

# TIBA End of Programme Review Report

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University of Edinburgh

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## Executive Summary

This End of Programme Review (EPR) represents the final phase of NIRAS-LTS' evaluation of the National Institute for Health Research (NIHR) Tackling Infections to Benefit Africa (TIBA) at the University of Edinburgh programme. The period of review for the final report covers from the end of the Mid-term Review (MTR), January 2020, to the final reporting period for TIBA projects, August 2021. TIBA is designed to shift the centre of gravity of health research for Africa to institutions in Africa. African leadership and the creation of equitable partnerships are central to this goal, as is the intention to strengthen the capacity of African health research scientists and the health research 'ecosystem' in which they work.

The EPR utilises a theory-based approach to the evaluation and explores a range of evaluation questions that cover the OECD-DAC criteria of relevance, coherence, effectiveness, efficiency, impact and sustainability. The evaluation team reviewed three TIBA Work Packages (WPs) as part of their primary source data: WP2: Making a Difference; WP4: Out of Africa Fellowship; WP6: Data Science; and WP6: Emergency Response, Covid-19. Other data came from interviews with TIBA programme and project staff, a TIBA-wide survey, and a targeted case study that included observations and interviews with the TIBA Ghana at the University of Ghana.

## Findings

**Relevance:** Based on the activities reviewed by the evaluation team in the context of TIBA's outcomes and impacts, and the practical, real-time application of the emergency response preparedness support, the evaluation team finds TIBA's activity selection and design to be highly relevant to the programme objectives. Each WP provided a complementary schedule of activities which were well designed to contribute to greater overall outcomes. Of note, the TIBA programme demonstrated foresight and understanding of global and national healthcare needs by incorporating a WP on emergency response. In addition, the ability of the TIBA projects to quickly and effectively adapt their activities to combat Covid-19 should be highlighted and demonstrates the real need for greater pandemic or epidemic response knowledge and skills in the TIBA countries. Where needs were identified within the TIBA projects during implementation they were often responded to, such as the provision of M&E training. However, there remain opportunities to enhance TIBA's design for Phase 2, including extending WP timelines, facilitating cross-border communication and increasing procurement budgets.

**Efficiency:** TIBA performed within expectations in terms of efficiency, although Covid-19 contributed to certain time efficiency challenges. Overall, based on the data reviewed, TIBA projects were largely able to complete activities on time and within budget, although it should be noted some costs were reallocated due to Covid-19 delays for which the projects are now seeking additional funding towards continuity and sustainability. Notably, respondents positively identified efficiency within working with the central TIBA programme team, which further demonstrates contribution towards TIBA's objective of moving the centre of gravity for African health research to Africa, with the programme team playing a support and facilitation role rather than an overly administrative or bureaucratic one. The most significant challenge identified was in multi-country collaboration and communication, which indicates that efficiency can decline as projects seek broader, regional focuses and remits.

**Effectiveness:** Based on the data reviewed, the TIBA programme largely achieved its intended outputs within the lifetime of the programme. While adaptations to certain activities had to be made to account for the Covid-19 situation, the evaluation team finds those made to be reasonable and to have continued to contribute to output achievement. The level of ambition set in terms of outputs appears appropriate and, as discussed further below, the causal links from these outputs to outcomes remain viable. TIBA has demonstrated particular effectiveness in terms of capacity building, increasing the availability of African-led health research and, as a result, ensuring African leadership in this space. An important conclusion which can be drawn from TIBA is that developing research based on localised needs, working with local researchers and ensuring strong local partnerships are all key to ensuring increased buy-in and engagement, promoting wider interest and securing access to important networks, all of which are important

precursors for achieving wider impact and sustainability in terms of policy influence and shifting the centre of gravity for health research to Africa. It should be acknowledged that TIBA experienced several challenges in terms of delivery effectiveness, such as multi-country communication and community engagement difficulties, but where appropriate the TIBA leadership has demonstrated an ability to respond to these challenges and provide additional support where required (i.e. the CEI training). Overall, the evaluation team finds that TIBA has been delivered effectively but would note that the transition to a hub-and-spoke model in TIBA 2 (requiring greater multi-country collaboration) limits how well this can be used as an indicator to predict effectiveness in TIBA 2.

**Impact:** The evaluation team selected two outcome pathways of the TIBA theory of change to be tested to evaluate impact: one from the **enhanced research capacity**, and one from the **research into use** pathway. Looking across the portfolio of projects, the evidence provided gives high confidence that the TIBA programme as a whole contributed to Outcome 1, “**African researchers contribute to the academic evidence base on African health systems and infectious disease,**” and Outcome 2, “**African researchers have new knowledge, skills, technology, and networks.**” For Outcome 5, “**Healthcare professionals/ policymakers/ communities do things differently (better),**” there is medium confidence in contribution. This is due to the fact that outside of the Covid-19 emergency response work, there is limited evidence of actual policy or practice change stemming from TIBA activities within the reporting period. However, there is good evidence that several TIBA projects have fulfilled necessary criteria to inspire such change and it is anticipated that confidence in contribution to this outcome may increase over time as new policy decisions are made and TIBA data is incorporated within national approaches and policies.

The evaluation team has identified **lessons learned** and **recommendations** for the EPR, either through review of the Work Packages or identified by the TIBA cohort through reporting, interviews and the EPR survey.

Lessons Learned
<ul style="list-style-type: none"> <li>• <b>Community engagement</b> and the need and benefit of health research being driven by local needs was highlighted throughout OAF, MaD and DS project reporting as being essential to the project being able to achieve its aims. Both the MaD and DS projects reported on empowering and engaging with local stakeholders, community members and/or local health workers as essential components of “transferring ownership” to local communities or local health officials, and building capacity at the local level.</li> <li>• <b>Partnerships with government departments</b> within a project are a likely mechanism to potentially influence policy change.</li> <li>• <b>Internal communication among the TIBA cohort was found to be another mechanism for success</b> across the portfolio of projects, or when it was not strong, a hinderance to a few projects. As one interviewee stated, “if the project is to be successful, the communication backbone has to be very strong.”<sup>1</sup> TIBA leadership should continue to strengthen communication and ways of working between PIs and TIBA partner countries, particularly when collaborating on a multi-partner country project.</li> </ul>
Recommendations
<ul style="list-style-type: none"> <li>• <b>Inclusion of embedded monitoring, reporting and learning support.</b> A common request from TIBA projects throughout TIBA was greater support in monitoring and reporting results effectively to TIBA. Specifically, TIBA projects noted challenges in effectively evidencing outcome or impact level results which they felt their projects had contributed to. While some monitoring and reporting training was carried out in TIBA 1, it is recommended that more embedded support be provided for TIBA 2.</li> <li>• <b>Explicit exploration of theory of change assumptions.</b> In a future TIBA 2 programme, it is strongly recommended that TIBA review the pathways to impact outlined in its theory of change and update them, with particular consideration paid to the underpinning assumptions.</li> <li>• <b>Develop a platform for wider pan-Africa collaboration on medical research and training.</b> TIBA is arguably in a unique position to establish and facilitate a pan-African platform for further collaboration outside the TIBA</li> </ul>

project countries. Several projects reported requests for engagement from institutions outside the TIBA ecosystem.

- **Explore options to address expertise attrition.** A notable achievement of the Out of Africa Fellowship is that 100% of Fellows were retained in their respective institutions. However, projects noted that attrition of expertise – new graduates and other emerging experts leaving the country due to lack of opportunities in Africa – poses a significant challenge to ensuring sustainable results for TIBA. While it is beyond TIBA’s remit to provide or facilitate employment for PhD graduates or other health experts involved in TIBA training, there may be some actions TIBA can take given its position to mitigate this challenge.
- **Continue policy engagement work started in TIBA 1.** It is understood that many of the TIBA 1 projects included in TIBA 2 will be conducting research related to but somewhat separate from their TIBA 1 projects. Policy change, particularly in developing countries, can be a lengthy process and requires continued momentum and engagement. It is, therefore, strongly recommended that the continuing TIBA 1 projects maintain efforts to influence policy in relation to the work they have already completed to ensure it is realised.
- **Raise outcome ambition in TIBA 2.** Based on the findings in this EPR, TIBA 1 has performed largely to expectation and, in relation to the emergency preparedness, even exceeded expectations. As such, it would be appropriate for TIBA to raise outcome-level ambition in TIBA 2. Of the outcomes analysed in this review, both Outcome 1 and 2 relate to relatively short-term achievements and could be made more ambitious in TIBA 2 (note, Outcome 5 remains appropriate for TIBA 2).

## Acronyms

Acronym	Definition
DS	Data Science project
EPR	End of Programme Review
MaD	Making a Difference project
MTR	Mid-Term Review
NIHR	National Institute for Health Research
OAF	Out of Africa Fellowship programme
RIP	Rapid Impact Project
TIBA	Tackling Infections to Benefit Africa
WP	Work Package

# 1 Introduction

This End of Programme Review (EPR) represents the final phase of NIRAS-LTS' evaluation of the National Institute for Health Research (NIHR) Tackling Infections to Benefit Africa (TIBA) at the University of Edinburgh programme. The period of review for the final report covers from the end of the Mid-term Review (MTR), January 2020, to the final reporting period for TIBA projects, August 2021.

TIBA is designed to shift the centre of gravity of health research for Africa to institutions in Africa. African leadership and the creation of equitable partnerships are central to this goal, as is the intention to strengthen the capacity of African health research scientists and the health research 'ecosystem' in which they work. NIRAS-LTS (LTS) has been contracted to monitor and evaluate implementation of the TIBA investment over the whole delivery period.

## 1.1 Overview of TIBA

Tackling Infections to Benefit Africa (TIBA, which means "to cure an infection" in Swahili) is an Africa-led, multi-disciplinary research programme that explores and draws lessons from the ways that different African health systems tackle infectious diseases. Funded by the NIHR, it is a four and a half year, £6.9 million investment that started in June 2017 and will run until January 2021.

The TIBA programme is designed to mobilise the technical expertise within the University of Edinburgh (UoE) and their African partner research institutes, to reduce the incidence and impact of infectious diseases in Africa. Africa bears a disproportionate burden of infectious diseases, and TIBA's approach emphasises the need to empower African scientists to effectively address and reduce the burden and threat of Neglected Tropical Diseases (NTDs), such as schistosomiasis, malaria, trypanosomiasis and lymphatic filariasis, and improve preparedness for epidemics (such as Ebola and Covid-19). Through TIBA, the UoE works in partnership with leading scientists from Botswana, Ghana, Kenya, Rwanda, South Africa, Sudan, Tanzania, Uganda and Zimbabwe to generate new knowledge and inform and influence health policy and strengthen health systems in partner countries. TIBA works on all aspects of infectious diseases management – from basic research to uptake by local communities – in a single, unified framework. This meets an often articulated but rarely addressed need to view infectious disease management not in isolation but in the context of local health systems and wider societal issues.

TIBA has four specific aims:

- To improve the diagnosis & surveillance of infectious diseases in resource-poor settings.
- To improve the deployment of existing drug treatments & enhance local capacity to develop new ones.
- To improve the deployment of existing vaccines & enhance local capacity to develop new ones.
- To improve the management of both endemic & emerging infections by:
  - strengthening health systems, with special attention to ethics and governance;
  - improving policy development and implementation (e.g. drug procurement, local licensing, regulatory harmonization); and
  - enhancing capacity to respond to infectious diseases emergencies, while protecting capacity to manage endemic diseases concurrently.

Critically, TIBA is designed to shift the centre of gravity of health research for Africa to institutions in Africa. African leadership and the creation of equitable partnerships are central to this goal, as is the intention to strengthen the capacity of African health research scientists and the health research 'ecosystem' in which they work.

## 1.2 Purpose and Scope

The purpose of the EPR is to assess progress to date since the MTR and understand the extent to which TIBA has achieved what it set out to do. It also serves to further identify areas of best practice and lessons learned to carry forward in any future iterations of TIBA, for example in TIBA2. It will also assess the TIBA programme’s contribution to its theory of change and to assess its performance in terms of effectiveness, efficiency, coherence, impact and sustainability. The review seeks to draw out learning from the TIBA programme as to what worked well and why, what challenges were faced and how they were overcome, and whether there are opportunities for improvements going forward, primarily to inform the implementation of the second phase of the programme.

## 2 Methodology

### 2.1 Evaluation Questions

The EPR utilised a theory-based approach to the evaluation, seeking to test the theory of change and explore a range of evaluation questions (EQs) covering the OECD-DAC criteria of relevance, coherence, effectiveness, efficiency, impact and sustainability. The evaluation team developed 13 evaluation questions to explore in this EPR, which were reviewed and agreed by TIBA leadership.

Table 1 EPR Evaluation Questions

Criteria	Evaluation Question
Relevance	1) To what extent have TIBA projects – and the TIBA programme as a whole - correctly and appropriately addressed the identified problems and needs?
	2) (How) has TIBA been able to respond to the shifting context and needs identified during the programme period, most notably in relation to Covid-19?
Coherence	3) Are TIBA activities internally coherent? i.e. TIBA’s constituent parts align well with programme objectives and are complementary in terms of focus.
	4) Are TIBA activities externally coherent? i.e. they align well with other TIBA-like interventions being delivered at that level, adding maximum value and avoiding duplication.
Efficiency	5) How efficient is the TIBA partnership, including its management systems and processes, as a mechanism to support health policy and health system change through targeted research and capacity development?
Effectiveness	6) Has TIBA met its aim to deliver world-class multi-disciplinary research that explores and draws lessons from the ways that different African health systems tackle infectious diseases?
	7) (How) has TIBA been able to enhance the capacity of African researchers and research institutions in target countries and beyond?
	8) To what extent has TIBA been able to translate and synthesise TIBA knowledge and innovations into accessible formats to facilitate uptake and influence among decision-makers at national, regional, continental and/or global scales? & (how) has this led to strengthened and improved health systems in target countries and beyond?
	9) (How) has TIBA become greater as a programme whole than the sum of its project parts, and what role has this played in achieving the TIBA objectives?
	10) (How) has TIBA ensured African leadership, and what role has this played in achieving the TIBA objectives?
Impact	11) To what extent is TIBA likely to achieve its intended outcome and thus contribute to the overall impact aim? i.e. stimulating positive health outcomes for TIBA’s target populations. & have there been any unintended effects, either positive or negative?



Criteria	Evaluation Question
	12) To what extent has TIBA been successful in shifting the centre of gravity of health research for Africa to institutions in Africa?
Sustainability	13) How, when, and under what conditions will the insights and outcomes delivered through the TIBA Partnership be replicated, continued or scaled up after the end of the programme?

## 2.2 Data Collection

The EPR relied on a combination of primary and secondary evidence. The principal source of data came from the programme reporting shared by the TIBA team for the following Work Packages (WPs) reviewed for the EPR:

- WP2: Making a Difference project (MaD)
- WP4: Out of Africa Fellowship programme (OAF)
- WP6: Data Science project (DS); Emergency Response, Covid-19

Additional primary data was gathered via key informant interviews, stakeholder surveys and onsite observations. The table below summarises the interviews conducted for the EPR. Additional interviews were conducted in 2020 at the conclusion of the Rapid Impact Projects (RIP, WP1) as part of the mid-term review which informed learning in relation to the overall TIBA programme.

*Table 2 Interviews Conducted for the EPR*

Stakeholder Type	Number
TIBA Programme Team	3
Making a Difference Project	3
Out of Africa Fellows	2
Data Science Projects	4
EPR Total	12
Additional RIP Interviews	12

The evaluation team initially intended to undertake two surveys – one for the programme level staff and one for the project level researchers and teams. When reviewing potential survey participants, it was agreed that one survey for all stakeholders would be both more appropriate and efficient. The survey was deployed to capture perceptions of a sample population of the TIBA cohort and what that sample considers to be best practice and lessons learned. It also served to probe the efficiency of the TIBA partnership and programme as a whole. The survey was distributed to 30 TIBA colleagues of which nine completed the survey, giving it a 30% response rate. These respondents worked on or supported work on RIPs, OAFs, MaDs, DS projects, and/or the Covid-19 Response work.

For the EPR, one site visit study was conducted with the implementing team in Ghana. The site visit included face to face interviews and direct observations of the research facilities, undertaken by a local evaluation consultant.

## 2.3 Data Analysis

During the scoping phase, the evaluation team selected two outcome pathways on the theory of change to be tested – one from the **enhanced research capacity**, and one from the **research into use pathway**. The outcomes and outputs which were assessed during the EPR are provided in Table 3 below.

Table 3 TIBA selected theory of change pathways for the EPR

ToC pathway	Outcomes	Outputs
Enhanced research capacity pathway	1. African researchers contribute to the academic evidence base on African health systems & infectious diseases.	1.1: A body of high-quality, multi-disciplinary research is produced by TIBA.
		1.2: Research produced by TIBA is accessible to research communities, particularly in Africa.
	2. African researchers have new knowledge, skills, technology and networks.	2.1 High-quality capacity-building initiatives are funded and delivered by TIBA.
		2.2 TIBA researchers have access to new technologies and networks.
Research Into Use pathway	5. Healthcare professionals / policymakers / communities do things differently (better).	5.1: TIBA research informs national, regional or international level health policies / practice / investments.

In order to analyse these outcome pathways, the evaluation team explored the implicit assumptions underpinning them to ascertain whether they held true throughout the programme delivery. The analysis of the evidence was conducted using elements of process tracing, drawing on the process tracing evidential tests to establish whether evidence supported the implicit hypotheses of change leading to these outcomes. The process tracing tests allowed the evaluation team to build a picture of how change occurred and the extent to which the TIBA programme contributed to its achievement. The evidence tests also supported the evaluation team’s assessment of evidence strength. Wherever possible, data was triangulated with multiple sources to ensure its accuracy. This analysis process is discussed further in Section 4.5 below in the assessment of TIBA’s impact.

