

Volume 2: Annexes to the End-point Report

End-point evaluation of the UK Public
Health Rapid Support Team (UK-PHRST)

Date: 28 April 2021

Submitted by Itad



Contents

Annexes to the UK-PHRST end-point evaluation report (Vol. 2)

Contents	2
Annex 1: Terms of Reference	3
Annex 2: Evaluation Framework	19
Annex 3: Mapping of evidence against UK-PHRST Theory of Change assumptions	24
Annex 4: DHSC Global Health Security Theory of Change	28
Annex 5: Updated evaluation team structure	29
Annex 6: List of activities across the triple mandate	30
Deployments	30
Research projects	36
Research publications	46
Capacity development	53
Annex 7: Case study - Africa CDC	58
Annex 8: Case study – Nigeria CDC	78
Annex 9: Case study – Bangladesh, Cox’s Bazar	101
Annex 10: Thematic case study - Remote support	119
Annex 11: Key Informants interviewed	125
Annex 12: Documents reviewed at end-point evaluation phase	129

Annex 1: Terms of Reference



Public Health
England

LONDON
SCHOOL of
HYGIENE
& TROPICAL
MEDICINE



Terms of Reference

The UK Public Health Rapid Support Team Programme

Performance Evaluation and Independent Monitoring Agent

January 2019

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Contents

1. Introduction	4
2. Background	4
3. Performance Evaluation and Independent Monitoring Objective.....	6
4. Recipient.....	7
5. Scope.....	7
6. Methodology	11
7. Outputs	11
8. Performance Management	12
9. Constraints and Dependencies	13
10. Contract Management	13
11. Data Ownership.....	13
12. Risks and Challenges	13
13. Fraud	13
14. Finance	14
15. Assets	14
16. Skills and Experience	14
17. Logistics and Procedures.....	15
18. Reporting	15
19. Communication.....	15
20. Timeframe	16
21. Budget.....	16
22. Duty of care	16
23. Transparency	16
24. Ethical Principles	16
Annex A: UK-PHRST Strategic Framework (including Theory of Change).....	18
Annex B: UK-PHRST Logframe	18
Annex C: UK-PHRST M&E framework	18
Annex D: UK-PHRST Intellectual Property Agreement.....	18
Annex E: GHS Programme M&E strategy.....	18

Acronyms

AFRO	World Health Organisation Regional Office for Africa
ASC	Academic Steering Committee
CDC	U.S. Centers for Disease Control and Prevention
CDT	Core Deployable Team
DFID	Department for International Development
DHSC	Department of Health and Social Care
EVD	Ebola Virus Disease
FMoH	Federal Ministry of Health
GOARN	Global Outbreak Alert and Response Network
GHS	Global Health Security
HMG	Her Majesty's Government
IATI	International Aid Transparency Initiative
IHR	International Health Regulations
KPI	Key Performance Indicator
LMICs	Low- and Middle-Income Countries
LSHTM	London School of Hygiene & Tropical Medicine
MEL	Monitoring and Evaluation
ODA	Overseas Development Assistance
PHE	Public Health England
SEARO	World Health Organisation Regional Office for South-East Asia
PE&IM	Performance Evaluation and Independent Monitoring
UK-PHRST	United Kingdom Public Health Rapid Support Team
WHO	World Health Organization

1 Introduction

This document sets out Terms of References for a performance evaluation and independent monitoring (PE&IM) to support ongoing independent monitoring of programme delivery for the UK Public Health Rapid Support Team (UK-PHRST), including documentation of lessons learnt, and a mid- and end-point² programme evaluation. The document should be read in conjunction with the UK-PHRST Strategic Framework (Annex A), logframe results framework (Annex B), Monitoring, evaluation and learning (MEL) Framework (Annex C), UK-PHRST Intellectual Property Agreement (Annex D), and overarching Global Health Security Programme MEL Strategy (Annex E). Distinction of MEL responsibilities between UK-PHRST and the PE&IM agency are outlined below.

2 Background

A review of the World Health Organisation (WHO) emergency response following the 2013-16 West African Ebola virus disease (EVD) epidemic acknowledged the need for a global rapid response capability that could prevent public health events from escalating by reducing morbidity and mortality and related financial and security consequences.³ At the 2015 G7 Conference, the UK government announced the UK's commitment to help build the capacities required for countries to prepare for and respond to public health threats to prevent them from becoming global health emergencies. As part of this commitment, the UK created the UK-PHRST, funded by UK Official Development Assistance (ODA) with a 5-year (2016-21) budget of £20 million (i.e. £4 million per year). The programme has a triple mandate to integrate outbreak response, innovative research to generate evidence on best practices for outbreak control, and capacity building for outbreak response in ODA-eligible countries. Working with partners, the UK-PHRST will prevent outbreaks from becoming public health emergencies, reduce mortality and morbidity, and ultimately make the world safer from outbreaks of infectious diseases (Figure 1).

Formally launched in November 2016, the UK-PHRST is a partnership between Public Health England (PHE) and the London School of Hygiene & Tropical Medicine (LSHTM), with contractual arrangements to form an academic consortium with the University of Oxford and King's College London. The UK-PHRST is funded by the Department of Health and Social Care (DHSC). The UK-PHRST is linked to diverse infectious disease monitoring systems, identifying situations where the deployment of specialist expertise can mitigate these threats. When required, the UK-PHRST rapidly deploys on behalf of the UK Government a standing team of multidisciplinary public health professionals and researchers in countries that are eligible for ODA-funded assistance, which generally supports low- and middle-income countries (LMICs).⁴ However, the UK-PHRST's remit extends beyond simply responding to outbreaks, in addition seeking to identify and address the underlying causes. The UK-PHRST objectives are to:

- Within ODA-eligible countries, support rapid investigation and response to disease outbreaks at the source, with the aim of stopping a public health threat from becoming a health emergency

² For the purposes of the PE&IM, the end-point is considered 2021, which is the conclusion of the UK-PHRST's initial five-year funding period. As it is the HMG intention to build long-term capacity for outbreak response, follow-on funding and continuation of the UK-PHRST programme is anticipated, although not guaranteed.

³ Bausch DG. West Africa 2013 Ebola: From Virus Outbreak to Humanitarian Crisis. *Curr Top Microbiol Immunol.* 2017;411:63-92

⁴ Although not completely overlapping, most ODA-eligible countries can also be characterised as LMICs and, for simplicity, will be referred to as such in this document.

- Conduct rigorous research to aid epidemic preparedness and response and improve future response
- Generate an evidence base for best practice in disease outbreak interventions within ODA-eligible countries
- Train a cadre of public health reservists for the UK-PHRST who could be rapidly deployed to respond to disease outbreaks
- Build capacity in-country for an organised and rapid national response to disease outbreaks and contribute to supporting implementation of International Health Regulations (IHR)

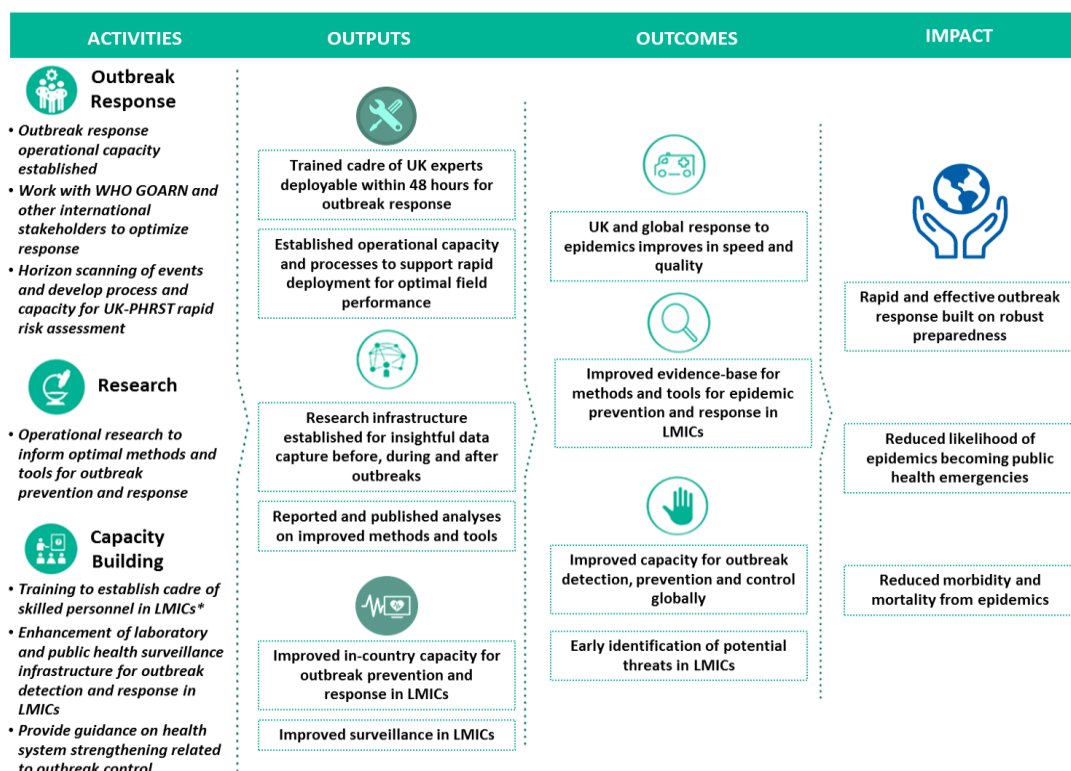


Figure 1: UK-PHRST Theory of Change

The UK-PHRST functions as one key component of the UK's broad programme and commitment to global health, which builds on the commitments set out in 'Health is Global'⁵, aligning with the principles set out in the 2015 UK Aid Strategy of tackling global challenges in the national interest⁶. The UK-PHRST will contribute to the UK's global health priorities of strengthening global health security (GHS), including supporting health diplomacy, contributing to global health and development, supporting learning and the evidence base for global action and mitigating the impact of health crises on commerce and prosperity, with all actions underpinned by research and innovation. Key policy principles include strengthening the capacity of global health institutions, such as WHO, and maximising the synergy and effectiveness of UK Aid investments, ensuring that the contribution of the UK to GHS is visible, credible, effective and of high impact. The UK-PHRST supports the Paris Declaration principles for making aid more effective, including respecting partner country leadership (*ownership*), using a country's own institutions and systems and strengthen capacity

⁵ Health is Global: An Outcomes Framework for Global Health 2011-15. HM Government, 2011.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215656/dh_125671.pdf

⁶ UK Aid: Tackling Global Challenges in the National Interest. HM Treasury and Department for International Development, 2015.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/478834/ODA_strategy_final_web_0905.pdf

development (*alignment*), *harmonisation* of donor organisation activities, and *mutual accountability* for development results.⁷

Given the need to rapidly establish the UK-PHRST, interim arrangements were put in place to create a functional administrative framework and core deployable team (CDT) for the first year of the UK-PHRST while a permanent structure was being developed and a permanent director recruited. The interim period ended and the UK-PHRST became operational in April 2017. To date, the UK-PHRST has engaged in eight outbreak responses (in Ethiopia, Nigeria, Sierra Leone, Madagascar, Bangladesh and The Democratic Republic of the Congo), is executing more than 15 research projects, and has contributed to numerous training and capacity building endeavours in Sierra Leone, Uganda, Ethiopia, and elsewhere. Building on this interim activity, the UK-PHRST is now progressing toward increasing field engagement and establishment of the permanent infrastructure for UK-PHRST maintenance and growth.

The UK-PHRST is intended to bring both domestic and international benefits, including:

- Strengthened UK public health capacity and enhanced workforce with greater global awareness, experience and outbreak response capability
- Enhanced career pathways related to combating outbreaks and infectious diseases, with resultant increased experience, technical capacity, and leadership skills of UK personnel, enhancing UK ability to both deploy internationally and at home to future outbreaks and public health emergencies
- Increased resilience within the UK since experts can also be available to respond and support public health incidents nationally when not deployed elsewhere
- Improved preparedness and resilience against potential public health events of international concern in LMICs, also contributing to the strengthening of IHR
- Promotion of British skills, resources and a proactive role in addressing global health challenges, including international training
- Reduction of risk of future economic and health disruption from unrecognised or uncontrolled outbreaks
- Building the UK's resilience to global threats through strengthened international networks that provide advance notice of threats and can elicit an early response

A programme of both internal and external MEL of the UK-PHRST is planned to assess performance, accountability and learning against objectives to achieve optimal UK-PHRST programme delivery. It is also a requirement of all ODA-funded projects.

1. Performance Evaluation and Independent Monitoring Objective

The UK-PHRST requires an external partner to provide a critical and constructive review of programme delivery, recommend improvements, evaluate results and complement the UK-PHRST internal monitoring processes. This should be done in line with the UK-PHRST MEL Framework (Appendix C).

In considering performance, accountability and learning in particular, the PE&IM should:

- i. Assess the model of UK-PHRST, which is a novel combination of public health operational activity, research, and capacity building

⁷ The Paris Declaration on Aid Effectiveness. Organisation for Economic Cooperation and Development (OECD), 2005
<https://www.oecd.org/dac/effectiveness/34428351.pdf>

- ii. Examine the extent to which UK-PHRST complements other UK ODA health security programmes (including the PHE Global Health IHR Programme) in partner countries and regions (e.g., AFRO, EMRO and SEARO) and supports coherent national and international health activities on preparedness and response
- iii. Determine the extent to which the UK-PHRST functions as a functional partnership and consortium
- iv. Assess the outputs and outcomes of UK-PHRST activities, including utilisation, sustainability, and the pathway to impact through the Theory of Change
- v. Generate additional evidence and insights
- vi. Support the UK-PHRST to inform, facilitate and disseminate learning from MEL

The **purpose** is to ensure that the UK-PHRST is having the intended impact by focusing on quality assurance and accountability and the facilitation of learning and adaptive management in order to improve programme decisions and performance. The PE&IM will ensure independent monitoring and quality assurance of programme delivery, documentation of lessons learnt, and robust tracking of results, providing assessment of the effectiveness of ODA funds.

2. Recipient

The recipients of the PE&IM are UK-PHRST and the DHSC GHS Team.

3. Scope

The PE&IM agency is expected to conduct a mid- and end-point evaluation of the performance and results of the triple mandate of UK-PHRST. The mid-point is expected to be undertaken in the first quarter of 2019/20 financial year (April-June 2019), with a report at the end of this quarter. The end-point evaluation is expected to be completed by March 2021.

The PE&IM agency will need to analyse raw data as part of the evaluation. The UK-PHRST team has set up its own internal monitoring system to ensure that programme data are captured, managed and analysed. Internal monitoring is measured against the UK-PHRST implementation plan. The UK-PHRST logframe (Annex B) describes data sources for project performance and results, and includes assessment of higher-level impact. The UK-PHRST will continue to record progress against the logframe and implementation plan quarterly, and produce annual internal evaluations in April/May (in line with the DHSC annual review). The data available from this monitoring varies as regards completeness, validity and reliability. The PE&IM is not expected to replace the UK-PHRST internal monitoring system but rather will complement and support it. In addition, the PE&IM will provide additional review that processes are adequate and make recommendations for their strengthening and completeness.

The PE&IM agency will need to construct systems and strong relationships with a broad range of stakeholders, based on mutual respect, to ensure sharing of data and insights regarding the UK-PHRST. In particular, key actor interviews and surveys of health professionals working alongside UK-PHRST for response, receiving UK-PHRST training and working in partner institutions collaborating to develop capacity, are likely to be informative for evaluating the programme and assessing sustainability.

The PE&IM agency is expected to explore the scope for joint evaluation or obtain wider input into the design of the evaluation, for example, from in-country agencies involved in outbreak response or research, during the design phase. Building ownership in the evaluation will contribute to the overall aim of strengthening in-country systems and approaches.

The PE&IM agency is expected to support the dissemination of learning from the evaluations, including at international meetings and conferences.

Division of Responsibilities Between UK-PHRST and the PE&IM agency

UK-PHRST

UK-PHRST is responsible for programme implementation and will conduct its own internal MEL. UK-PHRST will collect data on their implementation activities and lessons learnt, with documentation of contribution of programme activities towards outputs and outcomes. This will be based on quarterly monitoring and annual internal evaluations in April/May, in line with the DHSC annual review.

PE&IM agency

The PE&IM agency is responsible for the mid- and end-point evaluation of UK-PHRST. This includes primary data collection and analysis, as well as review and validation of data and reports collected by UK-PHRST in the course of programme delivery, required for the independent MEL of programme results. The independent PE&IM is to ensure documentation of lessons, robust tracking of results and quality assurance of delivery. Any subcontracting of programme implementation by UK-PHRST should be considered within the evaluation of the UK-PHRST programme implementation, including consortium partners (University of Oxford and King's College London). The PE&IM should collaborate with the DHSC GHS MEL team, which works across GHS programmes.

Evaluation Questions

The UK-PHRST has developed a set of evaluation questions under each objective, to be addressed as part of both the mid- and end-point evaluations. The PE&IM agency should provide an overview of how they propose to answer these questions in the bid, relating to the objectives. The PE&IM agency is invited to refine the proposed questions and to pose additional questions. The final set of questions will be agreed as early as possible during the design phase.

- i. Assess the model of UK-PHRST, which is a novel combination of public health operational activity, research, and capacity building:
 - To what extent has the UK-PHRST met its mandate of integrating outbreak response, research and capacity-building functions?
 - What are the advantages, disadvantages and value added of bringing together outbreak response, research and capacity building across the UK-PHRST's mandate?
 - Do short-term deployment demands override research plans?
 - Are research plans sufficiently flexible for research to stay on-course despite deployments?
 - How effective are the governance structures of this model and how could they be strengthened (to include advantages/disadvantages of funding arrangements and associated reporting)?

- ii. Examine the extent to which the UK-PHRST complements other UK ODA health security programmes (including the PHE Global Health IHR Programme) in the partner countries and regions (e.g. AFRO, EMRO and SEARO) and supports coherent national and international health activities on preparedness and response:
 - To what extent does UK-PHRST complement or duplicate other UK ODA-funded health programmes in partner countries (including the PHE Global Health IHR Programme)?
 - In what ways has the UK-PHRST augmented, complemented or duplicated pre-existing arrangements for deployment from the UK?
 - How effective is the joint UK-PHRST/DHSC/DFID/HMG engagement with WHO HQ, GOARN and WHO AFRO, and how could this be improved?
 - How effective are UK-PHRST working relationships with GHS programmes from other organisations, and how could they be improved?
- iii. Determine the extent to which the UK-PHRST serves as a functional partnership and consortium:
 - What are the advantages and disadvantages of the partnership and consortium approach (PHE, LSHTM, University of Oxford and King's College London)?
 - To what extent does the UK-PHRST work as a complementary and coordinated partnership between PHE and LSHTM?
 - To what extent does the UK-PHRST work as a complementary and coordinated consortium with the University of Oxford and King's College London?
 - How effective are the internal communication processes and what are the potential areas for improvement?
- iv. Assess the outputs and outcomes of UK-PHRST activities, including utilisation, sustainability and the pathway to impact through the Theory of Change:
 - Has the UK-PHRST achieved the intended outputs and outcomes?
 - Is the UK-PHRST Theory of Change an appropriate tool and valid as a reflection of the programme's impact?
 - Does the evidence for the UK-PHRST outcomes suggest that the programme is having its intended impact?
 - What evidence is there that UK-PHRST short-term scoping research projects have led to long-term research collaborations between UK and other partners?
 - How have the conceptualisation and design of the programme (Theory of Change and business case/work plan), programme implementation and external contextual factors contributed to programme results or limited delivery of results?
 - To what extent have relevant programme outputs been used and contributed added value during the programme?
 - To what extent have UK-PHRST activities been sustainable and led to long-term change (for example, evidence may include co-developed plans, and adequacy of workforce and funding)?
- v. Generate additional evidence and insights:
 - What evidence is available to suggest programme results beyond those that can be ascertained from logframe indicators alone?

- How and how effectively has the UK-PHRST acted as a conduit for wider engagement in national, regional and global health security development activities, including partnerships/collaborative working with national public health institutes (NPHIs), Ministries of Health, and international networks and organizations such as GOARN and WHO?
- To what extent has the UK-PHRST followed the NAO principles of Economy, Efficiency and Effectiveness and demonstrated value for money (see Section 2.4, Appendix C, UK-PHRST Framework for MEL)?
- What is the cost-effectiveness of a readily deployable core team (costs including salaries, training, occupational health and backfilling of reservists), compared to the costs of hiring external consultants?
- What data is available to support evidence of transparency (see Table 1, Appendix C, UK-PHRST Framework for MEL)?
- What is the UK-PHRST impact as regards equality and human rights? (See Section 13, Annex A for more detail on the expectations and how to measure)
- How can MEL data collection by UK-PHRST be improved (this includes more efficient data collection mechanisms, new appropriate indicators for inclusion in MEL, in line with the strategy testing approach)?
- To what extent does the UK-PHRST effectively communicate its activities and impact externally?

The PE&IM agency should complete evaluation reports at mid- and end-point at a minimum, answering all of the agreed evaluation questions. The PE&IM will make recommendations in order to strengthen programme delivery, particularly at the mid-point where there is still scope for programme adaptation. The mid-point evaluation is designed to be learning-focused, to inform programme adaptation for the final phase of the programme.

The evaluation needs to take into account the flexibility of programming due to it offering a rapid response function.

Geographic Focus

The PE&IM agency will need to be able to provide assurances that it can cover the triple mandate of UK-PHRST (response, research, capacity building) and travel to countries where there has been a recent UK-PHRST response (minimum two countries), where collaborative research is being undertaken (minimum two countries), and where there is a focus on capacity development (minimum two countries). The Suppliers will be responsible for their own duty of care and will need to be able to operate independently in these countries. The geographic focus of all UK-PHRST activity is ODA-funded LMICs. To date, the UK-PHRST has responded to outbreaks in Ethiopia, Nigeria, Sierra Leone, Madagascar, Bangladesh and The Democratic Republic of Congo. Though evident in all of these countries, to date focus in capacity building has been in Sierra Leone, Uganda and Ethiopia. More detail on the where UK-PHRST operational research is focused can be found on the website (<https://www.lshtm.ac.uk/UKUK-PHRST#research>), which is updated regularly. The PE&IM agency should propose which countries they will focus on and provide justification for this decision.

4. Methodology

The PE&IM agency should provide an overview of their proposed methodology in the bid, including how it is appropriate to the objectives. Further detail on appropriate

methodologies can be refined and agreed between the UK-PHRST and PE&IM agency as early as possible during the design phase. The proposed PE&IM should include a range of methods including (but not limited to) consideration of the following:

- Appropriate qualitative and quantitative methods to ensure proper triangulation of information and avoid data gaps during analysis and reporting
- Adaptive monitoring, evaluation and learning processes
- Valid methods of data collection, acceptable to an international public health audience, using innovative approaches where necessary
- Direct feedback on the programme from a representative cross-section of stakeholders, including programme beneficiaries, and UK and LMIC organisations
- An analysis of the operating environment and opportunities and challenges this presents
- Involvement of programme implementers and partner agencies in MEL development through a process of consultation and constructive feedback
- Potential for the use of analytical approaches, such as contribution analysis and/or a case study approach (for in-depth evaluation in a sample of countries)
- The use of evaluation criteria that cover relevance, effectiveness, efficiency, impact and sustainability

Experimental approaches are unsuitable to evaluation of this type of programme.

The programme covers different interventions in different country contexts, including where fluency in other languages, or translators, may be required. Appropriate approaches will have to be utilised that allow conclusions to be drawn. The UK-PHRST expects the PE&IM to contact all key stakeholders for interviews, to check information and to fill in any knowledge gaps.

Bidding agencies should clearly outline the methods, data sources, frequency of visits, etc. under each of the objectives (Section 3).

5. Outputs

Design Report and Work Plan (Within First Three Months)

Bids from tenderers should set out initial plans for the design report, to be completed within three months of the contract being signed (the design phase), including:

- Evaluation purpose and approach
- Evaluation questions and framework
- Detailed methodology for data collection and analysis
- Evaluation deliverables and work plan
- Governance
- Assessment of risks and vulnerabilities to the programme and potential mitigation activities
- Project management, including communications plan, progress monitoring, risk management and resource plan
- A costed and time-bound communication and dissemination plan

A consultation will be held with UK-PHRST to finalise the draft design report. The PE&IM agency will conduct meetings/workshops with UK-PHRST and partners to refine the plan during the start-up phase, and throughout the programme lifetime.

Evaluation Deliverables

- A risk matrix identifying the main risks and challenges for the MEL and how these will be mitigated (within the first three months and reviewed on a six-monthly basis)
- A delivery chain risk map that should, where possible, identify all partners involved in the delivery of PE&IM (within the first three months and reviewed on a six-monthly basis)
- Convening of meetings with UK-PHRST and partners, commencing with a start-up meeting to agree an MEL plan; thereafter on the findings of assessments (six-monthly in year one, annual thereafter, aligned to the reporting cycles, including annual reviews in April)
- Review of the UK-PHRST internal MEL products and processes, including the Theory of Change, logframe and monitoring tool, including a set of recommendations for improvements (e.g. new indicators; methods of data collection)
- Annual reports to feed into the annual reporting cycle of the UK-PHRST programme (April 2019, April 2020, April 2021), to include internal monitoring activities against the implementation plan
- Succinct summary papers and recommendations for programme governance and reviews (in line with the meetings convened above and ad hoc requirements)
- Support to the UK-PHRST to disseminate the learning from the evaluations, including at international meetings and conferences
- Mid-point evaluation report (by end of Quarter 2, 2019/20 financial year)
- End-point evaluation report

This is not an exhaustive list. The UK-PHRST welcomes suggestions by bidders on other MEL components that would be useful to ensure the UK-PHRST programme is effectively implemented.

6. Performance Management

This contract will be results-based. An output-based deliverables schedule will be agreed between UK-PHRST and the PE&IM agency based on the delivery of high-quality products and strategies outlined in the Terms of References.

UK-PHRST will manage performance and provide payment to the Supplier based on satisfactory delivery of outputs and key performance indicators (KPIs). Twenty per cent of personnel fee rates for each output will be linked to the delivery of time-bound quality outputs and KPIs. The payment for KPIs will be reduced if the quality is not satisfactory, following standards agreed by the Supplier and UK-PHRST. KPIs will not be allowed to be deferred except under exceptional circumstances specifically agreed with PHE. The contract will use a hybrid approach of payment and Suppliers should include a proposed hybrid payment mechanism in their bids, clearly linked to the outcomes and deliverables of the programme. This should include proposed KPIs, milestones and an element of input-based payments to be agreed with UK-PHRST. Suppliers should detail their proposed approach and provide supporting narrative. The PE&IM agency will be responsible for managing their own and all subcontractors' performance and tackling poor performances. They will be required to demonstrate strong commitment towards transparency, financial accountability, due diligence of subcontractors and zero tolerance to sexual misconduct, corruption and fraud.

7. Constraints and Dependencies

- The PE&IM agency should have a good contextual understanding of the geographies and UK-PHRST programme components, with a strong practical capability of assessing data and programme quality.
- The PE&IM will need to have good relationships and the capacity to engage with country partners. Suppliers are responsible for their own duty of care.
- There is a risk to the supplier that they will not be able to access the full range of stakeholders as planned.
- Data quality is a challenge as the nature of the UK-PHRST work means that results cannot be obtained by simply accessing reliable, validated datasets. The supplier will need to be competent to collect and analyse a variety of raw and varied primary data sources.

8. Contract Management

UK-PHRST will monitor the PE&IM agency's performance through progress update meetings every six months, during which results will be reported by the Supplier, in addition to formal annual performance reviews. The contract, through PHE, will allow for formal review points after the three-month start-up phase and at the programme mid-point, based on overall performance. Performance will be assessed according to delivery and quality of reports and progress against the work plans, with timely recommendations to feed into adaptive programming. PHE reserves the right to terminate the contract subject to programme performance and this will be set out in the contract. The UK-PHRST Programme Manager at PHE will be the key point of contact with the Supplier, supported by a wider programme team, including the UK-PHRST LSHTM Programme Manager and UK-PHRST Director.

9. Data Ownership

All data and metadata are owned by UK-PHRST. Bidders should ensure that all data are rigorously documented. Data will be shared between PHE and LSHTM and all sub-contractors according to the intellectual property agreement (see appendix).

10. Risks and Challenges

The Supplier will be required to provide a risk register as part of the design report that will be monitored and updated on a six-monthly basis. Risk management should cover external context, delivery, safeguards, operational, fiduciary and reputational risks.

11. Fraud

The Supplier will be required to set out their fraud mitigation strategies, including internal risk management and reporting systems. An annual audit will be required. In advance of any release of funds, Suppliers will be required to produce a delivery chain risk map which should identify all downstream partners (funded and non-funded) involved in the delivery of this evaluation. At a minimum, this should include details of the name of all downstream partners and their functions, funding flows (amount, type) to each delivery partner, high-level risks involved in programme delivery, mitigating measures and associated controls. The delivery chain map will be reviewed every six months with PHE.

12. Finance

PHE will conduct a due diligence review of the Supplier prior to disbursement of funding. The Supplier will be responsible for conducting due diligence on all

subcontractors. The PE&IM agency and any subcontractors will be required to submit a six-monthly financial report to accompany the six-monthly performance reports. These should provide a clear and detailed breakdown of activities against the work plan, fees and expense at HQ and country level.

13. Assets

If the PE&IM agency procures assets, PHE will require a comprehensive asset register. A decision on the assets from PHE, arrived at through an asset disposal plan, will be required at the end of the programme.

14. Skills and Experience

It is essential that the PE&IM agency (with any subcontractors) combine expertise relevant to all outputs in the following areas:

- Strong experience of various quantitative and qualitative PE&IM methodologies and ability to develop and use novel methods when necessary
- Experience in undertaking Monitoring, evaluation and learning of large programmes with multiple components and partners leading to programme adaption
- Experience and operational mobility in the countries/regions of operation and in the aid sector
- Experience of working with national governments/international and regional bodies in LMICs, especially in sub-Saharan Africa and Southeast Asia
- Ability to call on a range of experts as needed to address specific requirements
- Ability to present complex issues in a clear and accessible way
- Ability to incorporate flexibility and innovation into MEL design and approach
- Understanding of political economy, risks, and opportunities for any relevant countries and regions where a case study is proposed, or the ability to access expertise in countries selected during the design phase
- Experience in MEL of operational research
- Economic and value for money analytical skills
- Audit-type skills for analysis of programme management data
- Ability to bring together a wide range of partners for lesson learning and evidence uptake by a range of partners
- Experience evaluating peer-reviewed publishing
- Expertise in data disaggregation and analysis for illustrative and learning purposes
- Facilitation skills to share learning and communicate course correction between stakeholders
- Expertise in public health for at least one team member

If appropriate, UK-PHRST would consider a consortium approach to obtain the necessary skill mix, recognising that the programme combines expertise in broad and diverse realms, including research, MEL, and auditing. The UK-PHRST programme also aims to develop local capacity. The PE&IM bidders should demonstrate use of local capacities and demonstrate how these capacities will be developed.

15. Logistics and Procedures

The Supplier will be responsible for all logistical arrangements for themselves and members of the team. During the start-up phase, the PE&IM will need to elaborate on how it will meet the requirements in collaboration with UK-PHRST and partners. All relevant expenses should be covered by the contract budget (actuals only).

Suppliers should lay out how they propose to hire both core and contract staff to deliver the overall contract and for how many days a year. The UK-PHRST would expect a full-time staff member working on this for a significant proportion of her or his time to ensure coordination, consistency, timely reporting and to provide a regular point of contact with PHE (including travel to London at short notice). Should any key staff member(s) for delivery of the PE&IM leave the agency, UK-PHRST should be involved in the recruitment process for replacement staff. Other staff should be based in logical locations that will enable and facilitate effective fulfilment of this contract, including based in or travelling to countries where the UK-PHRST programme operates. This may involve a process of negotiation.

The Suppliers will propose learning/sharing opportunities (based on other convened events where possible) with costings.

16. Reporting

The reporting officer is the Director of UK-PHRST. All reports should be copied to the UK-PHRST Deputy Director of Research (based at LSHTM), the PHE Programme Manager and LSHTM Programme Manager. For day-to-day matters, the UK-PHRST PHE Programme Manager should be contacted (unless a delegate is named). The DHSC GHS team will receive the final mid- and end-point reports.

The PE&IM agency will provide six-monthly narrative reports on results assessment accompanied by a financial report, risk matrix and delivery chain-mapping updates. The PE&IM agency will meet UK-PHRST on a six-monthly basis to discuss the reports and completion of deliverables prior to payment. These reports will be shared with UK-PHRST programme partners and regular meetings will be convened at least every six months to discuss results and findings.

The Supplier will provide annual reports to feed into the annual reporting cycle of the UK-PHRST programme. The annual report should be as specific as possible on recommendations for improved programme delivery. The timing of the annual reports will be clearly articulated by UK-PHRST in the PE&IM design phase.

The Supplier will provide a high-quality final report summarising the learning, evidence and clear recommendations resulting from the programme to inform public health preparedness programmes going forward. A high-quality interim version of the report should be available at completion of the UK-PHRST programme. Final payment will be made upon satisfactory agreement of the final report with UK-PHRST, including any independent assessment required.

As set out above, the PE&IM agency will submit financial monitoring bimonthly, with detailed financial reports at least every six months. Where possible, the PE&IM agency will aim to spend 90% of the financial year spend between April-December.

17. Communication

In agreement with the UK-PHRST, documents and findings may be published and shared more widely in order to be made available to a broader public audience. The PE&IM agency should clearly set out its lesson learning and dissemination approach in its communication plan to be agreed in consultation with UK-PHRST. Suppliers are expected to agree this plan with partners at the start-up meeting; this should then be developed into a costed and time-bound communication, evidence and dissemination strategy.

18. Timeframe

The Supplier will be mobilised during the first quarter of 2019/20 (Apr-Jun 2019). A mid-point evaluation should be conducted in Q2 2019/20 (Jul-Sep 2019). The UK-PHRST programme end date is March 2021, with final evaluation to be submitted at this date. More detailed milestones will be submitted in the proposed work plan and agreed after tender.

19. Budget

A maximum budget of £600,000, including any taxes, for the evaluation has been set. This total budget should cover all fees and expenses including travel. Bidders are invited to demonstrate what they could deliver within the allocated budget while maintaining excellent value for money and delivering high quality work. Payments will be made in two stages: the first following production of the mid-point report and the second after production of the final report.

20. Duty of care

The Supplier is responsible for the safety and well-being of their personnel and all third parties affected by their activities under this contract, including appropriate security and safeguarding arrangements. They will also be responsible for the provision of suitable security arrangements for their domestic and business property.

21. Transparency

PHE requires Suppliers receiving and managing funds to release open data on how this money is spent in a common, standard, re-usable format, and to require this level of information from immediate subcontractors, sub-agencies and partners. It is a contractual requirement for all Suppliers to comply with this and to ensure that they have the appropriate tools to enable routine financial reporting, publishing of accurate data, and to provide evidence of this to PHE. Further information is available from <http://www.aidtransparency.net/>

22. Ethical Principles

Proposals and tenders to conduct research or evaluations should include consideration of ethical issues. Treatment of ethics will be included in the assessment of bids. In practice, this will involve:

- Considering whether external ethics approval is needed
- Ensuring that the research will not cause harm to participants
- Ensuring that participation is voluntary
- Ensuring that confidentiality is protected
- Taking account of international and local legislation
- Ensuring that research and evaluation designs respect gender and cultural sensitivities
- Ensuring that data are stored securely and safely
- Ethical and transparent publication of research findings
- Protecting the independence of research and evaluation
- Seeking to ensure participation of marginalised groups.

