for the WHO Director-General: Towards 2030: WHO’S Response to communicable diseases in the SDG era and the policy document WHO contribution to communicable disease control in the SDG era. TDR also supported the WHO-Global Fund advisory group, and helped shape the Strategic Framework Agreement that supports implementation and operational research in countries receiving grants from the Global Fund to Fight AIDS, Tuberculosis and Malaria.



Building networks of expertise

Enhanced country research capacity to support the EndTB strategy

The regional model TDR piloted – the West African Regional Network for TB control (WARN-TB) – is now in place and attracting wide support from international organizations and donors. The network tested a new database (DHIS2-TB module) developed by the WHO's Global TB Department and Oslo University, and is now being offered to national tuberculosis programmes worldwide. The data were used to help countries define research priorities at national and subnational level. The network is also increasing uptake of new approaches developed by its members. New strategies that increase case detection among children under the age of five piloted in Ghana and Senegal were shared with other countries from the WARN-TB and tested in Guinea.

New Caribbean network launched to control vector-borne diseases

Representatives from all Caribbean countries and territories launched a new network in August 2017 on emerging vector-borne diseases. TDR helped them come together to draft a framework for data sharing, developing research plans, and improving surveillance, diagnosis and control. The network was a critical support during the Zika virus epidemic, with members exchanging protocols for case management and materials for diagnostics. Working groups also provided recommendations to Caribbean governments on the potential consequences of the devastating hurricanes on vector-borne diseases. The network's value was reinforced by key financial support from the European Union, the US Centers for Disease Control and Prevention, and individual Caribbean countries.

Four social innovation research hubs established in Colombia, Malawi, the Philippines and Uganda

The Social Innovation for Health Initiative (SIHI) continues to grow to examine how social innovation can improve health systems and services in low- and middle-income countries. The country hubs are working with the London School of Hygiene and Tropical Medicine and the Bertha Centre for Social Innovation at the University of Cape Town. In addition, a number of new resources were made available in 2017, including strategies for improving evidence generation, case studies and lessons learnt in low-income countries, and a review of the role funding agencies can play in this field.



WARN-TB members



2017 Key achievements. Research capacity strengthening and knowledge management

New equity and research uptake tools

Gender-based data analysis course piloted

The online training course was piloted in collaboration with the African Regional Training Centre at the University of Ghana School of Public Health. Students from Côte d'Ivoire, Ghana and Zimbabwe work in disease control programmes within ministries of health and national health services, research institutions and universities. They developed case studies that examine how gender-related roles and practices put women and men at higher or lower risk for certain diseases. This field of research highlights the significant inequities in the patterns of diseases, and in access to and control over necessary resources.

New evidence providing guidance on communicating research results to policy-makers

Video stories produced and shown by TDR increased understanding of research and commitments to make changes among policy-makers. The work came out of the COSMIC project that investigated ways to increase malaria prevention and treatment of pregnant women in Benin, Burkina Faso and the Gambia. Recorded stories told by the pregnant women, their husbands, caregivers and community leaders were used at a review of the research evidence. The findings are being shared with the research uptake research community, and used for further exploration into the effects of storytelling and use of video within the policy-making environment.

Videotaping interviews of research participants in Burkina Faso.



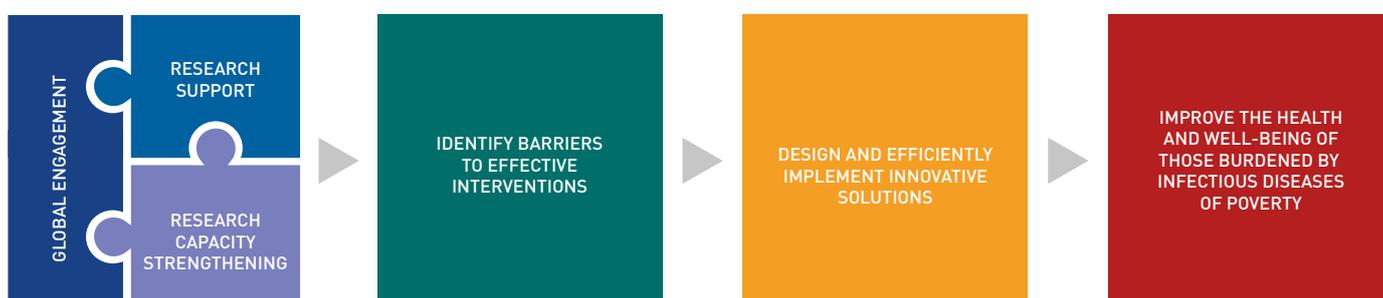
TDR's updated strategy: 2018-2023

Building the science of solutions

The updated six-year TDR strategy begins in 2018 with a greater focus on implementation research to increase access to health products and improve the effectiveness of proven interventions, particularly for the most vulnerable groups.



An impact pathway shows how 3 core functions – global engagement, research capacity strengthening and research support – are designed to lead to impact. These three areas will be reported on in the following section.



TDR 2017 Annual Report Feature – dengue

The cycle of TDR training, research, and global engagement: dengue in 2017

Dengue has spread rapidly in recent years. There are no vaccines or treatments, so prevention and control of the *Aedes aegypti* mosquito that transmits the dengue virus is critical. Early diagnosis is essential to prevent some people from progressing to severe dengue and death. This year's annual report features work underway or completed in 2017, showing the multidisciplinary approach that spans global engagement, research support and the strengthening of research capacity in endemic countries.

- A new WHO vector control strategy
- New interventions to reduce *Aedes aegypti* mosquitoes that transmit dengue
- Better warning signs to identify patients at risk of developing severe dengue
- A new tool that documents levels of insecticide resistance by the mosquitoes
- Analysis of a new biological vector control tool
- New operational guide for dengue outbreaks
- A session on dengue in Latin America included in the new massive open online course (MOOC) on implementation research
- New evidence on the value of screening for dengue among pregnant women in endemic areas, and incorporating messages for dengue prevention in maternal health education packages.

Global engagement for agenda setting

The Global Vector Control Response

TDR worked in close partnership with the World Health Organization disease control departments to develop The Global Vector Control Response 2017-2030 (GVCR). This provides a new cross-disease strategy to strengthen the control of vectors like mosquitos and bugs through increased capacity, improved surveillance, better coordination and integrated action across sectors and diseases. What works for one disease often works for another. For example, one mosquito, the *Aedes aegypti*, transmits the viruses of three diseases – dengue, chikungunya and Zika.



TDR 2017 Annual Report Feature – dengue

Using evidence to drive policy and practice changes

TDR is bringing together researchers and representatives from institutions in more than 25 countries – half from low- and middle-income countries – and 10 United Nations organizations to develop new approaches to control vector-borne diseases like dengue.

More than 80% of the world's population is at risk from at least one vector-borne disease, and more than half at risk from two or more. These risks have increased due to population mobility, land use and deforestation, extractive industries, changes in agricultural and water management practices, and climate change.

TDR is working with the Swiss Agency for Development and Cooperation (SDC), Canada's International Development Research Centre (IDRC) and the Swiss Tropical and Public Health Institute (Swiss TPH) to explore solutions that bring together ideas from multiple fields – not just the study of vectors and parasites, but also of the environment, weather, social systems and education.