## 2.4 Limitations and Challenges

The EPR managed several key risks and challenges during its delivery.

- **COVID-19:** the ongoing pandemic and resulting restrictions on international travel meant the team were unable to conduct site visits or interviews in person as initially envisioned. This was mitigated through the use of remote communications tools for interviews, such as Teams, and local consultants for activities on the ground in TIBA countries.
- **Data limitations:** due to resource limitations, COVID-19 and, to a lesser extent, the nature of the TIBA research projects, the evaluation team was unable to gather data from programme beneficiaries, with the exception of those receiving capacity building support from the programme. As such, the primary evidence for outcome level change in relation to health benefits among local communities has been provided by the reporting of TIBA projects. This is type of data source is a limitation due to the lack of ability for the evaluation team to verify the data source through triangulation. To mitigate this challenge, the evaluation team have developed a triangulation approach across the individual projects to increase confidence in findings.

## 3 Progress of Reviewed Portfolio of Work

### 3.1 Work Package 2: Making a Difference

The MaD projects build upon TIBA’s RIP portfolio of work. The MaD projects were designed to respond to relevant national and local health needs with a measurable and clear pathway to impact on the “poorest people.” TIBA funded four projects, led by a Principal Investigator (PI) within a multi-country and multi-partner team, involving two or more African partner countries. During the call for proposals for MaD, the TIBA leadership team picked out broad areas of interest and specialism across the RIP work, and invited key research leads in these areas to work up an application.

This created room for African PIs to shape proposals in response to local need. Four awarded projects were allocated £500k with a two year project timeline and which ran from 2018 to 2020.

The reviewed MaD project proposal and reports show that PIs created projects to respond to local and also national health needs, whilst also being directly relevant to one or more of TIBA’s four Aims. The MaD projects also display multi-disciplinary research across all four projects, working across the biomedical sciences for their research. The MaD reports also show that some projects were not as effective in conducting their research and delivering their findings, or being able to conduct their original proposed research. This was either attributed to Covid-19 delays, insufficient funding, or insufficient time. It is recognised by TIBA leadership that two years can be a short time frame to see long-term impact in research studies. Working in a multi-partner (i.e. across multiple TIBA partner countries) and multi-partner (i.e. with multiple lead PIs) way can also create coordination time lag or difficulties, as some of the MaD reports stated.

At the time of this review, all of the MaD projects still have pending publications or findings. However, the MaD portfolio of work has produced 23 research articles, an achievement in its own right. The table below gives the list of funded projects.

Table 4 TIBA-funded Making a Difference Projects 2018-2020

	Title of MaD project	Principle Investigator	Lead Institution and Country; Partner Countries
1	Developing and evaluating a comprehensive multiplex peptide array serological diagnostic for use in Africa	Professor Francisca Mutapi	University of Edinburgh, Scotland; with Sudan, Ghana and Zimbabwe
2	Understanding schistosomiasis among children under five years	Professor Moses Chimbari	University of KwaZulu-Natal, South Africa; with Zimbabwe, Tanzania and Rwanda
3	Contribution of maternal transmission and silent carriers in the epidemiology and persistence of African Trypanosomiasis in human and animal populations	Professor Charles Waiswa	The Coordinating Office for the Control of Trypanosomiasis Uganda; with Nigeria and Sudan
4	Novel candidates for anti-malaria vaccines identified using functional monoclonal antibodies in naturally exposed individuals	Professor Sam Kinyanjui, Prof Faith Osier (Kenya) & Professor Gordon A. Awandare (Ghana)	KEMRI-Wellcome Trust & WACCBIP; Ghana and Kenya

The four MaD projects submitted a final report upon completion and each report has been reviewed as part of this EPR.<sup>1</sup> A summary of the projects’ reported achievements are listed in Annex 1.

### 3.2 Work Package 4: Out of Africa Fellowship

TIBA’s OAF sits within WP4: Capacity Building, which is led by Prof Gordon Awandare (University of Ghana) and Dr Samson Kinyanjui (KEMRI-Wellcome Trust, Kenya). Nine contracts to eleven African Fellows were first awarded in 2019. The intent of the Fellowship was to fund projects and research in areas chosen by their institutions that would address one or more of the diverse challenges of health care systems in Africa. This included addressing current knowledge gaps that result in either non-deployment of diagnostics or interventions, or a lack of operational knowledge to improve the health of affected populations. Projects were expected to align with TIBA’s priorities and focus and have a specific outcome/impact that would be relevant to the affected populations. The total project budget available for

<sup>1</sup> The Ghana/Kenya MaD project submitted two separate reports for the same project.

each project was £85,000 and each project was given a one year timeframe. As part of the project implementation, each fellow had the opportunity to spend some time working at the UoE (or another TIBA partner institution) to gain new skills and research experience.

Due to the Covid-19 pandemic, not all the OAF research projects could be implemented fully. As such, eleven Fellowship projects were reviewed for this EPR and they cover work done by eleven Fellows from Botswana, Ghana, Kenya, Rwanda (two Fellows), Sudan, Tanzania, Uganda and Zimbabwe (three Fellows) between March 2019 and May 2020. The Fellows are managed by the TIBA Secretariat in Edinburgh.

OAF Fellows addressed issues related to diagnosis, treatment and surveillance of malaria, as seen in the projects by Rwanda and Ghana Fellows. Fellows in Botswana, Zimbabwe and Tanzania investigated schistosomiasis, while the OAF Fellow from Kenya studied sexually transmitted infections. The Fellow from Uganda studied trypanosomiasis and leishmaniasis was studied by the OAF Fellow in Sudan. One Fellow from Zimbabwe developed a biomedical curriculum which aims to improve the health workforce.

For the full summary of the Out of Africa Fellowship projects and status, please see Annex 2.

### 3.3 Work Package 6: Emergency Response (Covid-19)

TIBA's WP6, Emergency Response, is led by Prof Mark Woolhouse and Prof George Warimwe (KEMRI-WT, Kenya). This WP is designed to enhance local capacity to respond to health emergencies in all nine African partner countries by supporting the development of field diagnostics, data sharing, and performing real-time genomic analyses.

Historically, health emergency response has been outsourced in Africa and the TIBA leadership recognised the need for national epidemic response preparedness within Africa and the need to shift the centre of gravity of emergency response to Africa and African leadership. Before 2019 as part of this WP, TIBA was successful in delivering a Real-Time Virus Genome Sequencing workshop held in Accra, Ghana in December 2018 as part of WP3. TIBA funded three additional RIPs to sit within WP6 that focused on genomics sequencing and epidemiology of different viruses.<sup>2</sup>

Several TIBA partners (Botswana, South Africa, Edinburgh, Rwanda and Tanzania) are taking an eHealth approach to improving outbreak surveillance by optimising technologies (e.g. smart phones), surveillance system design and data communication and storage capabilities. This can be seen in the partner countries' MaD projects and through the DS projects. TIBA also has a substantial bioinformatics capacity (Edinburgh Genomics, Kwazulu-Natal) and phyloanalytics capability, allowing the programme to generate policy-relevant outputs in real time.

The global pandemic caused by the SARS-CoV-2 virus (hereafter referred to as Covid-19), presented an unexpected opportunity for TIBA to put WP6 to the test in a real world situation. It was an event where the skills that TIBA had been developing across different partner countries and institutions were needed and brought to the forefront. TIBA offered training, supported the OAF Fellows, and provided support to TIBA researchers and scientists who were responding to the Covid-19 pandemic in situ. As a result, several TIBA partner countries have done their first ever genome sequencing. This can be seen in Rwanda, where TIBA Rwanda led the country's genome sequencing of the Covid-19 virus. This in turn enabled Rwanda to sequence viruses locally for the first time<sup>3</sup> and is an excellent example of TIBA increasing a partner's local capacity. Other TIBA partner countries who were supported in Covid-19 genomic sequencing include Botswana, Ghana, Kenya and Sudan.<sup>4</sup> The Covid-19 sequencing outputs, which combined total

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<sup>2</sup> These projects are: **Botswana** - The use of the Minlon real time genomics sequencer for the epidemiology and investigation of rota virus outbreaks - post vaccine introduction - Botswana Case study. This project is being led by Dr M. Matsheka of the Botswana Institute for Technology Research and Innovation (BITRI). **Rwanda** - The epidemiology of Measles virus genotypes associated with outbreaks in Rwanda. This work is led by Ms Mukantwari Enatha of the Rwanda Biomedical Center, National Reference Laboratory Division. **Kenya** on characterising the endemicity and disease burden of Chikungunya virus infection. This project is being led by Prof George Warimwe of the KEMRI-Wellcome Trust Research Programme.

<sup>3</sup> NIHR, "GHR Impact Case Study," 02 August 2021, TIBA supplied document.

<sup>4</sup> Ibid; and also TIBA Covid-19 Activities, accessed 15 November 2021, <https://tiba-partnership.org/covid-19-activities>.

1,745 sequences, from the four TIBA partner institutions are feeding into national government policies and approaches to managing their response to the pandemic.<sup>5</sup> In addition, policy briefs were developed for Ghana, Kenya and Zimbabwe.<sup>6</sup>

A large part of TIBA's work in responding to the Covid-19 pandemic focused on capacity building through a variety of initiatives and activities:

- **Workshops:** A genome sequencing workshop and a virtual consultative workshop on strengthening research ethics for Covid-19 in Africa.
- Questionnaire on capacity for Covid-19 response. TIBA interrogated partner country's and their ability to mobilize students to respond to the pandemic.
- Research and publications:
  - Research and publication of an open-access paper in the BMJ Global Health journal on the provision of oxygen in Sub-Saharan Africa to fight Covid-19.<sup>7</sup>
  - Another published paper focused on recruiting students for the Covid-19 pandemic response.
- The TIBA Covid-19 Pandemic Response Unit published:
  - A comparative analysis of Covid-19 mitigation measures in TIBA countries.
  - Data sources for national Covid-19 responses in the WHO African Region.

TIBA provided epidemiological and data support to the Directorate of the World Health Organization (WHO) Africa Regional office and produced weekly updated Situation Reports, a Testing Report, two Mitigation Reports, and three Covid-19 genome reports. The work TIBA did for WHO Africa was recognized by the supranational organisation in press releases, which acknowledged the contributions of key TIBA researchers by name. These include Professor Francisca Mutapi, Professor in Global Health Infection and Immunity at the University of Edinburgh, and Professor Mark Woolhouse, Professor in infectious disease epidemiology at the University of Edinburgh, who took part in several press conferences.<sup>8</sup>

At the project level, Covid-19 negatively impacted on other WPs and projects to a certain extent. While TIBA leadership was expecting to suffer big delays or lose projects, this did not occur from Covid-19. TIBA leadership stated that when conducting routine reporting with projects, the impact of the pandemic was reported to be minor. However, a desk based review of the documentation for this EPR showed that all MaD projects reported negative impacts from the pandemic on their originally planned activities. DS and OAFs also reported that Covid-19 negatively impacted their work. This took the form of delays to project activities (MaD UoE and MaD KEMRI-Wellcome Trust) and in some cases prohibited projects from completion of analysis and reporting of results (MaD Uganda, MaD University of KwaZulu-Natal). The DS project in Zimbabwe was particularly affected by the pandemic. The project's OAF Fellow was unable to travel to receive specialised training in R script coding.

<sup>5</sup> NIHR, "2021 Interim Annual Report-TIBA," TIBA supplied document.

<sup>6</sup> TIBA, 2020. Policy Brief: Strengthening the COVID-19 Response in Zimbabwe: COVID-19 diagnosis in Frontline Health Workers. [online] Available at: <https://covid.kemri-wellcome.org/policy-briefs/> and also at Kemri Wellcome Trust. 2021. Policy Briefs: COVID-19. [online] Available at: <https://covid.kemri-wellcome.org/policy-briefs/>.

<sup>7</sup> Stein F, Perry M, Banda G, *et al* Oxygen provision to fight COVID-19 in sub-Saharan Africa, *BMJ Global Health* 2020; 5:e002786. <https://gh.bmj.com/content/5/6/e002786>.

<sup>8</sup> World Health Organization (WHO), Regional Office for Africa, "Opening statement, Covid-19 press conference," 14 January 2021, <https://www.afro.who.int/regional-director/speeches-messages/opening-statement-covid-19-press-conference-14-january-2021>, accessed 16 November 2021.

WHO Regional Office for Africa, "Social, environmental factors seen behind Africa's low Covid-19 cases," 24 September 2020, <https://www.afro.who.int/pt/node/13395>, accessed 16 November 2021.

WHO Regional Office for Africa, "Africa Covid-19 cases top 3 million, first wave peak surpassed," 14 January 2021, <https://www.afro.who.int/news/africa-covid-19-cases-top-3-million-first-wave-peak-surpassed>, accessed 16 November 2021.

### 3.4 Work Package 6: Data Science

The DS projects are a part of WP6 and are designed to enhance local capacity to respond to health emergencies in all nine African partner countries, by supporting the development of field diagnostics, data sharing, and performing real-time genomic analyses. As part of this WP, the TIBA directorate released a call in March 2020 to fund data science projects that would meet the following aims:

1. Identify the strengths and weaknesses in TIBA’s capacity to manage data (information) as a contribution towards improving national health systems;
2. Build data science and e-health capacity across TIBA partnerships; and
3. Strengthen partner capacity to engage in what is known as the “4<sup>th</sup> Industrial revolution,” where the automation, generation and analysis of big data is very significant.

TIBA provided £20k of funding for nine projects which were required to address two or more of the following outputs:

- Improved (quantifiable) capacity in data science and data management in TIBA partner institutes.
- Enabled research capabilities because of improved data science application within already ongoing TIBA projects or TIBA case study of proof of principal study.
- Improved (quantifiable) e-health, big data generation/management and/or data science in the context of the TIBA partner’s country.
- Detailed survey of the TIBA partner’s national stakeholder’s strengths, weaknesses and needs in health data collection or management.

In their call for proposal, TIBA leadership asked proposals to address relevant activities proposed by partners which are responding to a specified need in-country, in-institute or global needs. They requested that proposals that followed on to address data issues from previous work/ asked for proposals that linked to other TIBA activities, with the intervention being designed and directed entirely by the partner country. It recommended that learnings from other countries be considered. This ensured a coherent and relevant portfolio of projects funded by TIBA. Five of the funded DS projects were linked to RIP studies or other TIBA funded work. Two TIBA partner countries who were awarded funding are not included in this EPR report and analysis: Kenya never carried out their funded project activities and South Africa has not submitted a project report at the time of this writing.

A full summary of the DS projects is provided in Annex 3, with an overview provided in Table 5 below.

*Table 5 TIBA Data Science Projects*

	Title of Data Science Project	Principle Investigator	Lead Institution and Country; partner countries
1	Botswana - Identifying strengths and weaknesses in capacity to manage data	Prof. Nthabiseng A. Phaladze	University of Botswana (UB); with Botswana Institute of Technology Research and Innovation (BITRI); with the Neglected Tropical Disease (NTD) Unit of the Ministry of Health and Wellness

	Title of Data Science Project	Principle Investigator	Lead Institution and Country; partner countries
2	Ghana - Building the capacity of local TIBA partners for ethical use of data and big data management and analysis	Samuel Kojo Kwofie, PhD	Bioinformatics Coordinator West African Centre for Cell Biology of Infectious Pathogens (WACCBIP), Department of Biochemistry, Cell and Molecular Biology, College of Basic and Applied Sciences, University of Ghana, Accra, Ghana
3	Rwanda - A Big data platform for strengthening malaria surveillance program in Rwanda	Dr. Nadine Rujeni	School of ICT, College of Science and Technology, University of Rwanda; with Rwanda Information Society Authority (RISA)
4	Sudan - Strengthening data management and analysis	Professor Maowia M. Mukhtar	Bioscience Research Institute, Ibn Sina University
5	Tanzania - Improving Lymphatic Filariasis morbidity mapping and provision of care in Rural Tanzania using Mobile Communication Technology in Tanzania	Paul Kazyoba, PhD	National Institute for Medical Research (NIMR)
6	Uganda - Capacity building and infrastructural development for improved trypanosomiasis and other diseases data management	Ian Calvin Waiswa	Coordinating Office for the Control of Trypanosomiasis in Uganda
7	Zimbabwe - Situational Analysis of data science and data management capacity among TIBA Projects in Zimbabwe and other research projects being conducted at the Faculty of Medicine and Health Sciences	Dr. Shingirai M Chiwambutsa	University of Zimbabwe

### 3.5 Ghana Project Case Study

The evaluation team selected one TIBA country for deeper analysis via a short case study. After discussions with the TIBA team, Ghana was selected as it provided useful insight for all WPs and due to the important role Ghana is expected to play in TIBA 2. The team conducted several interviews with the Ghana project team and undertook observations in the research facilities.

#### Working Towards Achieving Intended Outcomes

Throughout the project delivery, the Ghana team communicated research findings with wider stakeholders, with a view to enhancing the African evidence base:

- Briefings on genome sequencing and COVID-19 data shared with the Ghana Health Service and Ministry of Health;
- Providing feedback to sample communities via *Community Diagnose* platform;
- Writing academic research papers for publication in scientific and medical journals;
- Radio and TV engagement for broader public dissemination, particularly in relation to COVID-19 updates.

#### Improving Capacity

The Ghana team have undertaken multiple activities to strengthen the capacity of African health care institutions and professionals, both within Ghana and internationally:

- Trained African researchers and institutions from 13 countries on genome sequencing and how to analyse the data;
- Collaborated with Kintampo Health Research Centre and trained their staff on genome sequencing and other scientific methods;
- Trained nurses, biomedical scientists, and medical laboratory scientists on improving diagnostics, and how to handle and score samples;
- Designed a tool to aid scientists handle and count parasites which has been shared with other countries to use;
- Supported PhD students and Post-doctoral fellows to travel for training in Edinburgh;
- Provided infrastructural and institutional capacity to the Biochemistry and Molecular Biology department of UG by resourcing the biomedical laboratory with equipment, supported the institution to develop tools and trained scientists.

