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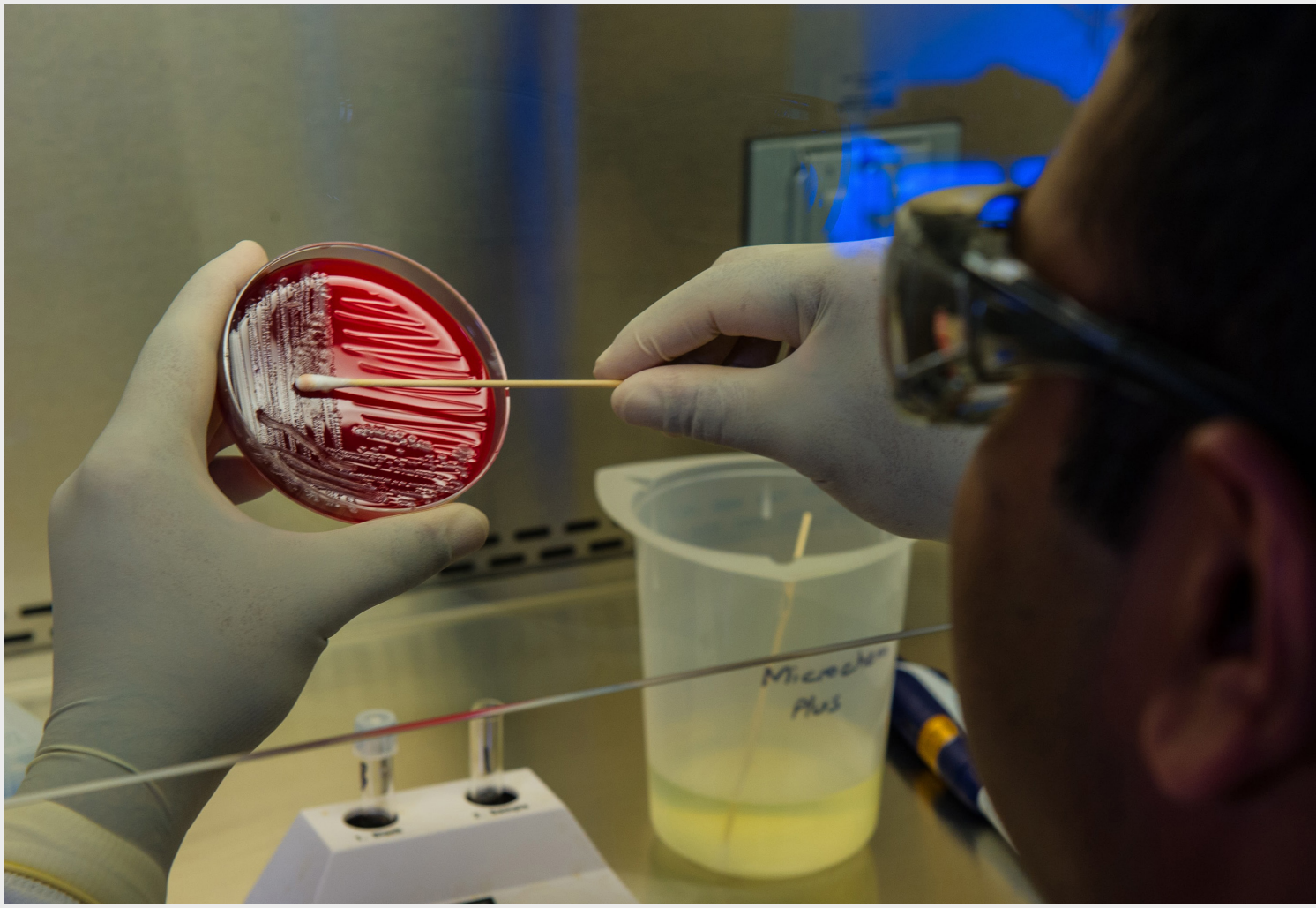

Sustaining AMR surveillance beyond the Fleming Fund

An analysis of enablers and blockers

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Contents

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Executive Summary

The Fleming Fund is a UK Department of Health and Social Care (DHSC) initiative to support up to 25 low- and middle-income countries (LMICs) to strengthen national surveillance systems for antimicrobial resistance (AMR). Since 2017, much progress has been made towards building country-owned AMR surveillance systems, through investments by the Fleming Fund, working with in-country partners and grantees. The main challenge now is how to sustain these systems without ongoing support from the Fleming Fund which is due to end at the beginning of 2026.

The prospects for sustainability in some countries are good but there will inevitably also be gaps in terms of continuation of specific activities. This paper provides information to support continuation of AMR surveillance by identifying enablers that help country programmes to transition to full country ownership and challenges (blockers) to sustainability, specific sustainability gaps and ways to mitigate these. Country case studies of Indonesia, Vietnam, Bangladesh, Pakistan, Kenya, Nigeria, and Uganda provide snippets of lessons learnt from implementing the Fleming Fund. Findings in this report are organised in three thematic sections, each important pillars of sustainability. Below is a summary of the enablers and blockers identified for each thematic area.