Annex 2: Evaluation Framework

Workstreams	Evaluation questions	Sub-questions	Focus at mid-point and end-point	Indicative criteria for judging performance	Data collection approaches	Analytical approaches
1. Design (Model and Strategy)	EQ 1 How appropriate is UK-PHRST's integrated model and consortium approach in contributing to improved outbreak response?	1.1 To what extent has UK-PHRST met its mandate of integrating outbreak response, research and capacity building functions?	<ul style="list-style-type: none"> Core focal area for mid-point and end-point 	<ul style="list-style-type: none"> Evidence of integration of the triple mandate components Evidence of value-added of model by comparison with a counterfactual (discussed in KIIs) Alignment with programme's ToC 	<ul style="list-style-type: none"> KIIs Document and literature review 	<ul style="list-style-type: none"> Triangulation between data sources and across stakeholder groups Exploratory and confirmatory case studies
		1.2 What are the advantages/disadvantages/value added of bringing the three functions and institutions together?				
	EQ 2 To what extent are UK UK-PHRST activities relevant, strategic and appropriate in relation to UK-PHRST programme goals?	2.1 Are the processes in place for prioritising/determining activities undertaken appropriate? 2.2 Are activities: a) necessary, and b) sufficient to contribute to programme goals? 2.3 What assumptions underpin the intervention logic and have they been upheld? 2.4 Are activities aligned to IHR/JEE/other relevant national and international policies?	<ul style="list-style-type: none"> This will be explored at mid-point (EQs 2.1 and 2.3) and end-point but conclusions may be limited at mid-point for EQ 2.2 due to programme implementation period being short 	<ul style="list-style-type: none"> Alignment with programme's ToC Evidence of effective processes for ensuring work is strategic, aligned to ToC/logframe and that process of prioritisation occurs based on this Alignment with IHR/JEE/other relevant national and international policies 	<ul style="list-style-type: none"> KIIs Document review 	
2. Implementation (Delivery,	EQ 3 How successfully has UK-PHRST been	3.1 To what extent have planned programme activities been implemented and programme outputs achieved? 3.2 Is the human resourcing model appropriate in terms of capacity, expertise	<ul style="list-style-type: none"> All EQs will be explored at mid-point and end-point. This area is 	<ul style="list-style-type: none"> Alignment with programme ToC 	<ul style="list-style-type: none"> KIIs Document review 	<ul style="list-style-type: none"> Triangulation and cross-case study analysis

Workstreams	Evaluation questions	Sub-questions	Focus at mid-point and end-point	Indicative criteria for judging performance	Data collection approaches	Analytical approaches
Process and Partnerships)	operationalised ?	<p>and ability to effectively deliver across the triple mandate?</p> <p>3.3 Are research plans sufficiently flexible for research to stay on course despite deployments?</p> <p>3.4 How appropriate are the governance structures of this model, including funding arrangements and reporting, and how could they be strengthened?</p> <p>3.5 To what extent does UK-PHRST work as a complementary and coordinated partnership between the consortium partners?</p> <p>3.6 How effective are internal communication processes within the consortium and how can they be improved?</p> <p>3.7 To what extent does UK-PHRST effectively externally communicate its activities and impact?</p> <p>3.8 What internal and external factors have influenced delivery and process?</p>	critical for mid-point as it will provide utilisation focused lessons learned to strengthen delivery and increase efficiency	<ul style="list-style-type: none"> ▪ Activities are delivered according to plans/ToRs ▪ Partnership functions effectively ▪ Coordination and communication across the programme/partners ▪ Regular, quality joint planning and consultation within UK-PHRST and with other stakeholders is in place ▪ Resources are available to fulfil expected workplans ▪ Evidence of factors influencing delivery and process 	<ul style="list-style-type: none"> ▪ Practice observation 	<ul style="list-style-type: none"> ▪ Exploratory case studies ▪ Research portfolio review
	EQ 4 To what extent does UK-PHRST complement or duplicate other UK ODA health security programmes in partner countries?	<p>4.1 How effective are the mechanisms in place in the UK and at country level to ensure a coordinated/complementary UK response?</p> <p>4.2 In what ways has UK-PHRST augmented, complemented or duplicated pre-existing arrangements for deployment from the UK and other UK ODA-GHS programmes in partner countries?</p>	<ul style="list-style-type: none"> ▪ 4.1 Will be explored at mid-point and end-point ▪ 4.2 Will be explored at mid-point only 	<ul style="list-style-type: none"> ▪ Assessment of UK-PHRST offer in context of other UK ODA GHS programmes ▪ Assessment of coordination mechanisms 	<ul style="list-style-type: none"> ▪ KIs ▪ Document review ▪ Practice observation 	<ul style="list-style-type: none"> ▪ Cross-case study analysis and triangulation ▪ Mapping of pre-existing arrangements for deployment/ other UK ODA-GHS programmes

Workstreams	Evaluation questions	Sub-questions	Focus at mid-point and end-point	Indicative criteria for judging performance	Data collection approaches	Analytical approaches
	EQ 5 To what extent has UK-PHRST supported coherent and collaborative national and international health activities on response?	<p>5.1 How effective is UK-PHRST’s external engagement with key strategic health actors nationally, regionally and globally?</p> <p>5.2 How effective is the joint UK-PHRST/DHSC/DFID/HMG engagement with WHO HQ, GOARN and WHO AFRO and how could this be improved?</p> <p>5.3 How effective are UK-PHRST’s working relationships with GHS programmes from other organisations and how could they be improved?</p> <p>5.4 Does the work of UK-PHRST complement or duplicate similar initiatives from other countries/organisations?</p>	<ul style="list-style-type: none"> This will be explored at mid-point to enable recommendations to be generated for the next phase of implementation on how external engagement and working relationships can be strengthened but a more in-depth analysis of performance will be possible at end-point based on the longer period of implementation 	<ul style="list-style-type: none"> Effective joint planning and consultation with other stakeholders is in place for UK-PHRST/joint-UK UK-PHRST awareness of and alignment with preparedness and response landscape: Joint External Evaluation (JEE), IHR systems development, other GHS actors/programmes Effective communication, coordination and relationship development with other GHS programmes/organisations 	<ul style="list-style-type: none"> KIs Document review Practice observation 	<ul style="list-style-type: none"> Triangulation across stakeholder interviews and cross-case study analysis Mapping of GHS programmes in countries
3. Performance (Results, Sustainability and Accountability)	EQ 6 What contribution are UK-PHRST’s deployment, research and capacity building outputs making to achieve programme outcomes?	<p>6.1 To what extent have programme goals (desired outcomes and impact) been achieved?</p> <p>6.2 How has UK-PHRST contributed to, or is likely to contribute to, these outcomes and intended impact?</p> <p>6.3 What evidence is available to suggest unintended consequences and results beyond the logframe indicators?</p> <p>6.4 What impact have contextual factors had on programme results?</p>	<ul style="list-style-type: none"> Due to limited available data it will be difficult to answer these EQs at mid-point but they will be fully explored at end-point At mid-point, we will review monitoring data, make recommendations 	<ul style="list-style-type: none"> Activities are on track Evidence of results for each component at country, regional or global levels are defined, tracked and recorded Gaps in anticipated results identified Evidence of unintended results/consequences in countries identified 	<ul style="list-style-type: none"> KIs Document review Review of MEL data 	<ul style="list-style-type: none"> Case studies Contribution analysis

Workstreams	Evaluation questions	Sub-questions	Focus at mid-point and end-point	Indicative criteria for judging performance	Data collection approaches	Analytical approaches
			on the results framework and ToC	<ul style="list-style-type: none"> Assess contribution made by UK-PHRST to containing disease outbreaks 		
	<p>EQ 7 Are programme outputs and outcomes likely to be sustained?</p>	<p>7.1 Were appropriate sustainability aspects embedded into the UK-PHRST programme design?</p> <p>7.2 What evidence is there that UK-PHRST short-term scoping research projects have led to long-term research collaborations between UK and other partners?</p> <p>7.3 To what extent are the project outcomes likely to continue after the project?</p>	<ul style="list-style-type: none"> 7.1 and 7.2 will be explored at mid-point and end-point It won't be possible to draw strong conclusions for 7.3 until end-point 	<ul style="list-style-type: none"> Programme activities, design and operationalisation promote sustainability Evidence of exit strategies/transition plans Country stakeholders report improved capacity in outbreak response related activities/research Non-UK-PHRST sources of funding are available for research 	<ul style="list-style-type: none"> KIIs Document review 	<ul style="list-style-type: none"> Triangulation of data sources and across stakeholder KIIs Research portfolio review
	<p>EQ 8 To what extent has UK-PHRST followed the NAO principles of economy, efficiency and effectiveness and demonstrated VfM?</p>	<p>Economy:</p> <p>8.1 Have inputs (e.g. staff, consultants, raw materials and capital) of an appropriate quality been purchased at the best possible price?</p> <p>8.2 What is the relative cost of a readily deployable core team compared to the costs of hiring external consultants?</p> <p>Efficiency:</p> <p>8.3 To what extent did actual spending deviate from the intended spending?</p>	<ul style="list-style-type: none"> VfM analysis will be undertaken at mid-point and end-point 	<ul style="list-style-type: none"> Prices paid for quality inputs exceed expectations/reference prices Output targets are met in line with allocated budget and the ratio between programme expenditure and outputs achieved increases over time Outcome targets are met/exceeded, the ratio 	<ul style="list-style-type: none"> KIIs Document and financial data review Review of MEL data 	<ul style="list-style-type: none"> VfM analysis Case study analysis

Workstreams	Evaluation questions	Sub-questions	Focus at mid-point and end-point	Indicative criteria for judging performance	Data collection approaches	Analytical approaches
		<p>8.4 EQ 3</p> <p>Effectiveness:</p> <p>8.5 EQ 1</p> <p>8.6 EQ 6</p> <p>Equity:</p> <p>8.7 What is the UK-PHRST impact as regards gender equality, equity and human rights?</p> <p>Sustainability:</p> <p>8.8 EQ 7</p>		<p>between outputs and outcomes achieved increases over time, qualitative assessment suggests that the programme has made a meaningful contribution to outcomes achieved</p> <ul style="list-style-type: none"> ▪ The benefits of grant/program activities are fairly distributed among those in need ▪ There is strong potential for programmatic gains to be fully sustained over time 		
	<p>EQ 9 Is UK-PHRST capturing the right data to measure results and ensure transparency and how can this be improved?</p>	<p>9.1 Is UK-PHRST’s current ToC measuring the right things to ensure that programme outcomes are captured? How can it be strengthened?</p> <p>9.2 What evidence of transparency is available?</p> <p>9.3 Are suitable MEL systems in place to adequately capture results and how can they be improved?</p>	<ul style="list-style-type: none"> ▪ Logframe and monitoring system will be reviewed at mid-point and end-point and recommendations developed with UK-PHRST 	<ul style="list-style-type: none"> ▪ Availability of quality data ▪ Availability of financial information ▪ Availability of programme documentation ▪ Alignment of performance measurement tools (logframe, ToC, programme monitoring) with each other and with programme results/model 	<ul style="list-style-type: none"> ▪ Review of logframe, monitoring system ▪ KIIs ▪ Review of financial data 	

Annex 3: Mapping of evidence against UK-PHRST Theory of Change assumptions

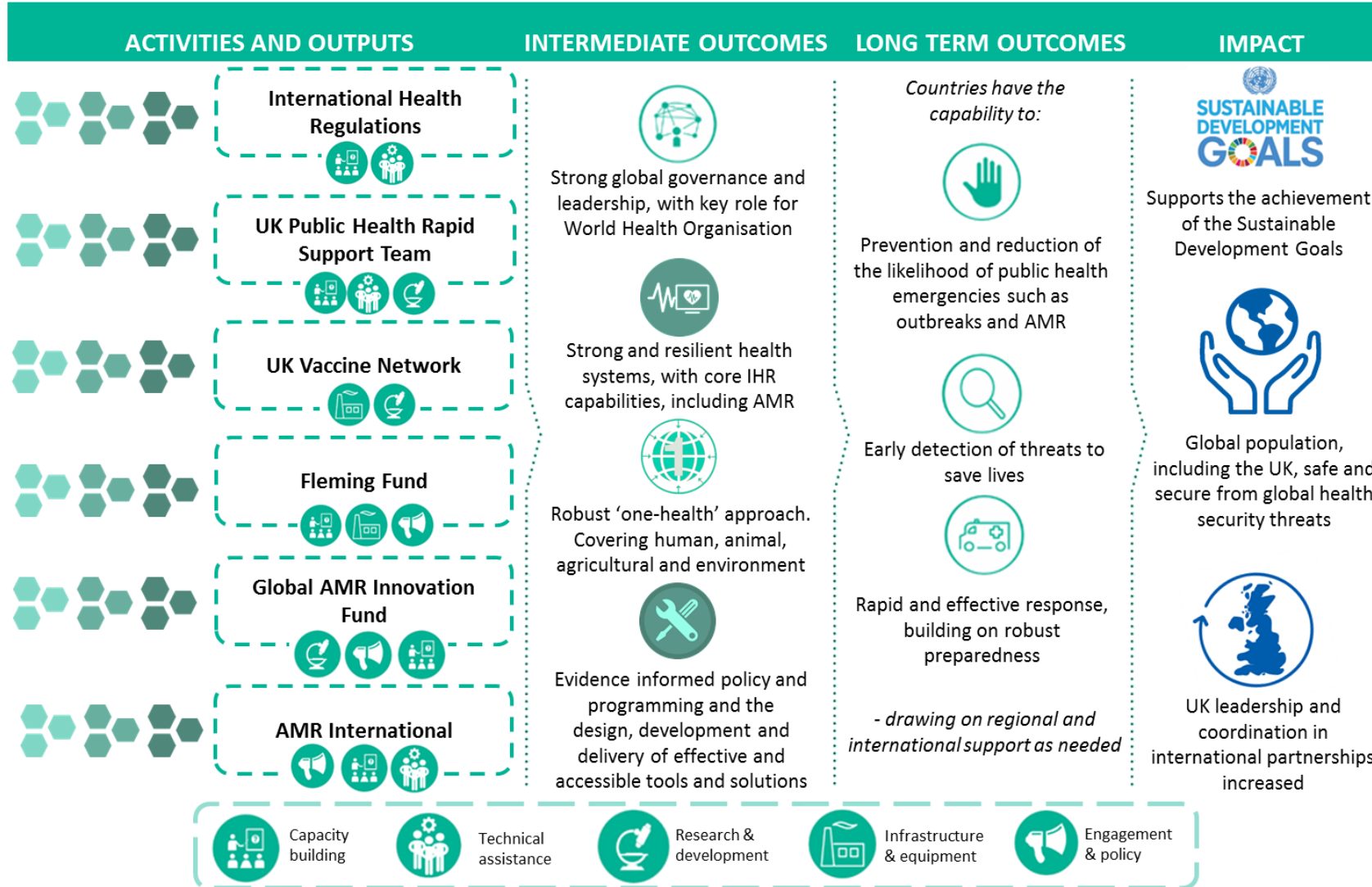
Theory of Change Result	Assumption	Evidence Rating and Summary
Impact: Improved outbreak response through enhanced operational effectiveness, evidence-based research, and capacity building at global, regional and country levels, to reduce morbidity and mortality and the likelihood of outbreaks becoming public health emergencies	The progression of an outbreak can be altered by enhanced response, research, and capacity building	No evidence
	Partner countries are working towards these goals, and are willing to work with UK-PHRST to do so	Strategy documents from partners confirm this and it is evident that partners are willing to work with UK-PHRST and vice versa from evidence across the evaluation and all stakeholder groups
	Resources are available in LMICs to increase capacity	Limited capacity as indicated by JEEs and interviews with LMIC stakeholders
Intermediate Outcome: UK, LMIC and global response to epidemics improves in speed and quality	UK workforce can be retained and increased when required to allow fast deployment of requested expertise	This is a mixed picture. Multiple internal and wider HMG stakeholders referenced impact of loss of key team members, and concerns about capacity of and use of reservists was raised. However, as seen in the case studies, for the deployments and other activities that did go ahead, the team members' expertise was broadly seen as excellent in speed and quality and sufficient in quantity.
	Other issues do not have significant impact on speed of deployment (<i>e.g. visas, approval process in the country, getting clarity of the country's request/ToR, COVID-19 testing</i>)	Limited evidence mentioning this has explicitly not held for some deployments and other activities, but the significance was not clear – activities did for the most part still appear to proceed. Some specific examples included logistics around deployment of the mobile lab; visa issues; import permit issues; delays with ethics approvals.
	Research, innovations and tools developed by UK-PHRST are seen as relevant and useful and therefore adopted by other global health/outbreak response actors	From the case studies there were examples of research and tools being used by both those countries and in case of Africa CDC, rolled out to/adopted by multiple member states.
	LMICs effectively use increased capacity so that it contributes to improved response speed and quality	As seen in the case studies, there were numerous examples of LMICs using increased capacity to improve their response. There was also other examples of this, e.g. in the Philippines deployment.
Short-Term Outcome 1: UK-PHRST contributes effectively as part of wider outbreak response	The UK-PHRST team has right expertise and capacity to support the wider outbreak response	As seen in the case studies especially and across activities more broadly, there was broad and extensive evidence reported across stakeholder groups that UK-PHRST's expertise was highly regarded and appropriate. Capacity was a more mixed picture however, as there were some instances of specific skills not being in sufficient supply, e.g. French language skills, and concerns about short-term nature of support.
Short-Term Outcome 2: Research findings applied by UK-PHRST and partners	There is a direct relation between research findings and the approach to outbreak response	There is limited evidence from Nigeria CDC and Cox's Bazar case studies that research findings are likely to be used in the response to future outbreaks.

in outbreak response and informs LMIC, UK and global policy-making	Future outbreaks allow for application of research findings	There is no evidence that this has happened as yet. However, as – for example – Lassa fever outbreaks and water diarrhoea outbreaks are recurring/seasonal; key research has been undertaken on Lassa fever (Nigeria), and tools developed for surveillance (e.g. in Cox’s Bazar) would be used in future outbreaks, this implies that this assumption has/will hold.
	Research findings are seen as relevant and useful and thus adopted and supported by/integrated into policies of key global actors (e.g. WHO) and LMICs to strengthen response	There is limited evidence that this has held a seen in the Nigeria CDC case study (PPE study informing revision of IPC guidelines), but otherwise the lack of evidence in this area should be noted.
Short-Term Outcome 3: Improved LMIC, UK and global capacity for outbreak prevention and response	Partner institutions and participants are willing to and have capacity to work together and implement learning from capacity building delivered by UK-PHRST	There is evidence in the case studies that LMIC partners have successfully implemented learning from capacity development delivered by UK-PHRST, and have rolled out learning to develop/revise key plans, strategies etc.
	UK-PHRST training responds to needs and is effective	As seen in the case studies and overall evaluation findings, UK-PHRST responds to requests and co-develops training, and in some cases has conducted needs assessments.
	Recipient countries have the necessary capacity (e.g. infrastructure) to implement learning	There was a slightly mixed picture here, as there were numerous examples cited of LMIC partners successfully implementing learning, however there were some examples cited in the case studies and in other areas of partners’ financial, human resource, infrastructure capacity (e.g. in labs) providing some constraints to taking learning forward to its full extent.
	Students/trainees engage in training activities, and learning outcomes set are realistic	There was no evidence in terms of specific learning outcomes that were set. Some LMIC stakeholders did stated that training was useful, but did not explicitly mention engagement levels.
	Partner institutions and participants are willing to work together and develop/use preparedness plans, strategies etc.	As seen in case studies and other findings, there was strong evidence of LMIC partners being willing to work together, and limited examples of development and use of plans, strategies, guidelines, e.g. IPC guidelines in Nigeria; PPE and IPC guidelines for Africa CDC.
	UK deployment mechanisms have capacity to engage in collaborative meetings/workshops	There was very limited evidence around UK deployment mechanisms, though in Cox’s Bazar both UK-PHRST and UK-EMT participated in coordination calls with FCDO. There was also evidence of some improved collaboration between UK-PHRST and the PHE IHR Project, e.g. with collaborations on seroprevalence surveys.
	Increased collaboration between UK deployment mechanisms improves overall capacity and effectiveness of UK outbreak prevention/response mechanisms	As above, there was very limited evidence around collaboration between different UK deployment mechanisms. In Cox’s Bazar, it was not clear how the participation in joint coordination calls improved capacity/effectiveness.

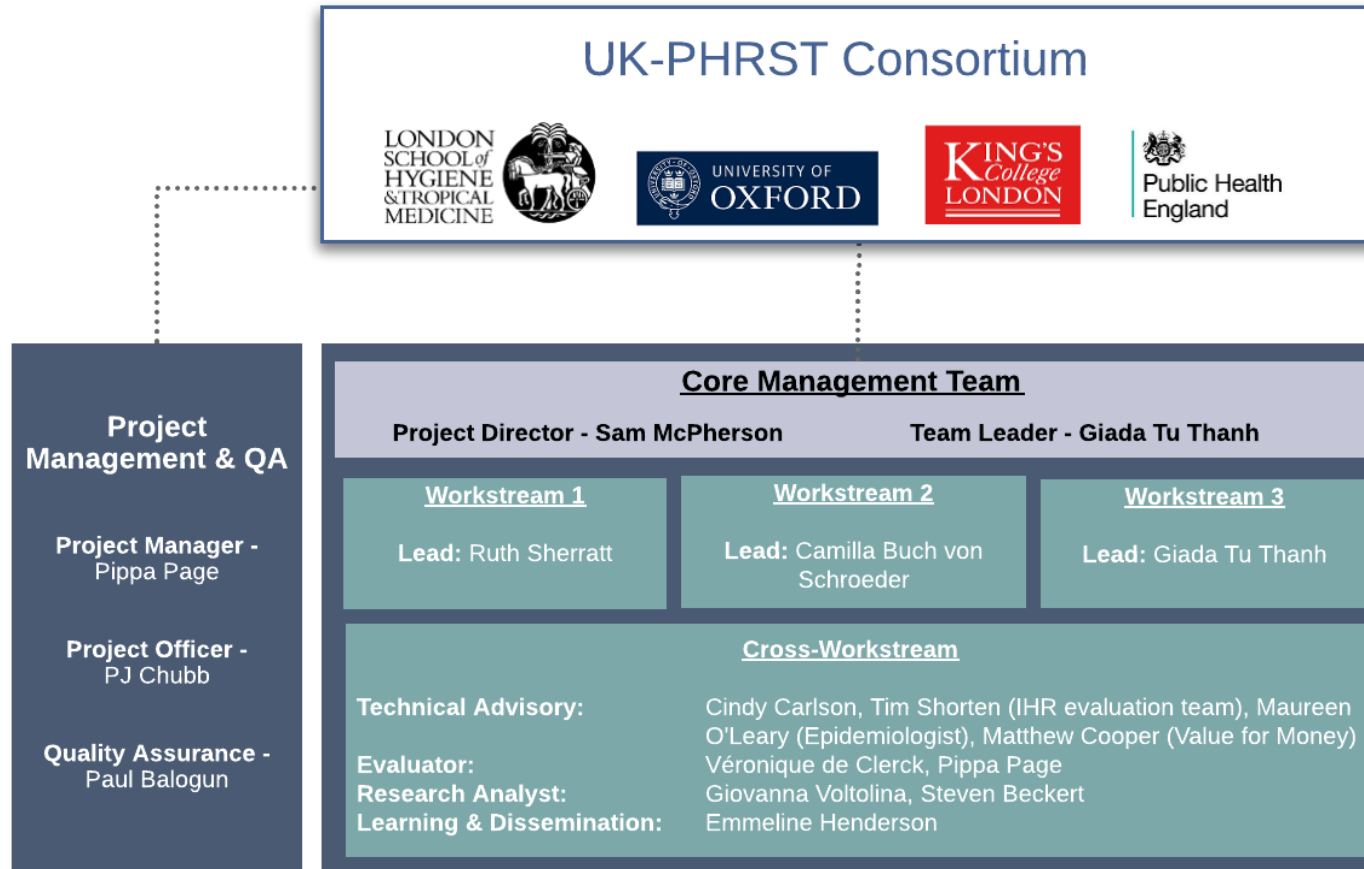
Output 1: UK-PHRST team members deployed with the necessary, speed, expertise and capacity to support LMIC outbreak response	UK-PHRST staff that are recruited are retained and/or replaced in a timely manner when needed	There was limited evidence of delays with recruitment, and the loss of several key team members especially during 2020 was cited as a concern.
	There are sufficient applications from persons with the skills and logistical circumstances required to act as reservists (as agreed by themselves and their employer)	From review of internal UK-PHRST documents, out of a revised target of 25 reservists, 18 were recruited (13 still in place at the time of the evaluation). Challenges were experienced in releasing recruited reservists from duties, and some staff were unable to deploy due to changes in personal circumstances.
	There are sufficient resources to fulfil training requirements for reservists	There was limited evidence from internal UK-PHRST stakeholders (including reservists/ research fellows) of reservists/fellows not being given sufficient orientation/experience before being deployed
	There are sufficient FETP trainees with the skills and logistical circumstances to contribute to the UK-PHRST (as agreed by themselves and their FETP line managers) and that sufficient numbers of FETP fellows elect to participate in the UK-PHRST	No evidence – no clear on how many of the reservists recruited were FETP fellows.
	UK-PHRST team has sufficient capacity to support activities across the triple mandate in line with goals, priorities and partner requests	There were some examples of key skills not being available, e.g. language skills, WASH, etc. for some deployment requests.
	Successful results from suitcase lab field tests show that the equipment is fit for purpose	There was limited evidence from the Philippines deployment that the deployment of the suitcase lab being fit for purpose.
	Countries have procedures to allow timely import of the case laboratory for outbreak response	There was limited evidence from the Philippines deployment that there were some delays importing the suitcase laboratory.
	Lab support is requested and successful	There was limited evidence from the Philippines deployment that the deployment of the suitcase lab being successful.
Output 2: Relevant research conducted on topics related to outbreak response published & disseminated	Research protocols are approved with sufficient speed within UK-PHRST/HMG systems and by relevant LMIC authorities	There was limited evidence of research being held up due to delays with ethical clearance from LSHTM and with clearance through the TSC (ASG at that time) and NIHR.
	Sufficient funding applications are approved	There was limited evidence of some funding applications being unsuccessful – one example was mentioned – a Nigeria meningitis study.
	Outbreak response duties are not so burdensome to prevent UK-PHRST staff from attending to research duties	There was limited evidence from some internal and wider HMG stakeholders that it was hard to pick research back up after being on a deployment.
	Submitted manuscripts will be reviewed and published in a timely manner by journals	There was very limited evidence of a long timeframe for publication of research – e.g. Sudan 2018 paper released in 2020.

Output 3: Proven, evidence-based, innovative methods, tools and resources for outbreak response available and shared	UK-PHRST team has capacity to support development of new /improved tools and processes	Despite small size of team, evidence shows that UK-PHRST has developed new/improved tools in all case studies and also as part of other deployments/activities.
	There is clear agreement on the definition of tools and methods of evaluation	No evidence
Output 4: Collaborative partnerships support outbreak response across the triple mandate	Partners are willing and able to engage in lesson-sharing forums	There was no explicit evidence of this, however in general partners were very willing and generally able to engage in UK-PHRST activities.
	Partners take forward actions from lesson-sharing forums	There was no explicit evidence of this, however in general partners were very willing and did share some examples of taking forward learning in terms of e.g. training conducted by Africa CDC being used and then rolled out to member states.
	UK-PHRST and partners have sufficient capacity to maintain collaborative engagement and learning	Limited explicit evidence
	Partners share learning with institutions/personnel who are involved in national response efforts	Training curriculum e.g. for Africa CDC ERT subsequently used for AVoHC, who are involved in national response efforts. Also in general, all of the partner stakeholders' interviewed for the evaluation are personnel involved in national response efforts.
	Partners are able to access and engage with technology/platforms being used for support across the triple mandate	Strong evidence as outlined in the remote support case study that partners were generally able to access support and training provided remotely, although some challenges with connectivity and platforms.
Output 5: Formal and informal capacity building provided to strengthen UK & LMIC response, outbreak management, and technical and research skills	UK-PHRST's capacity building offer is and remains relevant to LMIC partners' needs	There is no evidence of a defined offer in writing that is shared with LMIC partners, however LMIC partners did broadly refer that the capacity development provided is relevant and in line with requests.
	On the job and formal capacity building targets personnel that will continue to work in/contribute to LMIC outbreak response/management	Limited evidence that it explicitly targets specific personnel, but evidence that training is based on partners' requests, and so would be expected to include personnel that partners' see as most relevant to national/regional response efforts.
	LMIC personnel involved in trainings absorb relevant skills and competencies and utilise them in national response efforts	Limited examples from interviews of new skills being used in response efforts in case studies (mid-point and end-point).
	Online courses are accessible by those based in LMICs	Limited positive evidence based on participation in the MOOC and as outlined in remote case study.
	UK-PHRST membership in TWGs adds to UK-PHRST's ability to meet strategic goals around partnership and influencing policy	No evidence

Annex 4: DHSC Global Health Security Theory of Change



Annex 5: Updated evaluation team structure



Annex 6: List of activities across the triple mandate

Deployments

	Country (location)	Outbreak	Date	Mode of deployment	Deployment summary	Team members deployed	Staff time (person-weeks)
UK-PHRST Deployments April 2017 – March 2018							
1	Ethiopia	Acute Watery Diarrhoea	19 April – 16 May 2017	GOARN	A Request for assistance from GOARN was responded to by UK-PHRST with two epidemiologists and one case management specialist deploying for four weeks. This was in response to an outbreak of acute watery diarrhoea in the Somali region of Ethiopia.	Hilary Bower (Senior Epidemiologist) Alex Salam (Case Management) Thomas Waite (Consultant Epidemiologist)	12
2	Nigeria	Meningitis	4 May – 1 June 2017	GOARN	The UK-PHRST deployed two epidemiologists and one microbiologist for four weeks to support the meningitis outbreak in Nigeria. This was via a request from GOARN in close collaboration with colleagues from Nigeria Centre for Disease Control.	Helen Maguire (Senior Epidemiologist) Maria Saavedra-Campos (Field Epidemiologist) Jason Busuttil (Microbiologist)	12
3	Sierra Leone	Surveillance for Cholera and Typhoid	20 Aug – 28 Sep 2017	Bilateral	Following heavy rains and a mudslide in Freetown, there was an increased risk of water-borne disease outbreaks. The Government of Sierra Leone contacted HMG/UK-PHRST directly to support enhanced disease surveillance and laboratory operation. The UK-PHRST deployed a team of seven public health experts (two Microbiologists, two epidemiologists, two field epidemiology training fellows and one field logistician). The UK-PHRST Director deployed to provide senior coordination for two weeks.	Benedict Gannon (Microbiologist) Maria Saavedra-Campos (Epidemiologist) Sonal Shah (Microbiologist) Hilary Bower (Epidemiologist) Matt Knight (Logistician) Hikaru Bolt (FETP Epidemiologist) Monique Pereboom (FETP Epidemiologist) Daniel Bausch (UK-PHRST Director - Coordination)	26
4	Madagascar	Pneumonic and bubonic plague	4 Oct – 8 Nov 2017	GOARN	The UK-PHRST deployed to Madagascar through GOARN in support of the response to an outbreak of pneumonic plague affecting primarily two large urban centres, Antananarivo (the capital) and Toamasin, a coastal town. The UK-PHRST arrived in country at the very beginning of the international response to the outbreak and deployed for five weeks. Two epidemiologists and one clinician were deployed to support the Epidemiology & Surveillance and Clinical Management response pillars respectively.	Olivier le Polain de Waroux (Epidemiologist) Alex Salam (Clinical Case Management) Hilary Bower (Epidemiologist)	15

5	Bangladesh	Diphtheria	16 Dec 2017 – 19 Jan 2018	UK EMT	The UK-PHRST deployed to Bangladesh with the UK EMT through DFID. This was as part of the international response to an outbreak of diphtheria that was occurring in the Rohingya refugee camps South of Cox's Bazar. The UK EMT deployed at the same time as other international teams were scaling up their capacity to respond to the crisis. One Field Epidemiologist, one IPC Nurse and one Field Epidemiology Training Fellow were deployed for between one and four weeks.	Emilio Hornsey (Senior Infection Prevention and Control Nurse) Ashley Sharp (FETP Epidemiologist) Anna Kuehne (Field Epidemiologist)	9
6	Bangladesh	Surveillance for outbreak response (multiple diseases)	1 Feb – 20 Mar 2018	GOARN	The UK-PHRST deployed to Bangladesh at the request of GOARN/WHO to support the response to a large diphtheria outbreak in the refugee camps in Cox's Bazar, as well as the wider needs for IPC, surveillance, public health information and outbreak response in the context of the humanitarian crisis. Two epidemiologists and one IPC Nurse were deployed for between five and seven weeks.	Olivier le Polain de Waroux (Senior Epidemiologist) Emilio Hornsey (Senior Infection Prevention and Control Nurse) Anna Kuehne (Field Epidemiologist)	18
7	Nigeria	Lassa fever	27 Feb – 31 Mar 2018	Bilateral	At the request of the Nigerian Government, via the Nigeria Centre for Disease Control (NCDC), the UK-PHRST deployed a team consisting of an epidemiologist, FETP fellow, case management specialist and a logistician. The Terms of Reference were to support field-level interventions in case management, surveillance, case investigation and to supply logistics in the three hotspot states of Edo, Ondo and Ebonyi and capital-level data analysis and intervention strategy. The team deployed for a total of 5 weeks.	Hilary Bower (Epidemiologist) Elizabeth Smout (FETP Epidemiologist) Alex Salam (Clinical researcher/case management specialist) Matt Knight (Logistician)	20
UK-PHRST Deployments April 2018 – March 2019⁸							
8	DRC (Equateur)	Ebola Virus Disease	28 May – 10 July 2018	GOARN	Following a request for assistance issued by GOARN, UK-PHRST deployed a team to Equateur province, DRC to support the development and strengthening of early warning systems, contact tracing activities, active case finding, teaching, training, data management and analysis. Two epidemiologists and one data scientist were deployed.	Olivier le Polain de Waroux (Senior Epidemiologist) Hilary Bower (Epidemiologist) Patrick Keating (Data Scientist)	18

⁸ "The UK-PHRST deployed for a total of 88.5 person-weeks (619.5 person-days) in 2018/19, two-thirds of which were in response to the ongoing Ebola virus disease (EVD) outbreak in DRC. Deployment time in 2018/19 amounted to approximately 2.5 full-time staff, or nearly 20% of all working days for the core deployable team, with the largest demand for epidemiological and data analytical support (up to 75% of staff-time on deployment for some staff members). One reservist and 3 FETP fellows were also deployed in 2018/19 to two different outbreaks." (Source: UK-PHRST Annual Action Review 2018-2019).

9	Rwanda	Ebola Virus Disease (preparedness)	21 Nov - 20 Dec 2018	Bilateral	In collaboration with the UK Emergency Response Department, UK-PHRST deployed a senior Emergency Preparedness expert as well as FETP Fellow to Kigali. This was in response to a WHO request for assistance with establishment of an Emergency Operations Centre.	Daniel Kitching (Emergency Preparedness Manager) Matt Edmunds (Field Epidemiology Training Fellow)	7.5
10	Geneva (WHO HQ)	Ebola Virus Disease (DRC support)	10 Dec 2018 – Feb 2019	GOARN	UK-PHRST (FETP fellows) deployed to provide analytical and data management support to the incident management team (IMST) in WHO HQ Geneva on the ongoing Ebola Virus disease outbreak in North Kivu, DRC	Nicola Love (FETP fellow) Rebecca Hams (FETP fellow)	10
11	DRC (North Kivu)	Ebola Virus Disease	Aug 2018 – Mar 2019	GOARN	A series of UK-PHRST deployments through GOARN to support the MoH and WHO response to the Ebola virus disease outbreak in North Kivu. UK-PHRST Deputy Director of Operations led the team approach. This included responding to the needs in the field, coordination and management of the analytical cell and epidemiological analytical strategy. UK-PHRST personnel were identified and brought in as required to support the epidemiological analytical cell. The UK-PHRST Senior Epidemiologist, Data Scientists (x 2), UK-PHRST Director, Field Epidemiologist and UK-PHRST Research Nurse all deployed.	Daniel Bausch (UK-PHRST Director) Olivier le Polain (Senior Epidemiologist) Fanny Chereau (Field Epidemiologist) Thibaut Jombart (Data Scientist) Annelies Gillesen (Research Nurse) Patrick Keating (Data Scientist)	60.5
12	Nigeria	Lassa fever	20 Feb - 20 Mar 2019	Bilateral	In collaboration with the Nigerian Centre for Disease Control, UK-PHRST deployed one epidemiologist, one FETP fellow and the UK-PHRST field logistician to Nigeria in response to epidemic level transmission of Lassa virus.	Matt Knight (Field logistician) Nastassya Chandra (FETP Epidemiologist) Hikaru Bolt (Reserve Epidemiologist)	9
Summary of deployments April 2019 – March 2020							
13	DRC (North Kivu)	Ebola Virus Disease	April 2019 – Jan 2020	GOARN/LSHTM	A series of UK-PHRST deployments through GOARN to support the MoH and WHO response to the Ebola virus disease outbreak in North Kivu. UK-PHRST Deputy Director of Operations led the team approach. This included responding to the needs in the field, coordination and management of the analytical cell and epidemiological analytical strategy. UK-PHRST personnel were identified and brought in as required to support the epidemiological analytical cell. This response also	Daniel Bausch (UK-PHRST Director) Olivier le Polain (Senior Epidemiologist) Fanny Chereau (Field Epidemiologist) Thibaut Jombart (Data Scientist) Annelies Gillesen (Research Nurse) Patrick Keating (Data Scientist) Christopher Jarvis (Data Scientist, Reservist) Alex Salam (Case Management)	70.5

					includes the work of the UK-PHRST Director in his role as PI to the Johnson & Johnson Ebola vaccine trial.	Emilio Hornsey (IPC) Hilary Bower (Field Epi)	
13	Switzerland (Geneva)	Ebola Virus Disease	July - Dec 2019	GOARN	UK-PHRST Deputy Director of Operations deployed to Geneva (WHO HQ) to provide senior analytical support to the incident management team (IMST) on the ongoing Ebola Virus disease outbreak in North Kivu, DRC. Two FETP fellows also deployed to support epidemiology and surveillance activities.	Deputy Director of Operations, Olivier le Polain (Consultant) Paula Blomquist (FETP Fellow)	18
14	Bangladesh	Acute Watery Diarrhoea / Cholera	12 November 2019 – 9 December 2019	GOARN	A UK-PHRST reservist deployed to Bangladesh to support the surveillance and epidemiology of an outbreak of acute watery diarrhoea in the Rohingya Refugee camp in Cox's Bazar. This was part of the WHO led response.	Joseph Timothy (Field Epi Reservist)	5
15	Philippines	COVID-19	5 Feb – 22 Mar 2020	GOARN	GOARN deployment to WHO Western Pacific Regional Office to support regional preparedness for COVID-19. Support on epidemiology, surveillance and data analytics. One field epidemiologist and two Field Epidemiology Training Fellows deployed. Early repatriation of experts due to travel restrictions and border closures. Remote support continued.	Ioannis Karagiannis (Field Epi) Ranya Mulchandani (FETP Epidemiologist) Wendy Rice (FETP Epidemiologist)	9
16	Ethiopia (Africa CDC)	COVID-19	1 Mar – 20 Mar (in person)	Bilateral	A request for assistance from Africa Centres for Disease Control to support preparedness and response efforts relating to the global pandemic of COVID-19. An epidemiologist, social scientist, microbiologist and IPC nurse were deployed. <i>Early repatriation of experts due to travel restrictions and border closures. Remote support continued.</i>	Hilary Bower (Epidemiologist) Hana Rohan (Social Scientist) Emilio Hornsey (IPC expert) Ben Gannon (Microbiologist) Ashley Sharp (Epidemiology) Alex Salam (Clinical Case Mgmt) Elizabeth McFarland (Logistics)	7
17	Nepal	COVID-19	8 Mar – 22 Mar 2020	GOARN	GOARN deployment to WHO South East Asia Regional Office (SEARO) in Nepal to support diagnostics for COVID-19 and prepare assessment of the current systems at NPHL (including biosafety. Biosecurity and quality issues) and suggestions for scaled up capacity. <i>Early repatriation of expert due to travel restrictions and border closures. Remote support continued.</i>	Jonathan Ashcroft (Microbiologist)	2
Summary of deployments April – December 2020							
18	Tajikistan	COVID-19	10 Jun – 28 Jun 2020	GOARN	A deployment via GOARN to rapidly assess the response capabilities and diagnostics in Tajikistan in collaboration with European partners. No further	Ben Gannon (Senior Microbiologist) Ioannis Karagiannis (Field Epidemiologist)	4

					deployment of the microbiology laboratory was advised		
19	Gambia	COVID-19	23 Sep – December 2020	Bilateral	<p>In September 2020, a UK-PHRST Senior Epidemiologist conducted a joint assessment mission with Africa CDC at the request of MoH Gambia.</p> <p>In October 2020, two UK-PHRST epidemiologists (including 1 FETP fellow) and two microbiologists (including 1 reservist) deployed to improve COVID-19 surveillance and strengthen quality and safety of diagnostic laboratories (scale-up testing and contract tracing).</p>	<p>Ashley Sharp (Senior Epidemiologist)</p> <p>Ioannis Karagiannis (Field Epidemiologist)</p> <p>Elizabeth Marchant (FETP)</p> <p>Ben Gannon (Senior Microbiologist)</p> <p>Roland Ashford (Microbiologist)</p>	
Blended - remote and in-country (2020/2020)							
	Bangladesh	COVID-19	1 Aug 2020 - ongoing	GOARN	<p>At the request of WHO Bangladesh, a team of epi and data scientists are supporting the surveillance and response activities for the Cox's Bazar refugee camp. Working closely with colleagues in DFID Bangladesh to develop strategies to reduce the spread of COVID-19.</p> <p>In-country microbiology support was delivered in August with the aim of strengthening quality control systems, streamlined processes and make recommendations for increased diagnostic capability remote IPC support aided in the review and development of IPC guidance and policy.</p> <p>In-country data science and analytical support to Bangladesh Government to run seroprevalence study to estimate prevalence of COVID-19 antibodies (Oct - Dec).</p> <p>Remote support: Epi and Data Science – developing a dashboard for use by partners, focusing on COVID epidemiology in the refugee camps: Health Service data/EWRS/automated SitReps; remote support for IPC.</p>	<p>Jonathan Ashcroft (microbiologist)</p> <p>Ulrike Arnold (microbiologist) David Kennedy (Data Scientist)</p> <p>Joseph Timothy (Field Epi Reservist)</p> <p>Ashley Sharp (Senior Epi)</p> <p>David Kennedy (Data Scientist)</p> <p>Clare Sawyer (FETP)</p> <p>Lipi Begum (IPC)</p>	Ongoing
Remote only (2020/2021)							
	Ethiopia (Africa CDC)	COVID-19	Apr 2020 - Ongoing	Bilateral	<p>Initially an epidemiologist, infection prevention and control specialist, social scientist and microbiologist were engaged directly at the Africa CDC headquarters in Ethiopia. Since their return to the</p>	<p>Hilary Bower (Epidemiologist)</p> <p>Hana Rohan (Social Scientist)</p> <p>Emilio Hornsey (IPC expert)</p> <p>Ben Gannon (Microbiologist)</p> <p>Ashley Sharp (Epidemiology)</p>	Ongoing

					<p>UK, a comprehensive programme of remote support has continued with the Africa CDC team.</p> <p>Epidemiology Support to the surveillance technical working group: strategic & technical advice and guideline development on all aspects of COVID-19 surveillance including support to countries to set up alert and contact tracing systems, airport monitoring, and data systems.</p> <ul style="list-style-type: none"> • Development of community health worker training for COVID-19, which has now been rolled out to Member States 	<p>Alex Salam (Clinical Case Mgmt) Elizabeth McFarland (Logistics)</p>	
	Geneva (WHO)	Ebola DRC	Jun-Aug 2020	GOARN	Epidemiological data analysis support		

Research projects

No.	Project Title	Research Theme	PI host institution	Multidisciplinary expertise	Start date	End date	Location	In-country partner(s)	Influence: publication(s), presentations, policy processes	Sustainability aspects, longer-term collabs, external funding
1	Outbreak UK Rapid Support Team: Social Research Component	Social Science	LSHTM		Jan-16	Jun-18			3 oral presentations. Academic paper	
2	A mixed methods investigation of the training of Sierra Leonean responders to the Ebola Virus epidemic to provide Cognitive Behaviour Therapy to fellow health workers suffering from common mental health problems	Mental Health	Kings		Aug-16	Jun-17	Sierra Leone	Ministry of Health and Sanitation	three manuscripts and a successful conference	Letter of approval from the Chief Medical Officer, Sierra Leone, endorsing the collaboration with the RST
3	Effect of acute illness on contact patterns, Malawi	Epi	LSHTM		Jan-17	Mar-18	Malawi			
4	Study of the Aetiology of Severe Undifferentiated Febrile Illness Outbreaks in Sudan	Epi	LSHTM	Epi, Micro, Clinical	Jan-17	Dec-17	Sudan	Sudan National Public Health Laboratory, Federal Ministry of Health, Karary University	Briefings: to high level stakeholders including Federal Ministry Undersecretary of Health, Director of National Public Health Laboratory, FMOH Rapid Response Team/Epidemiology Unit Coordinator. 3-day workshop on Infectious Disease Epidemiology and Outbreak Investigation at Karary University. Presentation at UKPHRST interest group meeting, Draft papers on results of Darfur legacy sample study (submitted, awaiting decision) and Kassala Outbreak study (in preparation)	Led to longer-term research collaboration in Sudan. requests for specific technical and capacity- building assistance in epidemiological and laboratory skills for outbreak management. Assistance was also given to the National Public Health Laboratory leadership to develop a formal request to open discussion on a referral laboratory relationship with PHE Porton. substantial foundation of good will and active collaboration for future activities and research in Sudan

5	Establishing real-time evaluations of WASH on disease outbreaks in emergency settings	Epi	LSHTM		Jan-17	Jul-17		MSF - multiple country sites		three study protocols supported by data collection tools developed. Further research in DRC and South Sudan via MSF funding.
6	Rapid Research Needs Appraisal Protocol	Clinical Research	Oxford		Feb-17	Apr-19			result from the pilot was used to identify gaps in evidence to inform clinical research priorities. preliminary results from the pilot was presented at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE). protocol is registered on the Open Science Framework. an interactive workshop at the General Evidence Summit in Cape Town. BMC Medicine Publication of the methodology and Lassa fever pilot results	
7	Patient data quality improvement in epidemics: an audit of Ebola data	Clinical Research	Oxford		Feb-17	Dec-17				
8	An evaluation of outbreak surveillance and of the feasibility of rapid clinical characterisation of an outbreak syndrome in refugee population	Clinical Research	Oxford		Feb-17	Dec-17	Greece		A detailed report in the form of a manuscript. Expert work group convened and recommendations produced.	
9	Building readiness for real-time pathogen sequencing for surveillance and control of infectious disease outbreaks	Micro	LSHTM		Jun-17	Dec-17				