#### Influencing Health Policy

In terms of the health policy outcomes in Ghana, it remains too early to tell what impact the TIBA projects have had, but two key results have been achieved which indicate likely policy change in the future:

1. The TIBA Programme conducted a study on non-falciparum malaria parasite to see its effect on causing malaria. This research has triggered the Ghana Health Service and Malaria control program to test two drugs in clearing the pathogens.
2. TIBA has supported malaria vaccine development by identifying new vaccine targets in the parasite. This also has the potential to inform policy when these vaccine targets are met.

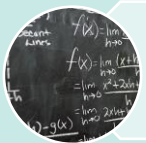


## Response to Covid-19

The Ghana project reported that COVID-19 presented several challenges, but also provided opportunities which may not have been available in a business as usual scenario.

Opportunities	Challenges
<p>The genome sequencing protocol design by TIBA for Malaria was redesigned for COVID-19, and was reportedly highly effective. This demonstrates the project's sustainability, highlighting how key knowledge and skills gained through TIBA are transferrable.</p>	<p>Supply chains were disrupted and the Ghana team reported significant delays in procuring reagents and equipment from the UK. To mitigate this, the team began to procure supplies directly from the manufacturers to minimise the links in the supply chain.</p>
<p>The pandemic served as an opportunity for scientists to operationalise and test the genome sequencing capacity received from TIBA before the outbreak in a real-world, emergency response scenario. This also enhanced the team's engagement and credibility with relevant government stakeholders.</p>	<p>Travel disruptions: several planned activities included local and international travel for in person engagement and training, but these activities were cancelled or postponed due to COVID-19. The Ghana team has now leveraged their existing results to secure additional funding to reinstate several of these activities.</p>

## Project Sustainability



Built both institutional and human capacity through training of more people, empowering more scientists, creating more networks, developing new collaborations, and identifying more donors to raise funds for future activities.



Making use of the TIBA findings to leverage and seek further funding. As a result of this approach, the centre had some complementary projects with the University of Colombia in US, to keep the centre moving forward after TIBA.



TIBA's *Community Diagnose* approach created the opportunity to continue work with sample sites in volta and central regions of Ghana to collect samples for the centre. These sample sites are still functioning and will continue to function beyond TIBA.



The scientists from the 13 countries who received training in genome sequencing will continue to use the skill in their various countries as a form of sustaining TIBA.

## 4 Findings

### 4.1 Relevance

**EQ 1: To what extent have TIBA projects – and the TIBA programme as a whole - correctly and appropriately addressed the identified problems and needs?**

As articulated in the Theory of Change, one of the ways in which TIBA achieves its impact is by increasing the knowledge, skills, technology and networks of African researchers (Outcome 2). The activities from the WPs reviewed for this EPR show outputs that are relevant to the objective of increasing knowledge. This can be seen explicitly with the OAFs and through the provision of training, expert guidance and mentoring, and peer review that the Fellows received during their projects. The projects within the OAFs sought to strengthen local research capabilities, based on identified needs and driven by an understanding of the local context. At the individual level (i.e. for each Fellow), the OAF enabled researchers to identify and address their “individual and common needs” and tailor their training to strengthen their individual capacity to operate in the health system and meet broader institutional and TIBA goals.<sup>9</sup>

The TIBA portfolio of work reviewed in this report represents a relevant body of work, where each WP and the projects within it actively seeks to identify and address problems and needs, driven by localised assessments of health issues and priorities. TIBA leadership ensured a robust approach to project selection, as evident in the Calls for Proposals for the MaD and DS projects. These two projects presented calls that encouraged PIs and their teams to create interventions that were based on addressing local and/or national needs. Similarly, the DS projects were implemented in response to the perceived need to strengthen data science knowledge and skills within the TIBA cohort. This need was identified in the learning from the RIPs and provides further evidence of the TIBA directorate appropriately addressing and responding to identified needs and problems.

In the RIP interviews, one area identified by all interviewees was in data reporting and monitoring and evaluation (M&E) training. A request for “baseline parameters and indicators to measure project success” was reported in the EPR survey. Within the OAF portfolio of work, one Fellow noted that “Data sharing was a challenge as some individuals and institutions were not willing to give out data. The M&E framework for the project were not applied from start. This presented a gap and provided constraint towards desired performance. Ensure that M&E tools are mastered before embarking on the project and also provide a budget for M&E integration in the project.”

There is evidence from the OAF reports that Fellows participated in a three-day M&E workshop hosted by NIRAS LTS, which shows TIBA leadership correctly addressing and responding to the TIBA cohort’s needs.

Alternative needs as identified by the TIBA cohort in their reporting show that many OAF Fellows found the one-year timeframe too short to complete all their activities. For the MaD projects, one PI identified the need for more programmatic resources, such as better vehicles to travel to communities. Improving communication between PIs who were undertaking multi-country work was another need the evaluation team identified from the reporting of both MaD and OAF projects. These findings will be explored more in Section 5, Lessons Learned.

**EQ 2: (How) has TIBA been able to respond to the shifting context and needs identified during the programme period, most notably in relation to Covid-19?**

TIBA leadership was well prepared to respond to the pandemic and put WP6 into action effectively, as evidenced by the activities and outputs undertaken and highlighted in Section 3.3. This was due to the design of WP6 and the vision the TIBA directorate had for it when it was created before the pandemic. The TIBA programme demonstrated foresight and understanding of global and national healthcare needs by incorporating a WP on emergency response.

<sup>9</sup> TIBA, “Out of Africa Fellowship Projects Synthesis Report,” November 2020, page 7. TIBA supplied document.

TIBA recognised that health issues were treated in isolation and, in times of crisis, a government's Ministry of Health were typically left to respond to the crisis.

*Interviewee A: "We knew we needed analytics and genome sequencing [in TIBA partner countries]. We knew that we wanted to do [this] through WP6 because those things [analytics and genome sequencing] were important but outsourced from Africa, and we wanted to transfer those [skills] to Africa. As it happened, we got an event where those skills were needed and brought it to the forefront. Covid-19 provided that opportunity and it was an opportunity...we had already planned for."*

TIBA offered training, supported the OAFs, and provided support to TIBA researchers and scientists who were responding to the Covid-19 pandemic in situ. This is evidenced by the TIBA Directorate meeting minutes which show TIBA's Covid-19 preparedness activities and TIBA's leadership response and coordination of outputs.<sup>10</sup> As a result, several TIBA partner countries have done their first ever genome sequencing. The TIBA PIs within these partner countries have now become appointees on Covid-19 task forces to advise governments.<sup>11</sup> In many cases, as highlighted by the Ghana Case Study, the support on vaccine development and genome sequencing already provided to TIBA projects prior to Covid-19 was effectively reoriented to supporting Covid-19 responses, providing a compelling example as to why such activities were relevant for TIBA's objectives. The success of TIBA in the Emergency Response work is strong evidence that the activities chosen were relevant for the TIBA objectives. Also of note was TIBA's ability to quickly and efficiently disseminate this WP's results online and through publications.

**Relevance Conclusion:** Based on the activities reviewed by the evaluation team in the context of TIBA's outcomes and impacts, and the practical, real-time application of the emergency response preparedness support, the evaluation team finds TIBA's activity selection and design to be highly relevant to the programme objectives. Each WP provided a complementary schedule of activities which were well designed to contribute to greater overall outcomes. Of note, the ability of the TIBA projects to quickly and effectively adapt their activities to combat Covid-19 should be highlighted and demonstrates the real need for greater pandemic or epidemic response knowledge and skills in the TIBA countries. Where needs were identified within the TIBA projects during implementation they were often responded to, such as the provision of M&E training. However, there remain opportunities to enhance TIBA's design for Phase 2, including extending WP timelines, facilitating cross-border communication and increasing procurement budgets.

## 4.2 Coherence

**EQ 3: Are TIBA activities internally coherent? i.e. TIBA's constituent parts align well with programme objectives and are complementary in terms of focus.**

The interventions from the WP2 (MaD) and WP6 (DS) projects are a coherent body of work, where each align with at least one of TIBA's focus areas and aims (and in some cases, more than one). Both the MaD and DS portfolio of work build upon the RIPs and, in many cases, established additional partnerships. This leads to TIBA funded researchers and scientists being able to utilise a greater degree of trust amongst partners and with communities or stakeholders.

This coherence can be seen in TIBA's Calls for Proposals in both MaD and DS, where TIBA leadership asked for proposals to address relevant activities proposed by partners to respond to specific needs in-country, in-institute or global needs. For the DS projects, it was requested that proposals addressed data issues identified in the RIP and linked to other TIBA activities, with the intervention being designed and directed entirely by the partner country. It

<sup>10</sup> NIHR, "TIBA 2020 Annual Report," pages 83 and 95. TIBA supplied document.

<sup>11</sup> Interviewee C.

recommended that learnings from other countries be considered. This ensured a coherent and relevant portfolio of projects funded by TIBA.

WP4 (OAF) provides training and skills to the next generation of scientists, and directly addresses TIBA's Outcome 2, "African researchers have new knowledge, skills, technology and networks." Additionally, many of the OAF projects were directly linked to other projects, either a RIP or MaD project, enabling application of knowledge gained under WP4. Overall, the design of the WPs and the projects reviewed are complementary to TIBA's aims and objectives and seem to be designed with coherence in mind. However, evidence from the survey suggests that coherence on a micro-level, specifically in terms of multi-country collaboration between TIBA institutions, did not always occur as expected. This is explored further in the findings on efficiency below.

**EQ 4: Are TIBA activities externally coherent? i.e. they align well with other TIBA-like interventions being delivered at that level, adding maximum value and avoiding duplication.**

There is evidence to suggest that TIBA is synergistic with national and supranational interventions. This can be seen through the Covid-19 response work, other institutions TIBA has partnered with in the MaD, DS and OAF projects, and how those partnerships were designed. The outputs generated for WHO Africa from the Covid-19 response work demonstrate that TIBA is aligned with external needs and activities. The press releases from WHO Africa show that through these outputs, TIBA contributed to deeper investigations to help WHO Africa fully understand the epidemiological implications of the virus.<sup>12</sup> The work can also be seen as contributing to WHO Africa's support to African countries to scale up public health response.<sup>13</sup>

TIBA partnerships within the MaD, DS and OAF projects show project activities and outputs that are aligned with other funders, such as the Wellcome Trust, and also TIBA partner country governments.<sup>14</sup> Furthermore, some of the OAF Fellows reported that they applied and received funding, or identified other funding sources, from other institutions that aligned with their research projects in order to continue their work. Critically, many of the Fellows are continuing at the institutions where they have established partnerships.

*Interviewee B: "There has been local retention of all of them [the OAF Fellows] going back to research and teaching junior colleagues about the expertise they've gained from their Fellowship. There's a tendency that Fellows might move on to other institutions but this is an example of where, because these institutions are still interested in the issues, they've retained the Fellows who can now continue supporting them with the knowledge and skills they've acquired."*

These partnerships demonstrate how TIBA collaborated with other national and international actors with similar objectives. Overall, it can be seen that TIBA identified its place within the wider sector and cooperated with existing institutions and players in the health research and scientific community to add value and increase capacity of African researchers and institutions. The evaluation team found no evidence of significant challenges in collaboration with non-TIBA institutions or that the TIBA funded activities crowded out local actors – indeed, for the latter, TIBA actively crowded local actors in, empowering them to conduct research for locally identified health needs.

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<sup>12</sup> WHO Regional Office for Africa, "Opening statement, Covid-19 press conference," 14 January 2021, <https://www.afro.who.int/regional-director/speeches-messages/opening-statement-covid-19-press-conference-14-january-2021>, accessed 16 November 2021. And WHO Regional Office for Africa, "Africa Covid-19 Cases top 3 million."

<sup>13</sup> TIBA, "Covid-19 Activities," <https://tiba-partnership.org/covid-19-activities>.

<sup>14</sup> For example, the MaD project in Ghana and Kenya partnered with the KEMRI-Wellcome Trust. The Botswana Data Science project partnered with the Neglected Tropical Disease Unit of the Botswana Ministry of Health and Wellness. The Uganda Data Science project was led by a PI in the Coordinating Office for the Control of Trypanosomiasis. For OAF projects, notable examples include the Uganda OAF study, which partnered with Avia-GIS and Botswana, who partnered with the Botswana Institute for Technology Research and Innovation.

**Coherence Conclusion:** Overall, the TIBA programme appears to be both internally and externally coherent. The WP design has been completed in a manner to ensure complementarity between the TIBA activities and to encourage collaboration between participating organisations. TIBA has demonstrated a good ability to develop and maintain effective partnerships with other actors working in the sector, and should be credited for designing activities led by localised needs and gaps to mitigate risks of overlapping activities with other actors.

### 4.3 Efficiency

**EQ 5: How efficient is the TIBA partnership, including its management systems and processes, as a mechanism to support health policy and health system change through targeted research and capacity development?**

In terms of process efficiency, there is evidence from the NIHR TIBA 2020 Annual Report (AR) to suggest that the TIBA directorate actively sought to reduce reporting requirements and develop ways of working within TIBA that minimized the administrative burden on partners. However, the AR acknowledged that “reporting requirements remain onerous and this is likely to be an issue in the final phases of the programme...”.<sup>15</sup> Out of the project reports reviewed for this EPR, the burden on reporting is only mentioned in the South Africa MaD project, whose PI stated it was difficult to collate and combine the separate reports from the other project country PIs into one report document, particularly as there was missing data in some partner reports. This points to a need for TIBA leadership to continue to standardise reporting requirements across partners, as discussed more in Section 6.

Many OAF Fellows reported that the one-year timeframe was not sufficient to complete their research projects. While the OAF projects were designed to be completed within a year, most of the OAFs were unable to meet this goal. The Covid-19 pandemic was a factor outside TIBA’s control that contributed to this, but not all OAF Fellows reporting this issue linked it to the pandemic, which indicates a broader need for additional time in these types of activities.

When asked about challenges, 100% of TIBA colleague respondents said “**Covid-19**” either had a “significant” or “very significant” impact on their projects. “**Time related pressures**” were also significant and very significant to 33% and 11% of the respondents, respectively. This was also reported for “**lack of capacity**” being a significant challenge on projects for 33% of respondents, and a very significant challenge for 11% of the TIBA cohort respondents. Finally, a “**lack of internal engagement**” was reported again by TIBA colleagues to be either very significant (22%) or significant (11%). “**Lack of external engagement**” was only reported by 11% as being significant to their project.

A lack of internal engagement was also found in the South Africa MaD project. This project was multi-partner, working across the TIBA partners of South Africa, Tanzania, Zimbabwe and Rwanda. The report feedback pointed to ineffective project coordination between the partners, resulting in a poor collation and dissemination of project results. Similarly, the OAF Fellow from South Africa working on the related research on schistosomiasis, reported a lack of internal engagement and cooperation from TIBA Uganda, who reportedly did not prioritise the work and which resulted in Uganda not being included in the study. While TIBA leadership is known for giving a lot of autonomy to PI and TIBA country leaders, this could signal a need for the TIBA directorate to facilitate cross-PI and cross-partner country working and structure collaboration in a more formal way. This could look like more clearly defined roles and remits for multiple PIs or multi-TIBA countries in Calls for Proposal, or more structured reporting requirements.

Encouragingly, 100% of respondents agreed that **working with TIBA programme staff was efficient**. This is further echoed by the Zimbabwe MaD project, which stated that the project had sufficient budget and project expenditures were well coordinated through the University of Edinburgh, who negotiated better prices and higher quality products than what was obtainable in other markets. One project-level interviewee stated that working with TIBA programme

<sup>15</sup> NIHR, “TIBA 2020 Annual Report,” page 6. TIBA supplied document.

staff was “wonderful” due to its “coordination, transparency and promotion of local leadership...Professor Mark gave a lot of authority to the leadership within the country and that has worked wonderfully.”<sup>16</sup>

Figure 1 Survey Results for Working with TIBA Programme Staff

### 18. Working with the TIBA programme staff was efficient.

[More Details](#)

● Agree	9
● Slightly Agree	0
● Not applicable	0
● Slightly Disagree	0
● Disagree	0



Further insight into programme efficiency can be seen through the citation analysis done as part of the EPR, presented in Box 1, TIBA Citation Analysis. The citation analysis highlights the reach of TIBA via its published outputs, with some papers being viewed thousands of times. From a knowledge and communications perspective, publishing open-access papers provides a highly efficient approach for disseminating key research findings to a wide and interested audience.

**Efficiency Conclusion:** TIBA performed within expectations in terms of efficiency, although Covid-19 contributed to certain time efficiency challenges. Overall, based on the data reviewed, TIBA projects were largely able to complete activities on time and within budget, although it should be noted some costs were reallocated due to Covid-19 delays for which the projects are now seeking additional funding. Notably, respondents positively identified efficiency within working with the central TIBA programme team, which further demonstrates contribution towards TIBA’s objective of moving the centre of gravity for African health research to Africa, with the programme team playing a support and facilitation role rather than an overly administrative or bureaucratic one. The most significant challenge identified was in multi-country collaboration and communication, which indicates that efficiency can decline as projects seek broader, regional focuses and remits.

#### 4.4 Effectiveness

**EQ 6: Has TIBA met its aim to deliver world-class multi-disciplinary research that explores and draws lessons from the ways that different African health systems tackle infectious diseases?**

The Covid-19 response work best exemplifies how TIBA delivered high quality, multi-disciplinary research that explores and learns from other African health systems.<sup>17</sup> The TIBA directorate deployed a questionnaire to interrogate partner countries’ capacity to respond to Covid-19 and their ability to mobilise students. Throughout the pandemic in 2020 and into 2021, TIBA has published comprehensive research, including an open-access paper in the BMJ Global Health journal on the provision of oxygen in Sub-Saharan Africa to fight Covid-19.<sup>18</sup> Additionally, the TIBA Covid-19 Pandemic Response Unit published a comparative analysis of Covid-19 mitigation measures in TIBA countries and data sources for national Covid-19 responses in the WHO African Region. TIBA provided epidemiological and data support to the

<sup>16</sup> Interviewee D.