Six groups have been awarded funding to conduct systematic reviews that cover four different areas:

- Industrial activities, with a special focus on gold mining, that are strongly disturbing the malaria ecosystems in Africa, Asia and Latin America
- Integrated strategies for disease prevention and control within the context of eco-bio-social approaches
- Displacement of people and consequences on disease transmission, examining knowledge on the impact of migration (for reasons of economic changes or civil unrest or war), displacement of temporary workers and any other population movements
- Intersectoral collaborations for disease prevention and control.

Recent work offers much promise, such as projects to improve housing and water supplies in Mexico, and reducing mosquito breeding sites in Brazil.

Dr Zee Leung from the International Development Research Centre (IDRC), one of the consortium members, says, "It's easy to say we should work across sectors but how do we do that? That is the challenge. We need to understand who should be involved and who does what."

“It's easy to say we should work across sectors but how do we do that? That is the challenge. We need to understand who should be involved and who does what. **”**



Implementing piped water supplies in Mexican housing to prevent disease transmission.



TDR 2017 Annual Report Feature – dengue

Environmental research for prevention

Reducing mosquito breeding

TDR-supported studies on scaling up interventions to reduce mosquito densities were published in 2017. The research examined the different types of scaling up possible, and provides examples from each of the four countries involved: Brazil, Colombia, Mexico and Uruguay.

Containers left outside are ideal breeding sites for the mosquito. Little attention has been paid to studying which of these containers produce the most mosquito larvae, so the studies examined that and how to reduce their numbers through community-based approaches to designing and installing screens and reducing the numbers of containers.

A paper published in 2017 puts into perspective the three types of scaling and five levels of issues to consider:

Political: Financial, human resources and/or administrative support provided by ministries of health or other sectors

Vector control: Support by vector control services and staff

Administrative: Regulations for involving industry in the process; management issues, project activities definition, field team and local enterprises

Supply: Availability and acquisition of materials

Acceptance: Acceptance of the intervention by those involved and/or served

Recycling decreases mosquito densities in Uruguay

A TDR-sponsored study in Uruguay showed that recycling significantly reduces the densities of mosquitoes and cuts in half the routine control costs. The research was conducted to identify measures to prevent outbreaks of dengue.

Female mosquitoes lay their eggs in water tanks and other containers around the home, such as discarded flower pots and tyres. Once they become embryos, they can survive dry periods for up to a year, so it's important to prevent this stage.

Uruguay was free of dengue until 2016, and since then its incidence has been increasing. It is surrounded by the endemic countries of Argentina and Brazil. The study investigated how to reduce the numbers of mosquito embryos by implementing recycling throughout the city of Salto, Uruguay. Strong community involvement helped to increase acceptance.

Recycling to reduce mosquitos in Uruguay.



The authors of the study that was published in 2017 cite the value of an interdisciplinary approach with the ministry of health and other government entities. They suggest this could be a model for other countries, particularly those affected by climate change that results in warmer temperatures which allows the *Aedes aegypti* to thrive.



TDR 2017 Annual Report Feature – dengue

New tools and approaches

***Aedes aegypti* resistance data collected and available for more than 30 countries**

The TDR-initiated Worldwide Insecticide Resistance Network (WIN) is documenting the levels of insecticide resistance of the *Aedes aegypti* mosquitoes that transmit arboviruses like dengue, chikungunya and Zika. The World Health Organization's Neglected Tropical Diseases Department has appointed the network to conduct ongoing surveillance of resistance mechanisms.

New warning signs for dengue outbreaks

The process of controlling dengue is benefitting from the completion of a major 5-year research initiative conducted by scientists across Europe, Latin America and South Asia. The IDAMS project produced maps and predictions of dengue risk throughout the world, and more refined criteria ("warning signs") to identify patients at risk of developing severe dengue. The latter results are based on multicentre observational prospective studies across South-East Asia and Latin America with more than 7000 participants.

The project also produced evidence that warning signals on the mosquito population level help to identify impending outbreaks. This has been translated into a 'model contingency plan' to help countries identify and react earlier to epidemics. It is also generating information on laboratory and clinical warning signs that could help identify cases which could evolve to severe dengue.

Controlling disease transmission

The DENFREE project identified key factors that determine dengue transmission and dynamics in order to develop new tools and strategies for controlling this transmission. The group estimated the risk of dengue spreading to uninfected areas, especially in southern Europe where there are mosquitoes capable of carrying the virus and transmitting it to people. Improved surveillance and diagnosis of people who carry the dengue virus but have no symptoms is critical, especially in regions that have never been exposed to the pathogen.

Predictive models were developed to enable specific interventions to be made to prevent or reduce the impact of an epidemic. These cover the environment, mosquitoes and humans.

"We have a good body of evidence now, so we are confident some of these findings can inform policy and be applied to control transmission and prevent outbreaks," said Piero Olliaro, who leads intervention and implementation research at TDR. The WHO is updating the dengue guidelines.

Of special importance is the network of clinical researchers as well as public health stakeholders in disease-endemic countries. The network provided an opportunity for clinicians, epidemiologists, policy-makers, medical virologists and basic scientists to exchange ideas and learn from each other.



TDR 2017 Annual Report Feature – dengue

Strengthening research capacity

Throughout all of TDR's work, research capacity is continuously built. The motto – there is no research without training, and no training without research – was clearly demonstrated by the work on dengue in 2017.

Dengue training materials

The 2017 'Operational Guide: Early Warning and Response System (EWARS) for dengue outbreaks' was developed in coordination with national control teams. Workshops using these materials were held in nine countries in Latin America.

A session on dengue in Latin America was included in the new massive open online course (MOOC) on implementation research. This free instructional resource includes a video and an interview with a ministry of health official in Colombia, making local knowledge available worldwide for analysis and use in other regions.





TDR 2017 Annual Report Feature – dengue

Research as part of a degree

Zinia Nujum received a TDR grant to study the risk of pregnant women and infants developing severe dengue, as part of her doctoral degree programme at the Medical College in Thiruvananthapuram, a city in the state of Kerala in India.

Zinia found that dengue in pregnancy was associated with higher delivery-related complications, newborn problems and hospital admissions, and overweight women had even higher adverse outcomes and preterm deliveries. The findings highlight the need for early diagnosis of dengue in pregnancy, and to look at the problem beyond a specific disease but to the role noncommunicable diseases like obesity play in public health.

The evidence is now being used to advocate for a state policy on screening for dengue among pregnant women in endemic areas, and incorporating messages for dengue prevention in maternal health education packages.



Work in 2018 and beyond

Research support



Disease control and elimination

Supporting malaria elimination

Countries nearing malaria elimination are finding pockets of lingering transmission, despite good preventive tools like insecticide-treated bednets and insecticidal wall paints. TDR projects are investigating this by examining the impact of insecticide resistance, and looking at social and environmental changes that may be altering mosquito behaviour. For example, mosquitoes may now rest and feed at different times of the day or in different locations, requiring new preventive measures specific to the time of day and the geographic location. The research is identifying the main factors that drive malaria transmission, with projects in Brazil, Burkina Faso, Cameroon, Ethiopia, Kenya, Mali, Papua New Guinea, Peru, Tanzania, Thailand and Viet Nam.

Finding ways to increase preventive treatment for pregnant women in the Gambia.