10	Clinical characterisation of patients admitted to pneumonic plague treatment centres during the 2017 Madagascar outbreak: a prospective cohort study	Clinical Research	Oxford		Nov-17	Mar-19	Madagascar	Institut Pasteur de Madagascar (IPM) and Hôpital Universitaire Joseph Raseta Befelatanana	Poster presentation of observational study results at American Society of Tropical Medicine and Hygiene November 2018 Publication of observational study paper in peer reviewed journal	Remaining funds used for pilot study in preparation for randomised controlled trial. Grant application submitted to Wellcome Trust/DFID for funding for randomised controlled trial of ciprofloxacin for the treatment of bubonic plague (£1,600,000)
11	Rapid identification and characterisation of avian influenza viruses by direct Nanopore sequencing	Micro	Oxford		Jan-18	Sep-19	Cambodia	Institut Pasteur du Cambodge	Standard Operating Procedure (SOP) for trialling in the field. A standard methodology for MinION sequencing in the laboratory. sequence data will be freely available to the scientific community through an NCBI genomics website	
12	Improving RST Social Science Preparedness	Social Science	LSHTM		Jan-18	TBC - ongoing project	Gambia, Sierra Leone, Liberia, Nigeria, and Ghana	Sierra Leone MOHS	An open access library for social science literature on emerging outbreaks	
13	Aetiology and clinical characterisation of severe undifferentiated febrile illness outbreaks in Sudan	Epi	LSHTM	Epi, Micro	Jan-18	Mar-19	Sudan	Sudan National Public Health Laboratory, Federal Ministry of Health, Karary University	Two academic papers	Relationships started to translate into requests for specific technical and capacity- building assistance in epidemiological and laboratory skills for outbreak management. In the NPHL VHF laboratory, a request for an 'informal' assessment of biosafety and quality assurance measure in Dec 2017 has translated into a practical programme of work that is being gradually carried out by local laboratory staff.
14	The usefulness of pre-deployment psychological screening for	Mental Health	Kings		Apr-18	Oct-18	global		Academic paper submitted to BMC Psychiatry. After the paper is published, we	

	humanitarian staff deployed to crisis situations: a systematic review								will circulate it (with a one-page summary) to our existing contacts at PHE Occupational Health, British Red Cross and UKMed. We will also publicise via social media and place copies on our website (planned)	
15	Translation of MinION sequencing from UK lab to field metagenomics laboratory	Micro	PHE	Mico, epi	May-18	Dec-19	Sierra Leone & Sudan	Sudan National Public Health Laboratory, Federal Ministry of Health, Karary University	CCHF sequence data also forms part of a PLOS Neglected Tropical Diseases paper. sequences submitted to GenBank (planned)	
16	Effective diagnostics and laboratory outbreak capability for Gastrointestinal pathogens in West Africa	Micro	PHE		May-18	Mar-20	Sierra Leone	MoHS Connaught hospital	Sierra Leone specific report to enable the MoHS to focus resources on possible enteric outbreak related pathogens. Academic paper (planned). Data presented at Sierra Leone Partnering for Outbreak Preparedness and Response Meeting – September 2019	
17	Cardiovascular function and ribavirin pharmacokinetics and pharmacodynamics in Lassa fever	Clinical Research	Oxford	Clinical, Social Science, Epi	Oct-18	TBC - ongoing project	Sierra Leone & Nigeria	Kenema Hospital, Owo Federal Medical Centre, Federal Teaching Hospital Abakaliki	feedback to WHO Lassa blueprint RnD team (planned). Academic paper (planned)	Funding proposal for a clinical trial or further observational studies (planned). Study links to International Severe Acute Respiratory and Emerging Infection Consortium) via the Wellcome Trust and the Bill and Melinda Gates foundation

18	Tools used for data collection, management and analysis within outbreak response; a landscape analysis and evaluation	Epi	LSHTM		Nov-18	TBC - ongoing project	global		Online dashboard (planned) Academic paper (planned)	collaboration with the WHO Health Emergencies team & Institute of Tropical Medicine in Belgium & the Helmholtz Centre for Infection Research in Germany and agreement to pool results from respective studies
19	Development and testing of an innovative oral fluid serology assay to identify past infection with Lassa Fever Virus	Epi	LSHTM	Epi, Micro,	Dec-18	Apr-20	Sierra Leone	Kenema Lassa Unit, Kenema District Medical Officer, Kenema Government Hospital (KGH), Tulane University (TU) and Sierra Leone University Nursing College		
20	Identification by TaqMan array card system and MinION sequencing of co-circulating pathogens that are clinically indistinguishable from Lassa Fever during seasonal Lassa virus outbreaks in Nigeria: a retrospective study.	Micro	PHE	Micro, epi, clinical	Jan-19	Feb-20	Nigeria	Nigeria Centre for Disease Control	Diagnostic recommendations to NCDC for possible inclusion into Nigeria's National Lassa Fever Testing Algorithm. final report and article for publication (planned) Theory-based workshop on the principles of sequencing and its utility in the context of an outbreak. This workshop was delivered at NCDC's NRL (Abuja, Nigeria), Jan 2019. Attendance >25. Project was featured in the UK-PHRST Microbiology poster presented at the UKs Microbiology Society's Annual Meeting	
21	Promoting earlier presentation of patients with Lassa	Social Science	LSHTM	Social Science, Mental Health	Jan-19	TBC - ongoing project	Sierra Leone		Recommendations on how to improve early presentation for Lassa	

	fever: Health seeking behaviour and Lassa fever admissions in Sierra Leone								fever are available to key stakeholders, including the Sierra Leone MOHS and Kenema DHMT. Academic publication (planned)	
22	Pathogen discovery in non-dengue haemorrhagic patients in the Philippines	Micro	LSHTM		Jan-19	Feb-20	Philippines	Research Institute for Tropical Medicine (RITM), Philippines		
23	What works in response to psychosocial aspects of Ebola? A systematic review to inform collaborative research with Africa CDC in The Democratic Republic of Congo	Mental Health	Kings	Mental Health, Social Science	Mar-19	Mar-20	DRC	Africa CDC	Series of recommendations for Africa CDC (planned)	
24	A Mixed Methods Analysis of Personal Protective Equipment and Infection Prevention Control Policies for Lassa Fever in Nigeria	Epi	PHE		Jul-19	Jan-20	Nigeria	Nigeria Centre for Disease Control. Irrua Specialist Teaching Hospital	Critical appraisal of guidelines Academic paper (planned)	Nigeria CDC is a long-term research partner
25	Rapid response molecular diagnostics for Crimean-Congo Haemorrhagic Fever	Micro	LSTM (Liverpool) / PHE		TBC (Likely Nov-19)	TBC - ongoing project	Turkey	Ministry of Health Virology Reference Laboratory, Ankara Turkey	Planned seminar day presenting to key external stakeholders. Two papers (planned)	

26	Effective diagnostics and laboratory outbreak capability for gastrointestinal pathogens in West Africa	Clinical Research	PHRST/LSHTM	-	31/10/2020	Sierra Leone	Ministry of Health	<p>Recommendations shared with MoHS Sierra Leone and partners, discussions regarding implementation underway</p> <p>- Open access scientific publication detailing findings and prioritisation methodology in preparation</p>	Laboratory SOPS and work aids will be deposited in the UK-PHRST Knowledge Hub
27	Development and testing of an innovative oral fluid serology assay to identify past infection with Lassa Fever Virus	Epi		-	30/09/2020	Sierra Leone	<p>Foundation for Innovation New Diagnostics (FIND)</p> <p>Coalition for Epidemic Preparedness Innovations (CEPI)</p>	<p>Two novel assays to detect antibodies to Lassa Fever Virus</p> <ul style="list-style-type: none"> • Independent evaluation of the assays by two endemic country laboratories • Open access publication of study results, tools and dataset • Study presentation via LSHTM seminars and UK-PHRST Knowledge Hub • Study results will be shared with LASV researchers in endemic countries when peer review is complete 	Externally funded by: Foundation for Innovative New Diagnostics/Coalition for Epidemic Preparedness Innovations. (UK-PHRST Core Deployable Team: Hilary Bower)
28	Lassa fever prospective cohort study – cardiovascular function and ribavirin pharmacokinetics and dynamics	Clinical Research	University of Oxford	-	30/06/2021	First Sierra Leone Then Nigeria	Owo Federal Medical Centre Lassa Fever unit	<p>Ongoing:</p> <p>- This project links to the UK-PHRST implementation activity of evaluating tools – in this case a treatment - for outbreak response as well as the UK-PHRST Theory of Change activities of conducting outbreak-relevant research in and after a response and supporting</p>	Negotiations are in process for Bristol University to take on PK analysis

									the development of research and research skills in outbreak-prone diseases	
29	Promoting earlier presentation of patients with Lassa Fever: health seeking behaviour and Lassa fever admissions in Sierra Leone	Social Science	UKPHRST		-	31/03/2021	Sierra Leone		Ongoing: - this study results from the Theory of Change activity of generating and conducting relevant research in and after a response	
30	Identification by TaqMan array card system and MinION sequencing of co-circulating pathogens that are clinically indistinguishable from Lassa Fever during seasonal Lassa Virus outbreaks in Nigeria: a retrospective study	Clinical Research	UKPHRST		-	31/03/2020	Nigeria	Nigeria CDC	Ongoing - generation and conduct of outbreak-relevant research pre, during and post outbreak	
31	Rapid response molecular diagnostics for Crimean-Congo Haemorrhagic Fever	Clinical Research	Liverpool School of Tropical Medicine (LSTM)		-	31/07/2021	Turkey	Ministry of Health Virology Reference Laboratory (MHVRL) in Ankara	Ongoing	
32	Strengthening viral haemorrhagic fever preparedness in Uganda by sero-surveillance of healthcare workers		Glasgow University and UCL		-	31/03/2021	Uganda	Ugandan health authorities (no specifics)	Ongoing - Outputs include the remote training package including REDCap data management, consent video, questionnaire, FAQs, and laboratory SOPs, all of which will be uploaded to the UK-PHRST Knowledge Hub after piloting, together with a lessons learned blog	

33	Strengthening public mental health capacity in Africa in response to the COVID-19 outbreak	Mental Health	Not clear	-	Likely 31/03/21	Africa CDC/Remote	Mental health and psychosocial support (MHPSS) members from Africa CDC, the West African Health Organisation (WAHO), the East, Central and Southern African Health Community(ECSA-HC), WHO AFRO and EMRO	Ongoing: - Psychological First Aid Training for African context Series of MHPSS webinars	
34	How can massive open online courses (MOOCs) be used to support outbreak response? An action research approach	Education	Not clear	Aug-20	31/03/2021	Global	Future Learn	Produce a framework to directly support to ODA-eligible countries to develop virtual learning as a tool for education - MOOC team were named joint winners of the LSHTM Director's Award for Excellence for Learning, Teaching, Assessment or The Wider Student Experience	
35	Feasibility assessment of a survey protocol using oral fluid-based anti-Ebola Virus (EBOV) immunoglobulin-G immunoassays to identify previously undetected EBOV infections in the high-risk Nzérékoré prefecture of Guinea.	Clinical Research	Not clear	Sep-20	Extended to 30/05/22	Guinea	No mention	Ongoing - objective of this project is to explore whether large scale screening with an easy-to-use, more community-acceptable oral fluid assay is a cost-effective way of identifying previously undetected Ebola infections and revealing locations at high risk of spill-over outbreaks of Ebola Virus Disease	The project builds on previous work on the novel assay (funded by the Wellcome Foundation) and leverages further human and financial resources from an ongoing FDA-funded project in Guinea led by co-investigator Professor Miles Carroll, de-duplicating and adding value to the use of UK-PHRST research funds

36	Interventions for COVID-19: A survey of public health and healthcare workers' assessment of current and future interventions, the practicality of, and barriers to, implementation in different contexts worldwide	Monitoring/Evaluation and Social Science	UKPHRST	Data Science	28-Sep-20	Mar-21	Global		Results will be analysed regionally and shared with decision-makers to facilitate planning and adaptation of interventions to improve response performance of Covid-19	
37	Population-based seroprevalence survey for COVID-19 Cox's Bazar (CXB) Rohingya Camps, Bangladesh		Bangladesh Institute of Epidemiology, Disease Control and Research (study leader)		Nov-20	Field-based Oct/Nov 2020; Remote Sep 2020 - Jan 2021	Bangladesh	Bangladesh Institute of Epidemiology, Disease Control and Research		

Research publications

No.	Title	Authors	Year	Publication	Link	Status
1	Rapid research needs appraisal methodology	Sigfrid L, Moore C, Garritty C, Maayan N, Lutje V, Marshall R, Salam A, Pestrige C, Buckley B, Soares-Weiser K, Clarke M, Horby P.	2017	Open Access Framework. Date created: 20 November 2017	https://osf.io/dzh3s/	published
2	The Breadth of Viruses in Human Semen	Salam AP, Horby PW	2017	Emerging Infectious Diseases; 23(11): 1922-1924. doi:10.3201/eid2311.171049	https://wwwnc.cdc.gov/eid/article/23/11/17-1049_article	published
3	Training peers to treat Ebola centre workers with anxiety and depression Sierra Leone	WatermanS, Hunter ECM, Cole CL, Evans LJ, Greenberg N, Rubin GJ and Beck A	2018	International Journal of Social Psychiatry; 1–10 (DOI: 10.1177/0020764017752021	http://journals.sagepub.com/doi/abs/10.1177/0020764017752021	published
4	The Epidemic Diseases Research Group field team. Clinical assesment is a neglected component of outbreak preparedness: evidence from refugee camps in Greece	Rojek AM, Gkolfinopoulou K, Veizis A, Lambrou A, Castle L, Georgakopoulou T, Blanchet K, Panagiotopoulos T, Horby Pwand	2018	BMC Med. 2018; 16: 43. Published online 2018 Mar 19	https://bmcmecine.biomedcentral.com/articles/10.1186/s12916-018-1015-9	published
5	Real-Time Modeling Should be Routinely Integrated into Outbreak Response	Bausch DG and J Edmunds	2018	American Journal of Tropical Medicine Hygiene; PMID: 29611508	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5953398/	published
6	A qualitative study assesing the feasibility of implementing a group CBT based intervention in Sierra Leone	Waterman S, Cole CL, Greenberg N, Rubin GJ, Beck A	2018	British Journal of Psychiatry International	https://www.cambridge.org/core/journals/bjpsych-international/article/qualitative-study-assessing-the-feasibility-of-implementing-a-group-cognitivebehavioural-therapybased-intervention-in-sierra-leone/0B969799F0D7EEF2DAFE66238FBD78D1	published
7	Meningococcus serogroup C clonal complex ST-10217 outbreak in Zamfara State, Northern Nigeria	Brenda A. Kwambana-Adams, Rahab C. Amaza, Catherine Okoi, Murtala Rabiou, Archibald Worwui, Ebenezer Foster-Nyarko, Bernard Ebruke, Abdul K. Sesay, Madikay Senghore, Abdullahi S. Umar, Rabi Usman, Adamu Atiku, Garba Abdullahi, Yahaya Buhari, Rabiou Sani, Husaini U. Bako, Bashir Abdullahi, Alliyu I. Yarima, Badaru Sikiru, Aderinola Olaolu Moses, Michael O. Popoola, Eme Ekeng, Adebola Olayinka, Nwando Mba, Adamu Kankia, Ibrahim N. Mamadu, Ifeanyi Okudo, Mary Stephen, Olivier Ronveaux, Jason Busuttill, Jason M. Mwenda, Mohammed Abdulaziz, Sulaiman A. Gummi, Adebayo Adedeji, Andre Bitu, Linda Omar, Mamoudou Harouna Djingarey, Wondimagegnehu Alemu, Umberto D'Alessandro, Chikwe Ihekweazu & Martin Antonio	2018	Scientific Reports open access. Date created: September 2018	https://www.nature.com/srep/	published

8	Health care worker vaccination against Ebola: 1 vaccine acceptance and employment duration in Sierra Leone	Mario Jendrossek, W John Edmunds, Hana Rohan, Samuel Clifford, Thomas A Mooney, Rosalind M Eggo	2018	Vaccine	https://www.sciencedirect.com/science/article/pii/S0264410X19300295	published
9	Investigation into Ebola infections within isolation units. - Analysis of readmission and community deaths following discharge negative	Lead author: Emilio Hornsey	2018	abstract accepted as posters for the forthcoming Infection Prevention Society conference		presented
10	What is the risk of Ebola virus transmission to patients in isolation facilities? A review of the literature	Lead author: Emilio Hornsey	2018	abstract accepted as posters for the forthcoming Infection Prevention Society conference		presented
11	Outbreak analytics: a developing data science for informing the response to emerging pathogens	Polonsky, Jonathan; Baidjoe, Amrish; Kamvar, Zhian; Cori, Anne; Durski, Kara; Edmunds, John; Eggo, Rosalind; Funk, Sebastian; Kaiser, Laurent; Keating, Patrick; le Polain de Waroux, Olivier; Marks, Michael; Moraga, Paula; Morgan, Oliver; Nouvellet, Pierre; Ratnayake, Ruwan; Roberts, Chrissy; Whitworth, Jimmy; Jombart, Thibaut.	2018	Philosophical Transactions of the Royal Society B	https://royalsocietypublishing.org/doi/full/10.1098/rstb.2018.0276	published
12	Action not justification: how to use social science to improve outbreak response	Hana Rohan, Daniel G Bausch, Karl Blanchet	2018	Plos Channels and Collections Blog	https://blogs.plos.org/collections/action-not-justification-how-to-use-social-science-to-improve-outbreak-response/ https://channels.plos.org/ebola	published
13	Isolation of viable Zika virus from spermatozoa	Alex Salam ;Peter Horby	2018	The Lancet Infectious Diseases	https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(18)30020-3/fulltext	published
14	Severe Undifferentiated Febrile Illness Outbreaks in the Federal Republic of Sudan – A Retrospective Epidemiological and Diagnostic Study	H. Bower, T. E. Fletcher, R. Mohamed, M. Al Zain, A. El Halawi, A. Osman, A. Semper, T. Brooks, J. Osborne, J. Furneaux, S. Dowall, V. Graham, G. Slack, R. Hewson, N. Beeching, J. Whitworth, D. Bausch, I. Abdalla, M. Mustafa.	2018	Abstract accepted as posters for International Meeting on Emerging Diseases and Surveillance, Vienna Nov 9-12 2018; paper being finalised, planned submission to EID		presented
15	CHARACTERISTICS OF PATIENTS ADMITTED TO PNEUMONIC PLAGUE TREATMENT CENTRES DURING THE 2017 MADAGASCAR OUTBREAK: A PROSPECTIVE COHORT STUDY	Alex Salam, Mihaja Raberona, Prisca Andriantsalama, Anna Funk, Faraniaina Andrianarintsiferantsoa, Rodrigue Hasiniats, Dominique Razafimandimb, Lyndsey Castle, Reziky Mangahasimbola, Laurence Baril, Bertrand Renaud, Eric Bertherat, Arnaud Fontanet, Minoarisoa Rajerison, Peter Horby, Mammy Randria, Rindra Rendremanana,	2018	Abstract accepted as poster for the American Society of Tropical Medicine and Hygiene, New Orleans, 28 Oct-1 Nov 2018		presented

16	Unrecognised Ebola virus infection in contacts: what can we learn from it?	Tom E Fletcher and Hilary Bower	2018	The Lancet Infectious Diseases	http://dx.doi.org/10.1016/S1473-3099(18)30689-3	published
17	Producing evidence to inform the care of patients with Ebola Virus Disease: A systematic review and meta-analysis of clinical data from the West Africa (2013-16) epidemic	Amanda Marieanna Rojek, Alex Salam, Robert J Ragotte, Emily Liddiard; Ahmed Elhussain; Anna Carlqvist; Michael Butler; Nzelle Kayem; Lyndsey Castle; Lang'O Odondi; Kasia Stepniewska; Peter Horby	2018	The Lancet Infectious Diseases		accepted
19	Planning for Large Epidemics and Pandemics: Challenges from a Policy Perspective	Vageesh Jain, Adriano Duse, Daniel G. Bausch	2018	Current Opinions in Infectious Diseases	https://journals.lww.com/co-infectiousdiseases/Fulltext/2018/08000/Planning_for_large_epidemics_and_pandemics_.9.aspx	published
20	RESPONSE TO AN OUTBREAK	Olivier le Polain de Waroux & Daniel G. Bausch	2018	Control of Communicable Diseases Manual", edited by David Heymann	-	accepted
21	Outbreaks in a Rapidly Changing Central Africa — Lessons from Ebola	Vincent J. Munster, Daniel G. Bausch, Emmie de Wit, Robert Fischer, Gary Kobinger, César Muñoz-Fontela, Sarah H. Olson, Stephanie N. Seifert, Armand Sprecher, Francine Ntoumi, Moses Massaquoi, and Jean-Vivien Mombouli.	2018	New England Journal of Medicine	https://www.nejm.org/doi/full/10.1056/NEJMp1807691	published
22	Rapid needs appraisal to inform clinical research prioritise in response to (re-) emerging outbreaks	Louise Sigfrid, Alex Salam, Catrin Moore, Karla Soares-Weiser, Chantelle Garritty, Rachel Marshall, Nicola Maayan, Candyce Hamel, Charlotte Pestridge, Brian Buckley, Mike Clarke, Peter Horby	2018	The results of one of the RST funded operational research projects to be presented as part of a training workshop at the Global Evidence Summit in South Africa to be held on 13-18 September.	https://www.globalevidencesummit.org/about-summit	presented
24	Lessons learnt from Ebola virus disease surveillance in Équateur Province, May–July 2018	Jonathan Polonsky, Franck Mboussou, Christopher Haskew, Olivier le Polain de Waroux, Marie Roseline Darnycka Belizaire, Vital Mondonge, Valentin Mukinda, Patricia Ndumbi Ngamala, Emilie Peron, Jillian Murray, Oliver Morgan, Mamoudou Harouna Djingareyb and Benido Impoumab	2018	World Health Organisation - Weekly Epidemiological Record	http://apps.who.int/iris/bitstream/handle/10665/279701/WER9403.pdf?ua=1	published
25	A rapid research needs appraisal methodology to inform clinical research priorities in response to outbreaks - results from the Lassa fever pilot	Louise Sigfrid, Catrin Moore, Alex P Salam, Nicola Maayan, Candyce Hamel, Chantelle Garritty, Vittoria Lutje, Brian Buckley, Karla Soares-Weiser, Rachel Marshall, Mike Clarke, Peter Horby University of Oxford	2018	BMC Medicine	https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-019-1338-1	published

26	Floods as human health risks	Ellen Bloomer, Owen Landeg, Olivier le Polain de Waroux	2018	Encyclopedia of Environmental Health, 2nd edition	https://doi.org/10.1016/B978-0-12-409548-9.11462-9	published
27	Severe Undifferentiated Febrile Illness Outbreaks in the Federal Republic of Sudan: A Retrospective Epidemiological & Diagnostic Cohort Study	Bower, Hilary; MUSTAFA, MUBARAK; Alzain, Mazza; Gannon, Benedict; Elageb, Rehab; Mahmoud, Iman; Eldegail, Mawahib ; Taha, Rihab;Semper, Amanda; Atkinson, Barry; Carter, Daniel; Dowall, Stuart; Furneaux, Jenna; Graham, Victoria; Mellors, Jack; Pullan, Steven; Hewson, Roger; Beeching, Nick; Whitworth, Jimmy; Fletcher, Tom;	2019	International Journal of Infectious Diseases	https://doi.org/10.1016/j.ijid.2018.11.302	published
28	Early transmission and case fatality of Ebola virus at the index site of the 2013–16 west African Ebola outbreak: a cross-sectional seroprevalence survey	Joseph W S Timothy, Yper Hall, Joseph Akoi-Boré, Boubacar Diallo, Thomas R W Tipton, Hilary Bower, Thomas Strecker, Judith R Glynn, Miles W Carroll	2019	Lancet Infectious Diseases	https://www.sciencedirect.com/science/article/pii/S1473309918307916?via%3Dihub	published
29	New Filovirus Disease Classification and Nomenclature	Jens H. Kuhn, Takuya Adachi, Neill K. J. Adhikari, Jose R. Arribas, Ibrahima Elhadj Bah, Daniel G. Bausch, Nahid Bhadelia, Matthias Borchert, Arne Broch Brantsæter, David M. Brett-Major, Timothy H. Burgess, Lado Marta Castro-Rial, Daniel S. Chertow, Christopher G. Chute, Theodore J. Cieslak, Robert Colebunders, Ian Crozier, Richard T. Davey, Hilde de Clerck, Rafael Delgado, Laura Evans, Mosoka Fallah, William A. Fischer II, Tom E. Fletcher, Robert A. Fowler, Thomas Grūnewald, Andy Hall, Angela Hewlett, Andy I. M. Hoepelman, Catherine F. Houlihan, Giuseppe Ippolito, Shevin T. Jacob, Michael Jacobs, Robert Jakob, Frederique A. Jacqueroiz, Laurent Kaiser, Andre C. Kalil, Rashidatu F. Kamara, Jimmy Kapetshi, Hans-Dieter Klenk, Gary Kobinger, Mark G. Kortepeter, Colleen S. Kraft, Thomas Kratz, Henry S. Kyobe Bosa, François Lamontagne; H. Cliff Lane, Leslie Lobel, Julius Lutwama, G. Marshall Lyon III, Moses B. F. Massaquoi, Thomas A. Massaquoi, Aneesh K. Mehta, Vital Mondonge Makuma, Srinivas Murthy, Tonny Seikikongo Musoke, Jean-Jacques Muyembe Tamfum, Phiona Nakyeyune, Carolina Nanclares, Miriam Nanyunja,	2019	Nature Reviews Microbiology	https://www.nature.com/articles/s41579-019-0187-4	published

		Justus Nsio-Mbeta, Tim O'Dempsey, Janusz T. Pawęska, Clarence J. Peters, Peter Piot, Christophe Rapp, Bertrand Renaud, Bruce Ribner, Pardis C. Sabeti, John S. Schieffelin, Werner Slenczka, Moses J. Soka, Armand Sprecher, James Strong, Robert Swanepoel, Timothy M. Uyeki, Michel van Herp, Pauline Vetter, David A. Wohl, Timo Wolf, Anja Wolz Alie H. Wurie and Zabulon Yoti				
30	Shifting the Paradigm—Applying Universal Standards of Care to Ebola	William A Fischer II, Ian Crozier, Daniel G Bausch, Jean-Jacques Muyembe, Mulangu Sabue, Janet V Diaz, Richard Kojan, David A Wohl, and Shevin T Jacob	2019	New England Journal of Medicine	https://www.nejm.org/doi/full/10.1056/NEJMp1817070	published
31	The complex ethical landscape of biobanking	Jonathan W Ashcroft, Cheryl C Macpherson	2019	Lancet Public Health - commentary	https://doi.org/10.1016/S2468-2667(19)30081-7	published
32	Chapter 357 - Viral Haemorrhagic Fevers	Daniel Bauch	2019	Textbook - Goldman-Cecil Medicine, 2-Volume Set	ISBN 323532667	published
33	UK-PHRST: The UK's Novel Approach to Outbreak Response	JW Ashcroft, BW Gannon	2019	Microbiology Today		accepted
34	Detection of Crimean-Congo Haemorrhagic Fever cases in a severe undifferentiated febrile illness outbreak in the Federal Republic of Sudan: a retrospective epidemiological and diagnostic cohort study	Bower, H, Mustafa, M, Alzain, M, Gannon, B, Elageb, R, Mahmoud, I, Eldegail, M, Taha, R, Semper, A, Atkinson, B, Carter, D, Dowall, S, Graham, V, Mellors, J, Pullan, S, Hewson, R, Beeching, N, Whitworth, J, Fletcher, T	2019	Plos NTD	https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0007571	published
36	Pneumococcal conjugate vaccine use during humanitarian crises	Kevin van Zandvoort, Francesco Checchi, Emma Diggle, Rosalind M. Eggo, Kartini Gadroen, Kim Mulholland, Catherine R. McGowan, Olivier le Polain de Waroux, V. Bhargavi Rao, Catherine Satzke, Stefan Flasche	2019	Vaccine	https://doi.org/10.1016/j.vaccine.2019.09.038	published
37	Transmission risk of respiratory viruses in natural and mechanical ventilation environments: Implications for SARS-CoV-2 transmission in Africa.	Anuoluwapo Sopeyin, Emilio Hornsey, Tochi Okwor, Yewande Alimi, Tajudeen Raji, Abdulaziz Mohammed, Hiwot Moges, Ezinne V C Onwuekwe, Frank J Minja, Onyema Ogbuagu, Folasade Ogunsola, Elijah Paintsil.	2020	BMJ Global Health	https://gh.bmj.com/content/5/8/e003522	published

38	In-Flight Transmission of SARS-CoV-2.	Edward M Choi, Daniel KW Chu, Peter KC Cheng, Dominic NC Tsang, Malik Peiris, Daniel G Bausch, Leo LM Poon and Deborah Watson-Jones	2020	Emerg Infect Dis.	https://dx.doi.org/10.3201/eid2611.203254	published
39	Kankasha in Kassala: A prospective observational cohort study of the clinical characteristics, epidemiology, genetic origin, and chronic impact of the 2018 epidemic of Chikungunya virus infection in Kassala, Sudan	Hilary Bower, Mubarak el Karsany, Abd Alhadi Adam Hussein Hussein, Mubarak Ibrahim Idriss, Maaza Abasher al Zain, Mohamed Elamin, Ahmed Alfakiyousif, Rehab Mohamed, Iman Mahmoud, Omer Albadri, Suha Abdulaziz, Alnour Mahmoud, Orwalbrahim Abdalla, Mawahib Eldigail, Nuha Elagib, Ulrike Arnold, Bernardo Gutierrez, Oliver G Pybus, Daniel P Carter, Steven T Pullan, Shevin T Jacob, Tajeldin Mohammedin Abdallah, Benedict Gannon, Tom E Fletcher	2020	medRxiv	https://www.medrxiv.org/content/10.1101/2020.09.23.20199976v1	pre-print
40	COVID- 19: Identifying countries with indicators of success in responding to the outbreak	Kennedy DS, Vu VK, Ritchie H, Bartlein R, Rothschild O, Bausch DG, Roser M, Seale AC	2020	Gates Open Research	https://gatesopenresearch.org/articles/4-62	Published
41	Learning from each other in the COVID-19 pandemic	Seale AC, Ibetto M, Gallo J, le Polain de Waroux O, Glynn JR, Fogarty J	2020	Wellcome Open Research	https://wellcomeopenresearch.org/articles/5-105	Published
42	The usefulness of pre-employment and pre-deployment psychological screening for disaster relief workers: a systematic review	Elena Opie, Samantha Brooks, Neil Greenberg, G. James Rubin	2020	BMC Psychiatry	https://bmcp psychiatry.biomedcentral.com/articles/10.1186/s12888-020-02593-1	Published
43	Inactivation analysis of SARS-CoV-2 by specimen transport media, nucleic acid extraction reagents, and detergents fixatives	Stephen R. Welch, Katherine A. Davies, Hubert Buczkowski, Nipunadi Hettiarachchi, Nicole Green, Ulrike Arnold, Matthew Jones, Matthew J. Hannah, Reah Evans, Christopher Burton, Jane E. Burton, Malcolm Guiver, Patricia A. Cane, Neil Woodford, Christine B. Bruce, Allen D. G. Roberts, Marian J. Killip	2020	bioRxiv	https://doi.org/10.1101/2020.07.08.194613	Published
44	Back to basics: the outbreak response pillars	Fisher D., Carson G., on behalf of the GOARN Steering Committee	2020	Lancet	https://doi.org/10.1016/S0140-6736(20)31760-8	Published
45	Coronavirus: The psychological effects of quarantining a city	G James Rubin; Simon Wessely	2020	The BMJ Opinion	https://blogs.bmj.com/bmj/2020/01/24/coronavirus-the-psychological-effects-of-quarantining-a-city/	Published
46	The cost of insecurity: from flare-up to control of a major Ebola virus disease hotspot during the outbreak in the Democratic Republic of the Congo	Thibaut Jombart, Christopher I Jarvis, Samuel Mesfin, Nabil Tabal, Mathias Mossoko, Luigino Minikulu Mpia, Aaron Aruna Abedi, Sonia Chene, Ekokobe Elias Forbin, Marie Roseline D Belizaire, Xavier de Radiguès, Richy Ngombo, Yannick Tutu, Flavio Finger, Madeleine Crowe, W John Edmunds, Justus Nsio, Abdoulaye Yam, Boubacar Diallo, Abdou Salam Gueye,	2020	Euro Surveill	https://dx.doi.org/10.2807%2F1560-7917.ES.2020.25.2.1900735	Published

		Steve Ahuka-Mundeke, Michel Yao, and Ibrahima Socé Fall				
47	Preparedness for emerging epidemic threats: A Lancet Infectious Diseases Commission	Vernon J Lee; Ximena Aguilera; David Heymann; Annelies Wilder-Smith; for TheLancet Infectious Diseases Commission	2020	The Lancet Infectious Diseases	https://doi.org/10.1016/S1473-3099(19)30674-7	Published
48	Effect of Acute Illness on Contact Patterns, Malawi, 2017	Judith R. GlynnComments to Author , Estelle McLean, Jullita Malava, Albert Dube, Cynthia Katundu, Amelia C. Crampin, and Steffen Geis	2020	Emerging Infectious Diseases	https://doi.org/10.3201/eid2601.181539	Published
49	Event-based surveillance at health facility and community level in low-income and middle-income countries: a systematic review	Anna Kuehne; Patrick Keating; Jonathan Polonsky; Christopher Haskew; Karl Schenkel; Olivier Le Polain de Waroux; Ruwan Ratnayake	2019	BMJ Global Health	https://gh.bmj.com/content/4/6/e001878	Published

Capacity development⁹

Activity	Location	Format	UK-PHRST role/involvement	Year	Dates	Total participants	Total LMIC-based participants
Africa CDC induction courses	Ethiopia (Addis Ababa)			2017			
-	Sudan	Workshop	Hilary Bower	2018			
Outbreak workshop - Karary University and Government	Sudan	Workshop	Hilary Bower	2017			
Assisted Sierra Leone College of Medicine & Allied Sciences (COMAHS) in developing a MSc in Public Health Programme	Sierra Leone	Qualification	Patrick Keating & Anna Kuehne lead Capacity Building with COMAHS	2017	Ongoing		
Trained study team for research project	Sudan	Interactive face-to-face course	Led by Hilary Bower	2017	to 2018	10	
Training of local staff on research protocols in the context of clinical research	Sierra Leone, Nigeria	Face-to-face training, ongoing mentoring and support face-to-face and via Whatsapp group	Led by Alex Salam	2018	to 2019		
Epidemic response team training programme, sponsored by Africa CDC	Ethiopia (Addis Ababa)	Face-to-face meeting	Contribution from Ioannis Karagiannis & Senior FETP Scientific Co-ordinator	2018	to 2019		
Contributions to building a Massive Open Online Course in Disease Outbreaks in LMICs	Online	Website - https://www.futurelearn.com/courses/disease-outbreaks	UK-PHRST supporting LHSTM	2018	to 2019		
Train the trainer' training course on outbreak logistics and supply chain management	Nigeria	Face-to-face training course	Matt Knight and RST Operations team	2018	to 2019		
Workshop on Public Health Info services in Humanitarian crisis	Senegal (Dakar)	Face-to-face training	Olivier Le Polain	2018	to 2020		
Creation and launch of Epidemic Response Anthropology Platform (ERAP) website		Website - https://www.epidemicresponse.net/	Hana Rohan contributed capacity building	2018	to 2021		

⁹ The table shows capacity building activities formally recorded by UK-PHRST. Due to the nature of deployment and close working relationships with partner countries and organisations, the full spectrum of capacity building activities including more informal capacity building may not be captured here.

Social Science Epidemic Preparedness Workshop and launch of West African Social Science Epidemic Response Network			Hana Rohan contributed capacity building	2018	to 2022		
Behaviour change risk comms and outbreak response a best practice Workshop	Ethiopia (Addis Ababa)	Workshop	Hilary Bower facilitated	2019			
Baseline learning needs assessment of Africa Centre for Disease Control Epidemic Response Team (ERT) and African Volunteer Health Corps (AVoHC) to provide a baseline for capacity-building planning (French & English)	Ethiopia (Addis Ababa)	A remote project taken on by RST as a result of a request from the Africa CDC training technical working group - and carried out by online survey	Hilary Bower, Ioannis Karagiannis (UK-FETP), Simon Parker (UK-FETP) contributed to capacity building	2019	Feb-August		
Deployment to Cox's Bazar to support operational research and manuscript writing for partners involved in the response to the Rohingya refugee crisis	Bangladesh (Cox's Bazar)	Support operational research and manuscript writing for partners on the field	Fanny Chereau contributed to capacity Building	2019	June - July		
Delivered General Virology module at COMAHS	Sierra Leone	Qualification	Ben Gannon & Jonathan Ashcroft led capacity building	2019	July		
Workshop on 'Developing a strategic agenda around outbreak & humanitarian data collection & analytics'	United Kingdom	Face-to-face workshop	Organised by UK-PHRST, contribution made by Olivier Le Polain and Patrick Keating	2019	20-22 March 2019		
Facilitating a rolling IPC webinar programme with Africa CDC and ICAN. Support to an online community of practise. Weekly sessions via Zoom and ad hoc support to Telegram community of practise.	Remote	Online remote training in 6-week blocks	Emilio Hornsey contributed to Capacity Building	2020	April - November	4000+	4000+
COVID-19: Tackling the Novel Coronavirus	Global	Online	UK-PHRST led, contributions from Anna Seale, Maryirene Ibetto, Ben Gannon, Olivier le Polain, Hana Rohan, Hilary Bower, Ioannis Karagiannis, Emilio Hornsey, Dan Bausch, Arlinda Cerga-Pashoja, David Kennedy, Peter Horby, Dan Brunsdon, Rosanna Glazik	2020	March - August	236,102	123,516

Development of Monkeypox Capacity Building project to set up long term sequencing capacity at NCDC	Nigeria	Project work	Jonathan Ashcroft led capacity building	2020	Ongoing		
Africa CDC Technical Working Group for Training	Remote	Telecon	Hilary Bower & Ashley Sharp	2018	Ongoing		
Organised and delivered the first face-to-face WASHFIT training course (3 days) for and with health partners operating in Cox's Bazar district	Bangladesh (Cox's Bazar)	Face-to-face training course	Emilio Hornsey contributed to Capacity Building	2018	August		
Designed and delivered IPC study day	Bangladesh (Cox's Bazar)	Face-to-face	Emilio Hornsey contributed to Capacity Building - designed and delivered one day face-to-face bespoke training package for newly appointed IPC nurses (7 in total) working in IOM supported primary health facilities in Kutapalong	2018	August		
Facilitator at the Multivariable Analysis module of MediPIET, the FETP for non-EU Mediterranean and Black Sea countries	Albania	Face-to-face	Ioannis Karagiannis led the redevelopment of some of the material, taught and facilitated in the course	2019	December		
Development of the public health library at COMAHS	Sierra Leone		Hana Rohan contributed capacity development, supported by Anna Kuehne and Patrick Keating	2019	November		
LSHTM modules: Extended & Basic Epidemiology; Epidemiology in Practice; STATA training; DL Humanitarian Health session	Global		Hilary Bower (lecturer)	2020			Approx 40-50% of students
Class II Biological Safety Cabinet training	Gambia	Practical face-to-face training	Ben Gannon	2020			19
PCR result interpretation	Gambia	Lecture	Ben Gannon (lecturer)	2020			10
PCR software training	Gambia	Lecture	Ben Gannon (lecturer)	2020			4
Emergency Spill training	Gambia	Practical face-to-face training	Ben Gannon delivered training	2020			19
Laboratory Safety: BSL3 management	Gambia	Mentoring, practical training	Ben Gannon delivered training	2020			1
Mentoring on Biosecurity - waste disposal	Gambia	Mentoring	Ben Gannon delivered training	2020			1

Training for laboratory team in Kenema, Sierra Leone and Irrua Nigeria in novel Lassa fever assay and pooling for research serology testing as part of the FIND independent evaluation of Lassa Serology Assays	Online (Sierra Leone, Nigeria)	Online	Hilary Bower (LOFA principal investigator)	2020	28th Sept - 1st Oct 2020		Approx. 20
Uncontained lab spills training	Bangladesh	In-person training	Presented	2020	August	Approx. 20	Approx. 20
Validation process training	Bangladesh	In-person training	Presented	2020	August	Approx. 20	Approx. 20
Supported Africa CDC IPC Manufacturers workshop	Online (Africa)	Online	Emilio Hornsey supported ACDC PPE manufacturers workshop, wrote concept note, invited speakers, moderated a session and provided input to the final report	2020	August	500+	500+
Quality Management Systems training	Bangladesh	In-person training	Presented	2020	August	Approx. 20	Approx. 20
Sudan Oubreak Group	Remote	WhatsApp	Hilary Bower started up the group and contributed together with members of the group (FMOH, State Health Ministry, WHO Kassala, Sudan FETP) to dissemination of guidelines, tools, information to facilitate quick access to information on COVID-19 knowledge and control	2020	February - September - postings several times a week, now adhoc		
Training: COVID-19	Nigeria	In-person training	Presented	2020	January	Approx. 25	Approx. 24
Africa CDC 2 day Covid-19 Orientation Module for Community Health Workers	Online (Africa)	PowerPoint	Hilary Bower led project and wrote most of the module in collaboration with Southern African Centre for Infectious Disease Surveillance (SACIDS) Foundation for One Health (based in Tanzania)	2020	July		
Africa CDC surveillance webinars	Africa (Online)	Online	Hilary Bower contributed 2 presentations and supported agenda development	2020	June		Approx. 80-100

Africa CDC Modelling group	Online	Weekly meeting, SLACK channel and email	Hilary Bower was co-chair with Africa CDC colleague: contributing 1/ to bringing together African continent modelling groups together with international groups to inform models, and support sharing of technical knowledge and 2/ guidance and information sharing with international modelling groups to encourage adaptation of their models to African settings	2020	March - November		
Facilitator at a MoH-organised event in Antipolo, Philippines, to discuss evidence for community transmission of SARS-CoV-2 in the country and the role of field epidemiology.	Philippines	Face-to-face meeting	Ioannis Karagiannis led discussions on community transmission	2020	March		
Training on Diagnostic pipeline (COVID-19)	Nepal	In-person training and discussion	Presented	2020	March	Approx. 10	Approx. 8
Training: Lab4Epi	Online	Online	Presented	2020	October	FETP fellows	
Online lecture: Introducing the UK-PHRST: How we are supporting the COVID-19 response	Global	Online lecture	Delivered by Dan Bausch, Hilary Bower, Hana Rohan, Jonathan Ashcroft	2020	October	Approx. 70	
Lecture: Let's Talk COVID-19: Historians, Policy, and Public Health	Global	Online lecture	Rosanna Glazik was lecture facilitator - PHRST-supported series	2020	October		
Training course on MinION bioinformatics	Online (Nigeria)	Online presentation/discussion	Co-ordinated	2020	7th January	Approx. 15	Approx. 12
TED Talk	Online	Online	Presented	2020	April	Approx. 120	
Lecture: Let's Talk COVID-19: Use case scenarios for potential COVID-19 vaccines	Global	Online lecture	Delivered by Hilary Bower, Dan Bausch, Mary Ibeto	2020	July		
Lecture: Let's Talk COVID-19 "COVID-19 elimination in New Zealand: Could it work in the UK?"	Global	Online lecture	Delivered by Dan Bausch and Mary Ibeto	2020	July		

Annex 7: Case study - Africa CDC

Case Study Contribution Story Summary – UK-PHRST Support to Africa CDC (2018-2020)

Context

UK-PHRST started working with Africa CDC in 2018 by supporting training for their Epidemic Response Team. This started a positive partnership, which complements the PHE IHR Strengthening Project's ongoing support. The next key support provided by UK-PHRST was towards Africa CDC's 2020 COVID-19 response.