1. Government ownership and budget allocation

Enablers

- ✓ High level political champions
- ✓ Economic evidence
- ✓ Multisectoral approach
- ✓ Decentralised AMR governance and budgeting
- ✓ Public financial management (PFM)
- ✓ Costed National Action Plan
- ✓ Integration of AMR into national health insurance
- ✓ Models for equipment maintenance
- ✓ International reporting obligations

Blockers

- △ Competing priorities
- △ Cost of consumables and reagents
- △ Proprietary branded consumables
- △ Expense of active surveillance in animal health sector
- △ Vertical funding of AMR outside government systems
- △ Changes in funding landscape

2. Technical capacity building and retention

Enablers

- ✓ Integration of AMR into pre-service education
- ✓ National mentorship programmes/communities of practice
- ✓ Trust in data quality
- ✓ Plans for future scaling
- ✓ Quadripartite organisations

Blockers

- △ Brain drain and HR transfers
- △ Lack of private sector involvement

3. AMR data use integrated within national systems

Enablers

- ✓ Multi-sectoral stakeholder collaboration
- ✓ Digital data systems
- ✓ Primary health care reform agendas
- ✓ Antibiotic stewardship and inclusion of private sector in surveillance
- ✓ Domestic demand for data

Blockers

- △ Shortage of time for implementation
- △ Difficulty regulating AMC
- △ Reluctance or difficulty sharing data
- △ Vertical approaches not affordable

In under ten years the Fleming Fund has made a real contribution to putting AMR firmly on the agenda. Significant gains have been made in establishing quality data generation and use which are increasingly embedded in countries' internal systems and decision making. While these gains are important to identify and celebrate, so too is the "unfinished agenda" which is important to recognise in support of domestic and external resource mobilisation and policy advocacy.

While the Fleming Fund's design provided a layer of accountability and assurance, there is arguably a missed opportunity to use funding to leverage commitment from government to sustain investments through national budgets. As inflows from external development budgets shrink, channelling funding with fewer intermediaries and other ways of minimising fiduciary risks should be considered. However, technical cooperation between countries will also be important to maintain momentum and services.

Future investments will need to 'do more with less' through a process of prioritisation – something that surveillance data can and should support. Potential areas for coordinated 'optimised' solutions include:

- A form of regional pooled procurement mechanism similar to the approach adopted by the Fleming Fund for laboratory equipment and supplies to help with market shaping.
- National and cross-border network of trained personnel to support south to south skills transfer, based on the Fleming Fellowship Scheme, would be possible to replicate and could add immense value to existing initiatives.
- Integration of AMR into other programmes – for example, pooling resources in animal health to cover agricultural extension services, animal sample collection and vaccination in joint visits.
- Ensuring that laboratory services that provide bacteriological diagnosis are integrated into health sector planning, and do not remain overlooked in funding decisions for health sector improvement.

Overall, improving access to bacterial diagnosis in all sectors will help to strengthen systems, as well as provide evidence for action through surveillance data.

Introduction

The Fleming Fund is a UK Department of Health and Social Care (DHSC) initiative to support up to 25 low- and middle-income countries (LMICs) to strengthen national surveillance systems for antimicrobial resistance (AMR). Since 2017 the Fleming Fund has addressed the lack of quality assured data for use in policy and clinical practice, taking a systems approach to invest in laboratory upgrades, human resource capacity strengthening, data and data use, policy and governance. Not only does this provide surveillance data, but also important diagnostic services in both human and animal health.

Since 2017, much progress has been made towards building country-owned AMR surveillance systems, albeit with different levels of maturity across countries. This progress has only been possible because of the investments made by the Fleming Fund, working with in-country partners and grantees. The main challenge now is how to sustain these systems without ongoing support from the Fleming Fund which is due to end at the beginning of 2026.

The prospects for sustainability in some countries are good but there will inevitably also be gaps in terms of continuation of specific activities. In other countries, the likelihood of sustainment is lower, and depends heavily either on other external funding sources or on significant political will (ref: Political Economy Analysis report). These conditions seem unlikely to be met, with the changing global funding landscape meaning that some avenues of ongoing support can no longer be relied on. This situation necessitates a swifter path to self-reliance. Countries will have to decide between allocating additional domestic resources, finding other external funders, or rationalising and prioritising activities to fit within available budget.

The purpose of this paper is to provide information to support continuation of AMR surveillance, based on our decade of experience and collection of data on sustainability. There are two aspects that this paper examines:

First, to identify enablers that are helping high-performing Fleming Fund country programmes to transition to full country ownership, which can be shared with other country programmes to maximise prospects for sustainability.

Second, to identify factors which are challenges to sustainability as well as specific sustainability gaps to help countries address these[1].

The paper is organised in three thematic sections, each important pillars of sustainability:

1. Government ownership and budget allocation
2. Technical capacity built and retained
3. AMR data use integrated within national systems

1. This paper will not be able to cover all sustainability gaps but seeks to identify some gaps which have come to light as a starting point, to be built on with further country analyses.

Section 1: Government ownership and budget allocation

Enablers of sustainability

For countries showing the most progress towards sustaining AMR surveillance, the following factors have contributed to or enabled increased government ownership and budget allocations:

High level political champions – As AMR cuts across human, animal, environment and agriculture sectors, a political champion at the highest level of government brings influence that an individual line ministry lacks. In Vietnam the AMR strategy has been publicly endorsed by the Prime Minister paving the way for each sector to play its part. Without this framework, ministries are often placed in competition with each other for funding, whereas if there is a common purpose and leadership, the prospects are better. High level support at ministerial / director level within ministries is also key. Indonesia, for example, benefits from champions on AMR within both health and agriculture sectors.

Economic evidence – Advocacy and engagement with political leaders on AMR has played an important role in moving AMR up the political agenda, with economic evidence on the future burden and cost of AMR most effective. In Phase II, all Fleming Fund country grants are generating evidence on costs of AMR. In Indonesia, the Fleming Fund's relatively modest investment has been able to keep AMR at the forefront of discussions with high level decision makers in Indonesia using economic evidence. Fleming Fund is supporting important studies on burden of disease and economic impacts from AMR on human health and animal and aquaculture production.

Multisectoral approach – Where tensions can potentially exist between AMR containment and short-term economic interests in low-cost food production, building multisectoral coalitions are important to balance interests of different parties, leading to a more durable national response. Bangladesh is a good example where competing interests and complex dynamics between agencies were addressed through establishment of a multisector working group and national technical committee, with Fleming Fund support. Multi-sectoral governance arrangements – for example the creation of AMR Coordinating Committees – contribute to the demand for AMR data and thus government ownership.