Strengthening preparedness for early identification and response to dengue outbreaks

Work continues to strengthen and adapt alarm signals that came out of the development of the Operational Guide: Early Warning and Response System (EWARS) for dengue outbreaks. A wider spectrum of countries and other Aedes mosquito-borne arboviral diseases, including Zika and chikungunya, are being included.

Enhancing country research capacity to support the EndTB strategy

The West African Regional Network for TB control (WARN-TB) continues the learning and sharing among the countries. Countries will initiate new research projects for intensifying TB case finding in children and adults, based on experience in the region and innovative approaches discussed within the network. The WARN-TB model will be replicated in central Africa with the establishment of the Central African Regional Network for TB control (CARN-TB).

Defining *O. volvulus* transmission zones to support decisions to stop interventions for onchocerciasis elimination

The onchocerciasis control programmes in Africa are targeting elimination. Before interventions can be discontinued in an area meeting current WHO guideline requirements, it needs to be ensured that this area is not at risk of importing infections from neighbouring areas that share a parasite population (i.e. within the same transmission zone). TDR is continuing to support research for genetic markers for a field-suitable test to define transmission zones.

Community healthcare worker in Nigeria delivering ivermectin to a household.



Work in 2018 and beyond. Research support



Approaches for multiple diseases

Using data for epidemiological surveillance of drug safety

TDR's initiative with the World Health Organization to pool safety data – on drug exposures during pregnancy and on novel treatments for multidrug resistant tuberculosis – continues to grow with new data sharing agreements from contributing countries and expanded datasets. Work is generating evidence of drug safety in routine use that is needed to support treatment guidelines.

Improving the management of fever illnesses

TDR is working in two areas. The first is to provide the evidence on the microbiological causes of severe infections in infants under two months of age, a group particularly vulnerable to serious infections. The second area is studying the potential of C reactive protein (CRP) to be used as a marker for bacterial infection or severity in dengue cases and see its impact on patient management and outcome in those two groups of patients.

Identifying emergence of resistance of malaria and onchocerciasis parasites to the drugs used to control/eliminate them

Parasite resistance to the drugs used to control or eliminate infectious diseases is a threat to achieving disease control/elimination objectives, especially when only a single drug or drug combination is available. TDR is supporting research to identify markers of *O. volvulus* response to ivermectin for a tool that control programmes could use to monitor parasite response so that alternative strategies can be prepared and implemented when needed.

This helps countries and the World Health Organization to develop strategies to protect treatments for malaria, particularly in mass treatment programmes.

Environment and climate change

Increasing resilience under climate change conditions in Africa

This work covers how environmental, social and economic change affects the transmission of diseases. Community structures, dynamics and resilience, health systems performance and response to vector-borne diseases are all being studied. New collaborations and relationships are being built among not only health partners, but those in climate, meteorology, agriculture and education. A strong body of 69 papers has already been published as a result of this research. These are helping to build new frameworks that provide policy-makers with the evidence and community support to change practices and policies.

Improving environmental control of vector-borne diseases in South-East Asia

The incidence of dengue, chikungunya and Zika are rising and creating economic burdens in South-East Asia. So far, chemical insecticides have been the major approach in vector control, but insecticide resistance is growing in the mosquito vectors while the chemicals are having an effect on the environment. This research is encouraging the use of environmentally friendly and health technologies. The work is being implemented in collaboration with the Association of Southeast Asian Nations – Network for Innovation.

One project is investigating the impact of socio-ecological systems and resilience-based strategies on dengue vector control in schools and neighbouring household communities in Cambodia. Another is establishing a proof-of-concept for scale-up in endemic tourist spots of a method already found effective in Thailand. It combines two biological control techniques of the *Aedes aegypti* mosquitoes, the primary species responsible for transmitting Zika, dengue and chikungunya. One technique inserts *Wolbachia* bacteria into the mosquitoes to reduce transmission of the viruses to people, while not affecting the mosquito in any other way. The other is releasing sterile insects into the wild to reduce the overall numbers of mosquitoes that can transmit the virus.

Identifying urban health interventions that prevent and control infectious diseases of poverty

More than 50% of the world's population currently lives in cities, and that percentage is expected to increase to 75% by 2050, with most of this population in low- and middle-income countries. Mobility, poverty, inequality and climate change are some of the drivers of health risks in urban settings, including infectious diseases such as dengue, influenza (avian, swine flu), tuberculosis-AIDS, malaria, leishmaniasis, lymphatic filariasis, rabies and water-borne diseases.

TDR is taking its pioneering work in developing integrated community-based interventions in rural areas, and now also studying urban settings. The first phase is identifying what is known to work and the information gaps. This will then be used to develop new approaches.

The work covers field validation and implementation of rapid diagnostic tests, examining surveillance systems and integrated vector management schemes, and looking for interventions that improve housing and hygiene.

Building an international network to monitor and control the vectors of emerging arboviruses

The control of insects and other vectors that transmit diseases in poor countries relies mainly on the use of chemical insecticides, but resistance to these insecticides is growing. This covers not only chemical resistance, but also the vector-modified behaviour to bite at different times of the day or locations. TDR has drawn together global experts into a network to monitor this resistance and review alternative methods for vector control.



Work in 2018 and beyond

Research capacity strengthening

Major, ongoing training

Increasing operational research capacity and impact

TDR's Structured Operational Research and Training Initiative (SORT IT) programme continues to grow in force and impact. To date, the almost 500 papers that were written in five languages have resulted in 65% of them having an effect on policy and practice. Individuals from low- and middle-income countries constituted 90% of first authors, with almost half having a woman as first author. SORT IT is expanding into different thematic areas and more complex study designs. Countries have started to utilise independent funds, including from the Global Fund, which could be a model for expansion to other countries.

Developing tools and networks through the Regional Training Centres

TDR supports a network of six Regional Training Centres (RTCs) to conduct and disseminate courses on good health research practices in their regions. This includes implementation research (and the development of a massive open online course), and face-to-face courses on the basic principles and ethics in implementation research.

Increasing implementation research capacity through postgraduate training

The postgraduate training scheme supports seven universities to train students from low- and middle-income countries in implementation research on infectious diseases of poverty, mostly at the master's degree level. In addition to strengthening research capacity at individual and institutional levels, the scheme contributes to the promotion of the field of implementation research through the influence of the network of participating universities around the world.



New tool development

Launching massive open online course on implementation research

An introductory Massive Open Online Course (MOOC) is being launched in 2018 after more than two years in development. The course is a step-by-step training for public health researchers and decision-makers, disease control programme managers, academics and others that focuses on how to design and demonstrate robust implementation research projects to improve control of infectious diseases of poverty and generate better health outcomes.

Providing Implementation Research Toolkit in French

The implementation research toolkit designed to help research teams plan and conduct implementation research project will be available online in French in 2018. This should increase access to the resource globally, especially among Francophone researchers.

Expanding training for health interventions scale-up

TDR is supporting the United Nations Development Programme to build research capacity to support the introduction of new health technologies. The Access and Delivery Partnership, focused originally in Ghana, Indonesia and Tanzania, is being expanded to other countries. TDR's role is to provide training in implementation research and safety and pharmacovigilance.