STO 1: "UK-PHRST contributes effectively as part of wider outbreak response"

There was strong qualitative evidence from Africa CDC informants, background literature and other stakeholders that effective deployment of key expertise, and provision of expertise in the key areas of epidemiology, infection prevention and control (IPC), and laboratory helped to strengthen capacity for outbreak response (Factors 1 – 4), without which, response efforts would not be effective.

UK-PHRST contributed to these areas through provision of key outputs including **rapid, timely and successful deployments; the provision of valuable and essential expertise and capacity building (both in person and remotely); and through successful collaborative partnerships**. Specifically, UK-PHRST provided important contribution to deployment of expert surge capacity (Factor 1) through its deployment of seven multi-disciplinary experts across epidemiology, infection prevention and control (IPC), laboratory, social science, logistics and clinical case management (four deployed both in person and remotely; three remotely only). UK-PHRST's deployment team was considerably larger than that of other partners (1-2 persons each from US CDC and China CDC) and they provided the majority of the additional deployment personnel requested by Africa CDC.

Provision of IPC support during the COVID-19 outbreak (Factor 3) was also seen as an important contribution, and included development of regional IPC guidelines which were subsequently rolled out to and used by member states. Other partners appear to have been involved in the area of IPC (for example, WHO provided support to the creation of Infection prevention and control guidelines for ambulances transferring known or suspected COVID-19 cases; WHO, Resolve to Save Lives, Infection Control Africa Network (ICAN) supported training on IPC for journalists during COVID-19 and WHO and ICAN supported a webinar series on IPC for COVID-19) but Africa CDC stakeholder still rated UK-PHRST's contribution here as important.

Epidemiology support (Factor 2) and Laboratory support (Factor 4) was also seen as useful, but in these areas UK-PHRST's contribution was in the context of significant contribution (financial and/or technical) from multiple other organisations, including US CDC, WHO, China CDC.

STO 2: "Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making"

Research activities (incl. seroprevalence surveys and mental health research) by UK-PHRST were in very early stages at the time of the evaluation. No contribution towards this short-term outcome could be ascribed.

STO 3: "Improved UK and in-country capacity for outbreak prevention and response in LMICs"^{10,11,12}

There was strong but qualitative evidence from Africa CDC informants and other stakeholders that vital in-country capacity across the continent had been improved through the creation, training and mobilisation of various cohorts of Africa CDC rapid responders (Factor 1): indeed, some stakeholders saw this as Africa CDC's most important capacity, in terms of its impact on outbreak prevention and response across member states. There was also agreement that having a functional continent-wide rumour tracking system (Factor 2) was an important area of outbreak response capacity given learnings from prior outbreaks where rumours contributed towards mistrust of and attacks on health personnel¹³.

¹⁰ It is not possible to provide a full list of all the factors that contribute to increased in-country capacity, so the factors here focus on areas that UK-PHRST contributed towards and were seen as important factors within the broader context.

¹¹ It should be noted that Factors 2-4 from Short-Term Outcome 1 can also be seen as fitting under this Short-Term Outcome, as they all also involved aspects of capacity-building through the aspects of e.g. development of guidelines and SOPs, however to avoid repetition, they are not included here.

¹² As this case study is focussed on Africa CDC, UK capacity is not considered here.

¹³ "Rumour and violence rife as Congo Ebola outbreak surges out of control" (The Guardian, 2019). Accessed 18 Dec 2020 from <https://www.theguardian.com/global-development/2019/apr/24/rumour-violence-congo-drc-ebola-outbreak-out-of-control>

UK-PHRST contributed to these areas through provision of key outputs including **valuable and essential expertise and capacity building; and successful collaborative partnerships**. Specifically, UK-PHRST conducted a training needs assessment, developed the original Epidemic Response Team (ERT) training curriculum in 2018, and conducted some initial training sessions. This curriculum was then used by Africa CDC to support training of the much larger African Volunteer Health Corps (AVoHC). Additional training was designed and rolled out during the COVID-19 pandemic for the ERT, AVoHC and Community Health Workers (CHWs). While other partners (including US CDC, WHO, European Union and others) provided financial and/or technical support, UK-PHRST's development of the actual curriculum and some training materials, and facilitation of key sessions, was seen as pivotal even in the context of other partners' commitments. UK-PHRST also provided pivotal social science support by supporting the creation of the first continent-wide rumour tracking system. Key informant interviews and background documents indicated that UK-PHRST was the only partner involved in setting up this system, and as such, UK-PHRST's contribution towards this is considered vital.

Intermediate Outcome: "UK and global response to epidemics improves in speed and quality"

It was not considered feasible to measure UK-PHRST's or other partners' contribution towards this outcome at this stage, although it can be considered that the contributions at short-term outcome level to all result in some level of contribution at intermediate outcome level.

Summary of changes observed (with a focus at the short-term outcome level).

Key factors influencing factors ¹⁴ to Short-Term Outcome: <i>STO 1: UK-PHRST contributes effectively as part of wider outbreak response</i>	Overall influence of factor	Contribution
1. Deployments of key technical expertise to provide surge capacity at the start of the COVID-19 outbreak in Africa <ul style="list-style-type: none"> UK-PHRST deployed a multi-disciplinary team of seven people (four face-to-face initially, then additional three remotely). 	Essential	Important
2. Epidemiology support on COVID-19, (including to surveillance Technical Working Group, providing strategic & technical advice and guideline development) <ul style="list-style-type: none"> UK-PHRST sat on Technical Working Group (TWG) and provided support to set up alert, testing and contact tracing systems, airport monitoring, and data systems. 	Essential	Some
3. Infection prevention and control support on COVID-19 <ul style="list-style-type: none"> UK-PHRST support included development of regional IPC guidelines which are now in use by member states. 	Essential	Important
4. Laboratory support on COVID-19 <ul style="list-style-type: none"> UK-PHRST developed lab/diagnostics policies/SOPs/equipment & reagent specs to guide COVID-19 response. 	Essential	Some

Key factors influencing factors ¹ to Short-Term Outcome: <i>"Improved UK and in-country capacity for outbreak prevention and response in LMICs"</i>	Overall influence of factor	Contribution
1. Training of Africa CDC Epidemic Response Team, AVoHC (African Volunteer Health Corps) and Community Health Workers <ul style="list-style-type: none"> UK-PHRST conducted a learning needs assessment of the Africa CDC Epidemic Response Team (ERT), supported development of the ERT training curriculum and conducted some initial training. Africa CDC used the training curriculum to support training for the larger AVoHC, and training for the AVoHC and CHWs on various aspects of COVID-19 was also subsequently provided by UK-PHRST. 	Essential	Important

¹⁴ Factors to be hypothesised early on for testing through KIIs and data analysis and revision where appropriate.

2. Social science support to COVID-19 response, specifically including development of a continental rumour tracking system <ul style="list-style-type: none"> UK-PHRST sat on TWG and developed the rumour tracking system 	Important	Vital
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Key for case study summary:

Influence scale	Essential factor in explaining outcome	Important factor in explaining outcome	Contributory factor in explaining outcome		
Contribution of partner	Vital contribution	Important contribution	Some contribution	Limited contribution	N/A or zero contribution

Explanation of typology of factors:

- **Essential:** Without this factor the outcome would not have been achieved. There must be overwhelming validated evidence (from every stakeholder group interviewed, plus independent and/or robust documentary evidence) to use this rating. There are negligible to no mixed views in your evidence. The evidence is so robust that there is no further research to be done on other contributing factors.
- **Important:** Evidence has been validated and points to the factor being a major part in achieving the outcome. More than two thirds of the validated evidence point to this factor (this must include both stakeholder interviews plus independent and/or robust documentary evidence). There may be some mixed views in your evidence. Further research is required to fully understand other contributions.
- **Contributory:** More than a third of the validated evidence (including interviews and/or documentary evidence) points to this factor making some contribution. Perhaps the factor laid the groundwork, was an early trigger or was important early on in a process. However, there is a lot of evidence that other factors contributed more/to a greater degree to the outcome. Much more research is required to fully understand how the outcome was achieved.

Explanation of typology of contribution to factors by UK-PHRST programme:

- **Vital:** Without the UK-PHRST programme the factor would not be in place, either at all or at the scale observed. There must be overwhelming validated evidence (from every stakeholder group interviewed, plus independent and/or robust documentary evidence) to use this rating. There are negligible to no mixed views in your evidence. The evidence is so robust that there is no further research to be done on other contributing actors.
- **Important:** Evidence has been validated and points to the UK-PHRST programme being a major part in the factor being in place, either at all or at the scale observed. More than two thirds of your validated evidence points to the UK-PHRST programme (this must include both stakeholder interviews plus independent and/or robust documentary evidence). There may be some mixed views in your evidence. Further research is required to fully understand the contributions of other actors.
- **Some:** Between a third and two thirds of the validated evidence (so in the main) (including interviews and/or documentary evidence) points to the UK-PHRST programme making some contribution to the factor being in place, either at all or at the scale observed. Perhaps the UK-PHRST programme laid the groundwork, was an early trigger or was important early on in a process. However, you have a lot of evidence that there were other actors that contributed more/to a greater degree to the factor. Much more research is required to fully understand how the outcome was achieved.
- **Limited:** A third or less of the evidence (validated or not) points to this factor explaining the outcome. The evidence contains a plethora of views on which actors contributed to the factor. Much further research is required.
- **N/A or zero:** Given where there is no evidence pointing to the UK-PHRST programme making a contribution to the factor.

Strength of evidence table

Rank	Justification
1	Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.
2	Evidence comprises multiple data sources (good triangulation) of lesser quality, or the finding is supported by fewer data sources (limited triangulation) of decent quality but that are perhaps more perception-based than factual.
3	Evidence comprises few data sources across limited stakeholder groups (limited triangulation) and is perception based, or generally based on data sources that are viewed as being of lesser quality.
4	Evidence comprises very limited evidence (single source) or incomplete or unreliable evidence.

Full Case Study – UK-PHRST Support to Africa CDC (2018 – 2020)

1. Context of country programmes and implementation progress

Historical context and enabling environment for UK-PHRST¹⁵

The Africa CDC was established in 2017 as a specialist technical unit within the African Union, though its organisational structure was only agreed in January 2018. As part of the African Union, it supports all 55 states on the African continent.

The mission of the Africa CDC is “to strengthen Africa’s public health institutions’ capacities, capabilities and partnerships to detect and respond quickly and effectively to disease threats and outbreak based on science, policy and data-driven interventions and programs.” The intention is to do this by supporting member states:

- To establish early warning and response surveillance systems to address all health threats and health emergencies and natural disasters in a timely and effective manner;
- To address gaps in capabilities required for International Health Regulations (IHR 2005) compliance;
- To conduct regional- and country-level hazard mapping and risk assessments for Member States;
- In health emergency responses, particularly those which have been declared a public health emergency of international concern (PHEIC)
- To improve health promotion and disease prevention through health systems strengthening, by addressing infectious and non-communicable diseases, environmental health and neglected tropical diseases;
- To promote partnership and collaboration among Member States to address emerging and endemic diseases and public health emergencies;
- To harmonise disease control and prevention policies and the surveillance systems in Member States;
- To build public health capacity through, medium and long-term field epidemiology and laboratory training programs.

The Africa CDC is structured to work through five functions or pillars:

1. Surveillance and Disease Intelligence
2. Information Systems
3. Laboratory Systems and Networks
4. Preparedness and Response
5. Public Health Research.

During the course of 2020, a number of vacant positions were filled, and Africa CDC had a staff capacity of over 70 personnel, including embedded advisors from other agencies including US CDC, China CDC and Public Health England (PHE IHR Project Africa CDC Lead), and including staff based at collaborating centres in southern, eastern, western and central Africa.¹⁶

As Africa CDC is a regional organisation, rather than a nation state, it does not have its own health system. As such, the success of Africa CDC’s work is highly dependent on diplomatic relations with the governments of member states, and the health systems of those member states.

Overview of Africa CDC and UK-PHRST’s relationship

UK-PHRST started working with Africa CDC in 2018 after a three-day Africa CDC=led workshop in Addis Ababa. Africa CDC were asking participants for support with developing a training curriculum.¹⁷ Following this, both UK-PHRST and the PHE IHR

1 - Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

¹⁵ Most of the content within this section is based on the 2017-2021 Africa CDC Strategic Plan, unless otherwise referenced.

¹⁶ Africa CDC website Staff Directory. Accessed 17 Dec 2020 from <https://africacdc.org/staff-directory/>

¹⁷ UK-PHRST key informant x 2; Africa CDC key informant x 2.

Strengthening Project¹⁸ agreed to support UK-PHRST, and created a TWG. From this, UK-PHRST led on conducting a training needs assessment of the Africa CDC Epidemic Response Team (ERT) and supported development of a curriculum and provided some initial training.¹⁹ The ERT at that time was a group of approximately 60 personnel embedded across various countries, including Cameroon, DRC, Nigeria, South Africa, and Cote D'Ivoire, while those at African Union regional collaborating centres provide a two-way channel for data validation and technical support²⁰. Africa CDC then utilised this training needs assessment and curriculum to guide and support training of the much larger African Volunteer Health Corps (AVoHC)^{21,22} – at that time a group of approximately 800 volunteers across the continent. The PHE IHR Project Africa CDC Lead²³ then picked up on this work in the longer term, with support to create a directory of AVoHC volunteers²⁴. After this, UK-PHRST's next significant work was around the COVID-19 outbreak, beginning in March 2020 and continuing for several weeks.²⁵ However the relationship did continue throughout the period prior to this, from 2017-2020, with UK-PHRST team members' involvement in various Social Science and other networks and TWGs that are either led by Africa CDC or include their involvement²⁶.

Other key factors that may determine programme outcomes at the institutional level

Investments of other key actors (government and other donors):

Other significant partners for Africa CDC include its member states²⁷, WHO, US CDC, China CDC and the PHE IHR Project. A number of other organisations provide specific areas of help, which are elaborated where appropriate in subsequent sections²⁸. The PHE IHR Project, WHO, US CDC and China CDC all have long-term staff embedded within Africa CDC. US CDC funds the Director's salary and provides funding to other key programme areas such as supporting public health fellowships^{29,30} and China CDC also committed significant funding (500mill RMB) for infrastructure, including building of Africa CDC's new headquarters and conference centre^{31,32}.

¹⁸ Referred to as "PHE IHR Project" from this point forward.

¹⁹ UK-PHRST key informant x 1.

²⁰ "Coordinating response in Africa" (FutureLearn, 2020). Accessed 18 Dec 2020 from <https://www.futurelearn.com/info/courses/covid19-novel-coronavirus/0/steps/74699>

²¹ The AVoHC developed from a continental team of volunteers, comprising more than 800 doctors, nurses and other health professionals from across Africa that were deployed to West Africa to help control the Ebola epidemic and normalise health services in the affected countries of Guinea, Liberia and Sierra Leone. These same volunteers were then incorporated into Africa CDC's long-term African Volunteer Health Corps, which trains and equips this roster of volunteer medical and public health professionals across the continent.

²² African Volunteers Health Corps: Africa CDC website. Accessed 17 Dec 2020 from <https://africacdc.org/programme/emergency-preparedness-and-response/african-volunteers-health-corps/>

²³ A PHE-paid employee, embedded as a Senior Public Health Advisor within Africa CDC.

²⁴ Africa's Emergency Response Workforce: Rapid Response Team Directory: Africa CDC website. Accessed 17 Dec 2020 from <https://africacdc.org/download/africas-emergency-response-workforce-rapid-response-team-directory/>

²⁵ UK-PHRST COVID-19 Summary (UK-PHRST, 2020).

²⁶ UK-PHRST key informants x 2; Other academic key informant x 1; Africa CDC key informant x 2.

²⁷ For 2018, it was forecast that member states' contributions towards the African Union's total budget would rise to 41%, covering mostly operational expenses ("Annual report on the activities of the African Union and its organs" (African Union, 2017)

²⁸ Other partners listed on Africa CDC's website are African Development Bank, African Field Epidemiology Network (AFENET), African Society for Laboratory Medicine (ASLM), Bill and Melinda Gates Foundation, US CDC, Chatham House, China CDC, Coalition for Epidemic Preparedness Innovations (CEPI), Economic Community of West African States (ECOWAS), Emory University, Food and Agriculture Organization of the United Nations (FAO), Infection Control Africa Network (ICAN), International Association of National Public Health Institutes (IANPHI), Japan International Cooperation Agency (JICA), McKinsey & Company, Page Press, Project ECHO, Public Health England, Resolve to Save Lives, The Center for Global Health and Development (GHD), The Global Fund, LSHTM, UKAid, UNAIDS, United Nations Economic Commission for Africa, United States Agency for International Development (USAID), World Bank, WHO ("Our Partners" (Africa CDC, 2020), accessed 18 Dec 2020 from <https://africacdc.org/our-partners/>)

²⁹ "US warns over Chinese 'spying' on African disease control centre" (Financial Times, 2020). Accessed 18 Dec 2020 from <https://www.ft.com/content/cef96328-475a-11ea-aeb3-955839e06441>

³⁰ "African Union and U.S. CDC Partner to Launch African CDC" (US CDC, 2015), accessed 18 Dec 2020 from <https://www.cdc.gov/media/releases/2015/p0413-african-union.html>

³¹ "Communiqué on the Visit of the African Union Commission Chairperson to the People's Republic of China" (African Union, 2018), accessed on 18 Dec 2020 from <https://au.int/en/pressreleases/20180209/communiqu%C3%A9-visit-african-union-commission-chairperson-peoples-republic-china>

³² Ibid

WHO provides broad technical assistance across of all Africa CDC's activities, and the PHE IHR Project provides targeted technical assistance in areas such as workforce development³³. All of the previously mentioned institutions have also provided assistance during the COVID-19 outbreak, as have other actors including the European Union (which provided at least EUR25million)³⁴; the African Development Bank (\$23m)³⁵, Africa50 (\$300K)³⁶, Wellcome Trust and DFID (EUR2.3m)³⁷.

In contrast to the support provided by the above actors, UK-PHRST's support is by its nature short-term, they provide no financial support and there are no staff permanently deployed to the Africa CDC offices.

2. Inputs/activities to outputs

1. What were the proposed activities and outputs?

UK-PHRST didn't have proposals for specific activities with Africa CDC in advance. However, as part of the mid-point evaluation, they had shared that they wanted to build on their work with Africa CDC across the triple mandate. The following are the activities that they have ended up working with Africa CDC on based on Africa CDC's specified requests and needs:

- a) **ToC Activity "Deploy/support in line with UK-PHRST priorities and requests from partners"; "Develop/strengthen partnerships in global health architecture"; "Share learning and expertise working together during deployments and research"**
- o **Expected ToC Outputs: "UK-PHRST team members deployed with the necessary speed, expertise and capacity to support LMIC outbreak response" and "Proven, evidence-based, innovative methods, tools and resources for outbreak response available and shared"**

COVID-19 support 2020:

This initially consisted of the in-person deployment of four staff (one epidemiologist, one social scientist, one microbiologist, one IPC expert) deployed to Addis Ababa in early March to support Africa CDC³⁸. Early repatriation of staff³⁹ due to border closures and flight restrictions meant that three of the above personnel continued supporting the deployment remotely for a further 3-8 months, with some ongoing additional support afterwards. During the in-person deployment, a total of seven person weeks were spent supporting the following areas:

i. Epidemiology

- Support to the surveillance technical working group: strategic & technical advice and guideline development on all aspects of COVID-19 surveillance including support to countries to set up alert and contact tracing systems, airport monitoring, and data systems
- Development of community health worker training for COVID-19, which has now been rolled out to Member States
- Support for national seroprevalence surveys

1- Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

³³ PHE IHR Project Africa CDC Workplans 2019 – 2021 (PHE IHR Project, 2018 – 2021).

³⁴ "The European Union Supports Africa's COVID-19 Continental Response" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/the-european-union-supports-africas-covid-19-continental-response/>

³⁵ "African Development Bank supports continental strategy on COVID-19 with US\$27.33 million" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/african-development-bank-supports-continental-strategy-on-covid-19-with-us27-33-million/>

³⁶ "Africa50 supports COVID-19 response with US\$300,000 grant to Africa CDC" (Africa CDC, 2020). Accessed on 18 Dec 2020 from <https://africacdc.org/news-item/africa50-supports-covid-19-response-with-us300000-grant-to-africa-cdc/>

³⁷ "Wellcome and DFID support Africa COVID-19 continental response with € 2.26 million" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/wellcome-and-dfid-support-africa-covid-19-continental-response-with-e-2-26-million/>

³⁸ Staff arrived between 1-13 March 2020, and were repatriated between 19-30 Mar 2020 (COVID-19 Deployment SitRep, UK-PHRST (2020).

³⁹ Ibid.

ii. Infection prevention and control

- Support to webinar-based IPC training among health workers in member states
- Support to the IPC sub-group, which pulls together research activity on the continent related to IPC and COVID-19; the group has published a review paper on ventilation in African health care settings
- Support for development of IPC guidelines that are specific to the Region, including on PPE.

iii. Laboratory

- Assisting with developing Interim Guidance on the Use of Rapid Antibody Tests for COVID-19 Response
- More specifically, support with drafting lab/diagnostics policies/SOPs/equipment & reagent specs

iv. Social Science

- Support to the establishment and running of a novel continent-wide rumour tracking system that uses human-curated machine learning to track COVID-19 rumours on traditional and social media, and representing that system within the WHO-led Infodemiology Response Alliance
- Technical and coordination support for Partnership for Evidence-Based Response to COVID-19 (PERC)⁴⁰ a project that uses multiple data streams to track the secondary impacts of Public Health and Social Measures (PHSM) (including looking at patient acceptance of interventions, and a COVID-19 public perception survey)
- Support for development of continent-wide guidelines on physical distancing, developing a stepwise approach to the introduction of PHSM, and on easing of lockdowns

b) ToC Activity “Work with GOARN and other stakeholders to optimise response” and “Strengthen operational capacity and processes to support rapid deployment for optimal performance”:

- *Expected ToC Output “Collaborative partnerships support outbreak response across the triple mandate”*

i. Regional Deployment capacity (RST KII x 4, DHSC, reg PHI, national academic, national PHI)

- Supporting Africa CDC’s regional deployment mechanisms and supporting joint deployments, including UK-PHRST participation in joint Africa CDC deployment to Gambia (inc. possible use of suitcase lab mentioned by one RST KI)

c) ToC Activity “Generate relevant research question in and after a response” and “Conduct outbreak relevant research pre, during, post-response”:

- *Expected ToC Output “Relevant research conducted on topics related to outbreak response published & disseminated”*

i. Research (HMG GPH x 1, reg PHI x 2, WHO reg x 1, RST background doc x 1)

- A mental health research project funded by UK-PHRST is in initial stages. This is a collaboration across Africa CDC, WAHO, WHO-AFRO, and wider LSHTM (utilising LSHTM experts outside of those employed by UK-PHRST).

d) ToC Activities “Plan and deliver training according to needs assessment and to support cadre of skilled personnel in LMICs”; “Develop and deliver educational

⁴⁰ “Partnership for Evidence-Based Response to COVID-19” (Prevent Epidemics, 2020) accessed 18 Dec 2020 from <https://preventepidemics.org/covid19/perc/>

courses to support learning and research on outbreak response”; “Conduct needs assessment to identify gaps and areas that UK-PHRST can support”

- **Expected ToC Output “Formal and informal capacity building provided to strengthen UK & LMIC response, outbreak management, and technical and research skills”**

i. Support to Epidemic Response Team and thus AVoHC (African Volunteer Health Corps) Epidemic Response Team (2018)

- Involvement in conducting a needs assessment of Epidemic Response Team capacity, conducting training, curriculum development, communications. This was then used by Africa CDC to inform training of the AVoHC.

ii. Connecting Africa CDC with other networks (SSHAP) to build Social Science capacity of Africa CDC

What were the intentions of the activities/outputs?

- **COVID-19 support:** The intention was to provide surge capacity across multiple disciplines to support Africa CDC at the start of the COVID-19 pandemic in Africa in order to enable them to better control the outbreak.
- **Previous Epidemic Response Team and AVoHC support:** To strengthen continental human resources capacity for outbreak response via regional deployments to outbreak areas on the continent

2. Progress on the implementation of activities:

What outputs have been achieved?

- At the time of writing, all of the above activities and expected outputs have been achieved with exception of the following:
 - The research activity is still at early stages (but this is to be expected as research itself is not rapid, even if the research question and proposal generation is)

Are there any gaps between intention and actual activity implementation/outputs? (Maps to EQ 3.1)

- Due to the way UK-PHRST operates, there is no gap at activity level, as they do not plan far ahead for activities, and in case of Africa CDC at least, they were implemented as soon as a partner requested them.
- All activities appear to have led to expected outputs.

Any implications of gaps for achievement of outcomes?

- Not applicable.

3. Explanation for emerging differences between intended and actual inputs/ activities/outputs:

What factors have enabled or constrained implementation? (Maps to EQ3.8)

- **Constraints:**
 - **COVID-19 travel restrictions meant that UK-PHRST COVID-19 deployed team had to repatriate to the UK at short-notice.** This provided some constraints especially in areas such as case management, training on how to use PPE effectively (“If you watch how to use a PPE on video, it can never be the same as watching a person physically taking on the PPE – GHS109”) as they imply more face-to-face engagement, however the support did continue remotely.
 - **COVID-19 pandemic meant that UK-PHRST Social Science support to building Africa CDC’s/West Africa’s social science network and capacity was put on hold.**

- **Capacity of regional partners to continue working on multiple areas especially during an event like COVID-19 was limited.**
- **UK-PHRST lab lead was assigned to other duties on return to the UK, which prevented him from continuing to support on developing lab SOPs, guidelines etc.**
- **Comparatively short-term nature of UK-PHRST support is limiting its ability to provide mentoring and thus longer-term sustainability of work (despite remote support to some extent mitigating this).**

- **Enablers:**

- **Long-term relationship between Africa CDC and PHE** via core activities and also ongoing involvement in various TWGs (via IHR project and UK-PHRST (PHE and LSHTM staff), and including cross-over of Ashley moving from IHR to UK-PHRST).
- **UK-PHRST's prompt response to COVID-19 and arrival in-country as a large team provided vital surge capacity that benefited Africa CDC's COVID-19 response**, and helped to build trust so that remote work continued successfully.

Do these factors relate to UK-PHRST, other actors, or the wider context?

- **Constraints:**

- The COVID-19 related constraints relate to the **wider context**.
- The constraint around UK-PHRST "rapid" model and short-term nature of support relates to **UK-PHRST**.

- **Enablers:**

- The enablers relate to UK-PHRST and how they **build their partnership with Africa CDC**.

3. What were other actors doing during the project period that has a potential to influence the same outputs / outcomes? (Maps to EQ4.2, 5.1, 5.2, 5.3, 5.4)

At least 16 partners are collaborating with Africa CDC in a range of projects and activities. The following initiatives have the potential to influence the **UK-PHRST's short-term outcome "Improved UK and in-country capacity for outbreak prevention and response in LMICs"**:

- **The PHE IHR Project** and the UK-PHRST are collaborating on seroprevalence studies (*RST x1, PHE GPH x 1*). Additionally, the PHE IHR Project is supporting leadership activities with Africa CDC.
- **Trainings to Africa CDC Epidemic Response Team and AVOHC** was a collaborative effort with multiple partners including WHO-AFRO, US CDC, China CDC, Red Cross, MSF, UK-PHRST and funding was also provided by the European Union.⁴¹
- **The PACT partnership to expand COVID-19 testing** across Africa is coordinated by Africa CDC and put out a call for partners in the initiative.⁴²
- **AFTCOR, a continent-wide COVID-19 task force**, is led by Africa CDC with multiple partners (WHO AFRO, Global Fund, IMF, African Development Bank, European Union, DFID, Wellcome, NGOs, national organisation) and the linked Africa Joint Continental Strategy for COVID-19. The task force covers six workstreams including laboratory diagnosis and subtyping; surveillance, including screening at points of entry and cross-border activities; infection prevention and control in healthcare facilities; clinical management of severe COVID-19; risk communication; and supply chain management and stockpiles. UK-PHRST (Emilio) sits on IPC pillar within this task force.^{43,44, 45, 46}
- **SSHAP (Social Science in Humanitarian Action Platform)** work involves IDS, UNICEF, WHO-AFRO, Red Cross. This covers risk communications and community engagement work.

Additionally, the following organisations also are likely to influence the **UK-PHRST's short-term outcome "Improved UK and in-country capacity for outbreak prevention and response in LMICs"**:

2 - Evidence comprises multiple data sources (good triangulation) of lesser quality, or the finding is supported by fewer data sources (limited triangulation) of decent quality but that are perhaps more perception-based than factual.

⁴¹ "The European Union Supports Africa's COVID-19 Continental Response" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/the-european-union-supports-africas-covid-19-continental-response/>

⁴² "AU and Africa CDC launch Partnership to Accelerate COVID-19 Testing: Trace, Test and Track", Africa CDC, 2020. Accessed 18 Dec 2020 from <https://africacdc.org/news-item/african-union-and-africa-centres-for-disease-control-and-prevention-launch-partnership-to-accelerate-covid-19-testing-trace-test-and-track/>

⁴³ "Team Europe: Germany and European Union jointly support African Union's response to COVID-19" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/team-europe-germany-and-european-union-jointly-support-african-unions-response-to-covid-19/>

⁴⁴ "Africa Joint Continental Strategy for COVID-19 Outbreak" (Africa CDC, 2020).

⁴⁵ "Africa CDC establishes continent-wide task force to respond to global coronavirus epidemic" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/africa-cdc-establishes-continent-wide-task-force-to-respond-to-global-coronavirus-epidemic/>

⁴⁶ "Wellcome and DFID support Africa COVID-19 continental response with € 2.26 million" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/wellcome-and-dfid-support-africa-covid-19-continental-response-with-e-2-26-million/>

- **US CDC and China CDC provide longer-term ongoing support** (in form of both technical assistance and funding support) to Africa CDC. Both agencies have embedded staff within Africa CDC that sit within the Science and Programme Office⁴⁷ from where they provide ongoing technical and strategic advice. These agencies also support training of Epidemic Response Team, AVoHC and Community Health Workers; support to laboratory capacity; support to surveillance systems, and various other trainings e.g., on infection prevention and control. They also provide targeted support with provision of supplies, for example US CDC provided COVID-19 testing kits.⁴⁸ While it falls outside of the period in question, in October 2020 a new pathogen genomics initiative was launched with support from Bill and Melinda Gates Foundation and Microsoft.⁴⁹
- **WHO provides ongoing technical support in various areas.** This has included training on management of Public Health Emergency Operations Centers and facilitation of a pandemic response simulation exercise^{50,51}; training for ports of entry⁵² and Ebola training⁵³. They have also provided COVID-19 testing kits.⁵⁴
- **The Foundation for Innovative New Diagnostics (FIND) have partnered with Africa CDC in September 2020 to build capacity in readiness for the introduction of new, high-quality antigen rapid diagnostic tests (RDTs) for COVID-19.**⁵⁵

⁴⁷ Africa CDC Staff Directory (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/staff-directory/>

⁴⁸ "Africa CDC leads continental response to COVID-19 outbreak in Africa: Statement by the Director of Africa CDC" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/africa-cdc-leads-continental-response-to-covid-19-outbreak-in-africa-statement-by-the-director-of-africa-cdc/>

⁴⁹ "US\$100 million Africa Pathogen Genomics Initiative to boost disease surveillance and emergency response capacity in Africa" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/us100-million-africa-pathogen-genomics-initiative-to-boost-disease-surveillance-and-emergency-response-capacity-in-africa/>.

⁵⁰ "Training of trainers workshop on public health emergency operations centres opens in Addis Ababa" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/training-of-trainers-workshop-on-public-health-emergency-operations-centres-opens-in-addis-ababa/>

⁵¹ "Africa CDC participates in global simulation exercise to respond to a global pandemic" (Africa CDC, 2018). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/africa-cdc-participates-in-global-simulation-exercise-to-respond-to-a-global-pandemic/>

⁵² "Eighty experts participate in training on enhanced surveillance at points of entry" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/eighty-experts-participate-in-training-on-enhanced-surveillance-at-points-of-entry/>

⁵³ "Africa CDC and partners strengthen Ebola detection capacity in 10 high-risk countries in Africa" (Africa CDC, 2019). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/africa-cdc-and-partners-strengthen-ebola-detection-capacity-in-10-high-risk-countries-in-africa/>

⁵⁴ "Africa CDC leads continental response to COVID-19 outbreak in Africa: Statement by the Director of Africa CDC" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/africa-cdc-leads-continental-response-to-covid-19-outbreak-in-africa-statement-by-the-director-of-africa-cdc/>

⁵⁵ "Africa CDC, FIND partner to build capacity for COVID-19 rapid diagnostic tests in Africa" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/africa-cdc-find-partner-to-build-capacity-for-covid-19-rapid-diagnostic-tests-in-africa/>

4. Outputs to Short-Term Outcomes

What changes can be observed at the STO level?

STO 1: “UK-PHRST contributes effectively as part of wider outbreak response”

The African continent’s comparative overall success in controlling the COVID-19 pandemic has been widely discussed, and while all the different contextual factors⁵⁶ that may have supported this success are not yet fully understood, Africa CDC’s role has been lauded^{57,58,59}. Their quick adoption of lockdown and other public health measures such as hand-washing, mask wearing and social distancing and successful partnerships with other regional organisations and member states⁶⁰ seen as contributing to a comparatively successful response, with the number of COVID-19 cases and deaths across Africa much lower than in any other continent except Oceania (which has a fraction of the population of Africa)⁶¹. There are also strong indications that UK-PHRST has successfully contributed to Africa CDC’s wider outbreak response both directly and in terms of Africa CDC’s support to member states.

What factors were needed to produce the observed change? (*Maps to Assumptions, EQ2.3*)

1. Deployments of key technical expertise to provide surge capacity at the start of the COVID-19 outbreak in Africa

- **Influence of factor:** The provision of surge capacity via deployments from partner organisations at the start of the COVID-19 pandemic in Africa was seen as a very important factor that was behind the African continent’s overall comparative success in terms of managing the pandemic, and setting up vital systems that helped to manage this pandemic and will also be relevant for future outbreaks across the continent.
- **UK-PHRST contribution:** UK-PHRST deployed a multi-disciplinary team of seven people (four face-to-face initially, then additional three remotely). The team covered epidemiology, IPC, laboratory and social science. Support in all areas (although to a lesser extent laboratory) continued remotely with additional three team members involved after the team were repatriated to the UK, and also included remote support on clinical case management and logistics.^{62,63}

1 - Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

⁵⁶ “Coronavirus: Health chief hails Africa’s fight against COVID-19” (BBC, Sep 2020). Accessed 05 Jan 2021 from <https://www.bbc.co.uk/news/world-africa-54248507>

⁵⁷ “The coming of age of the Africa Centers for Disease Control” (Associated Press, 2020). Accessed 05 Jan 2021 from <https://www.brookings.edu/blog/africa-in-focus/2020/04/15/the-coming-of-age-of-the-africa-centers-for-disease-control/>

⁵⁸ “How Africa fought the pandemic — and what coronavirus has taught the world” (Financial Times, 2020). Accessed 05 Jan 2021 from <https://www.ft.com/content/c0badd91-a395-4644-a734-316e71d60bf7>

⁵⁹ “Africa: A coronavirus success story” (France 24, 2020). Accessed 05 Jan 2021 from <https://www.france24.com/en/africa/20201008-africa-a-coronavirus-success-story>

⁶⁰ “What explains Africa’s successful response to the COVID-19 pandemic?” (Medical News Today, 2020). Accessed 05 Jan 2021 from <https://www.medicalnewstoday.com/articles/what-explains-africas-successful-response-to-the-covid-19-pandemic>

⁶¹ Less than three million cases had been reported in Africa by 05 January 2021, compared to over 20 million in Europe, over 15 million in Asia, over 10 million in South America, over 18 million in North America. Oceania had 48-53,000 cases. Less than 70,000 deaths had been reported in Africa, compared to over 470,000 in Europe, over 445,000 in North America, over 290,000 in Asia, and over 330,000 in South America. Oceania had less than 1,200 deaths. Data retrieved from WHO COVID-19 dashboard 05 January 2021 from https://portal.who.int/report/eios-covid19-counts/#display=Continents&nrow=2&ncol=3&arr=row&pg=1&labels=view_countries&sort=cur_case_who;desc&filter=&sidebar=-1&fv= It must be noted that Oceania (approx. 42.9 million) has a much smaller population than Africa (1.216 billion) according to January 2021 WHO estimates.

⁶² UK-PHRST COVID-19 Summary (UK-PHRST, Sep 2020).

⁶³ COVID-19 Deployment SitRep March 2020 (UK-PHRST, Mar 2020).

- Africa CDC stakeholders variously described UK-PHRST’s deployment as “excellent”, as “senior level”, and it was based on a bilateral deployment request by Africa CDC. It was seen as a significant deployment at a critical time for the continent, and seen as building a good foundation for the continental COVID-19 response. UK-PHRST, wider PHE and DHSC stakeholders also described the deployment of a multi-disciplinary team at such a critical time as being very valuable.

Africa CDC and associated stakeholders described that *“that success story [of Africa CDC’s COVID-19 response] will not be complete without mentioning UK rapid response team, because they were key allies of Africa CDC when we were putting our strategy together, when we began rolling out implementation of our strategy, and they were part of those key pillars that responded to the pillars by supporting each and every member states in terms of deployment and capacity building. So, if they had not been there, it would have created a very, very big gap”* [Africa CDC – GHS109]

A call for support from Africa CDC at the start of the pandemic⁶⁴ requested the services of 16 people including both technical (nine persons) and management/administrative support (seven persons), namely Chief Science Officer, Data Manager/Statistician, Planning, reporting and monitoring advisor, Supply Chain Management Officer/Advisor, Logistician, Partnership / Resource mobilization Advisor, Grant Management Officer/Advisor, Finance advisor, Corporate Partnerships and Communication Advisor, Legal advisor, Critical Care Specialist, Infectious Disease Expert, Infection Prevention and Control Expert, Lead Epi-Analyst, and two Administrative Assistants. From the technical cohort, UK-PHRST team of four deployed in person and an additional three remotely can indeed be seen as the most significant contribution.

- **Contribution by other partners:** From KIIs and background documents few stakeholders mentioned to what extent other partners deployed at this time, but many references were made to UK-PHRST’s deployment being the largest and/or most significant. One stakeholder [GHS109] did mention that both China CDC deployed 2 people, one of whom left quite soon, and that US CDC deployed 2-3 personnel for various durations, and review of background documents indicates that US CDC provided support in the form of data analysis, communications, training, and various scientific activities⁶⁵. From the above breakdown of COVID-19 technical support requested by Africa CDC, this would appear to verify that the number of technical personnel deployed by other agencies was indeed much smaller than from UK-PHRST.