<sup>17</sup> For the purposes of this review, the term “world class” has not been assessed.

<sup>18</sup> Stein F, Perry M, Banda G, *et al*, “Oxygen provision to fight COVID-19 in sub-Saharan Africa.” <https://gh.bmj.com/content/5/6/e002786>.

Directorate of the WHO Africa Regional office and produced numerous weekly updated Situation Reports, a Testing Report, two Mitigation Reports, and three Covid-19 genome reports. Professor Francisca Mutapi and Professor Mark Woolhouse took part in several press conferences and their work was cited in several press releases.<sup>19</sup>

The OAF projects were designed to deliver multi-disciplinary research by providing a conducive environment of mentoring, upskilling and opportunities to publish. However, most of the OAF project reports reviewed for this EPR stated manuscripts were still in preparation, or that research was not yet completed. While Covid-19 negatively impacted the OAF projects by delaying work, this should not have impacted on Fellows' ability to publish in the long term, as all OAF projects were able to resume their research. There seems to be a more general difficulty in producing published research from this WP project.<sup>20</sup> This is recognised by TIBA leadership, who have found that "more deliberate efforts are needed to assess challenges currently facing these researchers and address them. Solutions may be individual based where training and other technical support is required, or organizational where strategies to create more opportunities to publish will be needed."<sup>21</sup> As many Fellows stated that the one year timeframe was not sufficient to complete their research, one organisational adjustment could be to extend the Fellowship length, which could then incorporate more concerted support and mentoring for Fellows to publish.

Other noteworthy evidence of multi-disciplinary work can be found in the DS projects. The Botswana DS project was a collaboration between the Computer Science Department and Faculty of Health Sciences and Faculty of Medicine and the University of Botswana, and brought in diverse experts to contribute to and lead high quality research and training on data science within the University of Botswana. Non-academic collaboration occurred with the Ministry of Health and Wellness Neglected Tropical Diseases Unit and also the WHO country office. When considering the entirety of the TIBA programme and research produced, the citation analysis highlights how published articles attributed to TIBA funding trends upwards over time: 33% of 2018 articles identified TIBA as a partner or funder; 50% in 2019; 57% in 2020; and 61% in 2021. This is an important trend, highlighting the growing body of academic literature published by over the course of the programme which identifies TIBA as a key player.

When asked about **accessibility of their outputs**, 22% of respondents in the EPR survey stated that their outputs were not accessible to people or organisations outside of their networks. As discussed in Section 5, Lessons Learned, communicating results and increasing accessibility and synthesis of outputs is an area where TIBA can improve upon.

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<sup>19</sup> World Health Organization, "Opening statement, Covid-19 press conference." WHO, "Social, environmental factors seen behind Africa's low Covid-19 cases." WHO, "Africa Covid-19 cases top 3 million, first wave peak surpassed."

<sup>20</sup> TIBA, "Out of Africa Synthesis Report," page 8.

<sup>21</sup> Ibid.



### Box 1 TIBA Citation Analysis<sup>22</sup>

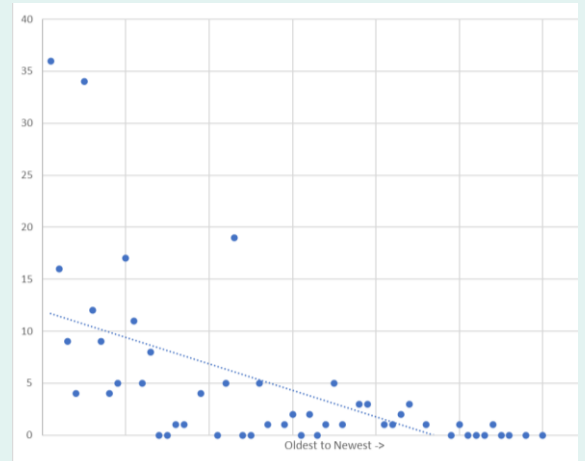
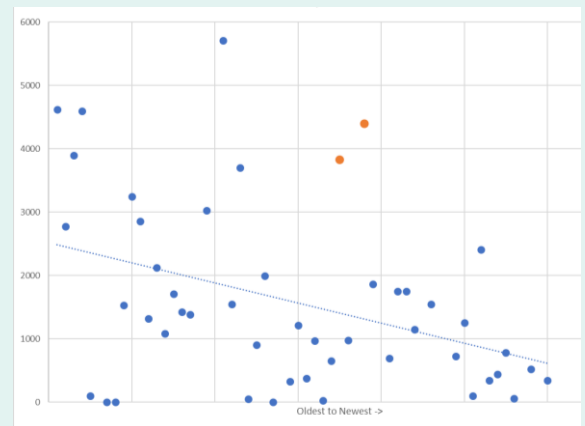
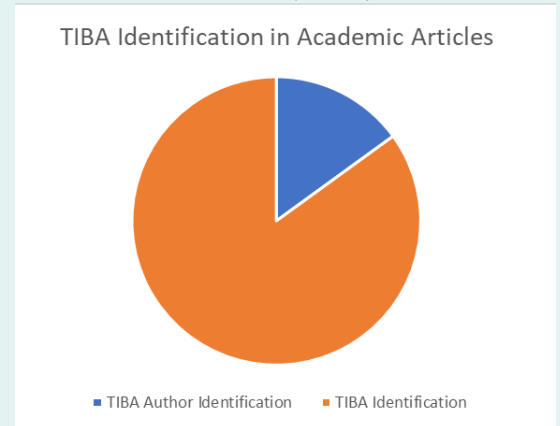
The evaluation team sampled 60 journals produced by the TIBA projects or co-authored by TIBA participants between 2018 and 2021. For ten of these articles, metrics on article views and citations were unavailable publicly.

The first assessment conducted was to establish whether the articles identified TIBA as a core funder or partner in the development of the article or underlying research. Overall, a majority of articles (85%) identify TIBA either by name or reference to the grant number, with a subset of around 18% identifying TIBA with the article text directly. The remaining articles (15%) reviewed identified TIBA in the author identification notes only. For the latter, often these articles do not expressly discuss or acknowledge research funders, which may account for the lack of TIBA identification.

The second assessment looked at article citations and views or downloads. The first graph charts the number of views per article, from oldest to most recent. In general, older articles have been viewed more than recent articles, in line with expectations. Outliers at the more recent end of the data are typically articles relating to Covid-19 where engagement has been significantly higher (see orange markers representing articles on Covid-19 published in Q4 2020). For the articles with zero views, these have been included as metrics were available for citations, but not for article views.

For article citations, the results follow a largely similar trend. On average, the sampled articles had 4.68 citations each, but around 30% of the articles sampled with available metrics had no citations listed. In addition, there appears to be limited correlation between the number of views and the number of citations. This is within expectations as an article subject matter would typically be the driver for citation rather than its number of readers.

In general, articles which promoted, explored or described new tools for analysing or combatting infectious diseases were cited more frequently than those which presented the results of specific case studies. In terms of subject matter, articles published on schistosomiasis and/or schistosomes were cited most frequently, but the analysis is not statistically significant.



<sup>22</sup> Graphics from top to bottom: Box Figure 1 Proportion of Sampled Articles Identifying TIBA as a Funder; Box Figure 2 Views per Article; Box Figure 3 Citations per Article.



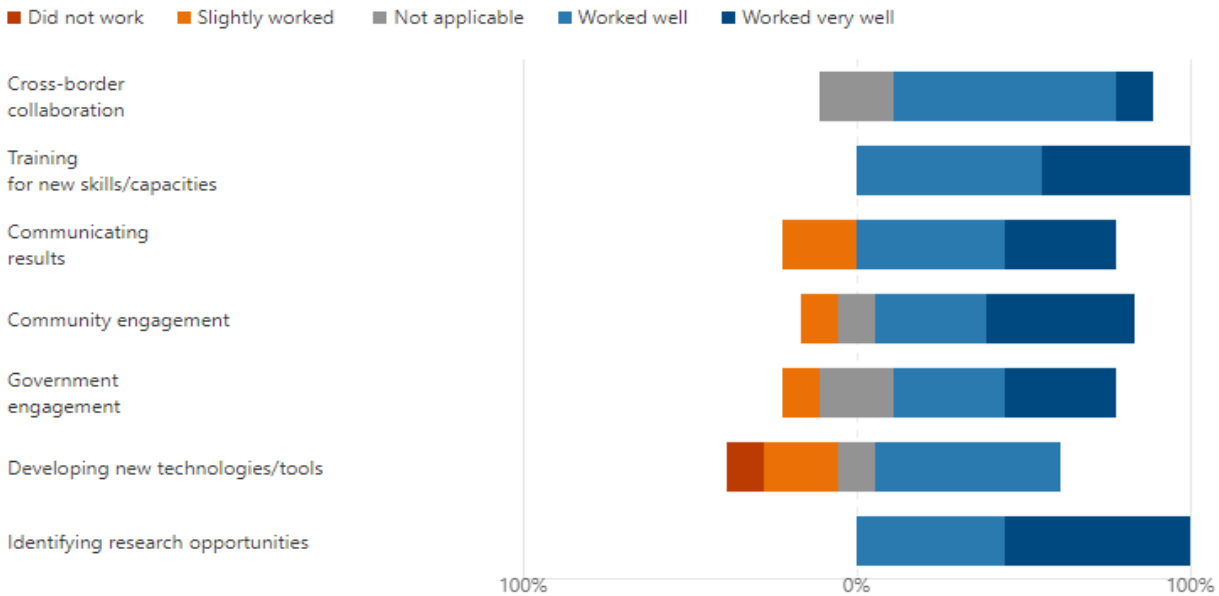
**EQ 7: How has TIBA been able to enhance the capacity of African researchers and research institutions in target countries and beyond?**

There is plausible evidence that all four WPs reviewed for the EPR have enhanced the capacity of African researchers and institutions through their interventions, to varying degrees. The EPR survey found that 100% of respondents agreed that their projects contributed to TIBA programme level Outcomes 1, 2 and 5.<sup>23</sup> In terms of their career, 89% of TIBA colleague respondents stated that they “strongly agreed” or “agreed” that the programme impacted their career in a positive way. In terms of what worked well with projects, “communicating new results” only worked slightly well for 22% of the respondents. Similarly, “engaging in the community” and “with government” only worked slightly well for 11% of respondents. “Developing new technologies/tools” did not work for 11% of the respondents.

Figure 2 EPR Survey Results for which Elements of TIBA Worked Well

**7. To what extent do you feel these aspects of your project have worked?**

[More Details](#)



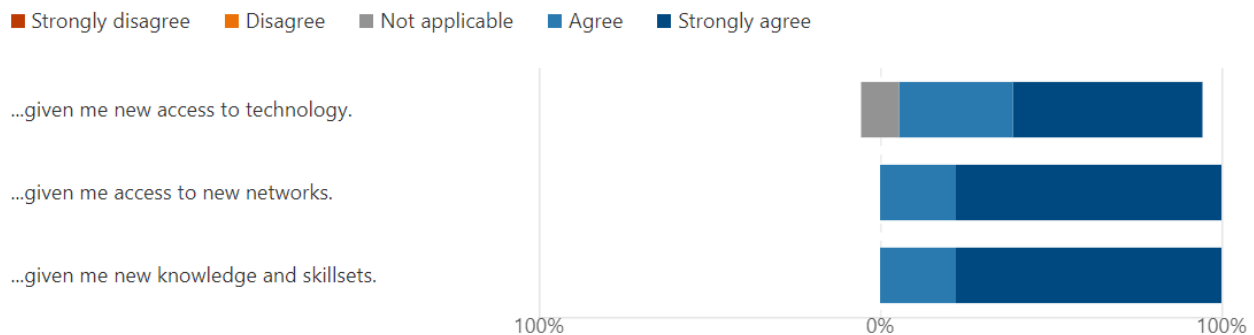
The EPR survey further shows that most survey respondents felt that their involvement with TIBA gave them new access to technology, networks, knowledge and skillsets, per Figure 3 below.

Figure 3 Survey Results on Benefits for TIBA Participants

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### 13. My involvement in TIBA has...

[More Details](#)



As discussed above, the COVID-19 work critically served to strengthen regional capacity of TIBA partners by providing resources and skills to conduct genome sequencing.<sup>24</sup> This TIBA-facilitated capacity has been nationalised with additional government/stakeholder funding in some countries leaving a legacy for future national responses to disease outbreaks and epidemics.<sup>25</sup>

The OAF projects show a significant contribution in terms of enriching local capacity to conduct research. All eleven Fellows were provided with funds to advance their research and they were mentored by senior researchers from Africa and Edinburgh, who gave hands-on training and individual career development.

The DS projects actively enhanced and built-up capacity through its body of work. This work shows clear ways in which projects have strengthened and improved health systems in targeted countries and has increased partner countries' abilities to work with big data, either through buying hardware for computation and storage or computer programmes, or by helping switch to eHealth platforms for field collection. A notable example is the DS project from the University of Botswana, which created a secure eHealth platform to collect, monitor and report on NTD<sup>26</sup> data that is interoperable with the Ministry of Health and Wellness and enables them to have active surveillance for NTDs in Botswana. The platform supports a secure mobile application that was developed and installed on 16 tablet devices to capture and track data in the field on different NTDs.

The MaD projects further demonstrate TIBA's ability to enhance the capacity of African research institutions and researchers. Within the MaD portfolio of work, the UoE-led MaD project developed microarray peptide chips to diagnosis endemic and epidemic diseases in three partner countries. The Uganda-led MaD project examined carriers of African trypanosomiasis in human and animal populations and utilised a novel diagnostic strategy supported by real-time Polymerase Chain Reaction (PCR) for identifying carriers. The project is exploring the use of Mini-PCR in the field for fast feedback of results. The MaD projects also exemplify good practice in community and stakeholder engagement, which all projects cited as a factor in achieving results or being able to conduct their research, as explored in Box 2 below.

TIBA Leadership recognised the need to improve TIBA partner institution's ability to conduct Community Engagement and Involvement (CEI) for identification of research project topics (co-creation), dissemination, translation into policy

<sup>24</sup> Rusakaniko, S., Makanga, M., Ota, M., Bockarie, M., Banda, G., Okeibunor, J., Mutapi, F., Tumusiime, P., Nyirenda, T., Kirigia, J. and Nabyonga-Orem, J., 2019. Strengthening national health research systems in the WHO African Region – progress towards universal health coverage. *Globalization and Health*, [online] 15(1). Available at <<https://globalizationandhealth.biomedcentral.com/articles/10.1186/s12992-019-0492-8#citeas>>

<sup>25</sup> NIHR, "2021 Interim Annual Report," page 4.

<sup>26</sup> Neglected tropical diseases, such as such as schistosomiasis, malaria, trypanosomiasis and lymphatic filariasis.

and practice, knowledge uptake and implementation. An internal TIBA cohort survey found that TIBA partners needed training on reporting and capturing essential data on the following:<sup>27</sup>

1. Nature of structures established,
2. Numbers of communities reached in given periods,
3. Inventory of community needs/challenges/aspirations,
4. Numbers of communities trained to ensure valuable participation and
5. Budgets allocated to communities for project related activities.

TIBA organised a 3-day CEI workshop in April 2021, which benefitted over 30 people across the partnership. The workshop aimed to provide a forum for TIBA partners to share processes and outcomes of CEI activities and learn from each other. The main outcomes of the workshop were capacity strengthening through enhanced CEI skills for participants, and policy and/or practice outcomes through developing a comprehensive implementation plans for CEI activities linked to in-country projects for the remaining period of the project, focusing on dissemination of research outputs and knowledge uptake.<sup>28</sup>

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<sup>27</sup> TIBA supplied document, "Global Impact Acceleration Written Report for Grant Holders," page 1.

<sup>28</sup> NIHR, "2021 Interim Annual Report," page 3.

## Box 2 Making a Difference: Engagement and Creating Buy-in for Stakeholders and Communities

All MaD projects participated in stakeholder and community engagement, as all of the projects studied human or animal populations. All four projects reported that the ability to engage and create buy-in from stakeholders or community members was essential for their projects to achieve its aims.

The Ghana and Kenya-led project found that recognition and participation of all relevant stakeholders at the beginning and throughout a project was critical to the project's adoption and success, for involving community members in the study. The researchers worked with regional, district and local community health directors and workers, to organise meetings that provided basic education on malaria and the study. At these meetings the community members were able to see malaria parasites under the microscope. The PIs reported that in doing so, this ensured the community owned the research and they willingly participated in the project by providing blood samples. The project found that involvement of the community "plays an essential role in bridging the gap between science, its output, and the final consumer" and that community-oriented research is more successful.

All participating countries in the University of KwaZulu-Natal, South Africa-led project conducted policy stakeholder mapping at the local, district, regional and national levels. The MaD project reports that South Africa was able to present the findings from their research to the South African government, who as a result included under-five year old children in the Mass Drug Administration strategy document that is currently being produced. Also essential to this MaD project's work was engaging communities across the four partner countries in this project. In Zimbabwe successful project activities took place due to the project engaging with the Permanent Secretary of Health and Child Care, who then communicated the project activities to all provinces and districts, allowing the project access to communities. The project reports that schistosomiasis education and awareness efforts were a success due to the mobilisation of school principals and teachers, caregivers, community leaders and local authorities, and "allowing community leaders to take the lead in education" of schistosomiasis.

Similarly, the Uganda-led project that studied Trypanosomiasis found that creating buy-in and giving agency to community members as a part of their research was essential for the project's success. The project actively sought to involve the community, who were given detailed explanations from the operations team of the project and how it was going to benefit them. The community was also given ways to participate in the project through mobilisation, spraying of cattle and sharing information in the localities.