Decentralised AMR governance and budgeting – In countries with devolved structures for decision-making and budgeting, building capacity for AMR stewardship and governance at all the relevant tiers is crucial for sustainability. In Pakistan, the Fleming Fund has worked at provincial level, supporting individual provinces such as Sindh to cost their entire AMR surveillance programme with a view to including this in their recurrent budgets.

Public financial management (PFM) – Where AMR is a new issue for countries with no budget lines previously assigned, it has been necessary to provide PFM support to Treasuries / Ministries of Finance to introduce budget lines relating to AMR into the regular budget structure, as a precursor to securing budget. In Kenya, the Fleming Fund has engaged with the Ministry of Finance and succeeded in adding a budget line for AMR, an important milestone.

A costed National Action Plan – Related to the above, a fully costed National Action Plan and incorporation of indicators relating to combatting resistance in national development plans are important levers for budget requests for AMR. A sound understanding of forecast requirements and costs of consumables is needed for this, and laboratory consumables need to be included in essential procurement lists. In Uganda, the National Medical Stores has requested Fleming Fund to quantify requirements for AMR surveillance (culture media, stains, reagents etc.) and this exercise resulted in some items such as VITEK cards appearing in national procurement lists.

Integration of AMR into national health insurance – Where national health insurance exists, inclusion of bacteriology testing services within benefit packages provides a sustainable and equitable source of financing for AMR surveillance. In Nigeria, the Fleming Fund is working with the Ministry of Health to make a case for antimicrobial susceptibility testing (AST) to be more readily available under the country's National Health Insurance. While basic tests are included, AST costs are currently covered only with referral to secondary or tertiary facilities.

Country Cases

Vietnam: Since the Fleming Fund started in Vietnam, the programme has worked under the close direction of government. While this is a necessity in Vietnam, it has also prepared the ground very well for sustainability. The Government takes its health reporting obligations seriously; the number of human health sites reporting to Medical Services Administration has increased from 16, when Fleming Fund started, to 58 sites currently, and is steadily increasing. However, Vietnam has not submitted data to GLASS since 2021, the year it joined the system, due to ongoing concerns about data quality and representativeness. A strategy on AMR has been endorsed by the Prime Minister, which helps drive policy prioritisation and budget allocation.

Over 90% of the population is covered by Social Health Insurance (SHI) including routine laboratory tests which are therefore funded on a sustainable basis. Consumables /reagents are procured by hospitals and reimbursed by the insurance fund. Whole Genome Sequencing and some isolate confirmation testing are not covered by SHI and Fleming Fund is currently supporting consumables for these.

Pakistan: Pakistan's decentralised provinces are responding to the challenge of sustainability. In Khyber Pakhtunkhwa province, testing for inpatients is mostly reimbursed through the government's Sehat Sahulat (social health insurance) card. In Gilgit Baltistan, the Fleming Fund provided catalytic support in the establishment of a microbiology lab for AMR which was not functional earlier. In Sindh, Fleming Fund supported a province- wide costing exercise, providing detailed estimates of the financial requirements to sustain AMR surveillance activities. The Sindh Government's aim is to include AMR surveillance in the recurrent budget, rather than in the PC1 development budget, which would be a mark of sustainability.

The Fleming Fund has conducted a study on the economic burden of AMR in Pakistan, which was reviewed and endorsed by all relevant stakeholders, including the National Institute of Health (NIH). This provides robust evidence for the government to mobilise its own financing for the AMR containment agenda. Moreover, the costing of the National Action Plan (NAP) 2024-2028, supported by Fleming Fund, has been completed and submitted to the Ministry of National Health Services for approval. This will strengthen sustainability by ensuring government ownership and securing future resource allocation for the national AMR response.

Workable models for equipment maintenance – The mass spectrometry equipment used for bacteriology – which allows automated testing with lower skill requirements – is sufficiently high tech that product guarantees preclude anyone other than the supplier carrying out maintenance. Drawing on previous experience with HIV, some countries are contemplating new supply arrangements which combine equipment maintenance with consumables supply. Uganda and Nigeria are both reported to be considering placement arrangements with equipment suppliers that would provide ongoing maintenance. Some suppliers of advanced laboratory instruments can use a rental model, with service and maintenance schedules, which reduces initial capital costs for the equipment, and ensures that these assets remain functional. This model depends on testing volume for cost effectiveness, so careful consideration is required on which sites could adopt it.

International reporting obligations – While most of the enablers of sustainability are domestic, a further enabler is the positive peer pressure that results from being part of international reporting communities such as WHO's Global Antimicrobial Resistance and Use Surveillance System (GLASS). Once countries start reporting to GLASS, they become part of a network of international collaboration which in turn establishes normative expectations that they will continue to report. Ongoing participation in GLASS brings benefits such as access for national reference laboratories (NRLs) to capacity building and confirmatory testing if necessary.

Country Case

Uganda: Despite scarce resources, Uganda has seen an increase in government ownership and resources for AMR. Fleming Fund has catalysed efforts to increase political commitment to AMR while some recent AMR-associated deaths also fuelled an interest in AMR data. A significant development has been the creation of a Parliamentary Forum for AMR supported by Fleming Fund, with a sub-committee for AMR under the Health Committee. Parliamentarians are guiding technical departments on timing of budget rounds, allowing closer working with the Ministry of Finance on budget allocation. Effective advocacy strategies have included facilitating visits by parliamentarians to hospitals, showing them the economic costs of AMR in terms of reduced food production as well as human interest stories on resistant bacterial infections.

> "You could see in the parliamentary meeting when we talked about AMR and reduction in supply of milk from cows, everybody woke up because some of them have farms themselves." **Fleming Fund Country Grantee**

There has been a gradual increase in allocation of funding for microbiology reagents by Uganda's government from about $13 million to $17.5 million over the last two years. The Permanent Secretary of MoH has recently written to the National Medical Stores asking them to allocate more budget to microbiology.