Clinical product development training

The advanced training in clinical product development, called the Clinical Research and Development Fellowship, has placed 91 scientists from low- and middle-income countries in pharmaceutical companies and product development partnerships since its inception in 1999. There they work on new treatments for malaria, tuberculosis and the neglected tropical diseases. The programme will undergo an impact evaluation in 2018 to inform the next round of fellowship awards.

Launching training course on ethics in implementation research

A two-and-a-half day course on ethical principles in planning, conducting and reporting implementation research is being launched in 2018. Extensively piloted in two TDR-supported regional training centres, the course is part of a growing suite of implementation research tools developed with TDR support.



Work in 2018 and beyond.

Research capacity strengthening

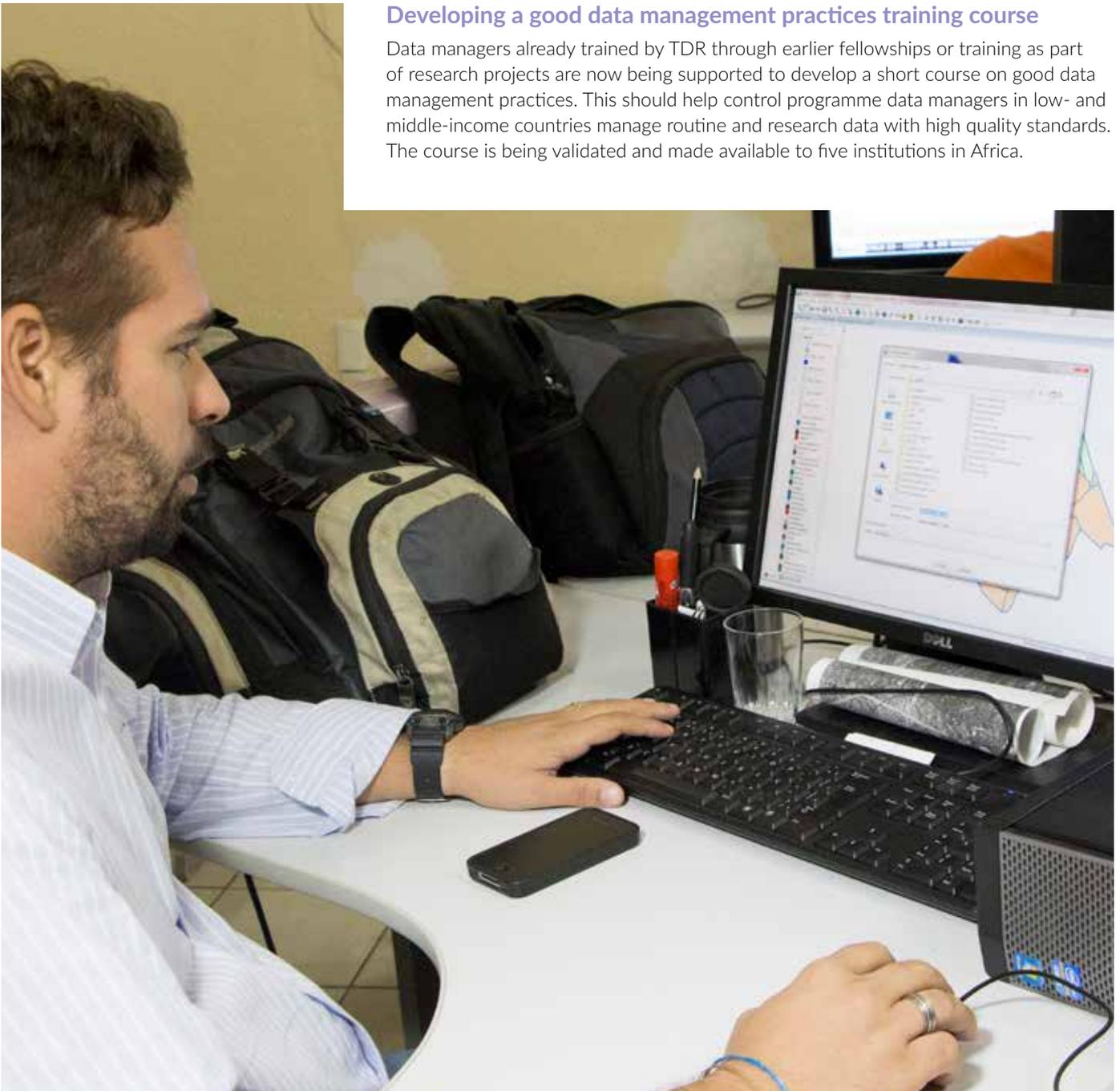
Support for data management

Sharing data

On behalf of the WHO, TDR provides technical input and acts as an observer to the Infectious Diseases Data Observatory (IDDO) in Oxford University. IDDO is working with governments in Guinea, Liberia and Sierra Leone to provide a platform to collate and share data collected during the Ebola epidemic in those countries by government and nongovernmental organization treatment centres, including Médecins Sans Frontières (MSF). TDR is also working with the Wellcome Trust to develop good practice standards in health research data management for sharing, including a joint study of governance arrangements in existing platforms.

Developing a good data management practices training course

Data managers already trained by TDR through earlier fellowships or training as part of research projects are now being supported to develop a short course on good data management practices. This should help control programme data managers in low- and middle-income countries manage routine and research data with high quality standards. The course is being validated and made available to five institutions in Africa.



New initiatives

Expanding modelling research fellowships

As modelling becomes more important in informing policy, low-resource countries need to have their own capacity. Modelling is useful for economic/cost-effectiveness analyses of interventions, assessment of the potential effect of interventions on transmission, morbidity or mortality and for aiding decisions on interventions required to achieve specific objectives. Building on the experience of the TDR Clinical Research Fellowship, TDR piloted a modelling fellowship which placed two fellows (from Ghana and Tanzania) in modelling groups currently receiving grants from TDR. Fundraising is ongoing to allow expansion into a broader programme.

Improving research through gender-based analysis

Gender-related roles and practices may put women and men at higher or lower risk of diseases. This field of research highlights the significant inequities in the patterns of diseases, and in access to and control over necessary resources. For example, in various malaria-endemic areas, certain roles and activities traditionally assigned to men may increase their exposure to malaria vectors, especially those working in gold mines or forest logging in the evening. The likelihood of being exposed to Rift Valley Fever is higher in certain cultures where women and girls tend the animal herds, and in fishing communities, men tend to present a higher incidence of schistosomiasis than other members of the community. In addition, making decisions about who sleeps under a bed net is also influenced by gender roles, norms and relations.

TDR is developing a course to help researchers and policy-makers in Africa learn how to conduct this type of analysis. An online course uses web conferencing, video conferencing, discussion forums, blogs (and blog moderation), social media for assignments, assigned reading and other class-related activities. The work is being done in collaboration with the WHO Department of Public Health, Environmental and Social Determinants of Health and coordinated with the TDR-supported Regional Training Centre at the University of Ghana School of Public Health. The course is being expanded to other research institutions and regional training centres.

Who sleeps under a bednet is often influenced by gender roles, norms and relations.



Work in 2018 and beyond

Global engagement



Supporting research fairness

The Research Fairness Initiative (RFI) is an accreditation system by the Council on Health Research for Development (COHRED) which promotes and validates responsible and fair practices in international collaborative research and innovation for health. The RFI is a first attempt at creating a systematic global evidence-based assessment of fairness in the field of global health. An internal review showed good compliance of TDR processes with the report metrics. There are plans to work with other organizations going through the process to agree on standards and increase fairness in research practices.