Another successful community and stakeholder engagement strategy was experienced by the UoE-led project. The project team was invited to speak on a popular radio channel in Accra, Ghana, *Starr FM*, where the team explained to the public why a febrile child needs to be taken to the hospital for proper diagnosis and treatment. The project team also explained the causes of fever and the implications of self-medication. The project reported that community members called in to ask questions and that "...the responses to their questions and feedback from the listeners was very encouraging."

**EQ 8: To what extent has TIBA been able to translate and synthesise TIBA knowledge and innovations into accessible formats to facilitate uptake and influence among decision-makers at national, regional, continental and/or global scales? & (how) has this led to strengthened and improved health systems in target countries and beyond?**

The Covid-19 work exemplifies TIBA's ability to translate, synthesise and influence decision-makers at all levels. This work developed and enabled genome sequencing capacity in Ghana, Kenya, Rwanda and Zimbabwe, and produced

academic literature and policy-oriented outputs. Ghana, Kenya<sup>29</sup> and Zimbabwe<sup>30</sup> developed policy briefs from their work that have influenced TIBA partner countries national policies on Covid-19 response.<sup>31</sup> Uptake by governments can be seen in Ghana, where the government gave additional funding to the University of Ghana to continue viral sequencing.<sup>32</sup>

Critically, the Covid-19 response work also gave TIBA the opportunity to translate their research into accessible formats to facilitate uptake and influence decision makers. This is seen in the published work for WHO Africa, including "Covid-19 mitigation policies by governments and changes in behaviour across WHO Africa Region," which created a new data set recording government mitigation responses to Covid-19 for WHO Africa Region.<sup>33</sup> There is currently an active production of Covid-19 weekly status reports for the WHO Africa.

Across the portfolios of work, there are a few projects that are likely to influence policy by the design of having a government ministry or office as a partner:

- The MaD project led by the KEMRI-Wellcome Trust and WACCBIP directly responded to the Covid-19 work and was able to produce the Covid-19 policy brief for the Ghana Health Service. In Kenya, the MaD project benefited from KEMRI-Wellcome Trust RP Programme-wide framework for community engagement, which targets the local Kilifi community, public health stakeholders and county health team. By design the project was embedded within the larger malaria research work at KWTRP, which in turn has close working links with the Ministry of Health in Kenya, and the National Malaria Control Programme.
- Botswana DS project featured a partnership between the University of Botswana and the Botswana Institute for Technology Research and Innovation (BITRI), and the Neglected Tropical Disease (NTD) Unit of the Botswana Ministry of Health and Wellness.
- Rwanda DS project partnered with the government body, the Rwanda Information Society Authority (RISA), and developed a platform to host all malaria related datasets and query them using the dashboards that can be shared to decision makers at national level and the external stakeholders.

Within the MaD portfolio of work, all of the projects reported on the potential to influence policy through close connections with ministry or government offices (UoE-led MaD and South Africa-led MaD), or through the formulation of policy documents (MaD Uganda and MaD Ghana/Kenya). Many of the OAF Fellows also reported that their projects had the "potential" to influence policy. OAF Tanzania Fellow reported that they had been "working very closely with the National Neglected Tropical Diseases Control Programme." This project is connected with the MaD South Africa-led project. However, the TIBA produced OAF Synthesis Report has found the following: <sup>34</sup>

*"Judging from the eleven studies under review, deliberate efforts are needed to strategize and build the capacity of African researchers to influence policy and practice. This involves learning different ways to disseminate research findings beyond the traditional workshops, policy briefs and publications. This starts with theorizing impact and mapping stakeholder, then strategies how, when and where to disseminate which information and what needs to be done in short, medium and longer terms."*

<sup>29</sup> NIHR, "GHR Impact Case Study."

<sup>30</sup> TIBA, 2020. Policy Brief: Strengthening the COVID-19 Response in Zimbabwe: COVID-19 diagnosis in Frontline Health Workers. [online] Available at: <https://tiba-partnership.org/tiba/sites/sbsweb2.bio.ed.ac.uk.tiba/files/pdf/TIBA%20%20Zimbabwe%20Policy%20Brief.pdf> and also at Kemri Wellcome Trust. 2021. Policy Briefs: COVID-19. [online] Available at: <<https://covid.kemri-wellcome.org/policy-briefs/>

<sup>31</sup> NIHR, "GHR Impact Case Study."

<sup>32</sup> Interviewee B.

<sup>33</sup> TIBA, "Covid-19 mitigation policies by governments and changes in behaviour across WHO Africa Region," 08 October 2020, <https://tiba-partnership.org/tiba/sites/sbsweb2.bio.ed.ac.uk.tiba/files/pdf/COVID-19%20mitigation%20policies%20by%20governments%20and%20changes%20in%20behaviour%20across%20WHO%20Africa%20Region.pdf>.

<sup>34</sup> TIBA, "Out of Africa Synthesis Report," page 8.

The DS projects show clear ways in which projects have strengthened and improved health systems in targeted countries and has increased partner countries' abilities to transform and synthesis data into findings, thereby allowing TIBA knowledge to be translated into accessible formats. A notable example of facilitating uptake with decision makers is Uganda's DS project, which responded to emerging health needs by developing Covid-19 Standard Operating Procedures for the Ministry of Health. The DS projects are explored more in Box 3 below.

While there is clear evidence of translating TIBA work into policy outputs regarding the Covid-19 response work, the evaluation team was unable to verify the outcomes or impacts of policy documents of the other WPs for their intended audiences. However, barring the Covid-19 work where governments responded swiftly, policy change takes time. Tracking the influence, uptake and impact of TIBA produced or influenced policy could be a subject for exploration for TIBA 2 through ex-post studies, and project teams should be encouraged to maintain momentum in promoting policy changes with their respective governments.

### Box 3 Effectiveness in Action: TIBA's Data Science projects

Big data can be a problem in the research, scientific and health communities. Many of the TIBA partner countries are awash in data from their projects, but as one project reported, "there are few specialised people in data science and data management" which leads to poor research outputs due to poor data management and data analysis. Furthermore, data is often collected and then siloed into datasets which are not interoperable, making extraction, querying, and analysis of data difficult for researchers and scientists to translate into impactful findings.

TIBA's DS projects are an excellent example of TIBA increasing the capacity of African researchers to translate and synthesise TIBA-funded knowledge and innovations and then transform them into accessible formats to facilitate uptake and influence among decision-makers. The Botswana DS project funded customization of an Open Source software (REDCap) to support data management activities for an NTD study. This project developed an eHealth platform for data capturing and monitoring of NTDs and has been piloted in a district in Botswana. The success of the pilot has led to a roll out of the platform to other districts in Botswana to enable the Ministry of Health and Wellness to have active surveillance for all NTDs in Botswana and guidance for elimination efforts.

The Rwanda DS project was linked to the Rwanda RI project on the evaluation of mixed malaria infections and developing a responsive surveillance of malaria in Rwanda. Where before malaria data was stored in different datasets, the Rwanda DS project created an interoperable platform for the malaria data collected by Community Health Workers (CHWs). The platform hosts all malaria related dataset and can be queried for the analysis. Sharing the data analysis through dashboards can be done with decision makers at national level and the external stakeholders. The project report states that due to the project activities and upgraded capabilities of tracking and recording malaria data in the field via mobile phones, Rwanda Biomedical Center (RBC) has started testing and adjusting malaria control indicators and integrating them in malaria prevention and control systems.

Similarly, the Tanzania DS project also used new technologies gained to shift from paper data collection in the field, to mobile phone collection. This enabled faster data collection, analysis and timely decision-making. The Tanzania DS project was integrated with the current institutional mechanisms put in place by Ministry of Health, as part of the comprehensive Health Management Information System of National NTD programme.

EQ 10: How has TIBA ensured African leadership, and what role has this played in achieving the TIBA objectives?

EQ 12: To what extent has TIBA been successful in shifting the centre of gravity of health research for Africa to institutions in Africa?

TIBA has ensured African leadership through its model, which prioritises work that is Africa-led, collaborative, inclusive and equitable. TIBA's model allows PIs and researchers to identify local needs and design projects and research based on needs identified by African researchers and leadership. The portfolio of projects in the WPs reviewed for this EPR

are found to be addressing or aligned with one or more TIBAs core aims, as stipulated by their respective Calls for Proposals.

The OAF represents how TIBA is ensuring the continuation of this leadership, by building and mentoring the next generation of African scientists and researchers. The intent of the OAF was to fund projects to address a current knowledge gap resulting from either non-deployment of diagnostics or interventions, or a lack of operational knowledge to improve the health of affected populations.<sup>35</sup> The Fellowships promoted projects that used multiple PIs to enable multidisciplinary and collaborative health research. It also allowed local PIs to develop research studies based on local needs and allowed the Fellows to learn from Senior Researchers who understood the local context. Co-PIs from UoE provided technical support to Fellows and local researchers that identified their needs in their proposals.

*Interviewee B: "TIBA spent 80% of funds in Africa. We need to shift from post-colonial thinking to allow local teams to identify the needs and the funding, and then empowering them to do that, which TIBA has done. TIBA is a step towards decolonising the mind and research."*

There is evidence to suggest that TIBA has been successful in contributing to shifting the centre of gravity of health research for Africa to institutions in Africa. For the Covid-19 emergency response work, by building capacity for genome sequencing through this WP, TIBA has contributed to shifting the centre of gravity of health research for Africa to institutions in Africa. The portfolio of projects across the RIPs, MaD, OAF and DS were identified by local scientists based on what is needed in their countries. The standard paradigm is for donors, typically from the North, to drive the identification and creation of research and projects in the global South. As one programme-level TIBA member stated, "There is a transition where African research is done by external funders, but ultimately those are not African-led. Other [institutions] have not been tremendously successful at succession planning and handing over to African scientists. We've [TIBA] have shown what you can do when you're using a different model."<sup>36</sup> TIBA's model to enable and transfer ownership to the local setting and to local scientists is instrumental to the success of their model and represents a shift from post-colonial thinking.

**Effectiveness Conclusion:** Based on the data reviewed, the TIBA programme largely achieved its intended outputs within the lifetime of the programme. While adaptations to certain activities had to be made to account for the Covid-19 situation, the evaluation team finds those made to be reasonable and to have continued to contribute to output achievement. The level of ambition set in terms of outputs appears appropriate and, as discussed further below, the causal links from these outputs to outcomes remain viable. TIBA has demonstrated particular effectiveness in terms of capacity building, increasing the availability of African-led health research and, as a result, ensuring African leadership in this space. An important conclusion which can be drawn from TIBA is that developing research based on localised needs, working with local researchers and ensuring strong local partnerships are all key to ensuring increased buy-in and engagement, promoting wider interest and securing access to important networks, all of which are important precursors for achieving wider impact and sustainability in terms of policy influence and shifting the centre of gravity for health research to Africa. It should be acknowledged that TIBA experienced several challenges in terms of delivery effectiveness, such as multi-country communication and community engagement difficulties, but where appropriate the TIBA leadership has demonstrated an ability to respond to these challenges and provide additional support where required (i.e. the CEI training). Overall, the evaluation team finds that TIBA has been delivered effectively but would note that the transition to a hub-and-spoke model in TIBA 2 (requiring greater multi-country collaboration) limits how well this can be used as an indicator to predict effectiveness in TIBA 2.

<sup>35</sup> TIBA, "Out of Africa Synthesis Report," page 1.

<sup>36</sup> Interviewee A.

## 4.5 Sustainability

EQ 13: How, when, and under what conditions will the insights and outcomes delivered through the TIBA Partnership be replicated, continued or scaled up after the end of the programme?

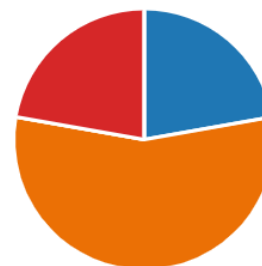
The TIBA directorates' application for NIHR funding of TIBA 2 provides an opportunity to continue and scale up areas of work and activities completed in TIBA I. The survey provides insight into perceptions of the TIBA cohort itself on the sustainability of their TIBA funded work. Over half of survey respondents, or 56%, found that the results of their projects were only "somewhat sustainable without further support". A further 22% stated that their projects were "somewhat unsustainable without further support."

Figure 4 Survey Results on TIBA Project Sustainability Perceptions

### 12. How sustainable do you believe the results of your project are?

[More Details](#)

● Highly sustainable without fur...	2
● Somewhat sustainable withou...	5
● Don't know	0
● Somewhat unsustainable with...	2
● Unsustainable without further ...	0



A strong sustainability achievement of TIBA is the related grant funding generated in support of TIBA-connected research and other capacity building projects. In addition, TIBA collaborators in Botswana, Ghana and Kenya leveraged £9,912,772.96 in additional funding up to 2024 from the Rockefeller Foundation, FCDO, the Wellcome Trust, the World Bank, and the Bill and Melinda Gates Foundation, to support their global health research, training capacity and COVID-19 research.<sup>37</sup>

As one TIBA programme-level interviewee stated, sustainability is broader than receiving monetary funding. TIBA has invested in not only resources but also in people by building South-South collaborations and acting as a catalyst for training and enhancing capacity on the ground.<sup>38</sup> In doing so, TIBA has ensured a measure of sustainability by virtue of the collaborations, relationships and knowledge built and which remain within TIBA partner countries and institutions. Of note, 100% of OAF Fellows were retained at their respective institutions following the completion of their projects. The Ghana case study highlights how new skills and technology gained through TIBA can have wider applications and lead to further cross-country collaborations. Of note, the *Community Diagnose* platform established by the Ghana team has ensured continued community engagement and data generation beyond the conclusion of the Ghana projects, demonstrating the value of consistent community engagement in sustaining such health research. Several challenges to sustainability were also noted during the EPR. First, the availability of research funding for African-led health research is reportedly limited at this stage, which reduces the possibility to sustain projects or conduct follow on research. Secondly, projects noted that while TIBA had enhanced knowledge and provided capacity for health researchers, there are limited local opportunities to apply such skills at this time and expertise attrition was noted as a challenge by some projects, including Ghana.

<sup>37</sup> TIBA supplied document, Related Funding (Cumulative), accessed 18 January 2022.

<sup>38</sup> Interviewee B.



**Sustainability Conclusion:** Due to the pending TIBA 2 application, it is somewhat challenging to draw a conclusion on TIBA’s sustainability as the programme may largely sustain itself with a second phase. That said, the evidence indicates many of TIBA’s results, particularly regarding capacity development and the production of publicly accessible, high quality research, will have sustainable outcomes beyond the lifetime of TIBA. While challenges have been noted in relation to sustainability, these are principally related to the availability of research funding which TIBA has limited opportunities to address directly.

#### 4.6 Impact and Testing the Theory of Change

EQ 9: How has TIBA become greater as a programme whole than the sum of its project parts, and what role has this played in achieving the TIBA objectives?  
 EQ 11: To what extent is TIBA likely to achieve its intended outcome and thus contribute to the overall impact aim? i.e. stimulating positive health outcomes for TIBA’s target populations & have there been any unintended effects, either positive or negative?

To enable TIBA to determine to what extent it has achieved (or is on track to achieve) the changes summarised in the Table 6, the evaluation team has sampled indicators at the outcome and outputs levels, per the table below. This EPR focuses on indicators developed with the theory of change that pertain to the manuscript and article publications, presentations, media engagement and TIBA programme activities. The indicators have been selected for being able to tell a meaningful contribution story for the programme since the MTR. In addition, testing the theory of change will help to answer EQs 9 and 11, which focus on Impact.

Table 6 TIBA Contribution to Outcome Level Change Hypotheses

ToC pathway	Outcomes	Contribution Hypothesis
Enhanced research capacity pathway	1. African researchers contribute to the academic evidence base on African health systems & infectious diseases.	By developing a body of high-quality, multi-disciplinary research which is accessible to research communities, particularly in Africa, TIBA has contributed to a greater academic evidence base on health systems and infectious diseases to be utilised by policymakers or other African health researchers.
	2. African researchers have new knowledge, skills, technology and networks.	By delivering high-quality capacity-building initiatives and facilitating access to new technologies and networks for TIBA researchers, TIBA has developed African capacities in terms of knowledge, skills, technology and networks.
Research Into Use pathway	5. Healthcare professionals / policymakers / communities do things differently (better).	By generating relevant, African-led research and knowledge, TIBA outputs have informed national, regional or international level health policies, practices and investments.

In order to assess contribution of TIBA’s impact as stated in the theory of change, the evaluation team adopted “Process Tracing Evidential Tests.” These tests examine the evidence provided and test them against the definitions as described in the table below, to determine how credible the evidence is and how confident we are in attributing contribution to change for TIBA.

Table 7 Process Tracing Evidential Tests

Evidential Test	Definition	Meaning
<b>Straw in the wind</b>	Evidence is supportive but is insufficient to decisively prove or disprove a hypothesis.	A sky piece – belongs to the puzzle but doesn't contain sufficient detail to confirm what the picture is.
<b>Hoop</b>	Evidence proves a necessary condition for the hypothesis to be confirmed, but is insufficient in itself.	An edge piece – necessary to complete the puzzle but does not confirm what the picture is.
<b>Smoking gun</b>	Highly persuasive evidence which can confirm hypothesis but which does not eliminate other hypotheses.	A text piece – provides a clear image of part of the puzzle but leaves the full picture open to interpretation.
<b>Doubly decisive</b>	Confirms the hypothesis as correct and eliminates all other hypotheses.	The puzzle box itself – confirms exactly what the picture is, leaving no room for doubt.