Challenges to sustainability

The following challenges to sustainability are identified, along with suggested actions to mitigate or eliminate them:

Competing priorities – Unsurprisingly, an array of other priorities plus declining external funding means that governments struggle to fully fund AMR surveillance even where political commitment, capacity and systems have been built. Economic downturns and high debts reduce the fiscal space while low per capita spending on health limits the envelope for health expenditure, posing a risk that surveillance will not be sustained at current levels. In most countries animal health is under-resourced compared to human health. As our PEA synthesis identified, specific strategic investments are needed to advance One Health approaches to AMR. One way to address this is to see surveillance systems as a biproduct of better diagnostic services and advocate based on the dual benefits of better quality (and less wasteful) client care alongside generation of AMR surveillance data for national health security, as part of an integrated "health systems strengthening" approach.

Cost of consumables and reagents – While fixed recurrent costs such as staff salaries and basic laboratory operating costs may be funded, funding for consumable supplies is often heavily constrained which impacts the number of tests that can be afforded; this in turn reduces the cost-effectiveness of the operation because sites are operating below their optimum capacity. In countries such as Indonesia and Vietnam costs for tests are sustainably funded as part of national laboratory budgets. Even so, there is a gap with supply not keeping up with demand. In Uganda reagents for automated mass spectrometry equipment are not yet on the national procurement list because of their high cost and because hospitals do not want to use their supplies budget on a small number of expensive items. This can

Country Case

Pakistan: Pakistan is one of the few countries in the world where less than 3% of GDP is allocated to health and is covering many priorities with a limited budget. While AMR policies exist, sustainable implementation of these is still a challenge. Recurrent costs for consumables and reagents are regarded as one of the biggest challenges.

> "We have provided equipment, we have built the capacity of staff, but the consumables need to be bought in every time and that is where a lot of resources are needed from the government side." **Fleming Fund Country Grantee**

Uganda: Equipment provided by Fleming Fund is maintained through a six-year contract for maintenance and not yet integrated with the government's national equipment maintenance arrangements. This is because equipment is high-tech with specific requirements for maintenance beyond hospital technicians (and during periods of warranty manufacturers maintain equipment themselves).

Regarding consumables, the National Medical Stores has requested Fleming Fund to quantify requirements for AMR surveillance (culture media, stains, reagents etc.). The country grantee has done a quantification exercise which resulted in some (not all) items such as VITEK cards – appearing in national procurement lists. However, reagents for the high-tech automated mass spectrometry equipment are not yet on the list because of their costs.

> "Each hospital has an account with National Medical Stores with a budget but they do not want to use up budget on up to three expensive items." **Fleming Fund Country Grantee**

The cost of bottles, and scarcity of stock, also means that clinicians are limited in how many bottles they can use per patient. How reagents for mass spectrometry machines are to be purchased going forward will need to be resolved.

be partially remedied by using what reagents and supplies there are more efficiently – for example, tightening up clinical protocol to focus on specific patient groups (e.g. neonates, children less than five-years-old or those with cancer). This focusses diagnostic services on those most in need.

Proprietary branded consumables – A separate issue, though related to the cost issue, is the requirement for own branded consumables, for example, blood culture bottles to work with manufacturers' equipment. In some countries such as Vietnam this can conflict with national procurement processes which require three quotes. Country procurement systems often opt for the cheapest generic bottles while hospitals say these do not work. Besides the relatively high cost, there are also periodic shortages in the supply chain of the branded bottles which drives up prices. Pooled procurement is a well-used approach to reducing cost, de-risking supply chains, and allowing commercial sector actors to enter otherwise risky markets. The Fleming Fund has provided reagents and consumables for equipment at much reduced cost compared to individual countries procuring independently. This model needs to be continued with support from a regional or global entity.

Cost of active surveillance in animal health sector – Across the board animal health is underfunded compared to human health for AMR surveillance. The animal health sector generally uses active surveillance which is relatively costly as it entails annual sample collection on farms and in otherwise healthy animals. In both Indonesia and Vietnam, while the costs of testing within human healthcare is sustainably funded, the Fleming Fund is still paying for consumables for AMR testing for animals. Elsewhere, there is a still greater sustainability gap within animal health; sustainability of AMR surveillance will depend on the willingness of private farmers to request and pay for services from public animal health laboratories, which is not yet assured. Work done by the Fleming Fund in Zambia has costed out the active surveillance and examined ways in which sample collection (which is the most costly component) can be incorporated into national animal health activities, such as vaccine rounds, or outbreak response (for example, for African Swine Fever, Foot and Mouth Disease or Avian influenza). Active surveillance in animals has contributed useful baseline data, enabling countries to advance on their learning curve, even if AMR testing does not continue as regularly in future.

Vertical funding of AMR outside government systems – The lack of AMR funds flowing through government systems (and to some extent the design of the Fleming Fund which has channelled funds outside of government) results in official budgets lacking budget lines for tackling AMR. Only the Bhutan government has been a direct Fleming Fund recipient. In Kenya, the lack of a precedent of money flowing through government for AMR surveillance hindered efforts to transition to government funding for surveillance. Engagement with ministries of finance at the design stage of programmes and national strategies is crucial for sustainability. Another way to look at this issue is by pressing for inclusion of bacteriology services within both animal and human health systems, seen as an improvement in diagnostic services, rather than direct spend on AMR surveillance. Establishing "AMR" as a vertical programme comes with risks to budget and sustainability, where embedding diagnostics within health systems may provide better incentives to maintain services.