2. ***Epidemiology support on COVID-19– including strategic & technical advice and guideline development on all aspects of COVID-19 surveillance including support to countries to set up alert, testing and contact tracing systems, airport monitoring, and data systems*** (RST KII x4, reg PHIx4, RST background doc x 2)^{66,67}

⁶⁴ “Critical Staffing Needs For Support By Partners”, Africa CDC, 2020. Accessed 18 Dec 2020 from https://africacdc.org/download/critical-staffing-needs-for-support-by-partners/?ind=1588947280401&filename=1588947280wpdm_CRITICAL%20STAFFING%20NEEDS%20FOR%20SUPPORT%20BY%20PARTNERS.pdf&wpdmdl=4898&refresh=5fdc7a7edfc031608284798

⁶⁵ “Accelerating Response Efforts Through Partnership with U.S. CDC” (US CDC, 2020). Accessed 18 Dec 2020 from <https://www.cdc.gov/globalhealth/healthprotection/fieldupdates/fall-2020/africa-cdc-covid.html>

⁶⁶ UK-PHRST COVID-19 Summary (UK-PHRST, Sep 2020)

⁶⁷ COVID-19 Deployment SitRep March 2020 (UK-PHRST, Mar 2020)

- **Influence of factor:** As a major pillar of any outbreak response, this area was considered pivotal to Africa CDC's overall response to the COVID-19 outbreak by stakeholders from UK-PHRST, wider PHE, DHSC and Africa CDC. It supported increased COVID-19 testing and improved understanding of the pandemic across the continent.
- **UK-PHRST contribution:** UK-PHRST deployed two personnel in-person to provide epidemiology support at the start of the COVID-19 outbreak in Africa. The in-person deployment combined with subsequent remote support included support in specific areas in successful collaboration with other agencies/partnerships. UK-PHRST sat on Africa CDC's surveillance TWG and provided support to set up alert, testing and contact tracing systems, airport monitoring, and data systems. For example, they also worked on the Partnership to Accelerate Covid Testing (PACT) which was looking at expanding testing significantly across the continent. One Africa CDC stakeholder referenced this partnership as incredibly important:

"[This] was started when testing was about 300K tests, after this was rolled out, we were able to support testing to about 16million in just about 4 months. So this was a major contribution that [UK-PHRST] supported." (Africa CDC KI (GHS117))

More generally, several Africa CDC stakeholders described UK-PHRST's epidemiology/surveillance contribution as "hugely successful" [GHS109] or similar.

- **Contribution by other partners:** Passing reference was made in interviews to the fact that US CDC also support on surveillance [GHS117] and that UK-PHRST worked along with them with oversight from Africa CDC to avoid duplication of effort, however there was no details given in terms of this support. Review of background documents indicates that US CDC support was significant and included support with a continent-wide surveillance dashboard that launched in April 2020, with support from US CDC, and helped to analyse disease trends and shape decisions, such as those around resource allocation⁶⁸.

Africa CDC COVID updates also provide some additional insights on input by other partners in this area⁶⁹:

"Africa CDC collaborated with the World Health Organization on 22 February 2020 to train in-coming analysts in event-based surveillance using the Epidemic Intelligence from Open Sources platform. These headquarters will be working closely with the Regional Collaborating Centres and Member States to track and verify COVID-19 related events, providing critical information to inform Member States' response and control efforts." ⁷⁰

⁶⁸ "Continent-wide Surveillance" (US CDC, 2020). Accessed 18 Dec 2020 from <https://www.cdc.gov/globalhealth/healthprotection/fieldupdates/fall-2020/africa-cdc-covid.html>

⁶⁹ "Novel Coronavirus (2019-nCoV) Global Epidemic – 17 March 2020" (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/disease-outbreak/novel-coronavirus-2019-ncov-global-epidemic-17-march-2020/>

⁷⁰ Ibid.

“Africa CDC in collaboration with WHO provided two Training of Trainers events for participants from 18 countries: Burkina Faso, Cameroon, Chad, Côte d’Ivoire, Egypt, Ethiopia, Ghana, Kenya, Mauritius, Mauritania, Nigeria, Niger, Zambia, Rwanda, Sao Tome and Principe, South Africa, Tunisia and Zambia to enhance surveillance at points of entry for COVID-19. Additional training is planned for March and April targeting the remaining countries in Africa.”⁷¹

“Africa CDC in collaboration with the U.S Centers for Disease Control and Prevention will be training 20 countries in event-based surveillance for COVID-19 starting in March 2020. The first training for 7 countries was held in Kampala, Uganda on 2-4 March 2020.”

3. Infection prevention and control support on COVID-19 (RST KII x 7, reg PHI x3)

- **Influence of factor:** Infection Prevention and Control is considered a vital pillar of overall outbreak response and by extension for managing the COVID-19 pandemic. The importance of having applicable IPC guidelines in place that could be rolled out for use by Member States was considered “instrumental” [PHRST105] by a UK-PHRST stakeholder as well as by Africa CDC stakeholder [GHS109].
- **UK-PHRST contribution:** UK-PHRST deployed one IPC expert in person at the start of the outbreak in Africa, and remote support continued afterwards. The UK-PHRST team member sat on all four TWGs related to IPC at Africa CDC, and supported various trainings for Community Health Workers and other capacity building efforts. UK-PHRST support included development of regional IPC guidelines which are now in use by member states. Another specific example was the deployment in terms of providing specifications for PPE, which allowed regional production of key PPE supplies to these specifications to take place [Africa CDC KII - GHS109]
- **Contribution by other partners:** No stakeholders mentioned whether other partners also provided IPC support, but review of background documents indicates that other partners did provide some technical assistance. For example, WHO provided support to the creation of Infection prevention and control guidelines for ambulances transferring known or suspected COVID-19 cases⁷²; WHO, Resolve to Save Lives, Infection Control Africa Network (ICAN) supported training on IPC for journalists during COVID 19⁷³ and WHO and ICAN supported a webinar series on IPC for COVID-19⁷⁴

4. Laboratory support on COVID-19 response (RST KIIx4, reg PHIx3, RST background doc x 2)

- **Influence of factor:** Ensuring good quality, consistent diagnostics is considered an important factor in controlling the spread of the COVID-19 outbreak. UK-PHRST’s support in this area was considered very useful, but it was very short-term.

⁷¹ Ibid.

⁷² “Infection prevention and control guidelines for ambulances transferring known or suspected COVID-19 cases” (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/download/infection-prevention-and-control-guidelines-for-ambulances-transferring-known-or-suspected-covid-19-cases/>

⁷³ “Infection Prevention Essentials for Journalists: A specialized training for journalists on infection prevention and control during COVID-19” (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/event/infection-prevention-essentials-for-journalists/>

⁷⁴ “Webinar Series on Infection Prevention and Control for COVID-19” (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/event/webinar-series-on-infection-prevention-and-control-for-covid-19/>

<ul style="list-style-type: none"> • UK-PHRST contribution: UK-PHRST’s microbiology lead was part of the in-person deployment at the start of the COVID-19 outbreak. However, he was not deployed for as long, and unlike other technical areas, his support did not continue remotely to such a significant degree. As part of his deployment, various stakeholders combined with background documents mentioned his support on developing key SOPs and specifications to support improved diagnostic testing. According to Africa CDC stakeholders, these have since been shared with all member states and are being actively used. However the very short duration of laboratory support was also referenced by some Africa CDC stakeholders, and it was felt that continued laboratory support remotely would have been beneficial. • Contribution by other partners: No mentions of deployed lab support by other partners was mentioned during interviews. Review of background documents did not provide any specific information on laboratory support by other partners during the period that UK-PHRST were providing support, beyond provision of testing kits by the European Union⁷⁵. 	
<p>STO 2: “Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making”</p> <p>Research on mental health and seroprevalence-surveys are in progress or in early stages, so related findings have not been applied by UK-PHRST or partners to date. However, there is appreciation for UK-PHRST’s efforts in this area and perception that the work is very valuable.</p> <p><i>“A unique contribution of RST has been their push for operational research during an outbreak – their advocacy has contributed to bringing that topic on the agenda. However, while the awareness of the importance of research during outbreak response has improved, resource constraints prevent Africa CDC and member states from fully operationalising that component of the triple mandate.” (KII - Africa CDC)</i></p> <p>What factors were needed to produce the observed change? (Maps to Assumptions, EQ2.3) N/A as no significant change yet observed</p>	<p>No evidence</p>
<p>STO 3: “Improved UK and in-country capacity for outbreak prevention and response in LMICs”</p> <p>There are strong indications that UK-PHRST is contributing to increased LMIC capacity for outbreak prevention and response through formal and informal capacity building work. The size of this contribution is harder to assess. Some specific examples were given of areas of work that UK-PHRST has supported which have led to improved LMIC capacity, however most stakeholders stated that UK-PHRST was either one actor among many and/or that the specific support that UK-PHRST provided was one comparatively small (but important) contributory component.</p> <p>What factors were needed to produce the observed change? (Maps to Assumptions, EQ2.3)</p>	<p>1 - Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting</p>

⁷⁵ “Team Europe: Germany and European Union jointly support African Union’s response to COVID-19” (Africa CDC, 2020). Accessed 18 Dec 2020 from <https://africacdc.org/news-item/team-europe-germany-and-european-union-jointly-support-african-unions-response-to-covid-19/>

1. **Training of Africa CDC Epidemic Response Team, AVoHC (African Volunteer Health Corps) and Community Health Workers**

- **Influence of factor:** The training of these different first responder groups was considered essential to Africa CDC's capacity to respond to COVID-19, and Africa CDC stakeholders stated that the fact that the ERT and AVoHC had received valuable training including that from UK-PHRST prior to the COVID-19 outbreak as vital in terms of Africa CDC having teams of people ready to respond across the continent. The additional training provided at the start of the COVID-19 outbreak was also considered very important in terms of strengthening capacity at the critical early states of the pandemic by UK-PHRST, wider PHE and DHSC as well as Africa CDC stakeholders.
- **UK-PHRST contribution:** UK-PHRST initially became involved in the training of the Epidemic Response team in 2018 (approx. 60 people), and this was then used to support training of the much larger AVoHC cadre (800+). This involved an initial needs assessment and developing of training curriculum, and subsequent training both prior to and during the COVID-19 response. Training of Community Health Workers during the COVID-19 response was also carried out across the training curriculum, covering all key areas including contact tracing and IPC. Over 10,000 CHWs are in place across the continent, and training over 25 countries online was conducted using modules developed by UK-PHRST. UK-PHRST, wider PHE and DHSC and Africa CDC stakeholders referred to UK-PHRST's support with training these various cadres as incredibly valuable:

"[in my opinion] the most significant contribution to Africa CDC, is their supporting of the operationalisation and capacity of the AVoHC...[UK-PHRST] have been instrumental to the development of the training module for that continental rapid response team...That has been very, very, very useful, especially for COVID, as we were able to pull up and deploy from day one across the continent due to the training and modules that UK-PHRST developed previously...That is one area UK-PHRST has been extremely helpful. I don't think Africa CDC could have done that without active support of UK-PHRST....It was very helpful as it came before the Ebola and COVID-19 outbreaks. They were deployed for Ebola in DRC also." (Africa CDC)

"UK-PHRST took care of the contact tracing and other training modules for Community Health Workers for COVID-19. That is proving to be one of the most impactful activities of Africa CDC towards COVID-19." (Africa CDC)

"The training materials for AVoHC, we have used that extensively. We are using all the training materials. In Nigeria, we are working with [Nigeria CDC], and UK-PHRST supported us to develop the Mental Health documents that are being used there." (Africa CDC)

"Finalisation of the Community Health Worker (CHW) modules of COVID-19 is a major achievement, which has been used to train CHWs across the continent. It also serves as template for local adaptation to different countries. Great achievement, and that was mostly the UK-PHRST finalising the whole package." (Africa CDC)

- **Plausible contribution by other partners:**
 - Other partners were mentioned by Africa CDC stakeholders as being involved in the training of the Epidemic Response Team (namely WHO-AFRO, US CDC, Red Cross, MSF). The level of contribution by each partner was not mentioned.

<p>2. Social science capacity building support to COVID-19 response, specifically including development of a continental rumour tracking system</p> <ul style="list-style-type: none"> • Influence of factor: Having a functional continent-wide rumour tracking system is seen as an important area of outbreak response capacity given learnings from prior outbreaks in Africa where rumours contributed towards mistrust of and attacks on health personnel. • UK-PHRST contribution: UK-PHRST supported the establishment and running of a novel continent-wide rumour tracking system that uses human curated machine learning to track COVID-19 rumours on traditional and social media, and representing that system within the WHO-led Infodemiology Response Alliance. From what can be gathered from interviews with UK-PHRST and Africa CDC stakeholders, there was no rumour tracking system in place prior to that put in place with UK-PHRST’s support in the early stages of the COVID-19 pandemic. In general, both UK-PHRST and Africa CDC stakeholders said that Africa CDC’s social science capacity was lacking compared to other technical areas prior to the COVID-19 outbreak. • Contribution by other partners: From interviews and review of background documentation, there does not appear to be any significant support from other partners in the development and running of the rumour tracking system specifically, or in social science support more generally. 	
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5. Evidence against key assumptions						
<p>Assumptions key</p> <table border="1" data-bbox="175 1198 1212 1388"> <tr><td>No evidence</td></tr> <tr><td>Strong evidence against this assumption</td></tr> <tr><td>Limited evidence against this assumption</td></tr> <tr><td>Limited evidence supporting this assumption</td></tr> <tr><td>Strong evidence supporting this assumption</td></tr> </table> <p>Increased collaboration between UK deployment mechanisms improves overall capacity and effectiveness of UK outbreak prevention /response mechanisms (Maps to EQ 4.1, 4.2)</p> <ul style="list-style-type: none"> • There is no evidence of joint deployments with other UK deployment mechanisms taking place with Africa CDC. No stakeholders mentioned e.g. UK EMT etc. supporting Africa CDC with deployments. • There is limited evidence of increased collaboration with the PHE IHR project (e.g. on seroprevalence work). 	No evidence	Strong evidence against this assumption	Limited evidence against this assumption	Limited evidence supporting this assumption	Strong evidence supporting this assumption	<p>Limited evidence supporting this assumption</p>
No evidence						
Strong evidence against this assumption						
Limited evidence against this assumption						
Limited evidence supporting this assumption						
Strong evidence supporting this assumption						
<p>There is a direct relation between research findings and the approach to outbreak response</p> <ul style="list-style-type: none"> • No evidence here – research with Africa CDC is at early stages. 	<p>No evidence</p>					
<p>Future outbreaks allow for application of research findings</p> <ul style="list-style-type: none"> • No evidence here – research with Africa CDC is at early stages. 	<p>No evidence</p>					
<p>Research findings are seen as relevant and useful and thus adopted and supported by/ integrated into policies of key global actors (e.g. WHO) and LMICs to strengthen response (Maps to EQ7.2)</p>	<p>No evidence</p>					

<ul style="list-style-type: none"> No evidence here – research with Africa CDC is at early stages. 	
<p>Partner institutions and participants willing to and have capacity to work together and implement learning from capacity building delivered by UK-PHRST (<i>Maps to EQ5.1, 5.2</i>)</p> <ul style="list-style-type: none"> There are indications that there is willingness from Africa CDC to work together, and they have successfully used UK-PHRST training materials to train additional numbers/cohorts of staff. However, some KIIs did indicate that Africa CDC’s financial and human resource limit the extent to which this can be done. 	<p>Limited evidence supporting this assumption</p>
<p>UK-PHRST training responds to needs and is effective</p> <ul style="list-style-type: none"> Several stakeholders stated that UK-PHRST responded to specific requests from Africa CDC and/or provided support based on needs assessments (e.g. AVoHC). No stakeholders raised specific concerns about the effectiveness of UK-PHRST’s training/training curriculum or materials, and several examples of training materials in active use within Africa CDC and member states were given. 	<p>Strong evidence supporting this assumption</p>
<p>Recipient countries have the necessary capacity (including e.g. infrastructure) to implement learning</p> <ul style="list-style-type: none"> Some KIIs did indicate that Africa CDC’s financial and human resource limit the extent to which learning can be cascaded down to member states, and that there are limitations at member state level in terms of e.g. actual lab capacity to conduct COVID-19 tests. 	<p>Limited evidence against this assumption</p>
<p>Students/trainees engage in training activities and learning outcomes set are realistic</p> <ul style="list-style-type: none"> There was no evidence in terms of specific learning outcomes that were set. Africa CDC stakeholders overall stated that training was useful, but did not explicitly mention engagement levels. 	<p>Limited evidence supporting this assumption</p>
<p>UK-PHRST team has right expertise and capacity to support the wider outbreak response (<i>Maps to EQ3.2</i>)</p> <ul style="list-style-type: none"> Most stakeholders very positive about expertise and individual capacity of UK-PHRST team members, being willing to continue to support remotely etc., and appreciated the fact a sizeable team of UK-PHRST deployed at start of COVID-19 outbreak in Africa, however there were concerns about short-term nature of deployments/support. There were some individual cases where it appeared that UK-PHRST capacity could have been stronger, e.g. with references from a small number of stakeholders to things such as the need to have contingency planning for staffing changes, and the redeployment of the UK-PHRST microbiology lead away from Africa CDC support to other duties. 	<p>Limited evidence supporting this assumption</p>
<p>Partner institutions and participants willing to work together and develop/use preparedness plans, strategies etc. (<i>Maps to EQ5.1, 5.2</i>)</p> <ul style="list-style-type: none"> Several stakeholder sited examples of UK-PHRST supported/developed plans, strategies, SOPs etc. being actively used by Africa CDC and/or member states. 	<p>Strong evidence supporting this assumption</p>
<p>UK deployment mechanisms have capacity to engage in collaborative meetings/workshops (<i>Maps to EQ3.2, 4.1, 4.2</i>)</p> <ul style="list-style-type: none"> There was mention of improved collaboration between UK-PHRST and PHE IHR Project, with e.g. collaborations on seroprevalence surveys. 	<p>Limited evidence supporting this assumption</p>

6. Short-Term Outcomes to Intermediate Outcome	
<p>Intermediate outcome: UK and global response to epidemics improves in speed and quality</p> <ol style="list-style-type: none"> What changes can be observed, if any, at the intermediate outcome level? (Maps to EQ6.1, 6.2) It was not considered feasible to measure UK-PHRST’s or other partners’ contribution towards this outcome at this stage, although it can be considered that the contributions at short-term outcome level to all result in some level of contribution at intermediate outcome level. What factors were needed to produce the observed change? (Maps to Assumptions, EQ2.3) Not applicable Summarise UK-PHRST plausible contribution to those factors (Maps to EQ6.2) Not applicable Summarise plausible contribution to those factors by other DPs or the government (Maps to EQ6.2) Not applicable 	<p>Evidence comprises few data sources across limited stakeholder groups (limited triangulation) and is perception based, or generally based on data sources that are viewed as being of lesser quality.</p>
7. Evidence against key assumptions	
<p>UK workforce can be retained and increased when required to allow fast deployment of requested expertise (Maps to Assumptions; EQ2.3, EQ3.8, EQ6.3, EQ6.4)</p> <ul style="list-style-type: none"> A multi-disciplinary team was in fact deployed at the start of COVID-19 outbreak in Africa, which indicates this assumption held for the Africa CDC deployment/support, despite the fact that key team members left during this period. 	<p>Strong evidence supporting this assumption</p>
<p>Other issues do not have significant impact on speed of deployment (Maps to EQ3.8, 6.3, 6.4)</p> <ul style="list-style-type: none"> No explicit evidence for or against this. 	<p>No evidence</p>
<p>Research, innovations and tools developed by UK-PHRST are seen as relevant and useful and therefore adopted by other global health/ outbreak response actors (Maps to EQ7.2)</p> <ul style="list-style-type: none"> Research at too early a stage – no evidence. 	<p>No evidence</p>
<p>LMIC’s effectively use increased capacity so that it contributes to improved response speed and quality</p> <ul style="list-style-type: none"> Multiple stakeholders cited examples of where UK-PHRST have used increased capacity in form of trained Epidemic Response Team members or Community Health Workers to support COVID-19 response; used UK-PHRST supported strategies, SOPs etc. to support response etc. 	<p>Strong evidence supporting this assumption</p>

Annex 8: Case study – Nigeria CDC

Case Study Contribution Story Summary – UK-PHRST Support to Nigeria CDC (2017-2020)

Context

In the last five years, Nigeria has experienced a number of outbreaks, including Lassa Fever, yellow fever, monkeypox, cholera, and cerebrospinal meningitis. UK-PHRST deployed to Nigeria for the first time in 2017 as part of a GOARN deployment to support the national response to a meningitis outbreak, which led to two subsequent bilateral deployments in 2018 and 2019 in support of two Lassa Fever outbreak responses. Since its first deployment, UK-PHRST has established a strong bilateral partnership with the Nigeria Centre for Disease Control (NCDC).

STO 1: “UK-PHRST contributes effectively as part of wider outbreak response”

Nigeria experienced two unusually severe outbreaks of Lassa Fever in 2018 and 2019. UK-PHRST contributed to outbreak response of Nigeria CDC and the Ministry of Health by providing cutting-edge technical knowledge and skills. Two multi-disciplinary teams of epidemiologists, case management specialists and logisticians deployed to Nigeria in 2018 and 2019, provided high quality expertise and technical support to NCDC and the Emergency Operations Centre (EOC) across the pillars of surveillance, data management, case management, research, and logistics. These deployments laid the foundation for a strong collaborative partnership between UK-PHRST and NCDC, leading to the development of comprehensive Lassa Fever research programmes and a joint NCDC, PHRST and PHE IHR research and capacity-building project on Monkey Pox. Several other partners contributed to the Lassa Fever outbreak responses, including WHO, US CDC, African Field Epidemiology Network, University of Maryland in Nigeria, E-Health Africa, Robert Koch Institute, Alliance for International Medical Action (ALIMA), and MSF (Belgium, France, Spain).

In early 2020, NCDC successfully established PCR testing for SARS-CoV-2 in two laboratories. This facilitated early case identification and thus helped improve the early response to the pandemic. A UK-PHRST microbiologist advised NCDC and WHO lab technicians on cycling conditions/new platform establishment, results interpretation guidance, and sequencing technical reach-back support. Multiple other partners, coordinated by the WHO, supported the NRL of NCDC in the response to COVID-19. However, there is no detailed information on their specific contribution to the establishment of COVID-19 testing capacity.

STO 2: “Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making”

The revision of national guidelines and training approaches for IPC/PPE for Viral Haemorrhagic Fevers (VHF), including Lassa Fever, was informed by UK-PHRST research findings on the IPC/PPE practices at health facilities. The study also helped to strengthen high level advocacy for the importance of quality assurance of PPE and the need to strengthen supply chain management for a more effective response. However, there is no evidence that these guidelines have been operationalised and used to improve outbreak response.

At the request of NCDC, and as part of the comprehensive Lassa Fever research programme, UK-PHRST supported NCDC to conduct a systematic review on IPC and the use of PPE for Lassa Fever to identify best practices and knowledge gaps. This led to a research study jointly implemented by NCDC and UK-PHRST with the aim of better understanding how PPE are used at health facilities during Lassa Fever outbreaks. The results of this study informed the revision of the national guideline. The research programmes on Monkey Pox and Lassa Fever will improve the evidence-base on these pathogens and has the potential to reinforce the overall capacity for outbreaks response.

STO 3: “Improved UK and in-country capacity for outbreak prevention and response in LMICs”

Nigeria’s outbreak response capacity has been strengthened through capacity development of key institutions and staff members in various pillars of outbreak response. The partnership with NCDC has provided several opportunities for formal and informal capacity building, both during deployments as an integral part of the research projects. During the 2018 and 2019 Lassa Fever outbreak response, UK-PHRST contributed to enhancing the capacity of NCDC and the Emergency Operating Centre (EOC). Capacity building has occurred notably in the areas of epidemiological analyses, interpretation and reporting, data management, case

management, laboratory diagnostics, clinical research and logistics at both the national and sub-national level. UK-PHRST is credited with building NCDC capacity for genetic sequencing for Lassa Fever and Monkey Pox, which will likely enable them to conduct sequencing of other pathogens. These activities reportedly led to sustained improvements in workforce practices in Nigeria.

The PHE IHR programme also contributed to enhancing the outbreak response capacity of NRL and NCDC. Effective collaboration between UK-PHRST and PHE IHR helped to coordinate capacity building activities, establish a joint initiative on Monkey Pox project, and provide joint support for the COVID-19 outbreak response.

UK-PHRST contribution to Intermediate Outcomes

UK-PHRST's contribution to Intermediate Outcomes cannot be estimated at this stage. However, the improved capacity to respond to outbreaks, multiple research studies, and effective deployments of the UK-PHRST (STO 1-3) could lead to overall improved outbreak responses in the future.

In particular, UK-PHRST capacity development of NCDC NRL in NGS techniques will greatly increase capacity for outbreak response as it can be used to detect any pathogen, including never seen before pathogens. For example, according to NCDC respondents, the NRL was able to successfully apply the NGS technique at the onset of the COVID-19 pandemic, which helped strengthen the early outbreak response. This is an indication that novel viruses can now be detected independently in Nigeria using domestic capacity.

Summary of changes observed (with a focus at the short-term outcome level).

Key factors influencing factors⁷⁶ to Short-Term Outcome: <i>STO1: UK-PHRST contributes effectively as part of wider outbreak response:</i>	Overall influence of factor	Contribution
1. Rapid deployment of multi-disciplinary experts to support the Lassa Fever outbreak response in 2018 and 2019 <ul style="list-style-type: none"> In 2018, UK-PHRST deployed an epidemiologist, a FETP fellow, a case management specialist and a logistician to support the NCDC and the Emergency Operations Centre (EOC) in the outbreak response. In 2019, UK-PHRST deployed an epidemiologist, a FETP fellow and a logistician to provide epidemiological and logistical support to the Lassa Fever outbreak. UK-PHRST arrived rapidly in-country (1-2 weeks before GOARN). 	Contributory	Some
2. Epidemiology and surveillance support to the Lassa Fever outbreak response <ul style="list-style-type: none"> UK-PHRST supported measures to strengthen surveillance, including development of SOPs and tools for: case finding and investigation, contact tracing, management and analysis of data, and for the generation of epidemiological reports. 	Important	Some
3. Case management support during the Lassa Fever outbreak response <ul style="list-style-type: none"> UK-PHRST supported: the review of Lassa Fever treatment guidelines, the development of case record forms, an investigation tool for healthcare associated infections, clinical management guidance and protocols for the use of ribavirin, improving the utilisation of case definitions and discharge practices, and the conducting of a mortality analysis and adult referral pattern audit. 	Contributory	Important
4. Logistics support during the Lassa Fever outbreak response <ul style="list-style-type: none"> UK-PHRST deployed a logistician to support the strengthening of supply chain management at the NCDC by introducing new procedures and tools for forecasting and inventory management of commodities, and training staff. 	Important	Important
5. Support for the establishment of COVID-19 testing capacity	Contributory	Important

⁷⁶ Factors to be hypothesised early on for testing through KIIs and data analysis and revision where appropriate.

<ul style="list-style-type: none"> UK-PHRST developed lab/diagnostics policies/SOPs/equipment & reagent specs to guide COVID-19 response 		
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Key factors influencing factors ⁷⁷ to Short-Term Outcome: <i>STO2: Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making</i>	Overall influence of factor	Contribution
1. Identification of knowledge gaps related to IPC/PPE for Lassa Fever and implementation of research study to investigate the operationalisation of existing IPC guidelines for VHF, in the case of Lassa Fever. <ul style="list-style-type: none"> The UK-PHRST conducted research on the use of PPE during Lassa Fever outbreaks which informed the revision of national guidance for IPC for VHF. The research also informed an adaptation of training protocols, and logistical support to the Lassa Treatment Centres (LTCs). 	Important	Vital
2. Research programmes on Lassa Fever and Monkey Pox have improved the evidence-base and have the potential to influence policy development and inform outbreak response to these two pathogens. <ul style="list-style-type: none"> UK-PHRST, in collaboration with NCDC, developed and implemented a comprehensive Lassa Fever research programme and an integrated research and CB project on Monkey Pox, including sequencing. 	Important	Important

Key factors influencing factors ⁷⁸ to Short-Term Outcome: <i>STO3: Improved LMIC, UK and global capacity for outbreak prevention and response</i>	Overall influence of factor	Contribution
1. Formal and informal capacity building of the Emergency Operating Centre (EOC) during the Lassa Fever outbreaks in 2018 and 2019. <ul style="list-style-type: none"> The UK-PHRST conducted research on the use of PPE during Lassa Fever outbreaks which informed the revision of national guidance for IPC for VHF. The research also informed an adaptation of training protocols, and logistical support to the Lassa Treatment Centres (LTCs). 	Contributory	Some
2. Research programmes on Lassa Fever and Monkey Pox have improved the evidence-base and have the potential to influence policy development and inform outbreak response to these two pathogens. <ul style="list-style-type: none"> UK-PHRST, in collaboration with NCDC, developed and implemented a comprehensive Lassa Fever research programme and an integrated research and CB project on Monkey Pox, including sequencing. 	Important	Important

Key for case study summary:

Influence scale	Essential factor in explaining outcome	Important factor in explaining outcome	Contributory factor in explaining outcome		
Contribution of partner	Vital contribution	Important contribution	Some contribution	Limited contribution	N/A or zero contribution

Explanation of typology of factors:

- Essential:** Without this factor the outcome would not have been achieved. There must be overwhelming validated evidence (from every stakeholder group interviewed, plus independent and/or robust documentary evidence) to use this rating. There

⁷⁷ Factors to be hypothesised early on for testing through KIIs and data analysis and revision where appropriate.

⁷⁸ Factors to be hypothesised early on for testing through KIIs and data analysis and revision where appropriate.

are negligible to no mixed views in your evidence. The evidence is so robust that there is no further research to be done on other contributing factors.

- **Important:** Evidence has been validated and points to the factor being a major part in achieving the outcome. More than two thirds of the validated evidence point to this factor (this must include both stakeholder interviews plus independent and/or robust documentary evidence). There may be some mixed views in your evidence. Further research is required to fully understand other contributions.
- **Contributory:** More than a third of the validated evidence (including interviews and/or documentary evidence) points to this factor making some contribution. Perhaps the factor laid the groundwork, was an early trigger or was important early on in a process. However, there is a lot of evidence that other factors contributed more/to a greater degree to the outcome. Much more research is required to fully understand how the outcome was achieved.

Explanation of typology of contribution to factors by UK-PHRST programme:

- **Vital:** Without the UK-PHRST programme the factor would not be in place, either at all or at the scale observed. There must be overwhelming validated evidence (from every stakeholder group interviewed, plus independent and/or robust documentary evidence) to use this rating. There are negligible to no mixed views in your evidence. The evidence is so robust that there is no further research to be done on other contributing actors.
- **Important:** Evidence has been validated and points to the UK-PHRST programme being a major part in the factor being in place, either at all or at the scale observed. More than two thirds of your validated evidence points to the UK-PHRST programme (this must include both stakeholder interviews plus independent and/or robust documentary evidence). There may be some mixed views in your evidence. Further research is required to fully understand the contributions of other actors.
- **Some:** Between a third and two thirds of the validated evidence (so in the main) (including interviews and/or documentary evidence) points to the UK-PHRST programme making some contribution to the factor being in place, either at all or at the scale observed. Perhaps the UK-PHRST programme laid the groundwork, was an early trigger or was important early on in a process. However, you have a lot of evidence that there were other actors that contributed more/to a greater degree to the factor. Much more research is required to fully understand how the outcome was achieved.
- **Limited:** A third or less of the evidence (validated or not) points to this factor explaining the outcome. The evidence contains a plethora of views on which actors contributed to the factor. Much further research is required.
- **N/A or zero:** This is given where there is no evidence pointing to the UK-PHRST programme making a contribution to the factor.

Strength of evidence table

Rank	Justification
1	Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.
2	Evidence comprises multiple data sources (good triangulation) of lesser quality, or the finding is supported by fewer data sources (limited triangulation) of decent quality but that are perhaps more perception-based than factual.
3	Evidence comprises few data sources across limited stakeholder groups (limited triangulation) and is perception based, or generally based on data sources that are viewed as being of lesser quality.
4	Evidence comprises very limited evidence (single source) or incomplete or unreliable evidence.

Full Case Study – UK-PHRST Support to Nigeria CDC (2017-2020)

1. Context of country programmes and implementation progress

Historical context and enabling environment for UK-PHRST

Nigeria has a high incidence of epidemic prone diseases. Since 2017, the country has been confronted with numerous outbreaks and public health emergencies, including Lassa Fever, yellow fever, monkeypox, cholera, meningitis, floods, and insurgency. The Ebola outbreak in 2014 was successfully contained by the government, but the crisis highlighted significant challenges with undertaking robust disease surveillance and outbreak response.

The Joint External Evaluation (JEE) of IHR core capacities conducted in June 2017, highlighted both strengths and weaknesses in preparedness and response to public health emergencies. While significant progress had been made in building capacity for prevention, surveillance and response to public health emergencies, the JEE demonstrated many critical gaps that need to be filled to protect Nigerians from the next major event. These results have helped to guide the National Action Plan for Health Security (NAPHS) planning process and to develop a roadmap for health security strengthening in Nigeria.

Overview of Nigeria CDC and UK-PHRST’s relationship

UK-PHRST has established a collaborative partnership with the Nigeria Centre for Disease Control (NCDC), which was legally established as the national public health institute responsible for disease control in November 2018. UK-PHRST has supported the NCDC across its triple mandate through deployments, research collaborations and ongoing capacity development through training and mentoring of public health leaders and front-line clinical staff.

1 - Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

2. Inputs/activities to outputs

1. What were the proposed activities and outputs?

The UK-PHRST did not seem to have a set of proposed activities with Nigeria CDC. However, it had set out to support Nigeria CDC to strengthen their capacity for outbreak response through 1) in-country multidisciplinary deployments; 2) cross-cutting research programmes; and 3) in-country capacity-building in various disciplines related to outbreak response.

The support has mainly focused on in-country deployments during Lassa Fever outbreaks, implementing a comprehensive Lassa Fever research programme, as well as NCDC and clinical staff capacity building for outbreak response. UK-PHRST also deployed to assist NCDC with an outbreak of meningitis in 2017, supported NCDC to establish testing capacity for SARS-Cov-2 in February 2020, and jointly developed an integrated research and capacity-building project on Monkey Pox (2019-2020) with NCDC.

What were the intentions of the activities/outputs?

These activities/outputs are intended to fill key research and capacity gaps identified by NCDC through strengthening the evidence-base on Lassa Fever and Monkey Pox. The research findings are meant to inform policy development and support Nigeria’s response to epidemic outbreaks. Further, the UK-PHRST support aimed to build the capacity of NCDC in outbreak response across epidemiology, data science, clinical management, IPC and microbiology/lab through formal and informal/on-the-job training.

1 - Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

2. Progress on the implementation of activities:

Deployments to support outbreak response:

The UK-PHRST provided multidisciplinary support to three outbreaks in Nigeria resulting in the development of strong collaborative links with NCDC, including an ongoing programme⁷⁹ and capacity building activities.

- In 2017, UK-PHRST deployed two epidemiologists and one microbiologist for four weeks to support the meningitis outbreak in Nigeria. This was via a request from GOARN in close collaboration with colleagues from Nigeria Centre for Disease Control.⁸⁰ Following this first deployment, UK-PHRST was invited bilaterally by the government through Nigeria CDC to support the Lassa Fever response in 2018 and 2019.
- In 2018, UK-PHRST deployed a team consisting of an epidemiologist, a FETP fellow, a case management specialist and a logistician, for five weeks.
- In 2019, one epidemiologist, one FETP fellow and the UK-PHRST field logistician were deployed to Nigeria to provide epidemiological and logistical support. During these deployments:

“UK-PHRST provided technical support and guidance to the Emergency Operations Centre (EOC), under the direction and coordination of the NCDC, in the pillars of surveillance, data management, case management, research and logistics. This included the development of SOPs and tools for case finding and investigation, contact tracing, and for the management and analysis of data and for the generation of epidemiological reports. UK-PHRST also supported the development or review of case management guidelines and tools. The logistician supported the strengthening of supply chain management procedures at the NCDC, for instance by introducing procedures for forecasting and inventory management of commodities.”

What outputs have been achieved?

- a) **Output 2: Research to build an evidence-base for optimum prevention and response conducted before, during, and after outbreaks. Knowledge sharing and external funding to maximise benefit.**
 - o **Output indicator 2.4: Cumulative number of research projects developed during/emerging from UK-PHRST deployment or remote support**

During the deployments, the UK-PHRST, in collaboration with the NCDC, identified a wide range of research questions leading to the co-development and implementation of a multidisciplinary Lassa Fever research programme. UK-PHRST's Lassa Fever deployments and partnership with NCDC led to the development of several research projects on Lassa Fever, including: two clinical studies focussing on the pathogenesis of the disease and case management; two microbiology studies; a study to better understand the use of PPE during Lassa Fever outbreaks; and an epidemiological study

⁷⁹ Mid-point evaluation report, Lassa Fever Case Study

to investigate risk factors for delayed presentation for care among Lassa Fever cases. During the first UK-PHRST deployment to support the response to a meningitis outbreak in 2017, NCDC and UK-PHRST also identified several research questions and discussed a research protocol; however, the proposal was never funded.

In 2019, the well-established partnership between UK-PHRST and NCDC provided the opportunity to jointly develop a multidisciplinary integrated research and capacity building programme on Monkey Pox. NCDC and UK-PHRST jointly launched a MinION sequencing project with NCDC's National Reference Laboratory in collaboration with the IHR Programme and PHE's National Infection Service. This project involved further development of next generation sequencing (NGS) capacity within NCDC, through in-depth practical training and data handling discussions.⁸¹ NGS is considered the most cutting-edge type of sequencing, which will make it possible for Nigeria to test viruses unilaterally and thus greatly increase NCDC's capacity for outbreak response in the long-term.

In February 2020, a UK-PHRST microbiologist supported the establishment of PCR testing for SARS-CoV-2. Key activities included the *“provision of cycling conditions/new platform establishment to WHO in-country lab lead, results interpretation guidance, and sequencing technical reach-back support. The PHRST microbiologist also supported NCDC staff (in conjunction with WHO) to perform validation studies on RNA extraction alternatives as Nigeria is not able to procure sufficient kits due to global shortage.”*^{82, 83}

b) ToC Output 5: Formal and informal capacity building provided to strengthen UK & LMIC response, outbreak management, and technical and research skills:

The partnership with NCDC has provided several opportunities for formal and informal capacity building, both during the deployments and as an integrated part of the Lassa Fever and the Monkey Pox research programmes. During the Lassa Fever deployments, UK-PHRST contributed to capacity development of Nigerian counterparts at national and sub-national levels in the areas of epidemiological analyses, interpretation and reporting, data management, case management, laboratory diagnostics and logistics.

The research projects on Lassa Fever and Monkey Pox have facilitated formal and informal capacity building of NCDC, front-line clinical staff, and lab technicians, particularly in the areas of laboratory diagnostics and clinical research. Nigerian counterparts were given opportunities to comment on research protocols and to support ethics application. However, there is further scope to provide an increasingly active role of Nigerian partners in research activities, in particular within protocol development and data analysis, which would strongly support in-country capacity-building for research.

UK-PHRST provided support to develop capacity of NCDC and MoH at the beginning of the COVID-19 pandemic. The UK-PHRST microbiologist provided informal training to lab technicians at the NRL as part of the establishment of national testing capacity for COVID-19, in collaboration with WHO and IHR. One of the NRL lab technicians trained by the PHRST microbiologist, reportedly replicated the training for staff in the laboratory in Lagos to support the expansion of COVID-19 diagnostic testing capacity across the country. UK-PHRST in collaboration with Nigeria CDC and PHE IHR also developed training material to improve the mental health component of the COVID-19 response, especially for NCDC staff.

⁸¹ PHRST271_Project Board Director's Report 3 March-2020.pdf

⁸² PHRST (2020). Summary of PHRST COVID-19 work

⁸³ See also: <https://www.lshtm.ac.uk/newsevents/news/2020/uk-public-health-rapid-support-team-deployed-help-international-coronavirus>

A need remains to develop a more explicit and long-term capacity-building strategy to respond to capacity gaps identified during outbreak and preparedness activities. UK-PHRST has provided significant support to bolster response and research capacity of NCDC and front-line clinical staff across various disciplines. However, key stakeholders in Nigeria and at UK-level noted that there is a need to develop a more explicit capacity-building strategy as part of a long-term partnership. This could possibly be combined with a long-term strategy and processes for remote support as part of a hybrid capacity-building model.