Each piece of evidence gathered in relation to one or more of the contribution hypotheses has been subject to these tests to demonstrate its strength and quality. A majority of evidence gathered passed the hoop test, demonstrating necessary conditions for the hypothesis to hold true, with some smoking gun evidence also identified. Due to the nature of the outcomes targeted by TIBA which are expected to be contributed to by TIBA activities but not solely attributable to them, the doubly decisive test was not relevant for this review. After testing the evidence, the evaluation team considered all relevant evidence for each contribution hypothesis to provide an assessment of confidence in its accuracy. This confidence assessment was based on the strength of evidence (i.e. which evidential tests it satisfied) and triangulation of the evidence (i.e. whether corroborative evidence could be found from multiple sources). The below table summarises the confidence ratings awarded with respect to these assessments. Note that for triangulation of evidence, a cumulative strength of evidence allowance was made with a two to one ratio (i.e. two pieces of straw in the wind evidence could be used to triangulate one piece of hoop evidence).

Table 8 Confidence in Contribution Ratings

	Triangulation ->		
Strength of evidence (cumulative)	Single evidence (1)	At least one piece of triangulated evidence (2-3)	Multiple pieces of triangulated evidence (4+)
Straw in the wind	Very low confidence – not included in findings	Low confidence – not included in findings	Medium confidence – included in findings, with alternate explanations explored
Hoop	Low confidence – not included in findings	Medium confidence – included in findings, with alternate explanations explored	High confidence – included in findings, with dissenting evidence noted
Smoking gun	Medium confidence – included in findings, with alternate explanations explored	High confidence – included in findings, with dissenting evidence noted	Very high confidence – included in findings

Based on these assessments, a summary of the contribution by each reviewed workstream to the selected outcomes is provided below. This chapter further explores the evidence which informed these assessments, and provides an overall summary assessment per outcome during its conclusion.

Table 9 Summary of Confidence in Contribution to Outcomes by WPs

	MAD	OOA	WP6 Emergency Response	Data Science
Outcome 1	High confidence in contribution	Medium confidence in contribution	High confidence in contribution	Low confidence in contribution
Outcome 2	High confidence in contribution	High confidence in contribution	Very high confidence in contribution	High confidence in contribution
Outcome 5	Medium confidence in contribution	Low confidence in contribution	High confidence in contribution	High confidence in contribution

#### 4.6.1 Making a Difference

**Outcome 1:** This EPR analysed the submitted MaD reports to find evidence that the four projects contributed to positive change and impact via the two Pathways to Impact identified in the TIBA Theory of Change, “Enhanced research capacity” and the “Research into use” pathway. However, the strength of the evidence and the type differs within each MaD project, and also from the participating country partners within a project. **All four MAD projects produced articles that were published in scientific journals, with a majority of those journals being open access, the primary authors being African scientists,** and full citations provided for journal articles. The articles produced focused on health systems and infectious diseases, and evidence of their use has been found in the citation analysis. **The MAD publications sampled had, notably, also been cited in research for infectious diseases outside of Africa,** in Asia and on a global scale. Based on this evidence, there is high confidence that the MAD WP contributed to Outcome 1.

**Outcome 2:** All four MaD projects reported on conducting a variety of capacity building and training workshops for their projects to impact Outcome 2, “African researchers have new knowledge, skills, technology and networks”. Across the portfolio, these trainings included training of post-graduates, undergraduates, research assistants, health workers and laboratory staff. Only the Uganda-led project provided pictures of their capacity building workshops. In addition, all four MaD projects reported on how their project provided new skills or knowledge to either the project team or beneficiaries of targeted capacity building sessions.

Not all projects required the introduction of new technologies, but a notable example from the MaD project portfolio includes **the UoE-led project, which developed 6 multiplex peptide microarray chips.** All partner countries were reported to have received their country specific microarray chips produced by PEPperPRINT and Innoscan710 scanners were installed at two partner institutions. There is also evidence of the acquisition of new technology for two of the projects, the Ghana/Kenya project with the new library of novel malaria antigens.

All four MaD projects reported on their collaborations and new networks they formed with partner institutions. For some, such as the Ghana/Kenya MaD project, **the partner institutions enabled local collaborations with government and also NGOs,** such as the Christian Health Services Association of Ghana. All four MaD projects also reported attending conferences and other stakeholder meetings to share their findings, which will have also enabled them to form new networks and provide an opportunity to possibly influence policy or health systems. By sharing their work across different forums, this also gives confirmation evidence of the skills and knowledge gained from their projects. Overall the evidence provided gives high confidence that the MaD projects contributed to Outcome 2.

**Outcome 5:** For the “Research into use” pathway, all four projects reported on some level strategic policy engagement with health or government officials. The MaD UoE-led project reported that while they didn’t create a specific policy strategy as part of their project, the structure of the project ensured stakeholder buy-in and policy influencing. The project held several meetings with the infectious and non-infectious diseases directorate in the Ministry of Health Sudan, Ghana Health Service, NMRL Zimbabwe and that these institutions were the main focal contact to this project. The project’s structure also lends itself to policy influence, as it was embedded within the larger malaria research work at the Kenya Medical Research Institute (KEMRI) - Wellcome Trust Research Programme (KWTRP), which in turn has close working links with the Ministry of Health in Kenya, and the National Malaria Control Programme.

The University of KwaZulu-Natal led project reported that each participating country was able to engage with the various stakeholders to argue for inclusion of PSAC in treatment programs. However, the projects could only make recommendations, which were reported to have been well received by officials. **South Africa partners in the project reported that its work was able to influence the South African government to include under-fives in the Mass Drug Administration strategy document**, although this cannot be verified by the evaluators. Uganda was able to provide evidence of policy engagement through pictures of a meeting and delivery of a policy brief to government officials.

Overall, the MaD projects evidence several necessary criteria of influencing policy or practice change – such as providing policy oriented outputs to appropriate stakeholders and engaging them directly – but there is insufficient evidence at the time of this review to determine whether such changes have been realised. While many MaD projects reported on policy influence at national, regional, and district levels, it remains to be seen if health care officials are doing things differently due to the MaD project’s activities. As such, the evaluation team can only provide medium confidence in the accuracy of the contribution hypothesis, acknowledging that subsequent policy change could also be driven by factors outside the TIBA outputs. Based on evidence reviewed and an assessment of the assumptions underpinning this hypothesis, it can be argued that such changes may be expected in the future, but that there has been insufficient time for this outcome to be realised. As discussed in Section 6, the evaluation team recommends that if TIBA 2 is funded, then a concerted effort should be made to study the impact of policy outputs produced and that continued efforts should be made to drive prospective policy changes advocated for under TIBA.

#### 4.6.2 Out of Africa

**Outcome 1:** Out of the eleven OAF Fellows, only two (Tanzania and Zimbabwe) reported on contributing to research as a part of their Fellowship. This “hoop” level evidence provides medium confidence that the OAF Fellows who published research contributed to Outcome 1, but a majority of the publications noted are still to be published and the evaluation team could not include them in the citation analysis to verify whether they have been accessed or used.

Many of the OAF Fellows stated that a manuscript was “in preparation” and it was acknowledged by the TIBA directorate that “not all projects could be implemented fully”.<sup>39</sup> The evaluation team recognise that the aim of the OAF is not primarily to contribute to Outcome 1 through publication of research. Instead, the Fellowship aims to address knowledge gaps in one or more of the diverse challenges within health care systems in Africa through mentorship and training of Fellows to conduct research. The OAF Fellows were supported to actively engage in research that was aimed at improving health systems, with a focus on addressing issues related to diagnosis, treatment and surveillance of NTDs (Rwanda, Ghana, Botswana, Zimbabwe and Tanzania). Other Fellows conducted research to address medical products, technologies and information (Kenya, Uganda, and Sudan). As identified by the OAF Synthesis Report, **promoting interdisciplinary research and training the skills required to conduct interdisciplinary research is an area TIBA could strengthen for the OAF Fellows**.<sup>40</sup> The evaluation team anticipates that confidence in this hypothesis may change with time as more OAF manuscripts are completed and has reflected this in the assessment, currently finding medium confidence that the OAFs have contributed to the achievement of Outcome 1.

**Outcome 2:** By design of this WP, the OAF primarily contributes to Outcome 2, “African researchers have new knowledge, skills, technology and networks”. Each Fellow participated in at least one capacity building component:

- **Botswana:** training in molecular biology techniques, immunology and bioinformatics skills.
- **Kenya:** training in health systems and policy research.
- **Ghana:** skills in rosetting assays, flow cytometry, and genome alignment and comparative genomic analysis.
- **South Africa:** data management, health system policy analysis and health intervention analysis

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<sup>39</sup> TIBA, “Out of Africa Synthesis Report,” page 1.

<sup>40</sup> Ibid, page 3.

- **Sudan:** training on genome analysis.
- **Tanzania:** training how to use multiplex diagnostic tool for peptide chips.
- **Uganda:** training on disease data analysis and modelling tools.
- **Zimbabwe:** one Fellow trained in bioinformatics, another in the CHARl diagnostic tool.

A majority of OAF Fellows reported on the capacity building initiatives they took part in for their own professional development. **Many reported that their time as a Fellow was useful to them and led them to acquire new knowledge and skills.** Additionally, many OAF Fellows delivered training sessions to other researchers and healthcare workers as part of their studies. A notable example includes the OAF in Zimbabwe, Prof. Mduluzo, **who helped develop the CHARl diagnostic screening tool and trained students, community health workers, research assistants, and community members on the use of the tool.** In addition, the Uganda OAF Fellow developed a training manual on spatial epidemiological analysis and delivered training to field staff in health, veterinary and entomology sectors.

**Every OAF Fellow benefited from access to networks.** A notable example includes the OAF Fellow in Botswana, whose partnership at BITRI has benefited from the developed capacity of the OAF Fellow in the laboratory diagnosis of schistosomiasis, PCR protocols, and real-time PCR testing. Most Fellows reported on how the Fellowship enabled them to forge new collaborations with senior researchers, in addition to their new skills. As a result, the evaluation team finds high confidence that the OAF WP contributed to the achievement of Outcome 2 for TIBA.

**Outcome 5:** Most of the OAF Fellowship projects did not provide evidence of influencing policy at any level, save for three projects: Botswana, Tanzania and Uganda. For the OAF Fellow in Botswana, the project had the Ministry of Health and Wellness, and Neglected Tropical Diseases involved by default of the project's design. The Fellow also reported that **the Ministry of Basic Education was supportive in permitting research to be conducted within school districts.** The OAF Fellow in Tanzania reported that the project worked very closely with the National Neglected Tropical Diseases Control Programme at national and district levels, which supported the field work in the study. Reportedly, **the "data generated from the project will be used by the Control Programme for planning and decision making,"<sup>41</sup>** although this has not been verified. In Uganda, the OAF Fellow developed risk maps and a training handbook on Spatial Epidemiologic Research, which have been used by government officials in COCTU and the Department of Entomology of the MAAIF to make "decisions on prioritising areas for tsetse control". The OAF Fellow in Uganda worked directly on the MaD Uganda project which looked at African trypanosomiasis in human and animal populations. The lead institute of this MaD project was the Coordinating Office for the Control of Trypanosomiasis in Uganda (COCTU), within the Ministry of Agriculture, therefore **making it plausible that the work done by the OAF Fellow will influence policy.** Other OAF projects reported that there was potential to influence policy. These include the OAF projects in Kenya, Rwanda, and South Africa. The OAF Fellow in Kenya interacted with the national leadership on HIV and Sexual Transmitted Infections (STIs) and was co-opted as a team member to assist in drafting the 2020-2025 National Strategic Framework on HIV, viral hepatitis and STIs. In Rwanda, the findings of the project were shared with the Management of Malaria and Other Parasitic Disease Division in the Rwanda Biomedical Centre (RBC), the Ministry of Health. In addition, their main audience for this work was the Malaria Programme in Rwanda. The South African OAF Fellow reported that the collaborations and engagements with MDA managers involved in implementation of MDA models.

For the OAFs in Botswana, Tanzania and Uganda which have reportedly contributed to policy and practice change, the evaluation team has found sufficient evidence to support medium confidence that the contribution hypothesis is accurate. However, on aggregate across the WP, the evaluation team finds there is currently low confidence of contribution due to a lack of triangulated evidence. This may change over time, once the OAF manuscripts are

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<sup>41</sup> TIBA Out of Africa project report- Tanzania. TIBA supplied document.

finalised and relevant policy outputs developed to advocate for appropriate change, and once tangible changes in policy or practice among the cooperating national institutions are applied.

#### 4.6.3 Emergency Response

**Outcome 1:** TIBA produced research as part of the Covid-19 emergency response work. This includes an open-access paper in the BMJ Global Health journal on the provision of oxygen in Sub-Saharan Africa to fight Covid-19<sup>42</sup>, and a published paper on recruiting students for the Covid-19 pandemic response in eight African countries<sup>43</sup>. **Both of these papers were authored by researchers from the UoE, and have been extensively accessed and cited by other researchers.** Other research conducted and published under this WP is “A comparative analysis of Covid-19 mitigation measures in TIBA countries, a case for development of multi-dimensional strategies for resource challenged countries,” available on the TIBA website.<sup>44</sup> Additional academic papers on Covid-19 responses in the African context have also received contributions from TIBA researchers.

**For the WHO Africa office, the TIBA directorate published a Covid-19 mitigation report, and three genome sequencing reports.** Currently, the TIBA directorate also publishes weekly Covid-19 situation reports for WHO Africa. Interviews with TIBA programme leadership reported that the WHO Africa office found TIBA’s “work and contribution very helpful.”<sup>45</sup> TIBA leadership and senior researchers have also been positively mentioned in WHO Africa press releases in relation to Covid-19 support.<sup>46</sup> As such, the available evidence provides a high level of confidence that the Covid-19 response aspect of WP6 is contributing to Outcome 1 per the hypothesis.

**Outcome 2:** To date, four TIBA partner institutions in Africa have generated a combined total of 1,745 SARS-CoV2 genome sequences (Botswana 193, Ghana 408, Kenya 856 and Rwanda 288) as a result of TIBA’s genome sequencing capacity building initiative; all these sequences have been uploaded on the Platform GISAID for other researchers to use.<sup>47</sup> In addition, the TIBA directorate hosted workshops to strengthen capacity TIBA partner’s capacity in responding to Covid-19. **Respondents from this projects and project reports have acknowledged that it is in large part thanks to the support provided by TIBA, both before and during the pandemic, that these outputs were achieved.** TIBA’s Covid-19 response work therefore provides “smoking gun” evidence of high confidence that it contributed to Outcome 2.

**Outcome 5:** TIBA leadership has reported that Covid-19 sequencing outputs from TIBA partner institutions in Botswana, Ghana, Kenya and Rwanda have fed into national government policies and approaches to managing their response to the pandemic. While there is evidence that these outputs were produced, it remains to be seen how “Healthcare professionals / policymakers / communities do things differently (better)” due to the outputs of this work but, based on the current evidence, there is high confidence that the Covid-19 response work will contribute to Outcome 5.

#### 4.6.4 Data Science

**Outcome 1:** The DS projects in Botswana, Rwanda, Tanzania, and Zimbabwe also reported to have articles in preparation for publishing in journals, based on the findings of their DS studies. Sudan has finalised two manuscripts and has submitted one for publication. At the time of this writing, no other DS articles have been submitted or have been published yet. **The evaluation team recognise that the core purpose of the DS projects for this WP is to enhance local capacity and build data science knowledge and eHealth management.** Based on the other Outcome 1 pathways,

<sup>42</sup> Stein F, Perry M, Banda G, *et al*, “Oxygen provision to fight COVID-19 in sub-Saharan Africa,” <https://gh.bmj.com/content/5/6/e002786>.

<sup>43</sup> Mkenda V, Woolhouse M, Mutapi F and Banda G. Recruiting students for the COVID-19 emergency response: lessons from eight African countries [version 1; peer review: 1 approved, 1 not approved]. *AAS Open Res* 2020, 3:42, <https://aasopenresearch.org/articles/3-42/v1>.

<sup>44</sup> TIBA, “Covid-19 Mitigation Project Stummary,” <https://tiba-partnership.org/tiba/sites/sbsweb2.bio.ed.ac.uk.tiba/files/pdf/COVID19%20Mitigation%20Project%20Summary.pdf>.

<sup>45</sup> Interviewee A.

<sup>46</sup> World Health Organization, “Opening statement, Covid-19 press conference.” \_ WHO, “Social, environmental factors seen behind Africa’s low Covid-19 cases.” WHO, “Africa Covid-19 cases top 3 million, first wave peak surpassed.”

<sup>47</sup> NIHR, “TIBA 2021 Interim Report,” page 4.



an intention to publish is likely to provide medium confidence of contribution to this Outcome, which can rise to high at a later stage if manuscripts are published.

**Outcome 2:** Out of the portfolio of DS projects, six of seven (Botswana, Ghana, Sudan, Tanzania, Uganda and Zimbabwe) conducted capacity building and training sessions or workshops. These projects reported on training sessions that directly enhanced and upskilled participants in targeted aspects of **data management and knowledge, such as biostatistics, health informatics, data collection in the field, and data monitoring and management.** Participants within these partner countries were from a range of multi-disciplinary professionals, including regional data collectors, researchers and scientists, healthcare workers such as nurses, and community drug distributors. The DS project in Ghana stated that its workshop helped it to “strengthen their networks with local partners.” Additionally, the DS projects gained access to new technologies and networks. **DS projects in Rwanda, Zimbabwe, Uganda, and Sudan used the funding to purchase equipment and software, which then enabled these partner countries to carry out the capacity building work.** The new hardware and training capacity sessions have also enabled these countries to continue their work utilising more advanced data science techniques or systems in the future. As such, there is high confidence that the DS projects contributed to Outcome 2.

**Outcome 5: All but one DS project (Zimbabwe) reported effective engagement with policy makers for their projects.** Zimbabwe’s engagement with the Ministry of Health and Child Care was curtailed by Covid-19, as the officials originally engaged in the project were focussed on responding to the pandemic. The DS projects also illustrate the ways in which the portfolio have informed policy and potentially contributed to Outcome 5. **The structure of the Botswana DS project by design can potentially impact policy at a local, regional and national levels:** one of the project’s partners was the Neglected Tropical Disease Unit of the Ministry of Health and Wellness. The project states that the platform they developed has an “offline functionality feature” and, critically, “is interoperable with other existing systems at the Ministry of Health and Wellness and supports a secure mobile application.”