Changes in funding landscape – Across the board there has been a very significant impact of the withdrawal of donor programmes (most notably from the US), which is causing an abrupt exit in many Fleming Fund countries and rupture of some activities. Loss of funding for the Food and Agriculture Organization (FAO) and USAID, the US Centers for Disease Control (CDC), in particular, has affected AMR activities. The discontinuation of the Fleming Fund will inevitably lead to reductions in available resources for sustaining surveillance of AMR, making domestic and alternative sources of financing more urgent than ever.

Country Cases

Vietnam: Due to inconsistent interpretation of Ministry of Health (MoH) guidance, SHI does not reimburse the cost of second blood culture bottles at some hospitals whereas more than one bottle would be best-practice. The need for proprietary branded consumables for use with MALDI-TOF equipment means that hospitals cannot comply with government's rigorous procurement rules that require 3 quotes. Sometimes, during tender processes, government sets the price too low and no vendor responds. Supply of bottles is therefore still a bottleneck, but hospitals do have the back-up option of switching to manual testing when required.

For animal health the picture is somewhat different. There are just three sites reporting as animal health uses active surveillance which is expensive and entails annual sample collection, the cost of which is borne by Fleming Fund. Fleming Fund is supporting advocacy with provinces to allocate their own funds towards AMR surveillance in the animal health sector. Starting in 3 provinces, there have been some positive results with cost share secured.

Indonesia: Political commitment to AMR surveillance is strong in Indonesia. However, there are differential budget allocations for AMR between human and animal health sectors. There is more reliance on Fleming Fund support for consumables purchased for animal health. The Ministry of Agriculture has suffered reduced budgets for the last two years, though may return to normal next year. FAO has been particularly badly affected by US cuts and Fleming Fund is working with them to try to fill gaps. Emerging priorities such as Foot and Mouth Disease outbreaks and a new massive school meals programme could cause AMR to slip down the government's agenda.

Kenya: While Kenya has political commitment to AMR, and the Fleming Fund investment has had a transformational impact, the Kenyan government has not yet taken ownership of budget allocation. Traditionally the government has looked to different funders to cover different parts of its AMR National Action Plan (NAP). One of the biggest hindrances to sustainability is at the finance level. Because of the design of the Fleming Fund grant, the Kenyan Treasury has never seen funds for AMR surveillance flow through it. This means there is no precedent of spending money on AMR, with no visible negative consequences of not spending on AMR. Kenya's Treasury makes spending decisions based on previous funding levels and the impact of previous allocations.

The Fleming Fund Country Grantee has worked with the Kenyan government to add a budget line related to AMR surveillance which will be implemented soon. Even if there is no actual budget allocation at this stage, the addition of the budget line is an important step. This underlines the importance of programmes such as the Fleming Fund engaging with ministries of finance at design stage to discuss the benefits of funding AMR activities from the government budget.

Country Cases

Bangladesh: The Government of Bangladesh (GoB) has responded to the threat of AMR, although the current political instability is having an impact on implementation. An increased allocation of resources for AMR was planned under the 5th Health, Population and Nutrition Sector Program (5th HPNSP) from an average of BDT 1,124 lakh per year for the preceding three years, to an average of BDT 1,900 lakh per year for the period 2024-2027. The current situation and delay in holding elections is stalling progress however and the future of the 5th HPNSP is uncertain. While a project proposal for One Health covering AMR has been developed with a budget of about 10 million USD over the period 2025-29, this is awaiting a decision.

According to the political economy assessment carried out for Bangladesh, the sustainability of AMR surveillance is further complicated by the complex dynamics between agencies within the Ministry of Health and Family Welfare, creating challenges for AMR coordination. Staff shortages, exacerbated by US funding cuts, and procurement challenges constrain the functionality of surveillance labs, while tensions exist between AMR containment and short-term economic interests in key sectors like livestock and aquaculture.

Indonesia: Prospects for financial sustainability of equipment and consumables are good. Early in Phase I, it was agreed with Government of Indonesia (GoI) that Fleming Fund would support specific equipment but that consumables and reagents would be covered by hospital budgets, which are substantial. Most patients are subscribed to the national insurance scheme which covers laboratory testing. Fleming Fund's investment in equipment has likely been catalytic – after Fleming Fund purchased 4 MALDI-TOF mass spectrometry machines, GoI purchased 20 more of its own. The Vice Minister of Health is a strong supporter of addressing AMR and is insisting that hospital labs allocate their own budget for consumables for bacteriology and diagnostics, and for antimicrobial susceptibility testing.

Nigeria: Consumables for the blood culture equipment supplied under the Fleming Fund are reported to be more expensive than for other brands and are more difficult to source locally. Outside the Fleming Fund, some tertiary hospitals have entered into an agreement with another supplier who is providing hosted services – placing leased automated blood culture testing equipment at sites without government having to buy it. This is regarded as a workable approach as the manufacturers are directly responsible for ensuring the equipment does not fail and for managing the supply chain for reagents which they do through local vendors. Many hospitals have joined this government scheme because of the cost and availability of blood culture bottles and reductions in capital spend.

A current sustainability gap is affordability of testing: costs of laboratory tests are an out-of-pocket cost, affecting who can access them. Under the government health insurance scheme, although a number of diagnostic tests are included in the insurance package, Microscopy Culture and Sensitivity (M/C/S) including antimicrobial susceptibility testing require a referral to secondary or tertiary care in order for clients' insurance to cover these tests. The Fleming Fund-supported National Policy Dialogue, which brings together key figures and policy makers, is making a strong case for resource mobilisation for AMR including enhanced coverage of susceptibility testing under national health insurance. Policy makers are also considering a cost-recovery approach for bacteriology tests whereby a minimal amount is charged, and funds are recycled to buy more reagents, but this continues to be a challenge due to the government's centralised finances.

Fleming Fund has done some work on awareness raising and has built capacity of the media and CSOs, leveraging these as well as core partners Nigeria Centre for Communicable Disease Control (NCDC) and the AMR Coordinating Committee (AMRCC) to advocate for budget mainstreaming of AMR with inclusion of budget lines for consumables and M/C/S tests. As a result of media sensitisation, awareness of AMR has significantly risen in the country, albeit still relatively low in peri-urban and rural areas and within sub-national governments.