TDR is also working with funding agencies on standards of good ethical conduct for supporting research projects in low- and middle-income countries. This includes the establishment of a new Global Code of Conduct to be used by the European Commission for funding applications within its framework programme.

Working with donors to strengthen research capacity

TDR's technical support to the ESSENCE on Health Research initiative, a multilateral donor initiative to Enhance Support for Strengthening the Effectiveness of National Capacity Efforts, continues to be a unique initiative within the global health architecture. ESSENCE is an effort to harmonize internationally funded research programmes and align them with the priorities of disease endemic countries and the principles of the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. Work is focused on research management and implementation research, developing a variety of good practice documents written by members.

Increasing uptake of evidence into policy and practice

TDR is working with a number of organizations to provide new evidence and training on how to increase the use of research evidence for policy and practice changes. Thematic online discussions initiated on the Healthcare Information for All (HIFA) virtual community are increasing awareness and interest. TDR also brings together members from the Evidence Informed Policy Network (EVIPNET) and SORT IT trainers and national disease control staff to share and assist with the interpretation of the vast amount of empirical findings that have accumulated in light of their own experiences, to communicate research findings and generate the best policy briefs.



Accelerating research to policy and research to implementation

Barriers to achieving disease control in low- and middle-income countries are numerous and diverse, including issues of supply chain, healthcare worker training/motivation/supervision, community/patient information, education and communication. National guidelines often need to be customized for specific regions. TDR provides collaboration grants between ministries of health and country academic institutions. Priorities are identified by the ministry, and staff within the ministry are provided training to plan, design and implement the needed research and to translate the research results into recommendations (policy briefs) for decision-makers. Work is underway in Ghana on lymphatic filariasis control.

Identifying research needs and shaping the research agenda

TDR is spearheading an initiative for WHO to support the development of a global agenda for public health research. A process using systematic reviews of research evidence is being developed for stakeholders to work together to identify the knowledge gaps and propose global health research priorities.

Using social innovation to improve health systems

TDR is advancing the social innovation field for communities challenged with infectious diseases. Social innovation engages communities in grassroots actions to develop improve access and delivery of health products and services. Businesses are created that provide social benefits, like setting up primary health posts in rural areas in Rwanda run by nurses, or teaching teachers in Malawi how to recognize symptoms of malaria in their students.

The Social Innovation in Health Initiative is studying what works and what does not, and advocating for social innovation to be further studied and used in a broad range of settings and in the context of health systems. Evidence and better understanding helps to enhance social innovations and ensure their sustainability. Country hubs with the capacity to leverage efforts at the national level and attract research funding are being set up across the globe to develop tools and guidelines in this emerging field. TDR is also using this approach within its West African Regional Network on Tuberculosis, and plans to do so in the dual HIV/syphilis elimination programme in the People's Republic of China.

Strengthening locally-led TDR Global activities

TDR Global is a community of grantees, experts, sponsors and partners who have been working with TDR to support global research on infectious diseases of poverty. It is a network of people who convene global discussions and foster locally-led activities to explore and build capacity for research that identifies health challenges in countries and communities, and how to overcome them. For example, the Philippines Social Innovation Hub at the University of the Philippines conducted its first "TDR Global Talk": Let's Talk about Social Innovation.

In 2018, the network is launching a series of activities to mobilize communities of practice that address gender issues in health through online discussions, challenge-solving workshops and a LinkedIn discussion group. A guide for Crowdsourcing in Health and Health Research is being tested and will be used to identify problems and develop solutions across TDR projects and TDR Global members' initiatives by crowdsourcing ideas. Community engagement at country level is also being developed and tested in Zambia.



Key publications and resources

TDR has a goal of supporting researchers in disease endemic countries to conduct research and lead the writing and publication of the research findings. The proportion of first authors from low- and middle-income countries remains at a high level at 73%. This is a good indicator of the quality and experience of investigators, since first authors are usually the lead investigators of the research projects. In 2017, 88% of TDR-supported publications were available in open or free access journals. Women were first authors in 38% of these publications. All TDR publications are freely available.



Research and capacity strengthening publications

Social innovation in health: case studies and lessons learned from low- and middle-income countries

This publication is the result of three years of collaborative case study research conducted by the Social Innovation in Health Initiative (SIHI) partners. Summaries of the 23 case studies presented display the diversity of approaches social innovations have taken to address grassroots health challenges. The insights and lessons learned derived from this case study research cast light on the valuable role social innovation can play in strengthening health systems in low- and middle-income countries. It analyses the factors involved and highlights areas that need further study to best advance social innovation in health, strengthen health systems and contribute to universal health coverage.



Operational Guide: Early Warning and Response System (EWARS) for dengue outbreaks

This guide was produced by TDR together with the World Health Organization's Department of Control of Neglected Tropical Diseases and regional offices, in the context of a European Union-financed research programme, the International Research Consortium on Dengue Risk Assessment, Management and Surveillance (IDAMS), to develop an evidence-based early warning system for outbreak detection and management of dengue fever outbreaks.

It is designed to provide programme managers with a user-friendly tool that can analyse and draw conclusions from historic dengue datasets; identify appropriate alarm indicators that can sensitively and specifically predict forthcoming outbreaks at smaller spatial scales; and use these results and analyses to predict and build an early warning system to detect dengue outbreaks in real-time. Together, these three components build technical capacity and provide a standardized methodology for predicting dengue outbreaks in countries where skills and resources are currently constrained.

Reports about TDR

TDR strategy 2018-2023 - Building the science of solutions

This is the TDR strategy for 2018-23 that was published in 2017. It lays out a focus on research for increased implementation and access, graphically displaying the impact pathway. TDR's unique value is explained through its integration of three core areas: research, research capacity strengthening, and global engagement. The document also includes the principles, partnerships, governance and management practices behind the strategy, as well as a review of the Programme's historical achievements.



TDR 2016 Results Report

The TDR Results Report illustrates progress made against the 23 key performance indicators that are part of the monitoring and evaluation matrix, in line with the current Performance Assessment Framework.

The report shows progress made on various performance indicators related to three overarching categories related not only to what is done (technical expected results), but also on how it is done (application of organizational core values and managerial performance).

The report notes a high implementation rate, numerous new health tools that are being used in critical areas, and an expanded education and training programme, particularly focused on researchers in disease endemic countries. It provides summaries of activities to increase equity, such as increasing opportunities for women. The report includes a series of lessons learnt that have further improved the Programme's managerial effectiveness.



TDR 2016 annual report - Health research impact that lasts

This report provides an overview of the 2016 key research achievements and ongoing progress; research capacity building and research priority setting activities; publications and resources; governance and management; performance overview, financial summary and contributors list.



Governance and management

TDR is co-sponsored by UNICEF, UNDP, the World Bank and WHO, and it is through these international, multilateral organizations that TDR has such an extensive reach and support. WHO acts as the executing agency of the Programme, and provides close ties with its departments for a continuous loop of research informing policy and policy informing research, which in turn supports planning and priority setting at international, regional and national levels.



TDR's overall management responsibility is ensured by the TDR Special Programme Coordinator, Dr Ren Minghui, who heads the Communicable Diseases Cluster, and is an Assistant Director-General of WHO. Day-to-day management is provided by the TDR Director. Thirty-two full-time staff come from all regions of the world.