Likewise, the Sudan DS project has reported on successful engagement and influence of policy makers, as **the project design included engagement and input from the Director of Communicable and Non-communicable Diseases from the Ministry of Health (MoH).** The project developed Risk Maps using ArcGIS to pinpoint disease outbreak hotspots and help predict future outbreaks. These were reported to have been delivered to the Ministry of Health (MoH) in Sudan, to enable decision makers and researchers to utilize the data. Additionally, the Sudan DS report further states that due to their study and the analysis of the data collected during the Ph.D. student project in detection of HRP273 Mutation, “the ministry of health is now conducting a larger study to determine the magnitude of the spread of the HRP2 mutation and its impact on malaria diagnosis using RDT.”

Based on the deep integration of the DS projects within national ministries and health services, and the reported intent to incorporate DS outputs within future policy related activities, the evaluation team has high confidence that the DS outputs can contribute to Outcome 5.

#### 4.6.5 Overall Contribution

Looking across the portfolio of projects, the evidence provided gives high confidence that the TIBA programme as a whole contributed to Outcomes 1 and 2. For Outcome 5, there is medium confidence in contribution. This is due to the fact that outside of the Covid-19 emergency response work, there is limited evidence of actual policy or practice change stemming from TIBA activities. However, there is good evidence that several TIBA projects have fulfilled necessary criteria to inspire such change and it is anticipated that confidence in contribution to this outcome may increase over time as new policy decisions are made and TIBA data is incorporated within national approaches and policies.

*Table 10 TIBA Programme Overall Confidence in Contribution to Outcomes*

TIBA Programme Overall Confidence in Contribution to Outcomes		
Outcome 1	High confidence in contribution	There is good evidence that the MaD and Emergency Response projects have contributed to the achievement of this outcome, and that the OAFs will do so to a greater extent as more of the resulting outputs are published and made available. As such, there is high confidence that TIBA has contributed to the achievement of this Outcome.
Outcome 2	High confidence in contribution	All WPs reviewed in this EPR demonstrate high confidence in contribution to Outcome 2, with the Emergency Response work being a particular standout due to evidence of the practical application of new knowledge, skills and technology provided by TIBA in addressing Covid-19 related needs and challenges.
Outcome 5	Medium confidence in contribution	At this stage, there is evidence that the WPs reviewed are well positioned for and taking appropriate actions to achieve Outcome 5, but there is limited evidence that this Outcome has occurred. As such, the evaluation team has medium confidence that TIBA will contribute to this Outcome overall, acknowledging the challenges of triggering and demonstrating contribution to policy changes. The exception is the Emergency Response work which has already had a tangible impact on national health responses to Covid-19.

## 5 Lessons Learned

The evaluation team has identified lessons learned from the EPR, either through review of the Work Packages or identified by the TIBA cohort through reporting, interviews and the EPR survey.

**Community engagement** and the need and benefit of health research being driven by local needs was highlighted throughout OAF, MaD and DS project reporting as being essential to the project being able to achieve its aims. Both the MaD and DS projects reported on empowering and engaging with local stakeholders, community members and/or local health workers as essential components of “transferring ownership” to local communities or local health officials, and building capacity at the local level. Also noted by members of the TIBA cohort was the need to be sensitive about delivering on what the project team communicated to communities. MaD Uganda reported that the trust from the community waned when the results took too long to come through and “made the community and the leaders uneasy about our engagements.” The importance of community engagement is recognised by TIBA leadership, which can be seen through their activities such as the CEI workshop. As noted in the TIBAll application, the TIBA directorate have incorporated community engagement into TIBA 2’s aims and programmatic design through WP5: “Dissemination, engagement and impact” to ensure they are engaging with communities and the appropriate stakeholders for research and delivery.

**Partnerships with government departments** in projects is a likely strong mechanism for potential policy influence, as noted on page 22. While perhaps not always a necessary, nor always appropriate, partnership for projects, it is an avenue to explore for TIBA 2 when conducting stakeholder mapping and engagement activities for projects.

**Internal communication among the TIBA cohort was found to be another mechanism for success** across the portfolio of projects, or when it was not strong, a hinderance to a few projects. As one interviewee stated, “if the project is to be successful, the communication backbone has to be very strong.”<sup>48</sup> TIBA leadership should continue to strengthen communication and ways of working between PIs and TIBA partner countries, particularly when collaborating on a multi-partner country project. This was identified in the MaD and OAF portfolio of work and was a finding in the EPR survey results: “Partner countries were working in silos and I think partner countries need to work more closely so as to learn from each other. Each country has their own strengths and weaknesses and bringing the partner countries closer together would help in building stronger partnerships and skills.”

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<sup>48</sup> Interviewee D.



As discussed in Section 4.5, some of the challenges experienced in the MaD portfolio of work revolved around communication between TIBA country PIs working on the same project. One of TIBA's programmatic strengths is the autonomy given to TIBA partners but as recognised by TIBA leadership the MaD projects have not "...reached a point where the leader of a MaD [project] can direct what partners do..."<sup>49</sup> There is a need for the TIBA directorate to explore ways in which to set clear roles and ways of working for multi-partner or multi-PI country research, in order to ensure effective collaboration. This could be through clear guidelines in the Calls to Proposals, or a standardised reporting template for multi-country projects.

A commendable action that the TIBA directorate are taking for TIBA 2 is the creation of a TIBA Alumni Network for all former students and fellows, who will have access to participate and contribute to TIBA-wide activities, project meetings and seminar series. As the work done in TIBA is collaborative, this could provide a forum for students to communicate, talk to each other and establish sustainable relationships among themselves.

## 6 Recommendations

Based on the findings generated and lessons extracted above, the evaluation team will make several core recommendations in this section. It should be noted that the evaluation team has had the opportunity to review the application for TIBA 2, submitted to NIHR in 2021. The below recommendations seek to account for this application insofar as is possible to avoid making recommendations related to elements of the programme which are expected to change in TIBA 2.

**Inclusion of embedded monitoring, reporting and learning support.** A common request from TIBA projects throughout TIBA was greater support in monitoring and reporting results effectively to TIBA. Specifically, TIBA projects noted challenges in effectively evidencing outcome or impact level results which they felt their projects had contributed to. While some monitoring and reporting training was carried out in TIBA 1, it is recommended that more embedded support be provided for TIBA 2. In particular, this support should work to establish consistent reporting indicators at the outcome and impact levels for the different TIBA projects, drawing on the data assessment and results categories developed by the NIRAS-LTS evaluation team in 2020, and should socialise these among the hub projects and, ideally, the spoke projects. Early stage engagement, buy-in and integration of these indicators will enable more consistent and reliable programme level reporting.

In addition, it is recommended that training is carried out early in the TIBA 2 programme on two topics: inclusion of verification evidence; and using monitoring data to inform real-time learning. The TIBA 1 projects have demonstrated an understanding of both topics (for example, the COVID-19 adaptations), but there remains room for improvement from a monitoring, evaluation and learning perspective. Regarding the former, the key areas of focus should be demonstrating contribution to complex outcomes such as policy change. While projects could consistently identify where material had been provided to policymakers or where engagement had taken place, there was less consistency in demonstrating how that material had influenced changes in policy and/or official practice. Early training on the types of evidence which could verify these results and be incorporated with project reporting would therefore be beneficial. Regarding real-time learning, the MEL support provided in TIBA 1 primarily focused on improving results reporting and less on self-evaluation, learning, and applying the results in real-time. Training on effective or best practice approaches to extracting project learning on a near real-time basis could allow the projects to respond more nimbly to contextual changes and ensures evidence-based decision making for such project adaptations.

**Explicit exploration of theory of change assumptions.** If the TIBA 2 application is successful, it is strongly recommended that TIBA review the pathways to impact outlined in its theory of change and update them, with

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<sup>49</sup> Interviewee A.

particular consideration paid to the underpinning assumptions. The TIBA 2 application explicitly explores many of these assumptions and the evaluation team has no reason to doubt that they are considered alongside the theory of change, but stating them explicitly and building in periodic review of the assumptions would be beneficial to ensure TIBA 2 is able to meet its objectives or make appropriate adjustments to its theory of change where assumptions do not hold true.

**Develop a platform for wider pan-Africa collaboration on medical research and training.** TIBA has done an excellent job shifting the centre of gravity in African health research to African institutions – the findings above highlight the effective empowerment of these institutions by TIBA. It has also facilitated cross-country collaborations among the TIBA project countries. Such collaborations can be vital in progressing a project: as one interviewee stated, “a sharing of experience between countries helped to troubleshoot some of the issues,” that was experienced on the project. As such, TIBA is arguably in a unique position to establish and facilitate a pan-African platform for further collaboration outside the TIBA project countries. Several projects reported requests for engagement from institutions outside the TIBA ecosystem or instances of where cross-country collaboration was less successful than hoped: the establishment of a collaboration platform could streamline this and further strengthen the South-South partnerships sought by TIBA. Such a platform could include learning or training materials for participants to access, a forum for engagement and questions, a library of TIBA supported research, and communications tools for TIBA projects and other institutions to engage with to reach wider audiences.

**Explore options to address expertise attrition.** Projects noted that attrition of expertise – new graduates and other emerging experts leaving the country due to lack of opportunities in Africa – poses a significant challenge to ensuring sustainable results for TIBA. While it is beyond TIBA’s remit to provide or facilitate employment for PhD graduates or other health experts involved in TIBA training, there may be some actions TIBA can take given its position to mitigate this challenge. The first is seeking to crowd in additional funders for further research related to the TIBA projects. TIBA 1 and its projects have already had some success in this regard (see the Ghana case study) but further facilitation of additional funding, leveraging TIBA’s international network, could create new opportunities for health researchers in country. A second option is linked to the previous recommendation, providing a platform through which health researchers and graduates could seek alternative pan-African posts. This could also be linked to the facilitation of further funding, encouraging donors or health funders to engage with the platform to identify project opportunities driven by African needs.

**Continue policy engagement work started in TIBA 1.** It is understood that many of the TIBA 1 projects included in TIBA 2 will be conducting research related to but somewhat separate from their TIBA 1 projects. While this reflects a natural progression for the achievement of enhancing information and understanding about infectious diseases in Africa, there is a risk that this may encourage projects to also divert efforts on influencing policy change relevant to TIBA 1 towards influencing policy change aligned to the TIBA 2 projects. As noted above, policy change, particularly in developing countries, can be a lengthy process and requires continued momentum and engagement. It is, therefore, strongly recommended that the continuing TIBA 1 projects maintain efforts to influence policy in relation to the work they have already completed to ensure it is realised.

**Raise outcome ambition in TIBA 2.** Based on the findings in this EPR, TIBA 1 has performed largely to expectation and, in relation to the emergency preparedness, even exceeded expectations. As such, it would be appropriate for TIBA to raise outcome-level ambition in TIBA 2. Of the outcomes analysed in this review, both Outcome 1 and 2 relate to relatively short-term achievements and could be made more ambitious in TIBA 2 (note, Outcome 5 remains appropriate for TIBA 2). For example, Outcome 1 could consider increased support provided directly to African-led health research due to wider understanding of and interest in locally identified challenges, and Outcome 2 could be revised to include consideration of how TIBA participants pass skills and knowledge on to other stakeholders through independent training or capacity building, particularly from a multi-country perspective, increasing the overall ecosystem strengthening effect of TIBA.

# Annex 1

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Making a Difference project summaries

**“Developing and evaluating a comprehensive multiplex peptide array serological diagnostic for use in Africa,”** University of Edinburgh

This project focused on developing, evaluating and deploying a comprehensive diagnostic tool for endemic, epidemic and emerging infectious diseases in three Africa countries. The diagnostic tool is based on the prototype serological infectome chip already developed in collaboration with TIBA Strategic Partner PEPperPRINT, who collaborated with TIBA to produce the customised chips for the project and test utility in three partner countries: Sudan, Zimbabwe and Ghana.

In total six multiplex peptide microarray chips were produced for the identification of priority pathogens and markers of autoimmune diseases. All partner countries received their country specific microarray chips produced by PEPperPRINT. In addition, Innoscan710 scanners were procured and successfully installed at two partner institutions.

In Sudan, three chips were developed to detect and diagnose the following<sup>1</sup>:

1. Respiratory pathogens, including Covid-19, SARS, MERS, influenza, and bacterial pneumonia pathogens.
2. 72 endemic pathogens, including malaria, leishmania, Schistosoma, typhoid fever, and brucella.
3. 32 autoimmune diseases.

Zimbabwe developed two chips that target 25 different endemic pathogens. Ghana developed one chip for detecting 26 febrile pathogens.

In addition, a large assembly of representative priority pathogens was collected, which the reports states could aid in the development of a cheap, multi-pathogen pan African chip for rapid diagnostics of common diseases across the continent.

Two training and capacity building sessions of partner countries were conducted during the project. One training on PEPperCHIP® Immunoassay was hosted by PEPperPRINT at the University of Edinburgh. A bioinformatic workshop was also held at the West African Centre for Cell Biology of Infectious Pathogens (WACCBIP), University of Ghana, Accra to train researchers and scientists in the microarray peptide selection and design. Educational training was also provided for two research assistants, a MSc student and a PhD student.

In Zimbabwe, 1800 samples were collected from different communities and hospitals. Ghana collected 1745 samples and Sudan collected 1200 from communities and hospitals. Those diagnosed as infected were provided with appropriate treatment, according to the project report.

The outcome of the project aligns with the TIBA priorities and objectives of improving the diagnosis and surveillance of infectious diseases in resource-poor settings in Africa. It will facilitate accurate diagnosis for better patient management and disease control.

**“Understanding schistosomiasis among children under-five years,”** University of KwaZulu-Natal, South Africa

This study involved an assessment of the burden of schistosomiasis among children under five years of age living in resource-poor settings in South Africa, Zimbabwe, Rwanda and Tanzania. The project had two main aims: 1) to determine the magnitude of the schistosomiasis and soil-transmitted helminths (STH) problem among under-five children; and 2) to propose strategies for accessing the children for treatment. The work aimed to provide the necessary evidence for policy makers in the study countries to consider including children in schistosomiasis treatment programmes.

The burden/infection intensity of schistosomiasis and STH among under-five children in all areas defined in the proposal were determined by all partners. For Zimbabwe and South Africa it was possible to compare the parameters for Pre-School Aged Children (PSAC) and School Aged Children (SAC).

The study found that across countries, co-infections of schistosomiasis with STHs were very common. All children who participated in the project were treated if they were found infected.

This project reported that Covid-19 negatively impacted activities and the project's ability to conduct analysis and achieve the project's aims as originally intended across all four partner countries. The project also reported that due to Covid-19, the two year project activities, analysis and reporting were condensed into one year, which further impacted on findings. It also stated that the four partner countries were unable to meet to discuss findings collectively.

**"Contribution of maternal transmission and silent carriers in the epidemiology and persistence of African Trypanosomiasis in human and animal populations,"** the Coordinating Office for the Control of Trypanosomiasis in Uganda

This was a multi-disciplinary study of Human African Trypanosomiasis (HAT) to understand the role of silent carriers and maternal transmission in maintaining *gambiense* HAT and *rhodesiense* HAT in endemic foci. Combined with a robust method for identifying carriers, this study identified carriers of the diseases to contribute to the evidence base for area-wide interventions across multiple HAT foci in Africa and to help meet the WHO target for HAT elimination by 2030. The project includes clinical studies to develop case management best-practice for carriers and their children, and an examination of epigenetic influences on HAT.

The project determined the role of silent carriers and maternal transmission in HAT epidemiology in through diagnostic studies on human and animal populations in Uganda, Nigeria and Sudan. It conducted key informant interviews and deployed questionnaires to a sample population to determine the contribution of gHAT burden on health and wellbeing, and also economic costs.

The study reported the following findings:

- *T.b. gambiense* gHAT and *T.b. rhodesiense* rHAT co-exist in districts of Uganda.
- *T.b. gambiense* (gHAT) persists in established foci in Uganda and Nigeria.
- Herders in Sudan are carrying HAT infections (type unknown).
- The rHAT reservoir can be eliminated by surveillance and interventions to remove the human infective parasites from the cattle livestock reservoir.
- Drugs and chemicals available for trypanosomiasis control remain effective for sustained control of rHAT from the animal reservoir.
- One health approach covering human and animal trypanosomiasis is essential for management of the African Trypanosomiasis
- Active surveillance is needed to assign risk status within districts to target control if elimination is to be achieved, with a focus on vulnerable South Sudanese refugee communities in Uganda.

Due to Covid-19 interruptions, all laboratory and social science studies were not completed at the time of reporting. The project held capacity building sessions for the project in Uganda, Nigeria and Sudan.

**"Novel candidates for anti-malaria vaccines identified using functional monoclonal antibodies in naturally-exposed individuals",** KEMRI-Wellcome Trust & WACCBIP

This project's goal was to develop local capacity across the whole spectrum of vaccine development from antigen discovery, through vaccine design and finally testing in clinical trials. A major challenge to develop more malaria vaccines is to identify which of the 5300 parasite-encoded proteins are targets of protective immunity. Specifically, this project targeted the creation of highly functional monoclonal antibodies that can be used to identify targets of immunity to malaria. The project was implemented across three countries where malaria is endemic: Kenya, Ghana and Tanzania.

The project achieved the following:

- Identification of 16 novel antigens for malaria that were determined as targets of immunity.
- Training of staff on the laboratory techniques involved in this work.
- A non-falciparum malaria brief submitted to Ghana Health Service, Ministry of Health and the National Malaria Control Program.
- The development of a Covid-19 policy brief that was delivered to the Ghana Health Service.