Section 2: Technical capacity built and retention

Enablers of sustainability

For countries showing the most progress towards sustaining AMR surveillance, the following factors are identified which have contributed to or enabled the building and retention of technical capacity:

Integration of AMR into pre-service education – Incorporating content on antimicrobial resistance into pre-service education for medical personnel and veterinarians embeds sustainability after a programme ends. In Pakistan the Country Grantee and the National Institute of Health, under the direction of the Ministry of National Health Services, Regulations and Coordination, facilitated the development of a national AMR training curriculum for 15,000 General Practitioners, an opportunity to integrate AMR into the private sector. In Uganda, a Fleming Fund Fellow contributed to the Infection Prevention and Control (IPC) and Antimicrobial Resistance Pre-Service Curriculum Guide for the East, Central, and Southern Africa Health Community. This strategic initiative seeks to transform how AMR and IPC are integrated into training for human, animal, and environmental health professionals across the region.

National mentorship programmes/communities of practice – System strengthening approaches build domestic capacity to sustain and replicate interventions funded during a project. National mentorship programmes are a way of transferring skills to new cohorts by experts whose own capacity has been built by training and international mentoring as part of the Fleming Fund and take into account staff turnover. When implemented as part of coherent human resources for health (HRH) policies, such programmes also serve to reward and recognise achievements of laboratory professionals who are selected as mentors. Communities of practice also combine technical skill exchange with a sense of camaraderie, networking and encouragement, helping boost morale and staff retention. In Uganda, the Fleming Fund has invested in supporting the national microbiology reference laboratory through mentorship, while staff from the national laboratory then mentor people in the field. The Fleming Fund country grant has helped to develop an integrated microbiology support centre which provides online support using the ECHO platform[2] as part of an emerging sustainable community of practice.

Trust in data quality – A Fleming Fund objective has been to build on and improve the quality of AMR data so that data is trusted and which then, according to the results chain, generates demand for data as a condition for sustainability. One mechanism through which countries have seen improvements in data quality is training in Quality Management Systems and in laboratory audit skills. Building these capacities is a sustainable approach as it institutionalises continuous quality improvement, backstopped by existing regional networks. In Nigeria laboratories are now increasingly able to perform their own audits and identify and take corrective actions.

Country Cases

Pakistan: Interventions to build capacity for bacteriology have taken a systems strengthening approach – training master trainers and mentors – so that this activity can be largely self-sustaining.

The Country Grantee and the National Institute of Health, under the direction of the Ministry of National Health Services, Regulations and Coordination (MNHSR&C), facilitated the development of a national AMR training curriculum for 15,000 General Practitioners, providing an opportunity to integrate AMR into the private sector.

One factor that has supported sustainable capacity building is close linkage with the Quadripartite organisations which ensures standardised, country-centric approaches are more likely to be sustained. Training has been carried out in conjunction with the country FAO office, to build local networks and relationships. FAO has recently launched a new global level platform "InFARM", with many countries signed up. A recent workshop was held in Bangkok to update and train country level focal points. The Fleming Fund is working to support Pakistan to generate AMR data to be uploaded to this system and shared globally. Fleming Fund has also helped GoP to compile and submit annual quantitative data to WOAH) on the use of antimicrobials in animals.

Nigeria: Prior to Fleming Fund, capacity in Nigeria to generate quality AMR data that was useful for decision-making was suboptimal. There was a lack of confidence in the results coming out of laboratories because of perceived poor quality. Data was captured using manual paper-based systems making it difficult to analyse. Today, in terms of confidence in quality data, and use of data in digital formats to inform prescribing decisions, the situation has improved significantly as a result of capacity building efforts on several fronts. Fleming Fund has invested in capacity building for QMS and in laboratory audit skills to enable laboratories to run audits and take their own corrective actions. Experts from outside the country were brought in for initial training, and the country grantee worked with regional grantees including EQAfrica and ASLM to support competency training and testing. This was followed by a mentorship programme for laboratories with national experts with experience in good laboratory practices mentoring staff in 17 human health labs, 6 animal health labs and 1 environmental health lab. A Community of Practice has been created by government, as an inherently sustainable self-organising structure with representation of all One Health sector stakeholders.

Beyond generating quality data, Fleming Fund has supported tools to guide the analysis of data. Facility level antibiograms that guide empirical treatment with antibiotics where testing may not be available are being developed and staff have been trained on how to use these tools. Laboratory personnel are now able to enter data using tablets or laptops into WHONET software and can retrieve, manipulate and process the data. Facilities now export data files to a central collation point to feed into a national antibiogram and other dashboards. While this is relatively recent, capacity to sustain this is still being built towards full country independence in AMR data management.

In terms of antimicrobial consumption, the Fleming Fund has built capacity at the pharmacy departments of the respective sentinel sites to track the consumption of antibiotics and allowing comparisons between facilities. The Fleming Fund has also supported point prevalence surveys (PPS) to gather data on prescribing behaviours and use of antimicrobials at the individual level and is working with the anti-microbial stewardship committees to design interventions with clinicians' buy-in to address antibiotic misuse.

2. The ECHO (Extension for Community Health Outcomes) is a global initiative that connects healthcare experts with frontline providers

Plans for future scaling – Given that the number of qualified laboratory personnel including microbiologists are generally low, plans to scale up microbiology testing provide future career pathways and create a demand for new skills. In Bangladesh the Fleming Fund has trained 1,936 laboratory workers (30% women). The government plans to scale microbiology testing beyond the Fleming Fund supported sites, providing potential opportunities for the cohort of trained laboratory staff as future trainers and mentors. Plans to expand AMR surveillance can sometimes outstrip the available HR capacity, as is the case in Uganda, which puts pressure on HRH but may lead to further planned training and mentoring.