TDR's top governing body is its Joint Coordinating Board (JCB), which includes a mix of representatives from developed and developing countries (see figure 1). A Standing Committee composed of representatives from the four co-sponsoring agencies, the Chair and the Vice-Chair of the JCB, the Chair of STAC, one representative from the JCB resource contributors group (a JCB member under paragraph 2.2.1 of the TDR Memorandum of Understanding-MOU), and one representative from a disease endemic country (which may be a JCB member under paragraph 2.2.2 or paragraph 2.2.3 of the TDR MOU), provides guidance and oversight on an ongoing basis. Programmatic and technical review comes from the Scientific and Technical Advisory Committee (STAC), which includes 15 internationally recognized scientists. Members serve in their personal capacities to represent the range of research disciplines.

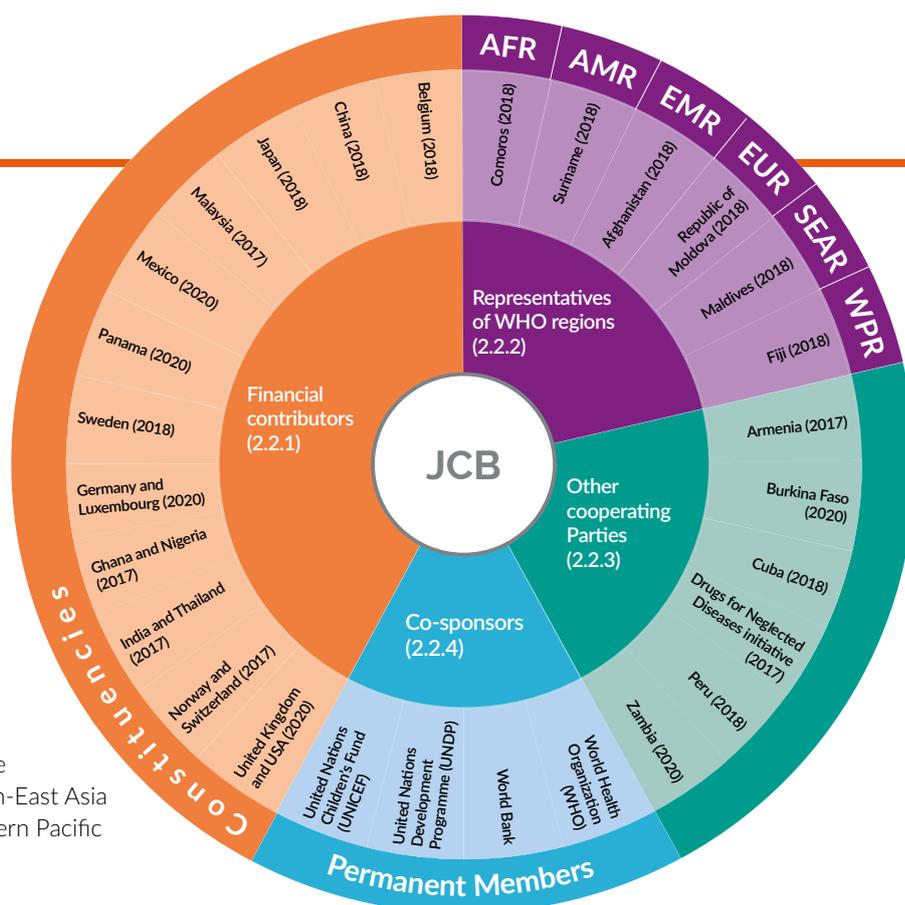
Joint Coordinating Board (JCB)

The Board comprises 28 members: 12 members selected by the resource contributors to the Programme (including six constituencies of two governments sharing one seat); six government representatives chosen by the six regional committees of WHO; six members representing other cooperating parties selected by the JCB itself; and the four co-sponsoring agencies.

Figure 1. JCB membership of the Coordinating Board (as of 1st January 2017)

WHO regions (Regional Offices)

AFR: Africa
AMR: Americas
EMR: Eastern Mediterranean
EUR: Europe
SEAR: South-East Asia
WPR: Western Pacific



Membership of the Scientific and Technical Advisory Committee (STAC) - To 31 December 2017

Term of membership	
(Chair) Professor Charles MGONE Dar es Salaam, Tanzania	2014-2017
Dr Ayat ABUAGLA Educational Development Centre, Sudan Medical Specialization Board, Sudan ☐ Research Fellow, Reproductive & Child Research Unit [RCRU], University of Medical Sciences & Technology, Sudan Medical Specialization Board, Khartoum, Sudan	2017-2018
Professor Maria Teresa BEJARANO Senior Research Advisor Unit for Research Cooperation, Department for Partnerships and Innovations, Sida, Stocksund, Sweden	2016-2017
Dr Graeme BILBE Research and Development Director, Drugs for Neglected Diseases initiative (DNDi), Geneva, Switzerland	2014-2017
Professor Moses BOCKARIE Director of South-South Cooperation and Head of Africa Office, European & Developing Countries Clinical Trials Partnership (EDCTP), Medical Research Council, Cape Town, South Africa	2014-2017
Professor Claudia CHAMAS Researcher, Centre for Technological Development in Health, Oswaldo Cruz Foundation (Fiocruz), Rio de Janeiro, Brazil	2016-2017
Professor Sónia DIAS Associate Professor, International Public Health, Institute of Hygiene and Tropical Medicine, Lisbon, Portugal	2016-2017
Dr Sara Irène EYANGO Directeur Scientifique, Centre Pasteur du Cameroun, Laboratoire National de Référence et de Santé Publique Ministère de la Santé Publique, Yaoundé, Cameroon	2016-2017
Professor John GYAPONG Pro-Vice Chancellor for Research Innovation and Development, University of Ghana, Accra, Ghana	2014-2017
Dr Subhash HIRA Professor of Public Health and Senior Advisor, Public Health Foundation of India, New Delhi, India	2017-2018
Professor Frank NYONATOR Project Director, USAID/ Ghana Evaluate for Health Project (E4H), Management Systems International (MSI), Accra, Ghana	2014-2017
Professor Stephen (Bertie) SQUIRE Professor of Clinical Tropical Medicine, Liverpool School of Tropical Medicine (LSTM) Consultant Physician, Tropical & Infectious Disease Unit, Royal Liverpool University Hospital, Centre for Applied Health Research and Delivery, Liverpool School of Tropical Medicine, Liverpool, United Kingdom	2017-2018
Professor Xiao-Nong ZHOU Director, National Institute of Parasitic Diseases, Chinese Center for Disease Control and Prevention, Shanghai, China	2014-2017