“Capacity-building would be great, if there was more structured focus on it. It got focus but more in a passive way and not as a result of deliberate action. It would be good after a response, to identify specific deficits and how can we support the development of those deficits and define more deliberate training guidance of members to improve that capacity?” (KII, Country stakeholder)

3. Explanation for emerging differences between intended and actual inputs/activities/outputs:

What factors have enabled or constrained implementation? (Maps to EQ3.8)

Do these factors relate to UK-PHRST, other actors, or the wider context? (Maps to EQ3.8, 6.4)

- **Enablers:**

- **The development of a bilateral collaborative partnership between the UK-PHRST and the NCDC over a longer period, facilitated the effective implementation of integrated activities across the triple mandate, including** a comprehensive research programme on Lassa Fever and an integrated research and capacity-building project on Monkey Pox. UK-PHRST was applauded by Nigerian stakeholders for its collaborative partnership and flexible support to the outbreak response, as well as for responding to knowledge and capacity gaps identified by NCDC and other national actors.
- **Effective coordination with the IHR programme facilitated the development of a joint Monkey Pox research and capacity-building initiative, including building NCDC NRL capacity for NGS and joint logistics training.** *“In Nigeria, the UK-PHRST laboratory specialist reportedly adopted a One HMG communications approach and included PHE IHR, DFID and the High Commissioner in discussions on laboratory training. Consequently, the UK-PHRST and IHR projects collaborated to deliver training on next generation sequencing, which aligned with their respective project objectives. Also, in Nigeria, PHE IHR Strengthening project was included in planning for the logistics training, which dovetailed with the PHE IHR Strengthening project objectives.”⁸⁴*

- **Constraints:**

- **The challenging security situation in Nigeria affected UK-PHRST’s ability to deploy and travel within the country.** Due to security concerns, the FCO imposed restrictions on travel to Nigeria during the 2019 elections, which initially delayed the deployment. General security issues have also had impact on UK-PHRST’s ability to travel to certain research sites. **There is a perception among Nigerian stakeholders that UK-PHRST is constrained by its small size and limited resources to work effectively**

⁸⁴ UK-PHRST Mid-point review

across the triple mandate and to provide long-term capacity building (including remote support). Stakeholders felt that the ability of the UK-PHRST team to provide remote support has been constrained by the fact that they are often involved in multiple activities at once, specifically that deployments in other countries limit their ability to respond quickly to NCDC request for remote support.

- **The UK-PHRST team is not able to cover all disciplines related to outbreak response. Therefore, UK-PHRST should access wider networks and a broader skills base in order to most effectively address identified research questions and capacity building needs.**

“Many identified research questions have not yet been implemented as research projects. It is likely that the large volume of research questions identified during the Nigerian deployments is beyond what the core deployment team could realistically implement on their own. Both Nigerian deployments identified a series of research questions and capacity-building needs relating to zoonotic infection, environmental transmission routes, and zoonotic surveillance, which would require input from currently unrepresented disciplines such as One Health experts, specialists in zoonotic and environmental epidemiology, and ecologists.”

There is an opportunity for UK-PHRST to support the Nigerian MoH to develop and publish a research agenda which could be supported by other research organisations/teams who are working in those areas and have the capacity to provide long-term research support.

- **The COVID-19 pandemic delayed the implementation of some planned activities in 2020, especially with regards to Lassa Fever clinical research.** Due to international travel restrictions, UK-PHRST was unable to deploy to Nigeria to conduct field work for research projects, or to support the COVID-19 outbreak response between March and September. This had negative effects on the clinical Lassa Fever studies, which experienced challenges with moving samples within Nigeria, and from Nigeria to the UK. The Oxford research team had to postpone a field visit to Owo for site monitoring and refresher training due to the cancellation of commercial flights. As a result, one of the components of the clinical study at Owo Lassa Fever ward was stopped in March 2020 and could thus no longer continue in tandem with the cardiovascular component as originally planned. Moreover, the pandemic affected laboratory capacity since the clinical processing of samples for Lassa Fever was in the same laboratory working exclusively on COVID-19 (as of April 2020). Moreover, the analysis phase of the Lassa Fever study using TaqMan array card system (TAC) and MinION NGS sequencing was delayed by the deployment of the project lead through GOARN to support the COVID-19 response in Nepal, and subsequently to the British Army as a reservist to support the UK domestic response to COVID-19.
- **UK-PHRST stayed in close communication with NCDC and provided some ad hoc remote support and advice during the COVID pandemic. However, there was no explicit strategy specifying how UK-PHRST would provide remote support and ways of working.** There was reportedly regular communication between the NCDC CEO and the Director of PHRST to discuss the COVID-19 pandemic in general terms, although this did not materialise in any concrete support to the outbreak response in Nigeria. Furthermore, UK-PHRST provided some remote support to the NCDC NRL,

for example in relation to the validation and optimisation of the detection kits. UK-PHRST also supported NCDC indirectly through extensive work with Africa CDC on COVID-19 and as part of the African Union Taskforce for COVID-19. However, while there was regular informal contact between some UK-PHRST and NCDC staff during the COVID-19 pandemic to discuss ongoing activities, no explicit effort existed to develop a multidisciplinary remote support strategy.

3. What were other actors doing during the project period that has a potential to influence the same outputs / outcomes? (Maps to EQ4.2, 5.1, 5.2, 5.3, 5.4)

A wide range of partners supported the two Lassa Fever outbreak responses in 2018 and 2019, including WHO, US CDC, African Field Epidemiology Network, University of Maryland in Nigeria, E-Health Africa, Robert Koch Institute, Alliance for International Medical Action (ALIMA), MSF-OCB (Belgium), MSF-F (France), and MSF-OCB (Spain). WHO (headquarters, WHO-AFRO and country office) *“supported NCDC incident management system, pillar activities and development of SOPs; deployed WHO-AFRO staff and GOARN consultants to support the response; took responsibility for implementing contact tracing; released WHO emergency funds and raised other funds on behalf of the Nigerian Government”*.⁸⁵

- **Both UK-PHRST, the PHE IHR and JHU supported the NCDC NRL to strengthen their capacity to conduct NGS independently.** PHRST collaborated closely with PHE IHR to train NCDC NRL staff in NGS as part of the joint Monkey Pox initiative. JHU supported NCDC to strengthen its capacity in the sequencing of cholera. This reportedly does not overlap with UK-PHRST sequencing activities, as JHU is sequencing cholera using a different technique (i.e. likely a predecessor to NGS), while PHRS has focused on the use of NGS technique for Lassa Fever and Monkey Pox.
- **The Foundation for Innovative New Diagnostics (FIND)** supported capacity building of the NCDC national reference laboratory and a network of four other laboratories. According to a Nigerian stakeholder, support of the laboratory was similar to that of UK-PHRST but extended to four other laboratories.

During the UK-PHRST project period, other key partners collaborated closely with NCDC to strengthen national outbreak response capacity. These projects likely contributed to the same outcomes as UK-PHRST. However, there is limited evidence available to assess their distinct contribution and results to improved outcomes:

- **International Health Regulations (IHR) Strengthening Programme (Public Health England).** In addition to the joint activities with UK-PHRST described above, the PHE IHR project aims to strengthen emergency preparedness, resilience, and response, enhancing national surveillance systems and public health laboratory strengthening. It focuses on long-term capacity building.
- **National Public Health Institute Strengthening in Nigeria (US CDC and International Association of National Public Health Institutes (IANPHI)).** The project aims to strengthen laboratory function; strengthen outbreak management and emergency response; and enhance risk communication capacity.
- **Alliance for Epidemic Preparedness and Response (A4EPR) (Private Sector Health Alliance of Nigeria (PHN) and NCDC).** The project aims to collaborate with the private sector to improve NCDC and States’ capacity to respond effectively to epidemic outbreaks and to strengthen risk communication.

3 - Evidence comprises few data sources across limited stakeholder groups (limited triangulation) and is perception based, or generally based on data sources that are viewed as being of lesser quality.

⁸⁵ 06_End of Mission Report_Lassa Fever Outbreak Nigeria 2018

- **Capacity Development for Preparedness and Response for Infectious Diseases (NICADE) Project (Robert Koch Institute (RKI)).** The project aims to support the national response to the threats of Hepatitis E virus (HEV) and antimicrobial resistance (AMR).
- **States' Public Health Emergency Operations Centre Establishment (NCDC).** NCDC is supporting Nigerian states in the establishment of Public Health Emergency Operations Centre (PHEOCs), including capacity building of staff on incident management capacities and its utilisation.
- **Manual on Universal and Outbreak Infection Prevention Control (MAURICE) Project (RKI and GIZ).** The project supports the implementation of training activities to improve IPC among health workers.
- **Regional Diseases Surveillance System Enhancement (REDDISSE) Project (World Bank).** The project aims to strengthen disease surveillance and response systems at regional level and in ECOWAS Member States.
- **RISE (Reaching Impact, Saturation, and Epidemic Control) consortium (Jhpiego, funded by USAID)** provided upgrades to EOCs in eight states across Nigeria to support the COVID-19 response.
- **Regional programme support to pandemic prevention in the ECOWAS region (RPPP) (GIZ, funded by EU/German Government).** The project aims to enhance the integration of gender and One Health aspects into risk communication; strengthen coordination between ECOWAS and its partners in disease control; and increase the robustness of human resources of the ECOWAS Commission, WAHO, RCSDC and the NCIs in disease control; and enhance digital disease outbreak management and surveillance.

4. Outputs to Short-Term Outcomes

What changes can be observed at the STO level?

STO1: "UK-PHRST contributes effectively as part of wider outbreak response"

There is indication that UK-PHRST successfully contributed to strengthening the wider response to the Lassa Fever outbreaks in 2018 and 2019, by providing cutting-edge technical knowledge and skills in a wide range of disciplines. According to Nigerian stakeholders, the quality and effectiveness response to the Lassa Fever outbreaks in 2018 and 2019 had improved compared to the 2017/2018 outbreak response. The UK-PHRST Lassa Fever deployments *"proved to be an effective way to strengthen a country's capacity for outbreak response; led naturally to the identification of knowledge and capacity gaps and provided opportunities to develop collaborations for addressing those gaps through research and capacity building activities, which are of direct relevance to the control of the outbreak."*⁸⁶

"UK-PHRST's support was (...) very good when we had a major Lassa outbreak. It was a major outbreak, and we weren't sure if it was due to a changed [mutated] virus as it appeared that it was more virulent. UK-PHRST were quickly on the field, then the MinION sequencing idea came forward. Back then, this provided evidence that the virus hadn't actually changed. So, this helped us to know that it was really a matter of continuing our usual response activities. Before that, people had been really worried. But by showing that the virus hadn't changed, that evidence supported our [Nigeria CDC] direction of travel in terms of our response activities." (KII, UK HMG Consortium staff)

1 - Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

⁸⁶ UK-PHRST Mid-point review, Lassa Fever Case Study

What factors were needed to produce the observed change? (Maps to Assumptions, EQ2.3)

1. Rapid deployment of multi-disciplinary experts to support the Lassa Fever outbreak response in 2018 and 2019

- **Influence of factor:**
 - Early detection as well as effective and rapid containment are critical strategies to control an emerging outbreak and prevent it from spreading further. The timely and rapid deployment of international experts to emerging outbreaks play an important role in supporting the national government to ensure a rapid response. All pillars of an outbreak response need to be covered and work in synergy, which requires a multi-disciplinary team of experts.
- **UK-PHRST contribution:**
 - UK-PHRST contributed effectively to the two Lassa Fever outbreak responses in 2018 and 2019 by strengthening the Emergency Operations Centre (EOC) capacity and systems for case identification and surveillance, data management, case management, procedures for PPE and IPC, and logistics. The multi-disciplinary technical support, resources and tools provided by the UK-PHRST were considered key factors by significant stakeholders in helping to strengthen the outbreak response. The bilateral deployment mode allowed UK-PHRST to arrive rapidly in-country, to respond directly to needs expressed by NCDC, and to have more open discussions regarding strategy directly with NCDC and its partners.
- **Contribution by other partners:**
 - The GOARN deployment team arrived in Nigeria 1-2 weeks after the UK-PHRST experts. WHO and US CDC seconded staff to the EOC to provide support across pillars. However, it seems that these staff were already in Nigeria at the time of the outbreak, and thus not part of a larger international deployment team. A stakeholder in Nigeria noted that *“We have the US CDC, which has a base in Nigeria. There is also the Robert Koch Institute but none of them have [the triple mandate] defined as what the UK-PHRST has. In any public health organisation, you will see components of the UK-PHRST like deployment, capacity building and research, but none of them have it as clearly articulated as the UK-PHRST team.”*

2. Epidemiology and surveillance support to the Lassa Fever outbreak response

- **Influence of factor:**
 - Epidemiology and surveillance are critical pillars of Lassa Fever prevention and control. Effective data collection, management and analysis can help monitor its burden over time, detect early indications of emerging outbreaks, determine risk factors for the disease and populations at greatest risk, as well as guide outbreak response activities.
- **UK-PHRST contribution:**
 - During the two Lassa Fever deployments, “the UK-PHRST supported measures to strengthen the collection, management, analysis, use, interpretation and presentation of surveillance and outbreak data. This included the development of Standard Operating Procedures (SOPs) and tools for case-finding and investigation, for contact tracing, for the management and analysis of data and for the generation of epidemiological reports. They supported data analyses that provided information on transmission patterns, priority areas to be targeted with control measures

and on population subgroups and geographic areas with higher mortality rates.”⁸⁷

- **Contribution by other partners:**

- Alongside other partners, the WHO country office and the PHE/IHR programme provided support to the Lassa Fever outbreaks. In 2018, WHO and PHE/IHR backed NCDC to organise a workshop for all partners to discuss strategies on epidemic response enhancement. Several other partners supported the surveillance pillar, including US CDC, African Field Epidemiology Network, University of Maryland in Nigeria, E-Health Africa, and Robert Koch Institute. These partners seconded data scientists, epidemiologists and community engagement specialists to support NCDC with data analysis and interpretation to guide decision-making and States with surveillance activities and Rapid Response Teams. In 2019, seconded US CDC staff chaired the surveillance pillar, while WHO chaired the data management pillar. WHO also seconded an in-country epidemiologist from the Health Emergencies department to provide technical and strategic support to the surveillance pillar and the data management pillar.⁸⁸

3. Case management support during the Lassa Fever outbreak response

- **Influence of factor:**

- Case management is an important pillar of the Lassa Fever outbreak response as it helps front-line health care workers in case identification, screening and triage, diagnostics and clinical management, IPC and contact tracing.

- **UK-PHRST contribution:**

- As part of the case management pillar, UK-PHRST “supported a wide range of activities including the review of treatment guidelines, the development of case record forms, an investigation tool for healthcare associated infections, clinical management guidance and protocols for ribavirin use. Support was also given to improve the use of case definitions and discharge practices and for the conduct of a mortality analysis and adult referral pattern audit.”⁸⁹

- **Contribution by other partners:**

- In 2018, several partners supported the revision of the National Guidelines for Lassa Fever Case Management, including WHO, World Bank, Public Health England, AFENET, University of Maryland, Baltimore, the US CDC, Medecins San Frontiers, ALIMA. The guideline was revised based on lessons learned and an After-Action-Review conducted after the January-May 2018 Lassa Fever outbreak. The updated guideline has likely been used during the subsequent epidemic outbreaks, including the one supported by UK-PHRST in 2019. The EOC case management pillar was supported by NCDC, Alliance for International Medical Action (ALIMA), MSF-OCB (Belgium), MSF-F (France), MSF-OCB (Spain), WHO. Provided technical assessment and guidance to treatment facilities, while MSFs and ALIMA supported IPC and treatment capacity, as well as construction and/or improvement of treatment facilities.⁹⁰

4. Logistics support during the Lassa Fever outbreak response

- **Influence of factor:**

⁸⁷ UK-PHRST Mid-point review, Lassa Fever Case Study

⁸⁸ 06_End of Mission Report_Lassa Fever Outbreak Nigeria 2018 and 09_End of Mission Report - Lassa Fever Outbreak Nigeria 2019

⁸⁹ UK-PHRST Mid-point review, Lassa Fever Case Study

⁹⁰ 06_End of Mission Report_Lassa Fever Outbreak Nigeria 2018 and 09_End of Mission Report - Lassa Fever Outbreak Nigeria 2019

<ul style="list-style-type: none"> - Effective logistics, including supply chain management systems and procedures, is important for ensuring the adequate supply and last-mile-delivery⁹¹ of commodities necessary to respond to Lassa Fever outbreaks. • UK-PHRST contribution: <ul style="list-style-type: none"> - UK-PHRST deployed a logistician to support the strengthening of supply chain management procedures at the NCDC, including the introduction of procedures and tools for forecasting and inventory management of commodities. Indeed, these procedures are still being used and have reportedly resulted in long-term improvements to logistics management at the NCDC. Additionally, the UK-PHRST logistician trained staff and advised NCDC logistics team on improving stock and supply chain management systems in Irrua and Owo, including measures to improve interstate communication on supply, and longer-term training needs for future outbreak logistics. • Contribution by other partners: <ul style="list-style-type: none"> - During the 2018 outbreak, NCDC and WHO coordinated supply of commodities and equipment to treatment facilities with focus on ribavirin, PPE and other IPC materials. There is no information available on other partner’s contribution during the 2019 outbreak.⁹² <p>5. Support for the establishment of COVID-19 testing capacity</p> <ul style="list-style-type: none"> • Influence of factor: <ul style="list-style-type: none"> - Nigeria CDC set up COVID-19 testing facility at the NRL in February 2020, before Nigeria had confirmed its first COVID-19 case. The early establishment of COVID-19 testing facility was critical to ensure effective testing at an early stage of the pandemic. This was significant in helping detect cases from the onset of the outbreak in Nigeria. • UK-PHRST contribution: <ul style="list-style-type: none"> - A UK-PHRST microbiologist supported NCDC to establish PCR testing for SARS-CoV-2 by providing technical advice on the cycling conditions/new platform establishment to the WHO in-country lab lead; results interpretation guidance; and sequencing technical reach-back support. He also supported NCDC staff (in conjunction with WHO) to perform validation studies on RNA extraction alternatives, as Nigeria is not able to procure sufficient kits due to global shortage.^{93, 94} • Contribution by other partners: <ul style="list-style-type: none"> - Several other partners supported the outbreak response to COVID-19. However, there is no detailed information on their contribution to establishing COVID-19 testing capacity. 	
<p>STO2: “Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making”</p> <p>The joint UK-PHRST and NCDC research project on the use of PPE in relation to Lassa Fever informed the revision of national guidance for infection prevention control (IPC) for viral haemorrhagic fevers (VHF). It also had an impact on the</p>	<p>Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality.</p>

⁹¹ Last-mile-delivery refers to the delivery of commodities to the last point of service, i.e. a health facility or pharmacy where the client or patient will access the product.

⁹² 06_End of Mission Report_Lassa Fever Outbreak Nigeria 2018.

⁹³ PHRST (2020). Summary of PRHST COVID-19 work.

⁹⁴ See also: <https://www.lshtm.ac.uk/newsevents/news/2020/uk-public-health-rapid-support-team-deployed-help-international-coronavirus>

training protocols and logistical support provided by the NCDC to Lassa Treatment centres (LTCs) as well as on the sharing of learning between all the LTCs due to the differing protocols at each site. “The recent edition of the NCDC IPC guidelines for VHFs has incorporated some of the findings from the [UK-PHRST] study [on the use of PPE for Lassa Fever], including the option of gowns rather than coveralls for body protection.”⁹⁵

The research findings also helped strengthen advocacy for the importance of quality assurance of PPE and need to strengthen supply chain management of the commodities. The research findings emphasised the quality of PPE which prompted a dialogue at a national level, regarding the development of assurance systems to safeguard the future procurement and donation of equipment that is fit for purpose. These results have informed national advocacy work for improvements to supplies to the LTCs⁹⁶. This has the potential to influence the effective use of PPE in the future, and in turn to prevent further spread of the virus.

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What factors were needed to produce the observed change? (*Maps to Assumptions, EQ2.3*)

1. Implementation of a research study to investigate how effectively the existing IPC guidelines for VHF were disseminated and how, in the case of Lassa Fever, they were operationalised in health facilities.

• **Influence of factor:**

- The PPE/IPC study provided important and necessary evidence to inform the revision of the national IPC guidelines for VHF and the adaptation of national training protocols and logistics support for Lassa Fever prevention and control. However, other factors informing its revision cannot necessarily be excluded, since the revision process started prior to the publication of the final research report.

• **UK-PHRST contribution:**

- UK-PHRST supported NCDC to identify existing knowledge gaps in the literature, formulate pertinent research questions, and design and implement a research study to better understand how PPE was used at LTCs. Upon recognition of the limitations in the existing national IPC guidance for VHFs, NCDC invited the UK-PHRST to jointly investigate whether the IPC policies they developed in 2017 were effectively disseminated and how, in the case of Lassa Fever, they were operationalised in the LTCs.⁹⁸ UK-PHRST, in collaboration with NCDC, first conducted a systematic literature review, which found that IPC, as a very important aspect of Lassa Fever prevention and control, was not well informed by proper literature. The aim of the research was thus to better understand how PPE was used at LTCs.

Where fewer data sources exist, the supporting evidence is more factual than subjective.

⁹⁵ PHRST319_UK PHRST Research Individual Projects_30.4.2020.pdf

⁹⁶ PHRST305_PHRST DRAFT Annual Review 2019-20.docx

⁹⁷ PHRST305_PHRST DRAFT Annual Review 2019-20.docx

⁹⁸ PHRST348_CASE STUDY Using PPE in outbreak response case study.

“Because Nigeria is a place that has [Lassa Fever] outbreaks all year round, and there are a lot of anecdotes around how people are using PPE across the different treatment centres across the country, despite the guidelines we give them. So, we wanted to give a very objective assessment of how people were adhering to the guidelines we were providing, because the PPE are very expensive.”(KII, National Public Health Institute)

- **Contribution by other partners:**

- There is no evidence of contribution from other partners to the research study as it was led by the UK-PHRST in collaboration with the NCDC IPC lead. However, the exclusion of other partners contributing to the revision of the national IPC guidelines for VHF cannot be made. Likely, because this began before the final research results were available, and since such guideline revisions are often led by a multi-stakeholder technical working group and supported financially and technically by multiple in-country partners including the WHO.

While UK-PHRST strengthened IPC policy for HVFs, they missed an opportunity to support capacity building and implementation of the revised IPC guidance. One key limitation mentioned by stakeholders is that the research on PPE/IPC was not accompanied by any explicit capacity building strategy during or after the research was completed, to support the implementation of the revised guidelines. The short duration of the field visit for the research project could be one explanation, as capacity building measures and support for implementation of national guidelines is a longer-term process.

2. The findings generated by the UK-PHRST/NCDC research programmes on Lassa Fever and Monkey Pox have improved the evidence-base on these two pathogens, and have the potential to influence policy development and inform outbreak response to Lassa Fever and Monkey Pox. However, a stronger involvement of national researchers in all phases of the research cycle is important to build sustainable national capacity to lead research independently.

- **Factor of influence:**

- UK-PHRST research projects on Lassa Fever and Monkey Pox are designed to fill important knowledge gaps and improve the global and Nigerian evidence-base on these two pathogens. Research findings have the potential to further influence policy in Nigeria, but only if they are effectively disseminated to global and national-level policy makers, other decision-makers, and key stakeholders.

- **UK-PHRST contribution:**

- UK-PHRST collaboratively identified research questions with key stakeholders during the Lassa Fever deployments in Nigeria. As a result, multiple research projects on Lassa Fever and Monkey Pox have been developed and implemented in collaboration with NCDC, some of which are still ongoing. There are early indications that the sequencing project supported by the UK-PHRST may inform national guidelines and protocols:

“The sequencing project may inform revisions to the Nigerian National Lassa Fever Testing Algorithm. The results of the project may also inform the strengthening of the Lassa Fever case definition in Nigeria. The UK-PHRST laboratory research in Nigeria will strengthen national laboratory surveillance and biosecurity

Evidence comprises few data sources across limited stakeholder groups (limited triangulation) and is perception based, or generally based on data sources that are viewed as being of lesser quality.

<p><i>capacity, which will help Nigeria to address a number of gaps identified by the Joint External Evaluation (JEE). As part of the implementation of the clinical research studies in Nigeria, local clinicians are being trained on clinical research methodologies to enable them to develop the skills necessary to independently lead clinical research.</i>⁹⁹</p> <p><i>"I feel the work that UK-PHRST is doing is improving our ability to respond to outbreaks and is supporting Nigeria CDC in terms of improving our response to Lassa and other pathogens. Now that we have a clear idea what other pathogens are with Lassa. It's important to us, if we have other public health issues at the moment, it [Lassa Fever] is not the worst in terms of morbidity and mortality, but in terms of numbers, and how it affects our country Lassa is the first, so their [UK-PHRST's] interest in Lassa has helped is tremendously. It is almost all year now. At the moment, while we wait for next [Lassa] spike, usually around dry season, we are working to improve diagnostics based on some of the research UK-PHRST have done already. Similarly, on Monkey Pox, where we are looking to improve access to commercially available reagents, UK-PHRST's support on this is important. Overall, our improved capacity in the lab to do these assays and get results out, speaks to a lot of improvements in the way we work, so overall the answer would be a yes, UK-PHRST has supported towards these outcomes" (KII, National Public Health Institute)</i></p> <ul style="list-style-type: none"> - However, there was no/limited evidence at the end-point evaluation to confirm whether the research results have been translated into policy and practice, as no concrete examples (other than the PPE/IPC research mentioned above) were identified by key stakeholders. - The mid-point review showed that there is further scope to give Nigeria counterparts a more active role in research activities. For example, by giving them a more hands-on role in protocol development and data analysis, which would strongly support in-country capacity building for research. There is no evidence that this has changed at the end-point. • Contribution by other partners: <ul style="list-style-type: none"> - There is insufficient evidence to assess how other partners may have contributed to improving the evidence base on Lassa Fever and Monkey Pox in Nigeria 	
<p>STO3: "Improved LMIC, UK and global capacity for outbreak prevention and response"</p> <p>What factors were needed to produce the observed change? (Maps to Assumptions, EQ2.3)</p> <p>1. Formal and informal capacity building of the Emergency Operations Centre (EOC) during the Lassa Fever outbreaks in 2018 and 2019.</p> <ul style="list-style-type: none"> • Influence of factor: <ul style="list-style-type: none"> - Capacity-building through formal and informal training and on-the-job coaching of both national level and front-line staff during outbreaks, 	<p>Strength of evidence (1 to 4 as per above table)</p>

⁹⁹ UK-PHRST Mid-point evaluation, Lassa Fever Case Study

contributes to improving the technical skills of those staff. If applied correctly in practice, this will improve the quality and effectiveness of the outbreak responses.

- **Contribution of UK-PHRST:**

- The UK-PHRST multi-disciplinary deployments to the Lassa Fever outbreaks in 2018 and 2019 provided opportunities for capacity building of Nigerian counterparts in the areas of epidemiological analyses, interpretation and reporting, data management, case management, laboratory diagnostics and logistics. UK-PHRST worked directly with EOC staff members under the direction of NCDC to support these response pillars. The multidisciplinary nature as well as the excellent technical expertise of the deployed UK-PHRST team, combined with a collaborative working style during the deployments, contributed to the transferral of knowledge and skills to Nigerian counterparts. These capacity-building activities have reportedly led to sustained improvements in workforce practices in Nigeria. Support was given at the national level, but also, critically, at the sub-national level.

“During deployment to Nigeria she [the UK-PHRST epidemiologist] created a system of Epi reporting and implemented this on the ground – by training staff on the ground how to produce this report. This strengthened Epi, surveillance and reporting processes at the national level in Nigeria CDC. They [NCDC] were [already] doing reporting, but they [UK-PHRST] strengthened the quality of reporting – better use of data, better interpretation of data – SOPs etc.” (KII, UK-PHRST reservist)

- **Contribution of other partners:**

- There is limited information concerning the contribution of other partners’ to formal and informal capacity-building in response outbreaks.
- The PHE IHR programme in Nigeria aims to build preparedness capability of NCDC in three main areas: 1) Emergency Planning Resilience and Response (EPRR); 2) Surveillance; and 3) Laboratory Support. The PHE IHR programme has delivered various trainings and workshops in generalist and technical areas, in particular in relation to EOC and Incident Manager trainings and Geographic Information Systems (GIS) which have positively contributed to improved capacity in EPRR. The 2019 mid-point JEE confirms this positive assessment, which indicates that capacity has improved in those areas.¹⁰⁰

2. The capacity of the NCDC National Reference Laboratory (NRL) to conduct sequencing of Lassa Fever and Monkey Pox has been strengthened and has improved their overall capacity to conduct sequencing independently and to respond to other disease outbreaks (including COVID-19).

- **Contribution of UK-PHRST:**

- In collaboration with the IHR Programme and PHE’s National Infection Service, UK-PHRST also supported a sequencing project with NCDC NRL to increase knowledge about the genetics of the Monkey Pox virus and to enable Nigeria CDC to conduct sequencing independently. This project built on previous work led by UK-PHRST to enhance NRL capacity for sequencing of Lassa Fever. Key stakeholders in Nigeria noted that this improvement in sequencing capacity was largely due to UK-PHRST capacity development efforts (i.e. transfer of knowledge and skills during on-the-job training) of NRL staff.

¹⁰⁰ Nigeria Contribution Story – Evaluation of PHE IHR; <https://ncdc.gov.ng/news/204/press-release---nigeria-holds-mid-term-joint-external-evaluation-of-international-health-regulations>

“UK-PHRST supported training of staff in sequencing for Lassa Fever and Monkey Pox at NCDC’s National Reference Laboratory (Abuja, Nigeria), which led on to supporting NCDC’s capacity to test for SARS-CoV-2, very early on in the pandemic.”¹⁰¹

“There is a Chinese proverb that says ‘do not give a man a fish every day but teach him how to fish’ or something like that. So, I think that when support helps in building capacity (...), when you leave, it is sustainable. Now what we are seeing in our sequencing work, it is now in our national reference lab. The [UK-PHRST] support was for Lassa and Monkey Pox, but now we are doing sequencing for COVID-19, we are running 10 sites. That is sustaining the initial sequencing work they [UK-PHRST] did with us (...). We have moved beyond [Lassa and Monkey Pox] to do COVID-19 sequencing, we are building capacity for sequencing across pathogens. With the initial support in equipment reagents and training and the partnership, that has increased our capacity.” (KII, UK-PHRST Technical Deployment Team)

- By strengthening laboratory capacity for sequencing, the support given to bolstering national capacity for laboratory sequencing of infectious diseases, will likely enable Nigeria to monitor a wider range of pathogens and will facilitate the earlier detection of potential health threats. Evidence strongly indicates that the UK-PHRST support to the NCDC NRL in establishing NGS for Lassa Fever and Monkey Pox diagnostics, enabled the NRL staff to conduct sequencing of COVID-19 as part of the outbreak response.
- **Contribution of other partners:**
 - The IHR Programme and the PHE’s National Infection Service also contributed to strengthening the capacity of the NRL. In addition, PHE IHR also supported the sequencing work financially. UK-PHRST teamed up with the IHR project to deliver laboratory trainings in next generation sequencing necessary for both the implementation of the Lassa Fever project and the IHR’s work on Monkey Pox.¹⁰² Moreover, JHU reportedly also trained NLR staff in sequencing as part of a tuberculosis sequencing project, likely also contributing to strengthening NRL capacity in this area. The UK-PHRST team visiting Nigeria in February 2020 for the Monkey Pox project worked closely with the IHR programme and WHO to support the NRL in establishing COVID-19 testing facility. The PHE IHR programme supports capacity development of the NRL as a core area. There is no evidence of overlap or duplication between PHE IHR and UK-PHRST.
 -
 - Despite the strong indication of the successful transferral of knowledge and skills to Nigerian counterparts from the PHRST teams, contributing to improved outbreak response capacity, stakeholders noted the need to develop an explicit capacity building strategy in collaboration with Nigeria CDC for building sustainable capacity in the long-term.

5. Evidence against key assumptions (*Maps to Assumptions; EQ2.3, EQ3.8, EQ6.3, EQ6.4*)

No evidence

¹⁰¹ PHRST320_UK PHRST Research Portfolio_30.4.2020.pdf

¹⁰² Mid-point review, Lassa Fever Case Study

Assumptions key	
No evidence	
Strong evidence against this assumption	
Limited evidence against this assumption	
Limited evidence supporting this assumption	
Strong evidence supporting this assumption	
<p>Increased collaboration between UK deployment mechanisms improves overall capacity and effectiveness of UK outbreak prevention /response mechanisms (Maps to EQ 4.1, 4.2)</p> <ul style="list-style-type: none"> There is no evidence of any other UK deployment mechanisms deploying teams to Nigeria during the same period as UK-PHRST in the KIs or documents received from UK-PHRST or sourced by the evaluation team. 	
<p>There is a direct relation between research findings and the approach to outbreak response</p> <ul style="list-style-type: none"> There is no evidence to validate this assumption. There is evidence, however, that research findings in Lassa Fever <i>have likely supported or will likely support</i> future outbreaks, as the comprehensive Lassa Fever research project has improved the evidence-base. Yet, there are no concrete examples of how research findings have been translated into concrete action correlated to a wider outbreak response. Research findings are relevant to future outbreaks. UK-PHRST research findings will inform the response to future outbreaks as it spans a wide range of topics and disciplines. For example, the IPC/PPE research provided important information about the practices and use of PPE at Lassa Fever Treatment Centres, influencing national guidelines, which will likely be applied (if effectively implemented/operationalised) in the Treatment Centres. 	Limited evidence supporting this assumption
<p>Research findings are seen as relevant and useful and thus adopted and supported by/ integrated into policies of key global actors (e.g. WHO) and LMICs to strengthen response (Maps to EQ7.2)</p> <ul style="list-style-type: none"> The Lassa Fever and Monkey Pox research are considered highly relevant by Nigerian stakeholders who noted that the findings will help them improve the response to future outbreaks. The UK-PHRST PPE study informed the revision of the national IPC guidelines for VHF, so in turn will influence future response activities (PPE/IPC) at the frontline, but only if the guidelines are effectively disseminated and implemented at the operational level (there was no evidence on this in our data). 	Limited evidence supporting this assumption
<p>Partner institutions and participants willing to and have capacity to work together and implement learning from capacity building delivered by UK-PHRST (Maps to EQ5.1, 5.2)</p> <ul style="list-style-type: none"> NCDC stakeholders recognised the excellent technical skills and support provided by the UK-PHRST team during deployments and research field visits. The collaborative partnership and capacity building approach is highly valued by the NCDC. NCDC noted that they will be able to conduct sequencing independently for other pathogens because of the capacity that was built by UK-PHRST (and JHU). 	Strong evidence supporting this assumption

<p>UK-PHRST training responds to needs and is effective</p> <ul style="list-style-type: none"> • There is no evidence of how training needs are identified. However, consensus exists amongst Nigerian stakeholders, noting that capacity building supported by UK-PHRST during outbreaks or research studies is relevant to the specific outbreak and to the general need for strengthening capacity in surveillance, sequencing, clinical research, logistics etc. The training is considered ‘effective’ by key stakeholders as the deployed UK-PHRST team members are highly skilled and collaborative. 	<p>Limited evidence supporting this assumption</p>
<p>Recipient countries have the necessary capacity (including e.g. infrastructure) to implement learning</p> <ul style="list-style-type: none"> • There is some evidence that the NCDC lacked the equipment and/or supplies for certain research studies, although UK-PHRST was able to fill those gaps by providing some equipment/supplies. Stakeholders mentioned the risk of depleting stocks of PPE, or that PPE and other deliverable supplies by the PHRST for research studies may be re-directed and used for COVID-19. However, there is no concrete evidence proof of this risk having occurred. 	<p>Limited evidence against this assumption</p>
<p>Students/trainees engage in training activities and learning outcomes set are realistic</p> <ul style="list-style-type: none"> • UK FETP have participated in the Nigerian deployments and have conducted research as part of these deployments. However, there is no evidence of specific learning outcomes. There is no evidence about any Nigerian students/trainees engaging in training activities. 	<p>No evidence</p>
<p>UK-PHRST team has right expertise and capacity to support the wider outbreak response (Maps to EQ3.2)</p> <ul style="list-style-type: none"> • Key stakeholders in Nigeria report that the UK-PHRST team working on deployments or research projects have relevant expertise, provided excellent technical input (knowledge and skills) to address the Lassa Fever outbreaks, and to support laboratory preparedness for COVID-19. The multi-disciplinary support (epidemiology, microbiology, case management, logistics etc.) was highly appreciated and is perceived to have improved Nigeria’s outbreak response to Lassa Fever. • However, some stakeholders also noted the limited capacity of the CDT to support Nigeria CDC consistently over time when they are deployed to other countries. 	<p>Strong evidence supporting this assumption</p>
<p>Partner institutions and participants willing to work together and develop/use preparedness plans, strategies etc. (Maps to EQ5.1, 5.2)</p> <ul style="list-style-type: none"> • There is some evidence that UK-PHRST collaborated effectively with the IHR programme (and to a lesser extent WHO) in Nigeria on joint initiatives (such as the Monkey Pox project) and coordinated their different inputs. Additionally, evidence stands of UK-PHRST coordinating its support for sequencing with other partners including JHU. However, none or limited evidence exists of how preparedness plans or strategies were developed/used, and to what extent UK-PHRST collaborated with other partners. 	<p>Limited evidence supporting this assumption</p>
<p>UK deployment mechanisms have capacity to engage in collaborative meetings/workshops (Maps to EQ3.2, 4.1, 4.2)</p>	<p>No evidence</p>

<ul style="list-style-type: none"> There is no evidence of how UK-PHRST engaged with other UK deployment mechanisms in Nigeria. 	
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6. Short-Term Outcomes to Intermediate Outcome	
<p>Intermediate outcome: UK and global response to epidemics improves in speed and quality</p> <p>1. What changes can be observed, if any, at the intermediate outcome level? <i>(Maps to EQ6.1, 6.2)</i></p> <p>UK-PHRST’s contribution to Intermediate Outcomes cannot be estimated at this stage. However, the improved capacity to respond to outbreaks, multiple research studies, and effective deployments of the UK-PHRST could lead to overall improved outbreak responses in the future.</p> <p>In particular, UK-PHRST capacity development of NCDC NRL in NGS techniques will greatly increase capacity for outbreak response as it can be used to detect any pathogen, including never seen before pathogens. This means that novel viruses can now be detected independently in Nigeria using domestic capacity.</p> <p>2. What factors were needed to produce the observed change? <i>(Maps to Assumptions, EQ2.3)</i> Not applicable</p> <p>3. Summarise UK-PHRST plausible contribution to those factors <i>(Maps to EQ6.2)</i> Not applicable</p> <p>4. Summarise plausible contribution to those factors by other DPs or the government <i>(Maps to EQ6.2)</i> Not applicable</p>	<p>Strength of evidence (1 to 4 as per above table)</p>

7. Evidence against key assumptions	
<p>UK workforce can be retained and increased when required to allow fast deployment of requested expertise <i>(Maps to Assumptions; EQ2.3, EQ3.8, EQ6.3, EQ6.4)</i></p> <p>No evidence</p>	No evidence
<p>Other issues do not have significant impact on speed of deployment <i>(Maps to EQ3.8, 6.3, 6.4)</i></p> <ul style="list-style-type: none"> There is no evidence that any other issues had an influence on the speed of the three deployments. The UK-PHRST team arrived faster in country during the Lassa Fever outbreak than the GOARN/WHO deployment team. 	No evidence
<p>Research, innovations and tools developed by UK-PHRST are seen as relevant and useful and therefore adopted by other global health/ outbreak response actors <i>(Maps to EQ7.2)</i></p> <ul style="list-style-type: none"> There is no evidence available to assess how global actors adopted research or tools from UK-PHRST’s work in Nigeria by other global health and outbreak response actors. 	No evidence
<p>LMIC’s effectively use increased capacity so that it contributes to improved response speed and quality</p>	Limited evidence supporting this assumption

- There is indication that NCDC used the sequencing skills they learned from UK-UK-PHRST to the COVID-19 outbreak. Nigerian stakeholders noted that the capacity building/training by UK-PHRST has improved their knowledge and skills, which they will apply to future outbreaks, as they did recently with testing for COVID-19.

Annex 9: Case study – Bangladesh, Cox’s Bazar

Case Study Contribution Story Summary – UK-PHRST Support to Cox’s Bazar, Bangladesh (2017-2020)

Context:

UK-PHRST are seen by national and regional stakeholders in Bangladesh as having played a critical role in **strengthening the disease response architecture** in the Rohingya refugee camps of Cox’s Bazar, particularly in relation to the COVID-19 outbreak response.

STO 1: “UK-PHRST contributes effectively as part of wider outbreak response”

Deployments were acknowledged to have provided a consistent and high level of expertise to support response to outbreaks of diphtheria, cholera and COVID-19. In the case of the COVID-19 outbreak, the UK-PHRST provided capacity and expertise otherwise missing from the WHO-led response. Stakeholders refer to epidemiological systems and processes improving and being strengthened as a result of UK-PHRST’s deployment, and better calibrated to inform resource prioritisation.

STO 2: “Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making”

The process of making **research** findings available and applying them during the COVID-19 response began while UK-PHRST were deployed. The UK-PHRST in partnership with national laboratories and the WHO, identified the need to assess both host and refugee population exposure to COVID-19 through the conduct of a seroprevalence antibody study. UK-PHRST rapid research mechanisms were used to expedite approval and funding for the study in September 2020, which is set to inform the direction of the next phase of the COVID-19 response in Cox’s Bazar.

STO 3: “Improved UK and in-country capacity for outbreak prevention and response in LMICs”

Evidence to suggest improvements in the overall **capacity** of the COVID-19 response in Cox’s Bazar are linked by stakeholders to UK-PHRST’s support to strengthen the surveillance strategy and guidelines within the camps. Stakeholders referenced the smooth and seamless integration of UK-PHRST team members as key to facilitating informal and integrated capacity building of national staff, and deployed UK-PHRST team members underscored the significance of established relationships built over multiple deployments as contributing to the success of deployments.