Quadripartite organisations (WHO, FAO, WOAH and UNEP) – A final factor that has supported sustainable capacity building is close linkage with the Quadripartite organisations which ensures standardised, country-centric approaches are more likely to be sustained. Pakistan Fleming Fund teams are working closely with the country FAO office to run joint training and supporting the Government to report into FAO and World Organisation for Animal Health (WOAH) data reporting platforms.

Challenges to sustainability

The following challenges to sustainability in terms of retained technical capacity are identified:
Brain drain and HR transfers – In many LMICs the perennial challenge to sustaining investments in skills is the transfer of personnel which can be subject to local political influences or other operational demands within a health system. Key government staff also get better paid roles in international or non-governmental organisations, including the private for-profit sector. When countries experience political turmoil, there is often higher than usual turnover of senior figures. Over the past eleven months Bangladesh has seen changes in leadership within government and power vacuums in some quarters that has paralysed decision-making. In Pakistan, as noted in the PEA, there have been large scale transfers within the bureaucracy and in the technical wings of departments, with effects on the leadership of institutions such as the NIH, potentially impacting on the sustainability of AMR investments. Bhutan has a well-documented problem with external migration (primarily to India or Australia) which has drained qualified staff from the public sector. Systems strengthening approaches which help embed mechanisms to build capacity within the country serve to mitigate this challenge.

Lack of private sector involvement – Many healthcare services are delivered by the private sector, yet capacity building within the private sector in AMR testing is extremely patchy. It is recognised that integrating the private sector into the AMR surveillance network is important given its critical role in providing services. Fleming Fund has started working witsome private sector sites (Bangladesh, Nigeria) but generally this has yet to happen at scale.

Country Cases

Uganda: the Fleming Fund has invested in supporting the national microbiology reference laboratory through mentorship. Staff from the national laboratory then support people in surveillance sites. In phase 1 of the programme, the national reference laboratory achieved accreditation from the College of American Pathologists. The country grantee has developed an integrated microbiology support centre which provides online support using the ALSM's ECHO platform. Although it is not yet fully functional, it is helping to develop a sustained Community of Practice.

There is clear incremental progress. Government is investing in some regional hospitals which are not supported by Fleming Fund and is now scaling up microbiology laboratories to make testing available at general hospitals and even health centres. For lower-level facilities – health centres – the likely challenge is going to be human resources. Although there are government plans to scale services, the HR structure for this level of facility, may not include a microbiologist.

Contributing to a regional sustainable approach, a Ugandan Fleming Fund Fellow contributed to the Infection Prevention and Control (IPC) and Antimicrobial Resistance Pre-Service Curriculum Guide for the East, Central, and Southern Africa Health Community, transforming how AMR and IPC are integrated into training for human, animal, and environmental health professionals across the region.

Bangladesh: Phase 2 of the Fleming Fund has been working on capacity building in human and animal health (including aquaculture) and more recently working on environmental health with the Institute of Public Health. The Fleming Fund supports 21 sentinel laboratories in 11 of Bangladesh's 64 districts, as well as working with two reference laboratories (one each for human health and animal health). Apart from support for equipment and logistics, 1,936 laboratory workers, of whom 30% are women, have been trained in quality data and data flow processes. The sites are successfully reporting into an AMR surveillance dashboard as well as reporting to WHO's GLASS through the National Coordination Centre.

This investment in skills has laid foundations for the Government's planned national expansion of its AMR surveillance programme. Resistance patterns are changing, for example, in the hill tract areas, and more sites are required for a representative picture. A Fleming Fund regional grant – CAPTURA – has supported the completion of a National Antimicrobial Prescribing Survey (NAPS) at four key healthcare institutions across Bangladesh which represents an important milestone in national efforts to strengthen capacity for antimicrobial stewardship (AMS).

Section 3: AMR data use integrated within national systems

Enablers of sustainability

The following enablers are identified which have contributed to consistent AMR data use integrated within national systems:

Multi-sectoral stakeholder collaboration – Closely related to the enablers for country ownership and budget allocation, multi-sectoral collaboration and One Health governance structures for AMR are an essential precursor for sustainable use of data within national systems. Across the board Fleming Fund has supported relevant ministries to establish One Health working groups to create sustainable governance structures. In most settings, functioning multisectoral structures such as AMR Coordinating Committees, with efforts organised around a National Action Plan, drive demand for AMR data.

Digital data systems – Digital data systems – for data to be used, it has to be easy to retrieve. Replacement of paper-based systems with user-friendly digital systems has been important for establishing workable data use routines. As we identified in the PEA synthesis, it is important that new technologies are tailored to local context, infrastructure, systems and capacity. In Uganda, the Fleming Fund supported a new digital system within the national reference laboratory for AMR which integrates pharmaceutical and laboratory data. This has now transitioned from external servers to government servers.

Primary health care reform agendas – in countries actively pursuing a primary health care (PHC) reform agenda, focusing on universal access to quality health services and preventive health, opportunities to integrate AMR emerge as part of better testing and diagnostic services. In Indonesia, where the government is pursuing its Health System Transformation Agenda, MoH is in the process of setting up a sample referral system of bacteriology samples from PHC level to district, provincial and national levels, to gradually expand the surveillance network to primary care level. This helps build the case for bacteriology services supporting universally available high quality clinical care.

Antibiotic stewardship and inclusion of private sector in surveillance – efforts to expand AMR surveillance to the private sector create stronger linkages between AMR surveillance and real-world prescribing behaviours and AMR control, given the volume of health services delivered by the private sector in many settings. Bangladesh is adding 24 private sector laboratories to the surveillance network. It has also carried out an antibiotic prescribing study with a view to strengthening antibiotic stewardship across the board.