# Annex 2

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Out of Africa Fellowship project summaries

**Botswana- "Development and evaluation of a colorimetric isothermal PCR based assay and an antigen multiplex diagnostic kit for the detection of urogenital and intestinal schistosomiasis"; Dr Tsepo Ramatla**

The project sought to address how effective the PCR based techniques were in the diagnostic detection of *Schistosomiasis* in a low endemic area of Botswana, in comparison to established parasitology methods. Successful optimisation and utilisation of PCR in the detection of *S. haematobium* in the Botswana context is a first for the country and major achievement that will benefit ensuing *Schistosoma* related studies. The results were corroborated using Real-Time PCR and concordance was found between conventional PCR and Real-Time PCR results. This marked a significant milestone in the project, as the results agreed with previously published reports that found that DNA detection techniques were more sensitive than urine Microscopy in the detection of *Schistosoma*.

The project is not directly connected to the TIBA Rapid Impact or Making a Difference projects, but it builds on the findings of the University of Botswana, Rapid impact project led by Prof. Nthabiseng A. Phaladze.

This project satisfies the first TIBA priority focus area of improving the diagnosis and surveillance of infectious diseases in resource-poor settings. In addition, it fulfils Focus Area 4: improving the management of both endemic and emerging infections, particularly under the subheading of enhancing capacity to respond to infectious diseases emergencies, while protecting capacity to manage endemic diseases concurrently.

BITRI has now developed capacity in the Laboratory diagnosis of Schistosomiasis using PCR protocols. This knowledge now resides with the institution and will be transferred to other BITRI personnel and Laboratory Health care practitioners whenever required.

**Ghana- "Identification of Plasmodium falciparum var gene sequences in IgM-binding rosetting clinical isolates." Dr Henrietta Esi Mensah-Brown**

The project had two specific aims based on the hypothesis that PfEMP1 variants of IgM-positive rosetting parasites possess a conserved sequence/epitope that is recognized by anti-PfEMP1 antibodies and which show surface reactivity with diverse parasite strains.

Specific aim 1: To identify the genes expressed by rosetting IgM-positive clinical isolates from severe malaria patients.

Specific aim 2: To determine the proportion of IgM-positive rosetting clinical isolates recognized by anti-PfEMP1 antibodies.

This project was not connected to a RI or MaD project. The major achievements of this project were mainly in the area of training. The postdoctoral Fellow was able to learn new scientific techniques which will aid the Fellow's growth as a science leader and independent researcher. It also enabled the Fellow to forge a collaboration with Prof Rowe at the University of Edinburgh. This will lead to further research and facilitate the training of graduate students from Ghana in the future. It also facilitated the acquisition of soft skills such as group and financial management.

**Kenya- "Feasibility Assessment for Health System Requirements for inclusion of Chlamydia, and Trichomoniasis screening in the routine ANC screening in Kenya," Dr Simon Masha**

This project sought to determine the health system requirements to include in routine screening for Chlamydia trachomatis and Trichomonas vaginalis in the routine ANC profile in Kenya. The fellowship was not connected to a TIBA Rapid Impact or Making a Difference project – or to another non-TIBA research project.



The Fellow attended a health systems and policy analysis course at the University of Edinburgh. From this training, the Fellow finalised a manuscript on the health system requirements for incorporation of antenatal care screening of Chlamydia and Trichomoniasis. The Fellow also attended an evidence synthesis training at the University of Ghana. From this we developed a systematic review article which is currently under review at BMJ STI. In addition, the Fellow presented the findings at a scientific conference.

**Rwanda- "Evaluation of mixed malaria infections and developing a responsive surveillance of malaria infections in Rwanda: Diagnostics of mixed species Malaria infections" Dr Jean-Pierre Munyampundu**

This project investigated the level of non-*Plasmodium falciparum* and mixed species malaria infections in Rwanda. The project sought to understand what is the best diagnostic tool, and what was the molecular basis for inter-species parasite interactions during mixed infections. Molecular interactions of different Plasmodium species were established, and new diagnostic markers were identified. The Fellow was trained in RNAseq and bioinformatics.

Through this project, 14 biomedical laboratory technicians at seven different health centres were trained in how to diagnosis of non-falciparum parasites with microscopes.

**South Africa- "A Review of National Mass Drug Administration Programmes of Schistosomiasis done in sub-Saharan Africa: Case of Tanzania/Zanzibar, Uganda and Zimbabwe," Muhubiri Kabuyaya**

The main question of the project was to identify the challenges and successes of schistosomiasis MDA programmes that have been undertaken in sub-Saharan Africa TIBA countries (Tanzania, Uganda and Zimbabwe) with the aim of developing an more effective model for implementing and monitoring schistosomiasis MDA programmes. This project was developed in the context of the TIBA South Africa Rapid Impact project that provided data to support inclusion of under 5 years old in MDA. This project was also connected to the Making a Difference USaCuF project (Understanding Schistosomiasis Among Children Under-Five years) project, which aims to pave way for inclusion of under five-year-old children in MDA programmes for Zimbabwe, South Africa and Tanzania

**Sudan- "Analysis of whole-genome sequences of Sudanese *Leishmania donovani* clinical isolates for development of new diagnostics, treatment and vaccines," Dr. Mohamed Abdelrahim**

The main objective of this study was to identify the parasite genomic markers associated with the different clinical forms. To some extent the first phase of the analysis to identify SNPs and Indels among the studied isolates was successful. Two findings were uncovered: genetic markers and their isolates showed high genetic homology despite the clinical origin of isolate; the candidate virulence genes were surprisingly homologous among the studied isolates,. The study concluded that the Sudanese *Leishmania donovani* isolates showed low diversity and proposed that the development of the different clinical forms is attributed to the host- parasite interaction mostly due to the induced host immune response.

The main achievements of this study included:

1. Accurate identification and clustering of leishmania isolates according to the disease phenotype.
2. Identification of parasite genomic markers associated with the development of the different clinical forms.
3. Development of tools for prediction of the development of the clinical phenotype.
4. Development of tools for accurate diagnosis and effective management.
5. Capacity building by high quality training of our fellow on whole gene sequencing and sequence analysis and establishment of sequencing and bioinformatics unit for endemic and emerging diseases.

This study is not linked to neither Rapid Impact or making a difference TIBA project.

Tanzania- "Assessing the impact of selective and timed treatment strategies on *Schistosoma haematobium* prevalence, intensity and *haematobium* prevalence, intensity and urogenital morbidities in north-western Tanzania," Humphry Mazigo

The aim of this project were to identify a hot spot area, specifically schools with a prevalence of identification of the hot spot areas (schools with prevalence  $\geq 30\%$ ) and design a treatment pattern that will follow the transmission cycles of *S. haematobium*.

The project implemented baseline cross-sectional surveys to identify school/areas with high prevalence to be included in the treatment trials. A total of 20,389 children from 88 randomly selected primary schools from four districts participated in the study. Overall, infection prevalence was 7.4% (95%CI: 7.0-7.7, 1514/20,389) and geometric mean infection intensity was 15.8eggs/10mls. A total of 1514 children received treatment; however, the follow-up rounds were affected by the closure of schools during the peak of covid-19 pandemic. Final follow-up in schools which had no infection at baseline and incidence of infection has been done after all the schools were opened in June.

The project worked closely with the National Neglected Tropical Diseases Control Programme at national and districts levels and the Department of Education- Primary schools' section. The National Programme via the district coordinators supported fieldwork. Results of the project have been shared with partners. The data generated from project will be used by the national control programme and the district NTD control department for planning and decision making for implementation of MDA based on the prevalence at each school/village.

The major achievements of this project were that the project provided an updated geo-prevalence maps of *S. haematobium* in the four endemic districts. The project also identified that the Itilima and Bariadi districts has a high prevalence of *S. haematobium* despite repeated rounds of mass drug administration to school children.

The project was connected to the USACUF Making a Difference project, "Understanding Schistosomiasis in children under-fives".

Uganda- "Model to strengthen disease information system for decision support using Ugandan tsetse, Animal and Human Trypanosomiasis data," Albert Mugenyi

This project aimed to identify the drivers of spatio-temporal heterogeneous HAT and AAT incidence and persistence, and also undertake risk mapping to identify areas where HAT is yet to be identified but appear suitable for the disease transmission.

The main achievements of this project were the establishment of geo-spatial databases for improved HAT and AAT disease monitoring and targeted response to emergencies. These databases will provide support towards the surveillance of infectious diseases (HAT/AAT) through provision of real-time processed decision support data and enhancing local capacity to use it. A risk map was produced in addition to a training handbook for Spatial Epidemiologic Research for research scientists and to support capacity development of tsetse and trypanosomiasis control staff.

This project was connected to the Making a Difference, Uganda project.

Zimbabwe- "Immuno-diagnostics technologies for NTDs and other infectious diseases (Understanding and application of bioinformatics, molecular and immunological techniques in diseases surveillance, diagnosis and control in Zimbabwe," Farisai Chidzondo

This project evaluated a comprehensive multiplex peptide array for serological diagnostic and surveillance of infectious disease endemic and epidemic prone in Zimbabwe.

The outcomes of this project include the identification of current and re-infections to inform treatment regimens and the determination of antibody levels after vaccination in children to inform whether or not vaccinations should be

repeated. This can allow for rapid diagnosis of infection and implementation of appropriate intervention such as treatment, isolation or vaccination.

In addition, the Fellow gained competence in enzyme-linked immunosorbent assays and Western blotting, and basic knowledge of techniques and skills were acquired in peptide-based microarray immunoassays, running 2D protein gels, scanning and analysis of data, and plotting graphs and analysis of data using graph pad prism. An assay for the detection of antibodies against fungal proteins in serum and urine was also gained.

The knowledge gained from the training is being used in the development of a chip to be designed and applied in disease surveillance in Zimbabwe to provide portable diagnostic kits for rural settings in Zimbabwe.

This project was connected to the Making a Difference project in Zimbabwe.

Zimbabwe- "Understanding Schistosomiasis and application of Multi-diseases immunological techniques in diseases surveillance, diagnosis and control in Zimbabwe," Takafira Mduleza

This project studies schistosomiasis in under-fives in Zimbabwe. It was connected to the Making a Difference project in Zimbabwe and sought to achieve the following:

1. To search and identify isolates of pathogens circulating in the study populations participating in the MaD project using search engine to establish common detectable markers for diagnosis.
2. Compare existing multiplex diagnostic tools developed for other diseases for the purposes of tailor making a chip appropriate for use in Zimbabwe.
3. To perform multiple assays in search for appropriate genes for incorporating into chip for use in Zimbabwe diseases surveillance.
4. Understand the bioinformatics of microbial pathogens circulating in Zimbabwe in the hope to design an appropriate diagnostic tool targeting several pathogens using one sample.

The project collected samples from the communities and the individuals were provided with appropriate treatment of the infections. The communities were made aware of the following:

- Prevalence of the infections in the communities e.g. *Schistosoma haematobium*, *S. mansoni*, undefined fevers of unknown origins, respiratory infections not identifiable due to lack of diagnostic tools.
- Provided with preventive health education.
- Made aware of possible high technology diagnostic tool to be used on further analysis of infection using the collected blood sample.

The project piloted the implementation of the CHARI referral chart for diagnosis of schistosomiasis and co-infections. Community workshops were held during mobilization at three different sites during programme implementation and recruitment. Participants were interviewed on general health problems, access to health delivery and WASH status in the village and available services.

The project developed a non-medical referral chart for diagnosing schistosomiasis and co-infections ahead of the application of multiplex screening tool for schistosomiasis and co-infections. The referral chart is named CHARI, which is useful for layman diagnosis of schistosomiasis and co-infections in children under 5 years old. It is also a useful tool for PSAC schistosomiasis diagnosis in rural settings for caregivers and village health workers.

Zimbabwe- "Development of Bioinformatics Curriculum for The University of Zimbabwe," Prof. Simbarashe Rusakaniko

This project sought to create a training curriculum to senior researchers in bio-informatics in modern diagnosis and design of appropriate technologies. This project was connected to the Making a Difference Zimbabwe project, which produced huge amounts of biological data and genetic data. The Fellow developed a bioinformatic curriculum for the University of Zimbabwe, which was reviewed by the University Curriculum Committee. The Fellow also engaged

stakeholders in the teaching and given collaborative teaching commitments across various departments within the University, including biology, pharmacology, immunology, computing science, community medicine and the Health Informatics Unit.

The project will implement the curriculum in the future to train senior permanent researchers at the University of Zimbabwe who would in turn impart the skill and knowledge to the students.

# Annex 3

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Data Science project summaries

Botswana – “Identifying strengths and weaknesses in capacity to manage data,” University of Botswana (UB)

This project addressed the data issues experienced in the Rapid Impact study on of Schistosomiasis in the Okavango Delta. The project developed a survey tool, reporting template and an eHealth platform for data capturing and monitoring of Neglected Tropical Diseases (NTDs) and has plans to pilot it in the Chobe district which has one of the highest burdens of NTDs.

The project also built capacity among health professionals amongst the collaborating partners, the University of Botswana (UB), the Botswana Institute for Technology Research and Innovation (BITRI), and the Neglected Tropical Disease (NTD) Unit of the Ministry of Health and Wellness. The project built capacity by developing a surveillance system specifically targeting schistosomiasis and other soil helminths and hosted training workshops with health professionals.

The project reported that a capacity building programme was established at the University’s e-Health Research Unit, to facilitate technology skills transfer to key stakeholders, including the Ministry of Health and Wellness.

Ghana – “Building the capacity of local TIBA partners for ethical use of data and big data management and analysis,” Bioinformatics Coordinator West African Center for Cell Biology of Infectious Pathogens (WACCBIP)

This project was a three day workshop to provide hands-on training to African researchers and scientists in the use of health and bio informatics, ethics in data sharing, machine learning and artificial intelligence, and on R, Stata and Python for data science. A total of 39 people attended the workshop, which was held remotely due to COVID-19.

Rwanda – “A Big data platform for strengthening malaria surveillance program in Rwanda,” School of ICT, College of Science and Technology, University of Rwanda

The project was developed to address the deficiencies in the data-based evidence that was presented in the surveillance of malaria in Rwanda. The project developed and deployed a big data platform in malaria surveillance infrastructure. This platform acts as a single place to query malaria data in Rwanda, where before it was silo’d in different datasets. The platform was created to function with the existing, SMS-based system used for tracking malaria cases in the community using Community Health Workers and phones. The platform hosts all malaria related dataset and healthworkers can query the dataset using the platform’s dashboard on their phone. The dashboard and retrieved data can also be shared with decision makers at national level and the external stakeholders.

During the development of the big data platform, the project used the cloud computing technology that was learned and acquired during previous TIBA projects to participate in the development of Rwanda COVID-19 knowledge base. This technology helped in the upgrading of COVID-19 knowledge base for the Rwanda Biomedical Center.

Sudan - “Strengthening data management and analysis,” Bioscience Research Institute, Ibn Sina University

Sudan has an established laboratory and field teams that generate large and valuable data of different parameters of diseases including malaria, leishmaniasis, trypanosomiasis and Arboviruses. This project sought to acquire new technology and build capacity to conduct in-depth data analysis of the their data.

The project achieved the following:

1. Acquired a high capacity server for data storage and analysis .
2. Strengthened the capacity of the data management unit at the institute.
3. Built capacity for analysis of the quantitative and DNA sequence data.
4. Completion of the analysis of 48 genomes of leishmania parasites.

Data collected from Malaria Rapid Impact project was entered and accessible to Ministry of health and researchers. Additionally, training of researchers on statistical methods and systematic reviews were conducted and risk maps were developed for the studied diseases.

Tanzania - "Improving Lymphatic Filariasis morbidity mapping and provision of care in Rural Tanzania using Mobile Communication Technology in Tanzania," National Institute for Medical Research (NIMR)

This project aimed to improve the Mass Drug Administration (MDA) reporting system for Lymphatic Filariasis in Tanzania using Mobile Communication Technology in Tanzania. The project strengthened the reporting system through training and the involvement of the Community Drug Distributors (CDDs) and frontline health workers. This involved training and identification of cases, treatment and implementation of a MDA. This project demonstrated how data can be reported through mobile phones to facilitate timely analysis and interpretation, leading to timely implementation of interventions against the targeted NTD.

Uganda - "Capacity building and infrastructural development for improved trypanosomiasis and other diseases data management," Coordinating Office for the Control of Trypanosomiasis (COCTU) in Uganda

The project conducted a series of training sessions for COCTU and Uganda Trypanosomiasis Control Council (UTCC) data collectors and staff. It trained staff on data management and also equipped the data management department with a laptop.

This project enabled COCTU extension staff to be able to query servers and associated software and easily set up online data hosts, which now informs the work of COCTU. Regionally, the different veterinary officers are able to coordinate emergency research, should there be need to be able to contain situations at that level. The COCTU has benefited the international partners as it is able to reach out, receive and visualise data in real time to tell the situation of the prevalence at a time it is focusing on elimination.

This project was connected to the Rapid Impact project in Uganda.

Zimbabwe - "Situational Analysis of data science and data management capacity among TIBA Projects in Zimbabwe and other research projects being conducted at the Faculty of Medicine and Health Sciences," University of Zimbabwe

This project sought to address the lack of development of quality data collection tools, lack of data management skills and lack of analytical skills among researchers. A situational analysis survey was conducted to determine the e-health capacity in TIBA Zimbabwe and to identify gaps and training needs.

The project held three workshop trainings in data management and analysis using Stata 16 with TIBA PIs, PhD students and research assistants as well as researchers outside of TIBA. All the data for TIBA projects was cleaned and stored and a Standard of Operating Procedures (SOPs) was developed. These SOPs will be used in the Strengthening COVID-19 Response project and other future works.

This project was linked to an Out of Africa Fellow. The work was negatively impacted due to COVID-19: the Fellow was unable to travel to the University of Edinburgh for a data science capacity training course.