While it is difficult to ascertain the precise **contribution of other actors** towards these outputs and changes, it could reasonably be assumed that across the other 36 international NGO and UN agency partners working in Cox’s Bazar, work towards similar outcomes was being undertaken, particularly in the rapid pivot towards supporting the COVID-19 response in 2020. Save the Children, UK-Med, Red Crescent Bangladesh and MSF were specifically referenced by stakeholders as being involved in epidemiological support (albeit clinic-based) and research. WHO, UNICEF, UK-Med, UNHCR, Save the Children and IOM all undertake activities to strengthen the capacity and quality of health systems in Cox’s Bazar, and therefore have the potential to influence in-country capacity for outbreak response and prevention. UK-PHRST’s contributions through deployment, research and capacity-building, are periodic and are likely to contribute to this ‘ecosystem’ of partners in Cox’s Bazar in more concentrated ‘bursts’, providing disease response-specific support rather than long-term humanitarian health activities. With the emergence of remote deployments during travel restrictions related to COVID-19, there is a possibility these dynamics may change and more continuous support could be provided.

Intermediate Outcome: “UK and global response to epidemics improves in speed and quality”

At this stage there is not enough evidence to measure contributions towards the intermediate outcome. Additionally, given the humanitarian crisis situation in Cox’s Bazar, many structures and resources put in place are often short-term measures. It is thus difficult to assess whether any investments in capacity will be retained by in-country personnel in the long-term. However, the rapid research in outbreaks protocol during the COVID-19 response deployment may provide an evidence base for its future use, potentially improving the speed of UK research implementation during an outbreak.

Summary of changes observed (with a focus at the short-term outcome level).

Key factors influencing factors ¹⁰³ to Short-Term Outcome:	Overall influence of factor	Contribution
Outcome: <i>STO 1: UK-PHRST contributes effectively as part of wider outbreak response</i>		
1. Availability of skilled technical expertise in line with the operational needs of the Cox's Bazar COVID-19 response <ul style="list-style-type: none"> UK-PHRST have been deployed to Cox's Bazar both remotely (various periods between March and October 2020) and in-person (August – September 2020, October – November 2020) to the COVID-19 response, at the request of WHO/GOARN: 3 epidemiologists, 1 data scientist, 2 microbiologists, and 1 IPC specialist. 	Essential	Important
2. Epidemiological and data analytics support to inform strategies for case identification within the camps <ul style="list-style-type: none"> UK-PHRST remote support to develop camp COVID-19 surveillance strategy, situation reports and data systems for capturing, analysing and visualising case information. 	Essential	Important
3. Laboratory support for improved diagnostics <ul style="list-style-type: none"> UK-PHRST in-person microbiology support focused on strengthening laboratory capacity, developing a quality measurement system, SOPs, risk assessments and guidance, and training two laboratory officials. 	Essential	Important

Key factors influencing factors ¹⁰⁴ to Short-Term Outcome:	Overall influence of factor	Contribution
Outcome: <i>STO 2: Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making</i>		
1. Design and implementation of rapid research during an outbreak <ul style="list-style-type: none"> UK-PHRST microbiology deployment worked with national lab manager to identify need for a seroprevalence study of COVID-19 antibody levels in the camp. Research protocols were rapidly developed by UK-PHRST following these initial discussions to mobilise funding and expedite approval for the study, and 1 data scientist was deployed to support data collection in October 2020. 	Essential	Vital

Key factors influencing factors ¹⁰⁵ to Short-Term Outcome:	Overall influence of factor	Contribution
Outcome: <i>STO 3: Improved UK and in-country capacity for outbreak prevention and response in LMICs</i>		
1. Capacity development across the response architecture in Cox's Bazar Rohingya refugee camps <ul style="list-style-type: none"> UK-PHRST personnel deployed to Cox's Bazar engaged in informal capacity development as part of their pre-agreed activities, facilitated by close working relationships and openness to partners' needs and requirements relative to operational priorities. 	Important	Important

¹⁰³ Factors to be hypothesised early on for testing through KIIs and data analysis and revision where appropriate.

¹⁰⁴ Ibid.

¹⁰⁵ Ibid.

Key for case study summary:

Influence scale	Essential factor in explaining outcome	Important factor in explaining outcome	Contributory factor in explaining outcome		
Contribution of partner	Vital contribution	Important contribution	Some contribution	Limited contribution	N/A or zero contribution

Explanation of typology of factors:

- **Essential:** Without this factor the outcome would not have been achieved. There must be overwhelming validated evidence (from every stakeholder group interviewed, plus independent and/or robust documentary evidence) to use this rating. There are negligible to no mixed views in your evidence. The evidence is so robust that there is no further research to be done on other contributing factors.
- **Important:** Evidence has been validated and points to the factor being a major part in achieving the outcome. More than two thirds of the validated evidence point to this factor (this must include both stakeholder interviews plus independent and/or robust documentary evidence). There may be some mixed views in your evidence. Further research is required to fully understand other contributions.
- **Contributory:** More than a third of the validated evidence (including interviews and/or documentary evidence) points to this factor making some contribution. Perhaps the factor laid the groundwork, was an early trigger or was important early on in a process. However, there is a lot of evidence that other factors contributed more/to a greater degree to the outcome. Much more research is required to fully understand how the outcome was achieved.

Explanation of typology of contribution to factors by UK-PHRST programme:

- **Vital:** Without the UK-PHRST programme the factor would not be in place, either at all or at the scale observed. There must be overwhelming validated evidence (from every stakeholder group interviewed, plus independent and/or robust documentary evidence) to use this rating. There are negligible to no mixed views in your evidence. The evidence is so robust that there is no further research to be done on other contributing actors.
- **Important:** Evidence has been validated and points to the UK-PHRST programme being a major part in the factor being in place, either at all or at the scale observed. More than two thirds of your validated evidence points to the UK-PHRST programme (this must include both stakeholder interviews plus independent and/or robust documentary evidence). There may be some mixed views in your evidence. Further research is required to fully understand the contributions of other actors.
- **Some:** Between a third and two thirds of the validated evidence (so in the main) (including interviews and/or documentary evidence) points to the UK-PHRST programme making some contribution to the factor being in place, either at all or at the scale observed. Perhaps the UK-PHRST programme laid the groundwork, was an early trigger or was important early on in a process. However, you have a lot of evidence that there were other actors that contributed more/to a greater degree to the factor. Much more research is required to fully understand how the outcome was achieved.
- **Limited:** A third or less of the evidence (validated or not) points to this factor explaining the outcome. The evidence contains a plethora of views on which actors contributed to the factor. Much further research is required.
- **N/A or zero:** This is given where there is no evidence pointing to the UK-PHRST programme making a contribution to the factor.

Strength of evidence table

Rank	Justification
1	Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.
2	Evidence comprises multiple data sources (good triangulation) of lesser quality, or the finding is supported by fewer data sources (limited triangulation) of decent quality but that are perhaps more perception-based than factual.
3	Evidence comprises few data sources across limited stakeholder groups (limited triangulation) and is perception based, or generally based on data sources that are viewed as being of lesser quality.
4	Evidence comprises very limited evidence (single source) or incomplete or unreliable evidence.

Full Case Study – UK-PHRST Support to Bangladesh, Cox’s Bazar

1. Context of country programmes and implementation progress

Historical context and enabling environment for UK-PHRST

In August 2017, extreme violence erupted in Myanmar’s Rakhine State, forcing hundreds of civilians to flee their homes. As of 2020, an estimated one million members of the Rohingya ethnic group have crossed from Myanmar into Bangladesh in several waves of displacement, 860,000 of whom have settled in two registered and 32 unregistered camps in Cox’s Bazar.

Medical care is extremely limited and does not meet international standards, whilst access to medicines is limited to hospitals, clinics and major pharmacies, which are mostly located in urban centres. The living conditions of the refugee population are extremely vulnerable, due to the clustering of populations in hastily constructed settlements, with shared WASH infrastructures and sub-optimal hygiene practices. Rohingya camps are located alongside impoverished host communities where thousands of vulnerable Bangladeshis live. This environment puts the population at extreme risk of outbreaks, as shown by multiple outbreaks of cholera since 2017. Cases of acute watery diarrhoea (AWD) across all Rohingya settlements also showed a rise in cases above the expected seasonal level.

Overview of UK-PHRST’s assistance to Cox’s Bazar

UK-PHRST has provided support in Cox’s Bazar since 2017, in epidemiology, IPC and microbiology:

1. December 2017 – January 2018 (UK-EMT) – Diphtheria outbreak (2 epidemiologists, 1 IPC specialist)
2. 1st February 2018 – 20th March 2018 (WHO/GOARN) - Diphtheria outbreak, and wider needs for IPC, surveillance, public health information and outbreak response in the context of the humanitarian crisis (2 epidemiologists, 1 IPC specialist).
3. 12th November 2019 – 9th December 2019 (WHO/GOARN) – Acute Watery Diarrhoea (Cholera) outbreak supporting the WHO-led response (1 epidemiologist).
4. March 2020 (remote) and 1st August 2020 (in-person) to November 2020 (WHO/GOARN) – COVID-19 response (3 epidemiologists, 1 data scientist, 2 microbiologists, 1 IPC specialist)

Other key factors that determine programme outcomes at the country level

Cox’s Bazar is one of Bangladesh’s poorest districts, with its poverty rate far exceeding the national average. It is also prone to floods and earthquakes and is affected by some 40 percent of the world’s total storm surges. Controlling infectious diseases, for instance by improving water and sanitation, is one of many interconnected efforts to improve people’s health and wellbeing. Further, mobile internet and data are reported to be cut off for many refugees in the camps, limiting access to reliable information about health and disease outbreaks and providing fertile ground for rumours and misinformation to spread. Service provision has been disrupted during the COVID-19 pandemic, and health-seeking behaviour has decreased - meaning routine life-saving vaccinations for young children have been significantly affected.

1 - Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

2. Inputs/activities to outputs

1. What were the proposed activities and outputs?

UK-PHRST appeared not to have proposals for their activities in Cox's Bazar, rather, they responded to requests from GOARN to deploy and drew up ToRs in alignment with the nature of these requests after accepting them. The needs within Cox's Bazar and the proposed activities for UK-PHRST were commonly defined through dialogue between the WHO office and UK-PHRST as deployment requests were issued and accepted. The following ToC activities and related outputs can be identified.

a) **ToC Activity: Deploy/support in line with UK-PHRST priorities and requests from partners**

- *Expected ToC Output: Formal and informal capacity-building provided to strengthen UK & LMIC response, outbreak management, technical and research skills*

b) **ToC Activities: Support development of research and research skills in outbreak response; Plan and deliver training according to needs assessment and to support cadre of skilled personnel in LMICs**

- *Expected ToC Output: Formal and informal capacity-building provided to strengthen UK & LMIC response, outbreak management, technical and research skills*

v. ***Diphtheria outbreak, 2017-2018 (RST background doc x2):***

UK-PHRST were deployed through UK-EMT for four weeks between December 2017 – January 2018 (1x IPC, 2x Epidemiologist) as part of the international response to an outbreak of diphtheria in Rohingya refugee camps south of Cox's Bazar. A further deployment of the same team members was made between January and March 2018 through GOARN/WHO. This deployment aimed to support the response to a large diphtheria outbreak in the refugee camps in Cox's Bazar, as well as the wider needs for IPC, surveillance, public health information and outbreak response in the context of the humanitarian crisis.

vi. ***Operational research capacity building***

During the second diphtheria deployment, UK-PHRST supported a workshop to build capacity in operational research and manuscript writing in complex and emergency environments, and organised and delivered the 3-day first face-to-face WASHFIT (Water And Sanitation for Health - Facility Improvement Tool) course for health partners operating in Cox's Bazar.

c) **ToC Activity: Strengthen operational capacity and processes to support rapid deployment for optimal performance**

- *Expected ToC Output: UK-PHRST team members deployed with the necessary, speed, expertise and capacity to support LMIC outbreak response*

Cholera outbreak, 2019

In November 2019, a PHRST field epidemiologist was deployed through GOARN to support WHO-led response in the surveillance and epidemiology of a cholera outbreak, for one month.

i. ***Field epidemiology***

- The deployment aimed to provide analytical field epidemiological investigation support, including potential scope for a case-control investigation. Due to design considerations shifted towards investigation and outbreak response support.

ii. ***Surveillance tool development***

1- Evidence comprises multiple data sources (both internal and external) (good triangulation), which are generally of decent quality. Where fewer data sources exist, the supporting evidence is more factual than subjective.

- UK-PHRST provided support to develop bespoke surveillance tools and protocols to enhance case detection, analysis and reporting of the outbreak, including the development of a GIS-based case reporting system for partners' use.

d) ToC Activities: Work with GOARN and other stakeholders to optimise response; Strengthen operational capacity and processes to support rapid deployment for optimal performance; Conduct outbreak relevant research pre, during, post-response

- o *Expected ToC Outputs: Collaborative partnerships support outbreak response across the triple mandate; Formal and informal capacity-building provided to strengthen UK and LMIC response, outbreak management, technical and research skills*

COVID-19 support

UK-PHRST were deployed at the request of the WHO Country Office through GOARN in March 2020. 1 data scientist, 3 epidemiologists and 1 IPC specialist were deployed remotely from the UK. In-person deployment took place on 2nd August 2020 (2 microbiologists, 1 data scientist).

i. Epidemiology/surveillance

- Development of surveillance strategy, including surveillance scripts to produce automated situation reports for partners' use; data systems for capturing, analysing and visualising case information¹⁰⁶; contributing to daily calls with partners and within WHO, development of strategies for health protection.
- Remote capacity development on basic epidemiological concepts, including analysis methods and defining data to be collected.

ii. Review and development of IPC guidance

- 4-week remote deployment (Sept-Oct 2020) of IPC specialist to review and develop infection control policy and guidance for in-community/home-based case management if the camp began to see large numbers of confirmed cases.

iii. Contributing technical microbiology expertise to WHO support for the IEDCR Field Laboratory

- In-person microbiology deployment to support the National Institute of Epidemiology, Disease Control and Research in conducting COVID-19 diagnostics in both host and refugee populations: assessing lab quality/safety, developing SOPs, risk assessments and guidance, tailored training to 2 lab officials, implementation of QA measurement system to increase confidence in diagnostic results. General COVID-19 diagnostic capacity expansion.

iv. Seroprevalence survey

- Remote and in-person data science and analytical support to a Bangladesh Government-led (supported by WHO, MSF and Bangladesh Red Crescent Society) seroprevalence study to estimate prevalence of COVID-19 antibodies, to help determine resource allocation.
- UK-PHRST research-in-response process used to initialise study approval and funding.

What were the intentions of the activities/outputs?

¹⁰⁶ COVID-19 dashboard drawing together epidemiology, laboratory and health service data. See: <https://cxb-epi.netlify.app/post/covid-19-dashboard/>

- **Diphtheria:** To support WHO in the diphtheria outbreak response, as well as the general humanitarian response, through technical support to Epidemiology and Health information and IPC.
- **Cholera:** To help control the outbreak of cholera in the Rohingya refugee camps of Cox's Bazar.
- **COVID-19:** To build on previous support to the WHO sub-office in Cox's Bazar by providing capacity to strengthen the in-camp response to COVID-19, through epidemiology and data science, IPC and laboratory support.

2. **Progress on the implementation of activities:**

What outputs have been achieved?

- All of the above activities have been implemented and outputs achieved, except the seroprevalence study which is ongoing.

Are there any gaps between intention and actual activity implementation/outputs? (Maps to EQ 3.1)

- Due to the way UK-PHRST operates there is no gap at activity level, as they do not plan far ahead for activities. In the case of each deployment to Cox's Bazar, activities were implemented as soon as possible after deployment was requested.
- In the case of work on shielding and IPC during the COVID-19 deployment, lower-than-expected confirmed case numbers in the refugee camps and concerns around viability affected the implementation of guidance developed by UK-PHRST employees, but preparatory work continued as intended.
- All activities appear to have led to expected outputs.

Any implications of gaps for achievement of outcomes?

- None observed.

3. **Explanation for emerging differences between intended and actual inputs/activities/outputs:**

What factors have enabled or constrained implementation? (Maps to EQ3.8)

• **Constraints:**

- Lack of social science expertise in the deployable team limited the ability to respond to the social and political dynamics influencing people's health-seeking behaviour in the camps – people were not coming forward for testing.
- COVID-19 travel restrictions removed ability to deploy in-person in response to GOARN requests between March-July 2020.
- Complexities of remote deployments impacted the efficiency of activities e.g. accommodating for time zone differences; harder to get a 'feel' for the situation; difficulties in reaching out to stakeholders in the camps, time lost in initial set-up and negotiation of ways of working.
- Lack of resources and longer-term investment in camp infrastructures may affect sustainability of implementation – perceived 'short-term' nature of the refugee problem by the government mean considerable negotiation is required to get things done, and systemic issues cannot be readily-addressed by other partners (NGO/PHIs) facing capacity issues.

• **Enablers:**

- Existing relationships and linkages and on-the-ground knowledge from previous deployments provided foundations for remote deployments and quick in-person deployment for COVID-19. Accumulated familiarity with the terrain, situation and personnel on the ground, through previous

deployments: e.g. the epidemiologist on remote deployment from March had previously been to Cox’s Bazar during another deployment – so he was able to deploy ‘smoothly’ remotely.

- Weak WHO/national capacity – vacancy for lead epidemiologist, enabled UK-PHRST to more readily ‘plug’ capacity gaps and implement activities
- Dynamic and collaborative international NGO/agency environment in Cox’s Bazar enabled information sharing and coordination (facilitated by WHO on the ground). FCDO also regarded to be dynamic entity in terms of leveraging UK-PHRST and facilitating discussions on funding, procurement etc.

Do these factors relate to UK-PHRST, other actors, or the wider context? (Maps to EQ3.8, 6.4)

• **Constraints:**

- COVID-19 and remote deployment constraints relate to the wider context; social science capacity constraint relates to UK-PHRST, and capacity and political will to implement health system solutions relates to other actors.

• **Enablers:**

- Existing relationships relates to UK-PHRST and how they have built partnerships with actors in Cox’s Bazar, and lack of WHO/national capacity and dynamic and collaborative NGO/agency environment relate to other actors.

3. What were other actors doing during the project period that has a potential to influence the same outputs / outcomes? (Maps to EQ4.2, 5.1, 5.2, 5.3, 5.4)

36 partners are deployed on the ground in Cox’s Bazar. The following organisations and their activities have the potential to influence the **UK-PHRST’s short-term outcome “Improved UK and in-country capacity for outbreak prevention and response in LMICs”**

- **WHO’s** core functions in Cox’s Bazar are to provide leadership on health matters and engage in partnerships where joint activity is needed, including shaping the research agenda and stimulating the generation of valuable knowledge. Further, the WHO’s Cox’s Bazar Emergency Operations Centre provides technical support and aims to build institutional capacity in a sustainable way.
 - The WHO coordinates health sector group in Cox’s Bazar through which WHO coordinates collaboration between all the different agencies.
 - The WHO conducted training workshops in March 2019 in Dhaka, Chattogram and Sylhet, Bangladesh, for strengthening capacities in dealing with large scale emergencies that might require international Emergency Medical Team (EMT) response. 135 doctors participated.
- **UNHCR** has stepped up its preparedness and response mechanisms in response to COVID-19, training health staff on case identification, referral and treatment and IPC. In March and April 2020, 127 CHW supervisors were trained on COVID-19 who then cascaded training to 2,400 volunteers from health and other sectors. Furthermore, UNHCR established two quarantine facilities (capacity 270 people) to help prevent the spread of the virus, and two Severe Acute Respiratory Infection Isolation and Treatment Centres (SARI ITCs) to provide 194 beds for severe COVID-19 cases, including those who require oxygen therapy. For critical cases UNHCR has also supported local health authorities to increase their capacity by setting up an 18-bed ICU in Cox’s Bazar’s main district hospital.

3 - Evidence comprises few data sources across limited stakeholder groups (limited triangulation) and is perception based, or generally based on data sources that are viewed as being of lesser quality.

- **UNICEF** provides primary health consultations in the Rohingya camps. In the first six months of 2020 over 122,000 primary health consultations have been provided. Additionally, UNICEF supports 18 government health facilities in Ukhiya and Teknaf providing health consultations for children and maternal care. At the start of the COVID-19 pandemic, UNICEF also trained 501 staff from its 14 health facilities in the camps and 25 staff from 18 government health facilities on COVID-19 infection prevention and control, and equipped them with appropriate personal protective equipment. Moreover, 165 health workers were trained on detecting, referral and appropriate management of COVID-19 cases. To support severe COVID-19 cases, UNICEF partnered with an NGO to operate a 200-bed isolation and treatment centre (SARI ITC) for the Rohingya and host communities as part of a collaboration with eight international actors to establish a surge capacity of 1,000 SARI ITC beds in the district.
- **UK-Med (EMT)** – Five UK-EMT personnel deployed to Cox’s Bazar on 7th May 2020 supported the COVID-19 response in the camps, including establishing and managing 3 severe infection isolation treatments centres, delivering comprehensive training in clinical treatment and IPC to staff at the treatment centres, supporting capacity expansion in the ambulance service and creating patient rehabilitation guidance and training materials.
- **Save the Children** has a presence in Cox’s Bazar since 2017 and is running 9 health facilities. They have also built and opened an isolation and treatment centre for families with COVID-19 symptoms, provide up-to-date medical information and awareness in camps.
- **The FCDO office** in Cox’s Bazar is active in raising funding and procurement for health operations within the camps, and plays a facilitation role in quickly linking UK-PHRST and UK-EMT deployments.
- **International Organisation for Migration (IOM)** supports health facilities within the camp, and among host populations, while also aiming to ensure the prevention of and timely response to communicable disease risks, including those with an outbreak potential, and prepare for other health emergencies including those engendered by the monsoon and cyclone seasons.

4. Outputs to Short-Term Outcomes

What changes can be observed at the STO level?

STO 1: “UK-PHRST contributes effectively as part of wider outbreak response”

What factors were needed to produce the observed change? (Maps to Assumptions, EQ2.3)

5. Availability of skilled technical expertise in line with the operational priorities of the Cox’s Bazar COVID-19 response

- **Influence of factor:**
 - Given the dense population of Cox’s Bazar’s camps, overstretched health services and reliance on NGOs and agencies to meet the needs of a growing Rohingya refugee population, an effective and sustained response to disease outbreak requires external support and uplift in the number of skilled personnel available to strengthen surveillance, diagnostics and infection control.
- **UK-PHRST contribution to factor:**
 - UK-PHRST deployed 7 people to the COVID-19 response in Cox’s Bazar. The quality of deployed UK-PHRST personnel was acknowledged as being consistently high, with a reliable level of expertise and ability to meet the challenges of the COVID-19 response in Cox’s Bazar. The speed at which expertise was deployable was considered to be advantageous.

“The quality is consistent with UK-PHRST, when we have had people, with very rare exceptions, they have also been very, very good, they have gotten the job done. They are very reliable, and having that reliable level of quality, is very important in emergency response.” (KII, Regional Public Health Organisation)

“The deployment was very operationally focused and aligned with urgent need” (KII, UK HMG)

“Obviously that there is a very strong UK-PHRST roster available, with expert knowledge, who are used to being deployed to these kinds of settings, and UK-PHRST have the necessary mechanisms to deploy them so quickly, [it] is all very positive. To be able to deploy lab and epidemiology capacity so quickly is really impressive.” (KII, Regional Public Health Organisation)

- UK-PHRST were able to fill critical capacity gaps in national surveillance teams (WHO/national government) with the expertise required in the vacant lead epidemiologist position (UK-PHRST x1). The ability of UK-PHRST to deploy remotely also contributed to the ability of UK-PHRST to be an effective part of outbreak response, by overcoming the constraints of COVID-19-related travel restrictions, and providing new opportunities for strengthened collaboration.

- **Plausible contribution by other partners:**
 - Stakeholders interviewed mentioned that UK-EMT were deployed to support the clinical side of the response, and that communication and alignment with other partners was largely coordinated through WHO. The

2 - Evidence comprises multiple data sources (good triangulation) of lesser quality, or the finding is supported by fewer data sources (limited triangulation) of decent quality but that are perhaps more perception-based than factual.

plausible contribution towards this outcome by other actors such as UK-EMT is likely, but the risk of duplicative activities may have been mitigated by strengthened communication and coordination between UK-PHRST and UK-EMT.

6. Epidemiological and data analytics support to inform strategies for case identification and strengthened procedures within the camps

- **Influence of factor:**

- Development of enhanced surveillance, strengthening data collection systems, analysis and outbreak modelling are critical to inform public health decisions, particularly in overcrowded refugee camps such as those in Cox's Bazar, where infections can spread rapidly.

- **UK-PHRST contribution to factor:**

- UK-PHRST provided remote support from 3 epidemiologists and 1 data scientist (the latter also deployed in-person) to support the WHO to undertake development of surveillance strategy, situation reports, data systems for capturing and visualising case information (including automated sitreps and a dashboard for use by partners) on which to base public health decision-making.
- UK-PHRST epidemiology and data analytics support established the “initial architecture” (WHO – GHS103) for gauging the scale of the COVID-19 outbreak in the camps in Cox's Bazar. A UK-PHRST deployee described how these efforts fed into health protection responses:

“I feel like we made a difference by kind of providing a method for synthesising the data being collected by people in the field who didn't necessarily have time nor expertise to do that.... I think by doing that and synthesising that data into kind of bite-size, easy chunks of ‘this many counts of reported cases’, ‘this many cases have been reported last week’, ‘this many tests were done last week’... I think it was really helpful that we were able to take a step back and look at the bigger picture, and say ‘not enough tests are being done here’, and ‘tests are being done in this age group’. And why is there no mortality reports, you know it can't be that no one's dying... And then we were able to use that to inform what kind of Health Protection response was being done on the ground, which I think is pretty useful that we were able to provide that.”
(KII, UK-PHRST)

- WHO stakeholders underlined the significance of UK-PHRST support to develop epidemiological and surveillance frameworks related to the overall response:

“For COVID we are not sure of the low morbidity and mortality numbers right now, but the initial architecture and response was really set up by Joe and UK-PHRST team, and the timeliness really made the difference, it was quick and good.” (KII, Regional Public Health Organisation)

“UK-PHRST have made a very, very significant contribution - much more significant than any other organisation that has been supporting us [WHO Cox’s Bazar], particularly when it comes to the development of the adaptation of the surveillance strategy for the camp on COVID-19, this is hugely due to UK-PHRST support.” (KII, Regional Public Health Organisation)

- **Plausible contribution by other partners**

- The WHO and partners, which includes UK-PHRST, are the only documented actors providing epidemiological and surveillance support for COVID-19 in Cox’s Bazar. Save the Children are suggested to be providing some granular-level epidemiological support, but not at the scale on which UK-PHRST’s activities were targeted (UK-PHRST103). The extent to which WHO systems were already being utilised effectively before UK-PHRST deployments is unclear, but one FCDO stakeholder suggests UK-PHRST’s efforts provided an important uplift:

“There is already a fairly effective early warning system that WHO operates more broadly on COVID-19. The components have been there, and there’s been a focus on how to address COVID-19 from surveillance to IPC and clinical management. UK-PHRST hasn’t been responsible for all these parts, but they’ve played an important role in boosting some of them.” (KII, UK HMG)

7. Laboratory support for improved diagnostics

- **Influence of factor:**

- Quality diagnostics are required for the timely containment of disease outbreaks. Against the backdrop of extremely high population density in the Cox’s Bazar Rohingya refugee camps, and the host population and a potentially high case load, functional and high-quality diagnostics for COVID-19 are critical to the overall response effort and to encourage confidence among local populations in public health decisions.

- **UK-PHRST contribution to factor:**

- UK-PHRST deployed two microbiologists to the Cox’s Bazar COVID-19 response between August and September 2020. Their work focused on strengthening laboratory capacity and quality, developing a quality measurement system, SOPs, risk assessments and guidance, and training two laboratory officials. A similar approach had been taken in the COVID-19 microbiology deployment to Nepal, which preceded the Cox’s Bazar deployment. The quality improvement activities used the same SOPs, risk assessments and quality management manuals as those used in UK laboratories, but tweaked to fit local needs. A UK-PHRST stakeholder commented that this shared foundation facilitated easier remote mentoring once the microbiology deployment ended (UK-PHRST15).
- Stakeholders suggest that the quality of relationships built during the deployment strengthened the work undertaken during UK-PHRST’s microbiology deployment in the camps. Informal support to the laboratory manager via WhatsApp continued after the deployment. The perceived need and subsequent development of the seroprevalence study appears to have emerged following this work:

“The work on labs has been useful. A lot of it has been making sure the COVID-19 response is informed. We’re in a slightly grey zone and the seroprevalence study will inform the direction. I am keen to see if we can use UK-PHRST advice and support in order to work with WHO in terms of the transition to the next phase, and get support and advice on that.” (KII, UK HMG)

- **Plausible contribution by other partners**

- The WHO has supported the IEDCR Field Laboratory at Cox’s Bazar Medical College for 3 years, with funding, resources and capacity building. Stakeholders did not refer specifically to other stakeholders providing microbiology and lab support at the time of the COVID-19 response, however.

STO 2: “Research findings applied by UK-PHRST and partners in outbreak response and inform LMIC policy-making”

1. Design and implementation of rapid research during an outbreak

- **Influence of factor:**

- The seroprevalence study is critical to improve understanding of the level of COVID-19 infection in the camps and host populations of Cox’s Bazar. With low testing rates reported and health-seeking behaviour influenced by social and political factors, there is otherwise limited understanding on how COVID-19 has spread throughout the target population and response actions taken are not based on reliable evidence.

- **UK-PHRST contribution to factor:**

- UK-PHRST were part of initial conversations about the need for a seroprevalence study to better understand antibody presence in the camp and host populations of Cox’s Bazar, facilitated through the microbiology deployment. New rapid research protocols were developed by UK-PHRST following these initial conversations, and funding secured for statistical expertise from the LSHTM Tropical Epidemiology Group, in conjunction with the deployment of 1x UK-PHRST data scientist via GOARN in October 2020 for 6 weeks to support the study. The UK-PHRST data scientist and LSHTM supported-statistician are working directly with Bangladesh Institute of Epidemiology, Disease Control and Research (IECDR) counterparts.
- Survey analysis aims to help inform and refine the response to COVID-19 in Cox’s Bazar, particularly on balancing and prioritising resources for epidemic response and support for normal health care facilities. The research is held up as an example by multiple categories of stakeholders as an effective integration of research in deployment. Further, the study is viewed as a tool to build and strengthen the capacity of the Cox’s Bazar response, and therefore has a reach across the triple mandate of UK-PHRST:

“With COVID-19 at the initial stage [they] had to focus on the immediate response, but they were definitely identifying those research opportunities in the midst of their deployment and capacity building work... [the seroprevalence study] came as an immediate response from the deployment. Am sure that research will move forward... Everything they have done has strong capacity

building component, supporting local government authorities with training, supporting local capacity. It is a WHO priority to support local capacity and UK-PHRST's support here is really key." (KII, Regional Public Health Organisation)

- **Plausible contribution by other partners:**

- The study has been operationalised by WHO and is led by the Bangladesh Institute of Epidemiology, Disease Control and Research, and involves multiple camp-based organisations, such as MSF and Red Crescent, so contribution cannot be attributed wholly to UK-PHRST. However, UK-PHRST appear to have mobilised funding and expertise to quickly to allow data collection and analysis to proceed.

STO 3: "Improved UK and in-country capacity for outbreak prevention and response in LMICs"

1. Capacity development across the response architecture in Cox's Bazar Rohingya refugee camps

- **Influence of factor:**

- In a resource- and human resource-constrained situation, sustained disease outbreak response may require increases in the capacity (in terms of skills, abilities and infrastructure). To assist this, external support should go beyond the immediate outputs (e.g. training, provision of funding/personnel) to build the abilities and/or infrastructure of the response architecture in the longer-term.

- **UK-PHRST contribution to factor:**

UK-PHRST personnel deployed to Cox's Bazar are suggested to have engaged in capacity development as part of their pre-agreed activities, facilitated effectively by pre-existing relationships, openness to partners' needs and requirements, and effective integration with existing teams. PHRST's existing relationships with WHO personnel are attributed to a longer-term building and refreshing of capacity, pre-dating the COVID-19 deployment:

"[UK-PHRST] really guided the work of national staff in the office, also through the strong capacity building component that they provided, and also by seamlessly integrating with other team members, so there was a lot of cross-fertilisation of learning." (KII, Regional Public Health Organisation)

"I remember some people who had no clue in 2018, are now well-versed in epidemiology concepts and have a decent working understanding of epidemiology. And I think that is not in small part due to high quality deployments, particularly from UK-PHRST deployment team." (KII, Regional Public Health Organisation)

- WHO stakeholders perceived capacity for outbreak response in Cox's Bazar to have improved as a result of UK-PHRST deployments, particularly around surveillance strategy, mechanisms and procedures. The tools developed are likely to be used for future outbreaks of other diseases. Further, effective alignment between UK-PHRST and FCDO contributed to improved in-country capacity for outbreak prevention in Cox's Bazar in terms of infrastructural capacity-building built - through UK-PHRST input into laboratory equipment procurement to meet longer-term health needs in Cox's Bazar:

“I was able to build in to that an eye post-COVID-19 with DFID – they were providing thousands of pounds of equipment. Before purchase, they wanted to know equipment was fit for purpose and could be used post-COVID-19. It was simply because they don’t have that technical expertise. So I was able to do the assessment and said ‘half of this equipment you don’t need, it’s the wrong type, change to this, etc’. What fed into that was the idea that we could also do this for vaccine preventable diseases.” (KII, UK-PHRST)

• Plausible contribution by other partners:

- There are no specific references to capacity-building activities by other partners. However, capacity-building is often an informal activity which comes about during other activities as a result of working together, rather than a discrete task. With 36 other partners working in Cox’s Bazar a reasonable assumption could be made that other informal capacity-building activities are happening.

5. Evidence against key assumptions (*Maps to Assumptions; EQ2.3, EQ3.8, EQ6.3, EQ6.4*)

Assumptions key

No evidence

Strong evidence against this assumption

Limited evidence against this assumption

Limited evidence supporting this assumption

Strong evidence supporting this assumption

Increased collaboration between UK deployment mechanisms improves overall capacity and effectiveness of UK outbreak prevention /response mechanisms (*Maps to EQ 4.1, 4.2*)

- Coordination between UK-PHRST and UK-EMT is suggested by stakeholders to be good, but there are few mentions of collaborative efforts on activities and the impact of these. Strengthened coordination with UK-EMT is referenced as being primarily at the project level, with support from FCDO. FCDO are recognised as having an operational role in UK-PHRST and UK-EMT deployments and procurement, and stakeholders mentioned that FCDO convenes three-way calls with UK-PHRST and UK-EMT to facilitate greater alignment. The overall impact in terms of effectiveness of UK outbreak prevention and response mechanisms is, however, unclear.

Limited evidence supporting this assumption

There is a direct relation between research findings and the approach to outbreak response

- There is strong evidence from stakeholder interviews that the intended eventual use of data from the seroprevalence study will be to inform the direction of the Cox’s Bazar outbreak response.

Strong evidence supporting this assumption

Future outbreaks allow for application of research findings

- Evidence from a key WHO stakeholder implied that the same surveillance tools would be applied to future acute watery diarrhea outbreaks which tend to occur during specific seasons. The sero-prevalence study findings and sampling

Limited evidence supporting this assumption

<p>strategy may contribute to the epidemiological evidence base in the camp, and be relevant to future outbreaks.</p>	
<p>Research findings are seen as relevant and useful and thus adopted and supported by/ integrated into policies of key global actors (e.g. WHO) and LMICs to strengthen response (Maps to EQ7.2)</p> <ul style="list-style-type: none"> No evidence. 	<p>No evidence</p>
<p>Partner institutions and participants willing to and have capacity to work together and implement learning from capacity-building delivered by UK-PHRST (Maps to EQ5.1, 5.2)</p> <ul style="list-style-type: none"> Epidemiology partners at WHO Bangladesh and other organisations' participation in the epidemiology TWG of the Humanitarian Response in Cox's Bazar were perceived to benefit from UK-PHRST capacity development. Specifically, among WHO colleagues, there appears to have been a willingness and ability to work collaboratively and implement learning from capacity development by UK-PHRST – stakeholders commented on the continuity of skills-building and capacity development through repeated deployments to Cox's Bazar (diphtheria, cholera, COVID-19). 	<p>Strong evidence supporting this assumption</p>
<p>UK-PHRST training responds to needs and is effective</p> <ul style="list-style-type: none"> There are strong indications that UK-PHRST capacity-building was operationally-focused and aligned with the needs of the Cox's Bazar COVID-19 outbreak response. For example, the epidemiological deployment was able to provide capacity development on basic epidemiological concepts for people to be aware of, but also how to analyse data and ensure the presence of a minimum data set. Capacity development and training was well-received by stakeholders, who also commented on the longevity of skills built across the UK-PHRST deployments to Cox's Bazar. 	<p>Strong evidence supporting this assumption</p>
<p>Recipient countries have the necessary capacity (including e.g., infrastructure) to implement learning</p> <ul style="list-style-type: none"> There is evidence that Cox's Bazar partners effectively implemented learning from UK-PHRST WASHFIT trainings during the diphtheria deployment by continuing to deliver the training themselves, suggesting the necessary capacity to implement learning was in place for this example. However, another UK-PHRST stakeholder deployed to Cox's Bazar suggested that it was difficult to imagine handing over work to recipient partners/personnel, referencing a lack of skills, time to train and resources for teaching. There may be contextual factors around the nature of the health emergency and challenge, which mediate the level of capacity. 	<p>Limited evidence supporting this assumption</p>
<p>Students/trainees engage in training activities and learning outcomes set are realistic</p> <ul style="list-style-type: none"> No evidence – no detail on learning outcomes of capacity development activities in UK-PHRST Cox's Bazar deployments. 	<p>No evidence</p>
<p>UK-PHRST team has right expertise and capacity to support the wider outbreak response (Maps to EQ3.2)</p> <ul style="list-style-type: none"> There is strong evidence from senior WHO stakeholders, and FCDO and other global health stakeholders that UK-PHRST were very operationally aligned with the needs of the Cox's Bazar COVID-19 response and had the requisite skills and technical expertise to support the outbreak. There is also limited evidence 	<p>Strong evidence supporting this assumption</p>

<p>from UK-PHRST personnel that social science input would have been helpful to better understand some of the social and political dynamics influencing health-seeking behaviour in the camp.</p>	
<p>Partner institutions and participants willing to work together and develop/use preparedness plans, strategies etc. (Maps to EQ5.1, 5.2)</p> <ul style="list-style-type: none"> No evidence on plans and strategies per se, but there are examples from the microbiology laboratory strengthening activities of participants being willing to develop guidelines and work to adapt UK laboratory guidance with UK-PHRST to meet local needs. 	<p>Limited evidence supporting this assumption</p>
<p>UK deployment mechanisms have capacity to engage in collaborative meetings/workshops (Maps to EQ3.2, 4.1, 4.2)</p> <ul style="list-style-type: none"> Limited evidence here, except for mentions of 1) UK-PHRST participation at the epidemiology TWG of the humanitarian response group, and 2) UK-PHRST and UK-EMT participation in coordination calls with FCDO. 	<p>Limited evidence supporting this assumption</p>
<p>6. Short-Term Outcomes to Intermediate Outcome</p>	
<p>Intermediate outcome: UK and global response to epidemics improves in speed and quality</p> <ol style="list-style-type: none"> What changes can be observed, if any, at the intermediate outcome level? (Maps to EQ6.1, 6.2) There is not enough evidence to support this intermediate outcome at the present time. Given the humanitarian crisis situation in Cox's Bazar, many structures and resources put in place in the camps are considered to be short-term measures, at least by the Bangladeshi government. It is therefore difficult to know whether investments in capacity will be retained by in-country personnel in the long-term. The implementation of the rapid research in outbreaks protocol during the COVID-19 response deployment may provide an evidence base for its future use, potentially improving the speed of UK research implementation during an outbreak. What factors were needed to produce the observed change? (Maps to Assumptions, EQ2.3) Not applicable. Summarise UK-PHRST plausible contribution to those factors (Maps to EQ6.2) Not applicable. Summarise plausible contribution to those factors by other DPs or the government (Maps to EQ6.2) Not applicable. 	<p>Evidence comprises very limited evidence (single source) or incomplete or unreliable evidence.</p>
<p>7. Evidence against key assumptions</p>	
<p>UK workforce can be retained and increased when required to allow fast deployment of requested expertise (Maps to Assumptions; EQ2.3, EQ3.8, EQ6.3, EQ6.4)</p>	<p>Limited evidence supporting this assumption</p>

<ul style="list-style-type: none"> • WHO stakeholders commented on the impressive ability of UK-PHRST to provide deployed personnel with appropriate expertise very quickly, but there is no broader evidence on workforce retention and increases. 	
<p>Other issues do not have significant impact on speed of deployment (<i>Maps to EQ3.8, 6.3, 6.4</i>)</p> <ul style="list-style-type: none"> • Limited evidence against this assumption. One remote deployee commented that a significant amount of time was lost at the beginning of their deployment by UK-PHRST navigating the modalities of remote deployment and establishing the activities, which could be seen as an inevitable outcome of using a previously untested mode of deployment. 	<p>Limited evidence against this assumption</p>
<p>Research, innovations and tools developed by UK-PHRST are seen as relevant and useful and therefore adopted by other global health/ outbreak response actors (<i>Maps to EQ7.2</i>)</p> <ul style="list-style-type: none"> • No evidence against this assumption. 	<p>No evidence</p>
<p>LMIC's effectively use increased capacity so that it contributes to improved response speed and quality</p> <ul style="list-style-type: none"> • Some evidence of Cox's Bazar partners having effectively used increased capacity following UK-PHRST WASHFIT trainings during the diphtheria deployment. One stakeholder commented that UK-PHRST have followed up with some WASH expanders previously trained, who have been continuing to deliver the WASH course. 	<p>Limited evidence supporting this assumption</p>

Annex 10: Thematic case study - Remote support

What was the context?