Financial performance summary

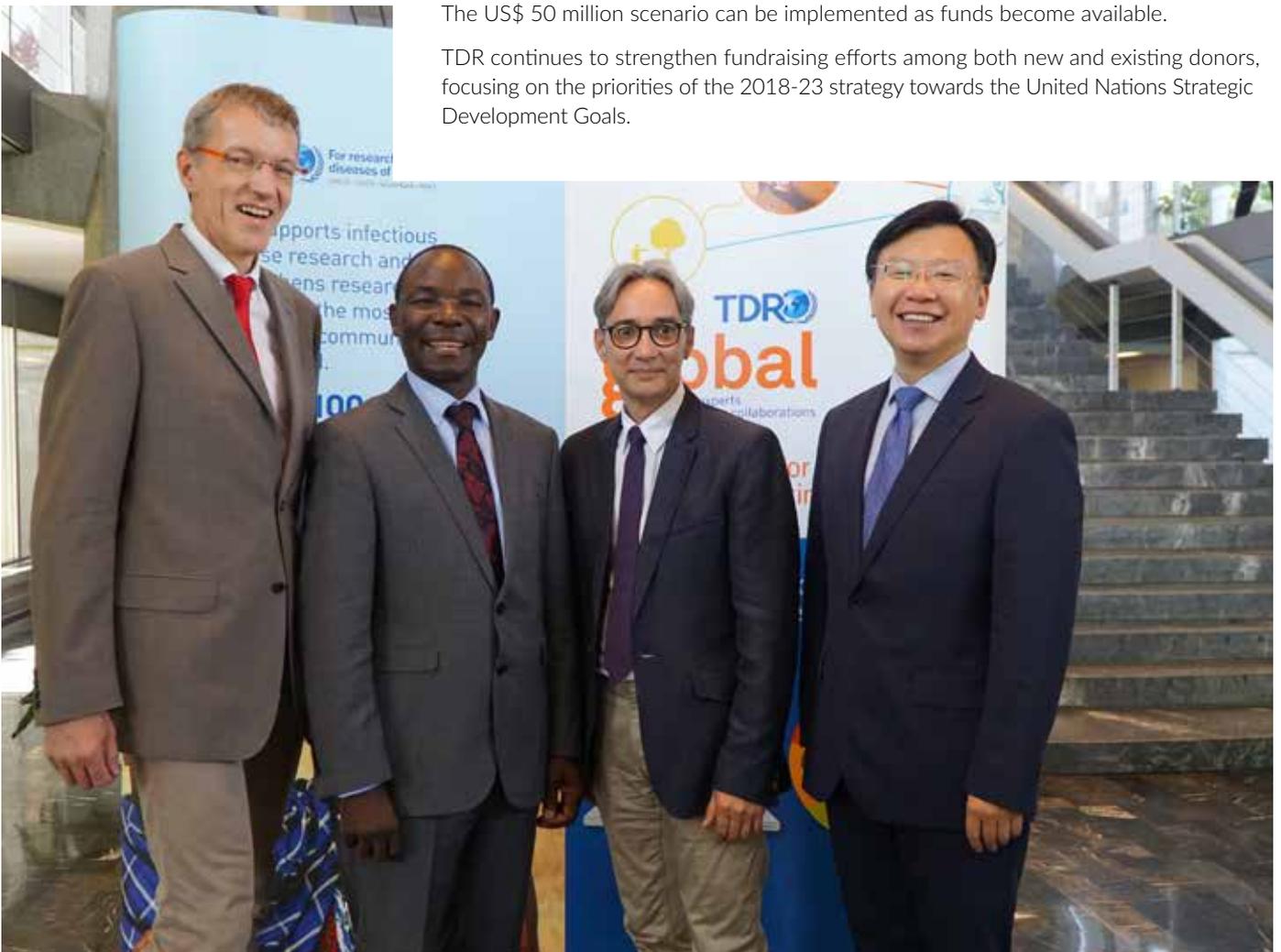
TDR strategy 2012-2017 completed: strong and effective implementation

The six-year strategy has been completed and strategic goals were met. Financial planning has ensured strong implementation at 94% of biennial planned costs.

In June 2016, the TDR Joint Coordinating Board (JCB) approved two budget scenarios for the biennium 2018-2019, a lower one of US\$40 million and a higher one at US\$ 50 million.

Implementation of the lower (US\$ 40 million) budget scenario began in January 2018. The US\$ 50 million scenario can be implemented as funds become available.

TDR continues to strengthen fundraising efforts among both new and existing donors, focusing on the priorities of the 2018-23 strategy towards the United Nations Strategic Development Goals.



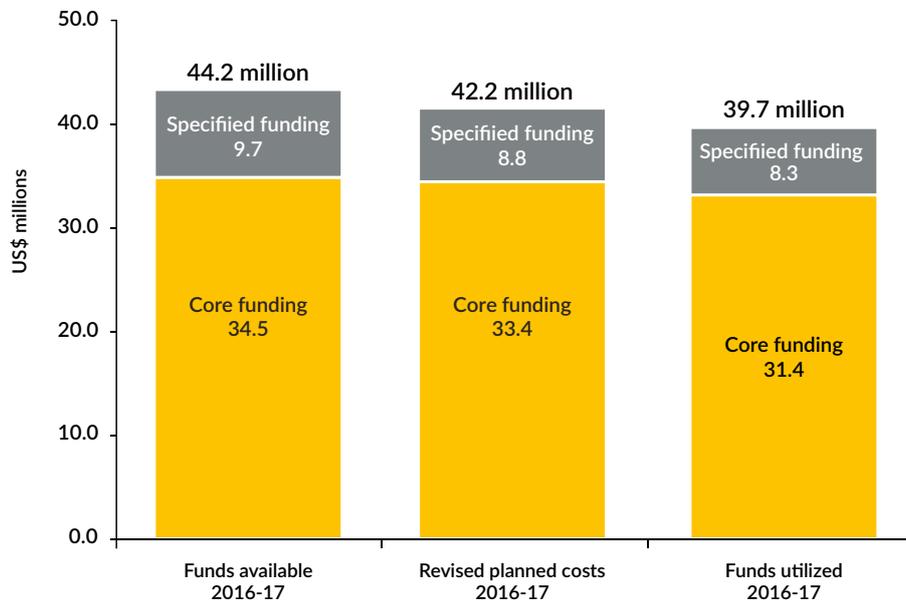


Figure 1: Financial situation as at 31 December 2017 (US\$ million)

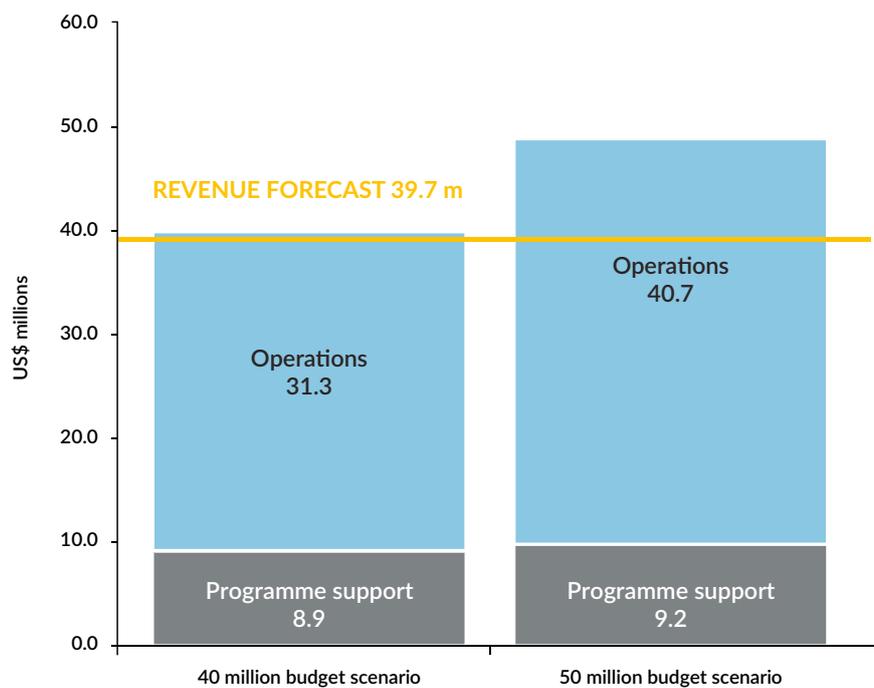


Figure 2: Financial outlook 2018-19 (US\$ million)

Performance overview

TDR uses its Performance Assessment Framework to measure progress in the implementation of its vision and strategic plan. Key performance indicators (see following table) have been developed in consultation with TDR stakeholders. These help assess not only what TDR does (TDR achievements and its contribution to changes in countries) but also how it does it (application of core values and management performance). Measurements are compiled in the annual TDR Results Reports: www.who.int/tdr/publications/about-tdr.