'Remote support' has evolved as a novel way of collaborating and providing online technical support to partners in the Global South. For UK-PHRST, it meant rapidly shifting from predominantly short-term field deployments of 6 weeks to longer-term provision of technical guidance to partners at country and regional level, using virtual communication means. Since its inception in 2016, UK-PHRST has deployed highly qualified experts to support multiple outbreak responses across a wide range of contexts. Initially, most of the deployments were commissioned through GOARN, but UK-PHRST has increasingly deployed bilaterally as they fostered collaborative partnerships with in-country institutions over time. The team deployed for 6 weeks at a time and worked on a rotational basis as needed. The deployment model was thus mainly built around in-country presence of the experts for a limited period, and UK-PHRST did not provide any significant technical support remotely beyond the 6-week field visit. Most deployments involved four or fewer UK-PHRST members. In March 2020, all UK-PHRST staff deployed overseas were pulled back to the UK in view of increasing travel restrictions due to the COVID-19 pandemic. This compelled the UK-PHRST to adapt its working strategy and rapidly switch most of its activities from in-country to remote support, both for COVID-19-related and other ongoing activities.

What did the UK-PHRST set out to do?

UK-PHRST successfully shifted from field-based deployments to remote working when COVID-19 hindered international travel. When the UK-PHRST team unexpectedly had to halt all field deployments, there was no contingency plan to guide them on how to continue working effectively with regional and national partners. The team adapted very quickly to the new situation and successfully shifted to novel ways of collaborating within the consortium and with partners in the Global South. They also increased the provision of integrated support across the triple mandate as they set out to support countries remotely, both through remote deployments, research and capacity development.

How did things play out in practice?

UK-PHRST quickly adapted to remote working which allowed them to continue providing multi-disciplinary support through the efficient and innovative use of technological resources. **In most cases, existing working relationships were adapted and expanded, rather than any new ones being created entirely remotely.** The COVID-19 pandemic intensified UK-PHRST's use of existing online tools for virtual co-working. The shift to remote support happened 'organically' rather than based on an explicit strategy, which allowed the team to provide remote support in a highly flexible manner based on demands of national and regional partners. Remote support was provided to these partners across a wide range of disciplines and contexts. The team adapted existing work plans and ongoing activities to a remote support modality, for example by switching to webinars, online training courses, web-based surveys, semi-structured online KII interviews, and virtual FGDs.

"We are piloting this online training in a month. A lot of the training content has been amended towards more webinars, powerpoints, engaging webinars, online forums and methods where we promote engaging. We will record these webinars so they can be used for future use as well. We're also recording powerpoints for videolinks. We're setting up our own platforms to have our trainings available online to ongoingly support our technical teams overseas." (KII, UK-PHRST)

UK-PHRST continued collaboration with existing partners, including Africa CDC, WHO/GOARN, Ministries of Health and other country-level partners, such as for example Nigeria CDC, Uganda, Sudan, Nepal and Cox's Bazar in Bangladesh. Key activities and achievements with key partners are described below:

Africa CDC

- In early March 2020, a multidisciplinary UK-PHRST team composed of an epidemiologist, an IPC specialist, a social scientist and a microbiologist were deployed to Africa CDC (ACDC) for three weeks to support them and the Africa Task Force for Novel Coronavirus (AFCOR), which was set up by ACDC to oversee the region's preparedness and response to COVID-19.
- After repatriation of the team, UK-PHRST continued to provide multidisciplinary remote support in collaboration with ACDC section heads, Emergency Operations Centre (EOC), AFCOR and technical working groups. Key support areas included strategy development, epidemiology and surveillance, IPC, laboratory, social science and case management.

WHO-AFRO, WAHO and ESCA

- UK-PHRST provided remote support for the development of a joint regional research project on the impact of COVID-19 on mental health (in collaboration with WHO-AFRO, ACDC, WAHO and ESCA Health Authority). This has given PHRST and regional partners access to data on mental health in multiple countries.
- One epidemiologist and two data scientists remotely assisted WHO-AFRO with analysis and interpretation of data gathered from across member states. The team provided brief reports on the data that different countries had provided.

Cox's Bazar

- UK-PHRST epidemiologists (FETP and reservists) provided remote support to the WHO office in Cox's Bazar to strengthen their COVID-19 response in the areas of EPI and surveillance strategy, including setting up EPI survey reports, surveillance data scripts, as well as developing a sero-surveillance study (in-country deployment).
- IPC specialist deployed remotely to support IPC.

MOOC

- UK-PHRST developed a Massive Open Online Course (MOOC) on COVID-19 providing a comprehensive quality introduction to COVID-19 for the wider public, and to serve as an educational support tool during and prior to outbreak responses.

Other

- Some remote support provided to Uganda (remote development of training materials for VHF preparedness research), Sudan (reviewing PCR machines in real-time to validate COVID-19 samples) and Nigeria (data analysis), WHO Western Pacific Regional Office (The Philippines) and WHO Nepal (COVID-19).

How did the triple mandate play out?

The shift to remote working had an overall positive impact on the operationalisation of the triple mandate as it allowed UK-PHRST to provide long-term remote capacity-building support and multi-disciplinary teams to jointly work with several countries at the same time. There is strong indication that remote working provided opportunities for scaling-up capacity-building efforts and for organically combining it with remote deployments. Remote support allowed the UK-PHRST team to better integrate and harmonise their activities, ToC, logframe and implementation plans, and bring the triple mandate

better together, especially by combining remote deployments and capacity development. Working remotely reportedly forced UK-PHRST to reflect more on what information to share internally amongst UK-PHRST team members, both in terms of deployment as well as research, which has led to a stronger crossover and collaboration across the three components of the triple mandate. For example, in Cox's Bazar, UK-PHRST supported the implementation of a COVID-19 seroprevalence study using a combination of social science and laboratory support. The aim was to better understand the outbreak and why there were fewer cases than first anticipated, and to investigate the social consequences of COVID-19. Cox's Bazar is the first example where UK-PHRST engaged through a rapid research proposal during a GOARN emergency deployment, while supporting remotely, and finally blended into an in-country deployment to support the implementation of the seroprevalence study. The support to Africa CDC also involved both long-term remote deployment and multiple capacity development activities, for example through webinars and online training courses.

COVID-19 had negative impact on the research portfolio as travel restrictions prevented the UK-PHRST team from traveling to countries for field work and some of the research studies experienced logistical challenges. Although a few activities could continue to be carried out remotely, such as data analysis, writing reports, and publishing articles, most UK-PHRST research projects were either paused or their implementation slowed down because of COVID-19 travel restrictions and other logistical challenges. In many cases, continuation of field work would have required that UK-PHRST researchers travelled to the field to support local researchers and clinical front-line workers with data collection, which was not possible during the early months of COVID-19. In Nigeria, a Lassa Fever research project was delayed because there were issues with the transportation of blood samples within the country and to the UK due to travel restrictions and airline regulations. Some stakeholders mentioned that it is particularly difficult to provide remote support to lab technicians without first having physically seen the local laboratory. Moreover, research during COVID-19 was not seen as a priority by many governments and partners involved in the emergency outbreak response which further exacerbated the issues. There is indication that the UK-PHRST adapted to the difficult circumstances and that implementation of research activities slowly resumed and went back on track towards the end of 2020. UK-PHRST has planned field visits in early 2021 to conduct in-country data collection and capacity building activities, and has contingency plans in place.

What were the positive outcomes?

Remote working enhanced continuity in projects and partnerships and enabled UK-PHRST to provide expanded multi-disciplinary remote support to countries and Africa CDC. Shifting to remote support allowed for increased continuity in projects as the UK-PHRST team could provide flexible and long-term support beyond the typical 6-week in-country deployment. UK-PHRST worked consistently with the same partners over a longer period of time, for example with Africa CDC, to which some UK-PHRST team members were deployed remotely for several months (e.g. UK-PHRST's social scientist). It also facilitated the use of a multi-disciplinary approach whereby multiple team members could support the same country or region (Africa CDC) simultaneously, whilst also working on other projects.

Existing relationships with in-country partners established during previous field visits or longstanding institutional and personal relationships contributed significantly to the effectiveness, and allowed UK-PHRST to leverage its ability to effectively work remotely. There was wide consensus among both UK-PHRST team members and partners in national or regional institutions that in-person contact and first-hand knowledge of the country are necessary conditions to work effectively together at a distance and build sustainable collaborative partnerships. UK-PHRST staff created personal connections and gained understanding of the context during in-country deployments which helped build trust necessary to continuing effective virtual technical support.

Providing remote support to a regional institution (Africa CDC) was an effective way of supporting multiple countries indirectly through the development of regional webinars, guidelines and tools for enhanced outbreak response. UK-PHRST collaboration with Africa CDC has demonstrated the ability of

UK-PHRST to provide high quality technical expertise remotely across the triple mandate, which has strengthened Africa CDC's ability to support AU member states in response to COVID-19 and other outbreaks. Several online guidelines, tools and communication platforms were developed with UK-PHRST assistance to support countries in their response to the COVID-19 pandemic. Given the complexity of COVID-19, the ability to deploy team members simultaneously through remote support enabled UK-PHRST to effectively contribute to strategic discussions across a wide range of disciplines.

Working from home and providing remote virtual support increased the flexibility of UK-PHRST's ways of working. From a human resource perspective, remote support increased the flexibility of UK-PHRST staff in terms of working hours and location, reduced travel, elimination of physical deployment challenges. This had positive effects on their ability to provide support to multiple countries and Africa CDC at the same time, and to respond to country demands and needs in a flexible and agile manner. It also has the potential to attract team members with a more diverse profile, and potentially to improve gender balance and diversity in the CDT, although there is no evidence that this has yet materialized.

Remote working helped improve internal communication and team work as new processes for co-working evolved when physical meetings were no longer possible. Shifting to remote working strengthened communication and teamwork across the UK-PHRST consortium. For example, UK-PHRST held systematic 'post-deployment debriefs' and weekly (now bi-weekly) 'remote working debriefs' with all team members involved in providing remote support. Enhanced communication and increased teamwork within the UK-PHRST team brought more opportunities for collaboration on single projects, leading to an increase in multidisciplinary teamwork, particularly with ACDC, and to significant synergies. UK-PHRST team members have reported to feel more integrated and attribute this positive change to more flexible remote co-working and acceleration of virtual communication.

What were the challenges?

It is difficult to create new partnerships and to jointly assess needs when working exclusively remotely. Stakeholders noted that inability to deploy may lead to reduced relevance and efficacy of remote support, since it is more challenging to carry out needs-assessment and elaborate realistic work plans remotely, especially without prior field experience in-country, contextual knowledge and experience, and a network with local partners. Creating new connections with partners remotely is challenging, particularly because prior in-country field experience of the UK-PHRST team and personal connections are important for effective remote collaboration.

Remote support has its limitations as not all activities can be carried out remotely, such as laboratory work and capacity building and research activities at sub-national level. There was wide consensus among stakeholders that remote support has limitations and should only be used as a supplement to in-person collaboration and hands-on technical support. This is especially true for practical training of front-line health workers and researchers and laboratory work. For example, in the Philippines, remote support was only possible because UK-PHRST staff members had strong prior working connections and were familiar with the local laboratory and its capacity.

Although remote working increased the flexibility of the UK-PHRST staff in a positive way, it also had important drawbacks in terms of mental health and the risk of burn-out. There was wide consensus among UK-PHRST stakeholders that there is a significant risk of burn-out and mental health issues caused by remote working from home, increased workload, working simultaneously on multiple projects, time zone differences, work/home life balance, and uncertainty about future funding. This might also influence staff retention. Key staff challenges included for example:

- There is likely a greater challenge to integrate new team members when working remotely.
- UK-PHRST team members feel they have been requested to participate in too many webinars as compared to the output.

- Supporting various countries across different time-zones has been challenging, although the working arrangements and priorities of UK-PHRST staff have been more flexible. This may also lead to a decrease in support effectiveness, as support is not 'real-time'.

How has UK-PHRST worked alongside others to contribute to observed programme outcomes?

The shift to remote support enhanced the capacity of UK-PHRST team members to participate in Africa CDC and country-specific working groups and their ability to coordinate activities with other partners. COVID-19 and remote working provided opportunities for UK-PHRST to increasingly participate in, and contribute to, technical working groups at ACDC and country level. Regional and national-level stakeholders highlighted that the virtual participation of UK-PHRST was an excellent opportunity for them to provide regular technical inputs and enhance collaboration and coordination with other partners. Multiple other international development partners, including UN agencies, bilateral partners, NGOs and academic institutions, supported the response to the COVID-19 pandemic at regional and country level. However, there are neither any specific details of how exactly they provided remote or in-country support, nor what virtual strategies and tools they might have used.

What is there to be learnt?

The shift to remote working had an overall positive impact on the operationalisation of the triple mandate given that COVID-19 and the rollback of in-country deployments made capacity development a more prominent part of the triple mandate, and facilitated integration of activities across the three components. UK-PHRST successfully developed innovative ways of providing remote capacity development, including through training webinars, online technical backstopping, and facilitation of technical discussions in virtual TWG meetings. The remote working enabled UK-PHRST to provide integrated support across the triple mandate through remote deployment for example to Africa CDC and selected countries. This was combined with continuous formal and informal capacity development of staff members at Africa CDC or at country level. Remote support is viewed as an effective way of providing policy and strategy support at the regional level, while at the same time having the potential to influence multiple countries through the support to guideline and tool development. Remote deployments can extend the technical support beyond the typical 6-week in-country deployments, which means capacity development can take place over a longer period of time, and thus enhance the sustainability of UK-PHRST's investments.

"The remote working has been an unintended outcome which has been quite serendipitous. It has opened up lots of opportunities, and equally the challenges of not being able to draw on the reservists has meant we have circled back to the drawing table on how to involve more country-based staff. How we address these challenges is currently ongoing. To think of recruitment from the regions in which we work, we try and have a blended approach. It was an issue that was on the horizon but we had not gotten there yet. So, somehow unintended. It was always on the implementation plan on how to engage LMIC people on our deployments, but it hadn't taken off yet. Now with COVID-19, it kind of happened organically with the work with ACDC and how this has increased, and it's opened up opportunities and it will be taken forward now. COVID-19 has accelerated this."

"I think one of the lessons of that is the need for decentralisation, and having people where the potential problems will be, rather than to have the people in the UK. So that's a reflection for our own school, so we have over half of our staff based in Africa, and I am going to continue to do that, to globalise. Because then you are less

handicapped by international travel bans, but also, I think it will also be important for one of the pillars, for capacity building, but on the other hand, you cannot put only one person somewhere, that is not efficient.” (KII, UK-PHRST Consortium Member)

Technical support for practical implementation often requires a hands-on approach and in-country presence. While there has been a positive increase of remote capacity development activities, it is more difficult to meet needs for hands-on support with practical implementation in the countries UK-PHRST provided remote support to supra-national organisations, which contributed significantly to the development of policies, guidelines, and tools for outbreak response. This, however, might not meet needs in countries, for hands-on capacity-building support. This is especially true for sub-national level where partners do not necessarily have reliable internet connections and regular access to online communication platforms.

There was broad consensus among stakeholders that in-person contact, and first-hand knowledge of the country are necessary conditions to work effectively together at a distance and to build sustainable collaborative partnerships. There is strong indication that personal connections established during field visits were necessary to guarantee effective remote support during the COVID-19 pandemic. Without previous familiarity of both context and partners, there could potentially be a lack of trust and personal connections with key members of partner organisations, as well as ambiguity about hierarchical structures. Country stakeholders felt that informal communication with the UK-PHRST team, especially through WhatsApp and Zoom calls, facilitated remote collaboration and timely and flexible technical support. Face-to-face interactions will continue to be necessary for establishing relations and long-term partnerships and for certain capacity development tasks, especially at the sub-national level and with clinical health care workers and lab technicians.

There is an opportunity for UK-PHRST to leverage its initial experiences with remote support to develop a ‘hybrid model’ that combines remote and in-country technical support to build sustainable outbreak response capacity. COVID-19 has accelerated the use of technology and digital tools to provide remote technical support to regional institutions and LMIC partners. To ensure continuity and sustainability, UK-PHRST needs to decentralise itself and prioritise a stronger engagement of regional and national specialists in the provision of technical support as well as capacity building. This could be done by supporting and enhancing the capacity of regional and country-level rapid response teams using a hybrid model. Such a model would help retain some of the advantages of remote working even when moving into the New Normal and resuming some level of travelling. Another advantage would be that it is a greener model that could help prevent Climate Change by reducing CO² emission from flights.

Annex 11: Key Informants interviewed

	Stakeholder Category	Organisation	Job title	Name
1	UK-PHRST	PHE	Research fellow	Alice Walker
2	UK-PHRST	LSHTM	Deputy Head of Research, UK-PHRST	Anna Seale
3	UK-PHRST	University of Oxford	Scientist	Annelies Gillesen
4	UK research collaborator	Institute of Development Sciences	Research fellow	Annie Wilkinson
5	UK-PHRST	PHE	Training Manager	Arlinda Cerga Pashoja
6	UK-PHRST	PHE IHR Africa CDC	Deputy Director of Operations	Ashley Sharp
7	Other Contacts	Gates Ventures	Director, Health & Life Sciences, Gates Ventures	Becky Bartlein
8	UK-PHRST	PHE	Senior/Lead Microbiologist, UK-PHRST	Ben Gannon
9	UK research collaborator	FCDO	Senior Research Fellow, Infectious Diseases	Cathy Roth (Dr.)
10	National PH Organisation	Nigerian CDC	CEO Nigeria CDC	Chikwe Ihekweazu (Dr.)
11	FCDO in-country	FCDO Nigeria	Health Advisor FCDO in Nigeria	Chris Lewis
12	Other Contacts	FutureLearn	Partnership Manager	Christina Melidou
13	UK-PHRST	PHE	FETP 2019	Clare Sawyer
14	UK-PHRST	LSHTM	Social Science Research Fellow	Dan Brunsdon
15	UK-PHRST	PHE	Director, UK-PHRST	Daniel Bausch
16	UK-PHRST Project Board Member	LSHTM	Head and Senior Fellow, Centre on Global Health Security at Chatham House & Professor of Infectious Disease Epidemiology at LSHTM	David Heymann
17	UK-PHRST	Research Fellow Education	Data Scientist	David Kennedy
18	UK-PHRST Project Board Member	UK Med	CEO UK-Med	David Wightwick
19	Regional PH Organisation	Africa CDC	Associate Professor in Social Science	Djoudalbaye Benjamin (Dr.)
20	UK-PHRST Project Board Member	PHE	Head of Global Operations, Global Public Health	Ed Newman
21	UN/WHO	WHO Cox's Bazar	WHO Country Office (Cox's Bazar)	Egmond Evers
22	UK-PHRST	PHE	Logistics Manager	Elizabeth McFarland
23	UK-PHRST	PHE	IPC Specialist	Emilio Hornsey

24	UN/WHO	WHO AFRO	Regional Advisor, Mental Health	Florence Baingana (Dr.)
25	UN/WHO	GOARN/ISARIC Global Support Centre	Consultant in Infectious Diseases & Honorary Consultant Public Health England	Gail Carson
26	UK-PHRST	LSHTM	Social Scientist	Hana Rohan
27	UK-PHRST	LSHTM	Communications Officer	Hannah Gladstone
28	Other GHS related programmes (UK ODA-funded)	DHSC - Global Public Health Security Programme Board member.	Head of GHS Preparedness, including UK-PHRST)	Helen Tomkys
29	UK-PHRST	LSHTM	Epidemiologist	Hilary Bower
30	Consortium partner organisation member, non-UK-PHRST	PHE	PHE Global Mental Health	Ian Walker
31	UK-PHRST Project Board Member	WHO	World Health Organization Assistant Director General	Ibrahima-Soce Fall
32	UK-PHRST	PHE	FETP scientific coordinator	Ioannis Karragiannis
33	UK-PHRST Project Board Member	NIS	Deputy Director - Field Service, National Infection Service, PHE	Isabel Oliver
34	UN/WHO	WHO GOARN	Public Health Consultant	Jeremy Kiff
35	Other GHS related programmes (UK ODA-funded)	PHE IHR Ethiopia	Country Lead & PHE IHR Senior Health Advisor in Ethiopia	John Forde
36	UK-PHRST	PHE	Lab Manager, UK-PHRST	Jonathan Ashcroft
37	UK-PHRST (Reserve)	LSHTM	Field Epi (Reserve)	Joseph Timothy
38	UK research collaborator	LSHTM	Chair of Emerging Infectious Diseases	Judith Glynn (Professor)
39	Consortium partner organisation member, non-UK-PHRST	LSHTM	Public Health Psychiatrist	Julian Eaton
40	Regional PH Organisation	Africa CDC	Consultant Medical Epidemiologist, Surveillance and Disease Intelligence	Justin Maeda
41	UN/WHO	WHO Cox's Bazar	WHO Country Office (Cox's Bazar)	Kai Von Harbou
42	UK-PHRST (Reserve)	PHE	FETP 2018 Cohort	Kanza Ahmed
43	UK-PHRST	PHE	Operations Manager	Katie Carmichael

44	Consortium partner organisation member, non-UK-PHRST	LSHTM	Dean for Faculty of Epidemiology and Population Health (faculty in which UK-PHRST LSHTM grant is run)	Liam Smeeth
45	UK-PHRST (Reserve)	PHE	Nurse, North-west London Health Protection Team	Lipi Begum
46	UK-PHRST	FETP	Co-director, UK Field Epidemiology Training Programme	Louise Coole
47	UK research collaborator	Liverpool University	Professor	Luis Cuevas
48	UK research collaborator	LSHTM	Professor of Diagnostics Research	Martin Hibberd (Professor)
49	UK-PHRST	LSHTM	Education Research Fellow	Mary Ibeto
50	Consortium partner organisation member, non-UK-PHRST	PHE	Director: Research, Translation & Innovation	Miles Carroll (Professor)
51	Regional PH Organisation	Africa CDC	Epidemiologist, Mental Health Lead, AU	Mohammed Abdulaziz
52	Non UK Academic Partners	University of Khartoum	Dean of Medical Laboratory Sciences at Karary University Khartoum and Deputy Director of the National Public Health Laboratory of Sudan.	Mubarak el Karsany
53	National PH Organisation	The Gambia MoH	Head of RRTs	Mustapha Sanyang
54	Consortium partner organisation member, non-UK-PHRST	PHE	Director Global Public Health	Neil Squires
55	UK-PHRST Project Board Member	FCDO	Senior Health Adviser, Policy Division, FCDO	Nel Druce
56	Other GHS related programmes (UK ODA-funded)	DHSC - Global Public Health Security Programme Board member.	Global Health Security Deputy Director	Nick Adkin
57	FCDO in-country	FCDO Bangladesh	Senior Humanitarian Advisor	Nick Harvey
58	National PH Organisation	Nigerian CDC	Chief Molecular Bioengineer, National Reference Laboratory, NCDC	Nnaemeka Ndodo
59	UN/WHO	WHO GOARN	Partnerships Officer Emergency Operations (WHE/EMO)	Oleg Storozhenko

60	Consortium partner organisation member, non-UK-PHRST	LSHTM	Director, LSHTM	Peter Piot
61	Regional PH Organisation	Africa CDC	NPHIs - Division Head	Raji Tajudeen
62	UK-PHRST	PHE	FETP 2019	Ranya Mulchandani
63	National PH Organisation	FMoH/NPHI	Technical Advisor Sudan Field Epidemiology Programm	Shahd Osman
64	Consortium partner organisation member, non-UK-PHRST	LSHTM	Associate Professor in Social Science	Shelley Lees
65	Other GHS related programmes (UK ODA-funded)	PHE IHR Nigeria	Senior Public Health Advisor, Public Health England IHR Strengthening Programme in Nigeria deployments and capacity building	Şola Aruna
66	UK-PHRST	PHE	Programme Manager	Susan Ismaeel
67	UK-PHRST	LHSTM	Programme Manager	Thom Banks
68	Consortium partner organisation member, non-UK-PHRST	PHE	Head of Global Health Security	Tina Endericks
69	National PH Organisation	Nigerian CDC	National Lead for IPC	Tochi Okwor
70	UK-PHRST	PHE	Microbiologist (CDT)	Ulrike Arnold
71	UK-PHRST	PHE	FETP 2019	Wendy Rice
72	Regional PH Organisation	West African Health Organization	Technical officer	William Bosu (Dr.)
73	National PH Organisation	The Gambia MoH	Head of planning	Yakob Siale
74	Regional PH Organisation	Africa CDC	Labs - Division Head	Yenew Kebede Tebeje

Annex 12: Documents reviewed at end-point evaluation phase

Published By	Published Date	Type of Document	Title of Document
PHRST	2020	Annual Review	UK PHRST Annual Review 2019-20 Global Health Security Programme Draft
PHRST	2020	Case study	Using PPE in outbreak response - Case study
PHRST	2020	Case study	Mystery pathogens and the role of the mobile laboratory flight case - Case study
PHRST	24/03/2020	Correspondence	Email exchange Itad - PHRST request for documents
PHRST	30/10/2019	Country Travel Advice Report	Country Travel Advice Report Bangladesh Moderate Risk Rating November 2019
PHRST	14/10/2020	Deployment agreement	UK-PHRST Second deployment the Gambia
PHRST	11/09/2020	Deployment agreement	UK-PHRST Deployment to the Gambia
PHRST	07/05/2020	Deployment summary	UK-PHRST summary of COVID-19 support – May 7th 2020
PHRST	01/10/2020	Deployment summary	Emergency deployments Summary 2020
PHRST	2020	Deployment summary	UK-PHRST COVID-19 Summary
PHRST	2020	Deployment summary	UK-PHRST summary of COVID-19 support
PHRST	2020	Deployment summary	Emergency Deployments - Summary
PHRST	12/08/2020	End of Mission Report	Tajikistan deployment - COVID-19- End of Mission Report
PHRST	13/03/2020	End of Mission Report	UK-PHRST Bangladesh deployment - Cholera - End of Mission Report
PHRST	14/07/2020	End of Mission Report	UK-PHRST DRC deployment - Ebola - North Kivu - End of Mission Report
PHRST	08/09/2020	End of Mission Report	UK-PHRST End of Mission Report - Microbiology CXB - Bangladesh
PHRST	23/10/2020	External communications	UK-PHRST Newsletter - October 2020
USAID, Save the Children		Factsheet	USAID and Save the Children. Factsheet - Ready: Global readiness for response to major disease outbreaks
PHRST	01/02/2020	Financial document	Expenses Guidance: CLAIMING EXPENSES FOR UK-PHRST TRAVEL THROUGH PHE GUIDANCE DOCUMENT FOR UK-PHRST STAFF
PHRST		Financial document	UK-PHRST BANK RESERVISTS – PAYMENT FOR TIME AND EXPENSES
PHRST		Financial document	INTERNAL (PHE) RESERVISTS EMAIL – PAYMENT FOR TIME – INTERNAL RECHARGE
PHRST		Financial document	Internal PHE reservists - payment for time and expenses - TEMP SAF change
PHRST		Financial document	Internal PHE reservists - payment for time and expenses - TIMECARDS
PHRST		Financial document	Finance Tracker 2019-2020
PHRST	01/03/2020	Guidance document	Guidance for publications and external publications_Final_02.03.20
PHRST	09/06/2020	Implementation Plan	UK RST Implementation Plan 2020-2021
PHRST	N/A	Job Description	Job Description - Assitant Professor in Social Science (Faculty: Public Health and Policy)
LSHTM	N/A	Lecture Slides	UK-PHRST in Sierra Leone: Integrating research and capacity building with emergency response
PHRST	01/05/2020	List of deployments	UK-PHRST deployments October 2019 to May 2020
PHRST	01/12/2019	Meeting Agenda	PHRST Full Team Meeting

PHRST	18/03/2020	Meeting Agenda	PHRST Full Team Meeting Agenda
PHRST	15/01/2020	Meeting Agenda	PHRST Full Team Meeting Agenda
PHRST	02/12/2020	Meeting Agenda	2020.12.02 Project Board Meeting agenda
PHRST	06/10/2020	Meeting mintes	Notes from UK-PHRST supporting COVID-19 webinar
PHRST	03/12/2019	Meeting Minutes	UK-PHRST Technical Steering Committee 3rd December 2019 Meeting Minutes
PHRST	04/12/2019	Meeting Minutes	Project Board Minutes 4th December 2019
UK-Med	01/11/2019	Meeting Minutes	UK-Med Outbreak Response Team for Project Board Presentation - Outbreak Response Register, Sarah Collis
PHRST	01/04/2020	Meeting Minutes	UK-PHRST OPERATIONAL DEBRIEFING
PHRST	31/03/2020	Meeting Minutes	UK-PHRST OPERATIONAL DEBRIEFING
PHRST	03/03/2020	Meeting Minutes	UK-PHRST Project Board Minutes
PHRST	04/12/2019	Meeting Minutes	Project Board Minutes 4 Dec 2019
PHRST	12/02/2020	Meeting Minutes	Senior Management Team Meeting Minutes 12 Feb 2020
PHRST	22/01/2020	Meeting Minutes	Senior Management Team Meeting Minutes 15 Jan 2020
PHRST	17/03/2020	Meeting Minutes	Senior Management Team Meeting Minutes
PHRST	18/12/2019	Meeting Minutes	Senior Management Team Meeting Minutes
PHRST	25/03/2020	Meeting Minutes	Senior Management Team Meeting Minutes
PHRST	18/01/2020	Meeting Minutes	PHRST Full Team Meeting
PHRST	04/03/2020	Meeting Minutes	Senior Management Team Meeting minutes
PHRST	11/03/2020	Meeting Minutes	Senior Management Team Meeting minutes
PHRST	01/12/2019	Meeting Minutes	PHRST Full Team Meeting
PHRST	03/06/2020	Meeting Minutes	PHRST Project Board Meeting Minutes (3 June 2020)
PHRST	01/04/2020	Meeting Minutes	UK-PHRST SMT Minutes (1 April 2020)
PHRST	08/04/2020	Meeting Minutes	UK-PHRST SMT Minutes (8 April 2020)
PHRST	22/04/2020	Meeting Minutes	UK-PHRST SMT Minutes (22 April 2020)
PHRST	29/04/2020	Meeting Minutes	UK-PHRST SMT Minutes (29 April 2020)
PHRST	06/05/2020	Meeting Minutes	UK-PHRST SMT Minutes (6 May 2020)
PHRST	27/05/2020	Meeting Minutes	UK-PHRST SMT Minutes (27 May 2020)
PHRST	17/06/2020	Meeting Minutes	UK-PHRST SMT Minutes (17 June 2020)
PHRST	24/06/2020	Meeting Minutes	UK-PHRST SMT Minutes (24 June 2020)
PHRST	08/09/2020	Meeting Minutes	UK-PHRST TSC meeting minutes (08.09.2020)
PHRST	14/07/2020	Meeting Minutes	UK-PHRST TSC meeting minutes (14.07.2020)
PHRST	07/04/2020	Meeting Minutes	UK-PHRST TSC meeting minutes (07.04.2020)
PHRST	10/03/2020	Meeting Minutes	UK-PHRST TSC meeting minutes (10.03.2020)
PHRST	10/06/2020	Meeting Minutes	UK-PHRST TSC meeting minutes (10.06.2020)
PHRST	12/05/2020	Meeting Minutes	UK-PHRST TSC meeting minutes (12.05.2020)
PHRST	29/07/2020	Meeting Minutes	UK-PHRST FTM Minutes (29th July 2020)
PHRST	19/08/2020	Meeting Minutes	UK-PHRST FTM Minutes (19th August 2020)
PHRST	02/12/2020	Meeting Minutes	2020.12.02 Project Board meeting
PHRST	02/09/2020	Meeting Minutes	UK-PHRST Project Board Minutes 2nd September 2020
PHRST	N/A	Meeting Report	Partnering for Outbreak Preparedness and Response: Research and Capacity Building Collaboration in East Africa UVR

PHRST		Monitoring Spreadsheet	2019-20 Q2 Risk register
PHRST	N/A	Operating Framework	GLOBAL PUBLIC HEALTH OPERATING FRAMEWORK, SECTION C: Travelling and overseas operation. How we work overseas.
PHRST	01/01/2020	Operating Framework	Core Management Team ways of working document
UK-Med	01/11/2019	Presentation	UK Med Outbreak Response Team Project Board Presentation Nov 2019
PHRST	05/11/2019	Presentation	Employee Assistance Programme presentation
PHRST	01/02/2020	Presentation	Sudan visit for planning (Research and CB) 24 Jan-15 Feb 2020
PHRST	03/03/2020	Project Board Paper	UK-PHRST Project Board Paper_ Research Governance update on the proposed approach for research governance for the remainder of the UK-PHRST funding cycle (i.e. through March 2021)
PHRST		Proposal	UK Public Health Rapid Support Team CSR Bid Strategic Case and Outline Proposal
PHRST	02/12/2020	Quarterly Director's report	Quarterly Director's Report for Project Board Meeting, 2nd December 2020
PHRST	02/09/2020	Quarterly Director's report	Quarterly Director's Report for Project Board Meeting, 2nd September 2020
PHRST	03/03/2020	Quarterly Director's report	Quarterly Director's Report for Project Board Meeting, 3 March 2020
PHRST		Quarterly report for DHSC	UK-PHRST Project Highlighting report August 2020
PHRST		Quarterly report for DHSC	UK-PHRST Project Highlighting report May 2020
PHRST		Quarterly report for DHSC	UK-PHRST Project Highlighting report November 2020
PHRST	03/06/2020	Request for Deployment	Request to deploy for COVID-19 Support - Tajikistan
PLOS Channels	26/09/2019	Research document	"Working in silos doesn't work for outbreak response": Localising social science response efforts in West Africa
PLOS Channels	18/12/2018	Research document	Action not justification: how to use social science to improve outbreak response
BMC Medicine	2019	Research document	A rapid research needs appraisal methodology results from Lassa Fever pilot
Elsevier - Clinical Microbiology and Infection	2019	Research document	A systematic review and meta-analysis of patient data from the West Africa (2013-16) Ebola virus disease epidemic
BioRxiv	01/07/2020	Research document	Inactivation analysis of SARS-CoV-2 by specimen transport media, nucleic acid extraction
BMJ Global Health	01/08/2020	Research document	Transmission risk of respiratory viruses in natural and mechanical ventilation environments: implications for SARS-CoV-2 transmission in Africa
The Lancet Infection	01/02/2019	Research document	Early transmission and case fatality of Ebola virus
The New England Journal of Medicine	11/04/2019	Research document	Shifting the Paradigm - Applying Universal Standards of care to Ebola
Elsevier - Vaccines	11/07/1905	Research document	Pneumococcal conjugate vaccine use during humanitarian crises
Neglected Tropical Diseases	2019	Research document	Detection of Crimean-Congo Haemorrhagic Fever cases Sudan
Abstracts / International Journal of Infectious Diseases	2019	Research document	Severe undifferentiated febrile illness outbreaks in the Federal Republic of Sudan – A retrospective epidemiological and diagnostic study (abstract)
BJPsych International	01/05/2019	Research document	A qualitative study assessing the feasibility of implementing a group cognitive-behavioural therapy-based intervention in Sierra Leone
American Journal of	2018	Research document	Real-Time Modeling Should Be Routinely Integrated into Outbreak Response (Editorial)

Tropical Medicine and Hygiene			
Nature	2018	Research document	Meningococcus serogroup C clonal complex ST-10217 outbreak in Zamfara State, Northern Nigeria
The Lancet Infection	01/02/2018	Research document	Isolation of viable Zika virus from spermatozoa (abstract)
The New England Journal of Medicine	2018	Research document	Outbreaks in a Rapidly Changing Central Africa — Lessons from Ebola
The Lancet Infection	11/02/2019	Research document	Unrecognised Ebola virus infection in contact persons: what can we learn from it?
Emerging Infectious Diseases	01/11/2017	Research document	The breadth of viruses in human semen
unknown		Research document	Health care worker vaccination against Ebola: vaccine acceptance and employment duration in Sierra Leone
UK Public Health Rapid Support Team Research		Research document	Severe Undifferentiated Febrile Illness Outbreaks in the Federal Republic of Sudan: A Retrospective Epidemiological & Diagnostic Study
Philosophical Transactions of the Royal Society B	2018	Research document	Outbreak analytics: a developing data science for informing the response to emerging pathogens
American Journal of Tropical Medicine and Hygiene	2020	Research document	Factors Influencing Atypical Clinical Presentations during the 2017 Madagascar Pneumonic Plague Outbreak: A Prospective Cohort Study
Nature Immunology	01/06/2020	Research document	The Ebola outbreak in the Democratic Republic of the Congo: why there is no 'silver bullet'
American Journal of Tropical Medicine and Hygiene	2020	Research document	COVID-19 Shining the Light on Africa
BMC Psychiatry	2020	Research document	The usefulness of pre-employment and pre-deployment psychological screening for disaster relief workers: a systematic review
Gates open research	2020	Research document	COVID-19 Identifying countries with indicators of success in responding to the outbreak
PHRST	01/04/2019	Research Document	Progress Report - RST3_02_HR_April 2019_FINAL
BMC Medicine	2019	Research document	Assessment of a health facility based active case finding system for Ebola virus disease in Mbandaka, Democratic Republic of the Congo, June-July 2018
The Lancet	17/08/2020	Research document	Back to basics the outbreak response pillars
BMC Medicine	2018	Research document	Clinical assessment is a neglected component of outbreak preparedness
CDC - Emerging Infectious Diseases	11/11/2019	Research document	Clinical Research During Outbreaks (CREDO) Training for Low- and Middle-Income Countries
the BMJ opinion	24/01/2020	Research document	Coronavirus The psychological effects of quarantining a city
Releve epidemiologique hebdomadaire	18/01/2019	Research document	Lessons learnt from Ebola virus disease surveillance in Equateur Province
BMJ Global Health	2019	Research document	Event-based surveillance at health facility and community level in low-income and middle-income countries
Emerging Infectious Diseases	2020	Research document	Effect of Acute Illness on Contact Patterns, Malawi

The Lancet	01/01/2020	Research document	Preparedness for emerging epidemic threats a Lancet Infectious Diseases Commission
Euro Surveillance	2020	Research document	The cost of insecurity from flare-up to control of a major EVD hotspot during the outbreak in DRC
PHRST	31/10/2020	Research document	UK-PHRST Research Portfolio Summary 1 April - 30 September 2020
PHRST	01/04/2019	Research document	The usefulness of pre-deployment psychological screening for humanitarian staff deployed to crisis situations: a systematic review - Progress report
Cochrane Response, Evidence Aid & University of Oxford	06/12/2017	Research document	Rapid research needs appraisal for outbreaks - Study protocol
PHRST	30/04/2020	Research document	UK PHRST Research Individual Projects (30.4.2020)
PHRST	27/04/2020	Research document	UK-PHRST Research Portfolio statement
PHRST	13/05/2020	Research document	UK-PHRST Research Proposal: Strengthening public mental health capacity in Africa in response to the COVID-19 outbreak: formative research on public health response
PHRST	10/08/2020	Research document	UK-PHRST Research Proposal: How can massive open online courses (MOOCs) be used to support outbreak response? An action research approach
PHRST	09/09/2020	Research document	UK-PHRST Research Proposal: Feasibility assessment of a survey protocol using oral fluid-based anti-Ebola Virus (EBOV) immunoglobulin-G immunoassays to identify previously undetected EBOV infections in the high-risk Nzérékoré prefecture of Guinea.
PHRST	10/08/2020	Research document	UK-PHRST Research Proposal: COVID-19 Public Health Interventions
PHRST	07/09/2020	Research document	UK-PHRST Rapid Research Proposal: Population-based seroprevalence survey for COVID-19 Cox's Bazar (CXB) Rohingya Camps, Bangladesh
PHRST	19/03/2020	Situation Report	Covid-19 Situation report 19 March 2020
PHRST	06/11/2019	Situation Report	EVD DCR Situation Report 6 Nov 2019
PHE	01/01/2019	Strategy Document	East Africa Research and Capacity-Building Hub
PHRST		Survey	UK-PHRST survey for stakeholders
PHRST		Survey	UK-PHRST survey for stakeholders Results
PHRST	06/12/2019	Terms of Reference	Technical Steering Committee Revised ToR
PHRST	2020	UK-PHRST staff job descriptions	Project Coordinator - UK-PHRST Knowledge Development
PHRST	2020	UK-PHRST staff job descriptions	Project Coordinator - UK-PHRST
PHRST	2020	UK-PHRST staff job descriptions	Research Fellow in Mental Health
PHRST	2020	UK-PHRST staff job descriptions	Research Fellow in Public Health
PHRST	2020	UK-PHRST staff job descriptions	Research Fellow
PHRST	2020	Website	UK-PHRST The Global Health Network - Website - About us



Itad is a global organisation. Our strategy, monitoring, evaluation and learning services work to make international development more effective. We generate evidence on important issues – from malnutrition to migration – to support our partners to make informed decisions and improve lives.

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