TDR is revising its Performance Framework to align it to the TDR Strategy 2018-2023, the Sustainable Development Goals, and the co-sponsors' strategic plans (including WHO's priorities on achieving universal health coverage, addressing health

emergencies and promoting healthier populations).

The year 2017 marked the successful conclusion of the implementation of TDR's 2012-2017 strategic plan. The agreed six-year performance targets were achieved to a large extent, both regarding technical achievements (outcomes, tools, strategies and solutions delivered and making an impact in countries), and how TDR worked to deliver these results, taking into consideration values such as equity, quality, sustainability, value for money and partnership.

Strategic, longer-term challenges are being carried forward into the TDR strategy 2018-2023, such as the ongoing efforts to increase the proportion of grants awarded to women scientists.

Expected results	Key performance indicators	Baseline (2011)	Target (2017)	Progress (contribution 2017)	Frequency of measurement
Technical expected results					
Outcome: Infectious disease knowledge, solutions and implementation strategies translated into policy and practice in disease endemic countries	1. Number and proportion of innovative knowledge, new/improved solutions or implementation strategies successfully applied in developing countries	0	30 ≥75%	31 (+7) 86% (42/49)	Measured annually, cumulative over 6 years
	2. Number of tools and reports that have been used to inform policy and/or practice of global/regional stakeholders or major funding agencies	0	7	11 (+3)	Measured annually, cumulative over 6 years
Main output: New and improved solutions and implementation strategies that respond to health needs of disease endemic countries developed	3. Number and proportion of innovative knowledge, new/improved solutions or implementation strategies developed in response to requests from WHO control programmes and/or diseases endemic countries	0	35 ≥87%	49 (+13) 100%	Measured annually, cumulative over 6 years
	4. Number of peer-reviewed publications supported by TDR and percentage published in open access journals	233 Not measured	≥150/ year 100%	1101 (2012-2017) (+200 in 2017) 88% open access (2017)	Measured annually
Feeder outputs: High quality intervention and implementation research evidence produced	5. Number and evidence of new/improved tools, case-management, control or implementation strategies generated through TDR facilitation with systematic quality review by external committees	0	40	49 (+13)	Measured annually, cumulative over 6 years
	6. Proportion of peer-reviewed publications supported by TDR with first author from Disease Endemic Country (DEC) institutions	61%	≥70%	73%	Measured annually
Enhanced research and knowledge transfer capacity within disease endemic countries	7. Number of DEC institutions and/or networks demonstrating expanded scope of activities and/or increased funding from alternative sources thanks to TDR support	0	5	8 (+3)	Measured annually, cumulative over 6 years
	8. Number of TDR grantees/trainees and proportion demonstrating career progression and/or increased scientific productivity	0	150 ≥80%	489 new trainees (+79 in 2017) 58/68 (2014) 85% (2014)	Measured on cohorts 3-5 years after training ended

Key stakeholders in disease endemic countries engaged in setting the research agenda and ensuring research reflects their needs	9. Number and evidence of research-related agendas, recommendations and practices agreed by stakeholders at global, regional or country level	0	9	9 (0)	Measured annually, cumulative over 6 years
	10. Proportion of TDR outputs produced with key DEC stakeholder active involvement	Not measured	100%	100%	Measured annually

Expected results	Key performance indicators	Baseline (2011)	Target (2017)	Progress (contribution 2017)	Frequency of measurement
Application of core values					
Equity Social and economic:	11. Proportion of TDR grants/contracts awarded to institutions or individuals in DECs (total count and total dollar amount)	59% DEC	75% DEC	74% DEC (amount) 62% DEC (count)	Measured annually
	12. Proportion of experts from DECs on TDR advisory committees	58%	60%	78%	Measured annually
Gender:	13. Proportion of women among grantees/ contract recipients (total count and total amount)	35% (n) 17% (\$)	50%	40% (% count) 29% (% amount)	Measured annually
	14. Proportion of women on TDR advisory committees	32%	50%	50%	Measured annually
	15. Proportion of women as first author of peer-reviewed publications supported by TDR (within a calendar year)	Not measured	50%	38%	Measured annually
Effective partnerships	16. Resources leveraged as direct contributions (co-funding, services or in-kind) to TDR projects (examples)	Not measured	tbd	\$ 1:1 (\$ TDR : \$ partners) People 1:30 (TDR : in the field)	Measured in the second year of each biennium
Sustainability of outcomes	17. Number of effective public health tools and strategies developed which have been in use for at least two years	51	67	86 (2017)	Measured in the second year of each biennium
Quality of work	18. Proportion of project final reports found satisfactory by peer- review committees	Not measured	>80%	100%	Measured in the second year of each biennium

Expected results	Key performance indicators	Baseline (2011)	Target (2017)	Progress (contribution 2017)	Frequency of measurement
Management performance					
Effective resource mobilization	19. Percentage of approved biennial budget successfully funded	78%	≥100%	87.9% (US\$ 39.5/45M)	Measured in the second year of each biennium
	20. Percentage of income received from multi-year agreements (>2yrs)	Not measured	tbd	17.3% (US\$ 6.8M/39.5M)	Measured in the second year of each biennium
Effective management	21. Percentage of staff workplans and performance reviews (including personal development plan) completed on time	Not measured	≥90%	89%	Measured annually
	22. Proportion of expected results on track	60%	≥80%	89%	Measured annually
	23. Proportion of significant risk management action plans that are on track	Not measured	≥80%	100%	Measured annually

Contributions table

TDR 2017 revenue

Contributor	
Core contributors	Amount (US\$)
Sweden	5 649 772
United Kingdom of Great Britain and Northern Ireland	3 726 383
Switzerland	1 676 829
World Health Organization	1 079 953
Luxembourg	1 074 114
Germany	901 442
Belgium	721 154
Norway	378 740
Japan	280 000
China	55 000
Thailand	41 759
Malaysia	25 000
Panama	14 000
Mexico	10 000
Cuba	5 000
Turkey	5 000
Miscellaneous	1 638
Subtotal	15 645 784
Contributors providing specific project funding	Amount (US\$)
Bill & Melinda Gates Foundation	1 338 325
U.S. Agency for International Development (USAID)	1 254 350
The Union (IUATLD)	100 000
Subtotal	2 692 675
TOTAL CONTRIBUTIONS	18 338 459

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