Country Cases

Bangladesh: The Fleming Fund is working with GoB to adopt a multi-sectoral approach in an effort to bring together the various actors. It has helped to set up a multi-sector working group and a national technical committee. In 2024, the Fleming Fund regional grant CAPTURA successfully supported a National Antimicrobial Prescribing Survey (NAPS) in partnership with national stakeholders including the Communicable Disease Control (CDC) division and the Institute of Epidemiology, Disease Control and Research (IEDCR) and the Directorate General of Drug Administration (DGDA). Subsequent point prevalence surveys (PPS) for antimicrobial use (AMU) conducted with the support of the country grant have accentuated the urgency of antimicrobial stewardship (AMS) to the government. The Fleming Fund has supported development of a national guideline on AMS for health facilities, and through its clinical engagement programmes has sensitised local clinicians and laboratory personnel to AMS at the facility level.

While GoB has a commitment to AMS, controlling antibiotic use in practice will remain a challenge. Producers are yet to properly engage with the need to prevent farmers misusing antibiotics, and have a high degree of influence over this group. Within human health, a recent Drug Act has passed but its implementation will need strong HR and monitoring. AMR data has been used during the formulation of Standard Treatment Guidelines for Common Infectious Diseases in Bangladesh. While an antibiogram exists, there is no protocol developed yet on how to use it locally, and institutional antibiotic use treatment guidelines are still needed. Currently all AMR data comes from the public sector. Fleming Fund is helping government to expand surveillance to the private sector where much health care is delivered in Bangladesh; 24 private sector laboratories will be added to the sentinel surveillance network as part of a significant expansion.

Indonesia: AMR is well integrated in national data use systems. There is an increasingly unified sense of what the AMR surveillance programme looks like and how that informs decision making at national level as well as within individual institutions. The Fleming Fund has supported the technical ministries and the coordinating ministries to establish One Health Working Groups and a national task force, creating sustainable governance structures. The National AMR Strategy for Human Health (StraNas), released in September 2024, guides Ministry of Health (MoH) initiatives, systems and mechanisms, within a people-centred approach with emphasis on joined up working.

While the target of 150 hospitals reporting to GLASS this year is a great indicator of success, AMR surveillance does not yet reach the primary healthcare (PHC) level which, in a country of Indonesia's size, is huge. Whereas the reporting hospitals provide a controlled setting for monitoring AMR, a lot of first- and second-line antibiotics are used at PHC level to treat upper respiratory tract infections and diarrhoeal disease, without attention to antibiotic stewardship or AMR surveillance. Neither WHO not the Fleming Fund work at this level, though the MoH is beginning to address this gap. It is in the process of setting up a sample referral system from PHC level to district labs, and then up to province and national levels. A guideline and national decree has been developed with Fleming Fund support but trials are needed to ensure the system works, and national budget still needs to be secured to cover the associated costs.

Within the animal health sector, budget allocation is a major issue. The Ministry of Agriculture's (MoA) budget has fallen in the last two years, impacting its programmes. Three to four years ago, the MoA was fully funding active AMR surveillance in broiler chickens but could not continue this over the last two years. The Fleming Fund stepped in to support this activity in order not to lose this important longitudinal data set and spur further national budget allocation, which is essential for understanding trends and detecting quality issues. MoA's budget may now recover somewhat but better efficiencies and integration of sample collection from animals with other animal health activities are needed to optimise use of scare resources.

Domestic demand for data – governments are increasingly recognising that AMR surveillance is not simply a diagnostic service and cost to the health system but can also offer savings for the wider health system if there is adequate data which is used for decision-making. Uganda has begun exploring whether there is scope to cut expenditure on ineffective drugs, and the Fleming Fund country grant has helped to augment existing data with field surveys to support this sort of decision-making and savings. Linking AMR data with shorter term financial benefits therefore enhances commitment to sustained AMR surveillance.

Challenges to sustainability

The following challenges to sustainability in terms of integrated data use are identified:

Shortage of time for implementation – Underpinning the Fleming Fund's theory of change is a sequence from generating robust data (focus of Fleming Fund phase 1), to supporting data use (focus of phase 2), and ultimately to effective antimicrobial stewardship and control. Although the programme will have run for 8 years overall, time has been lost in preparing for multiple short term funding rounds, as well as due to COVID-19. Inevitably the time required for embedding and institutionalising data use is insufficient in some settings. Countries not yet using AMR data for the purpose of controlling AMR (thus realising benefits in terms of AMR containment) may struggle to mobilise domestic resources for continued surveillance.

Difficulty regulating AMC – In many settings there is still a gap in terms of AM stewardship and development of clinical treatment guidelines especially at primary care level and in the private sector. Regulating antibiotic use within animal health also has difficult political economy challenges. This gap poses a challenge to governments' ability to use AMR data effectively.

Country Cases

Vietnam: Prior to the Fleming Fund, AMR was not well understood in Vietnam although there was a long history of research and One Health approaches due to Vietnam being considered a hotspot for avian influenzas since 2005. Strong collaboration already existed between human health, animal health and environment sectors. A national coordination mechanism continues to be led by a cross-sectoral steering committee within government, while an informal One Health Partnership has been formed that acts as an effective bridge between international and national partners on One Health issues including AMR.

The functioning multisectoral structures facilitate the use of AMR data within national systems, and data quality assurance is regarded as important. AMR data is reported from 58 sites which creates a burden of work. Efforts are ongoing to establish a system to quality assure and interpret data – as stakeholders understand that poor or badly interpreted data is worthless, even dangerous. Under phase 2, the Fleming Fund is advocating for an advisory committee as a data review mechanism to monitor quality and trends. The Fleming Fund is also conducting a pilot of whole genome sequencing (WGS) as government plans to include confirmation testing as part of healthcare services in future and requires evidence on its value.

In terms of antimicrobial consumption (AMC), government requires every hospital to undertake AMS, however there are not yet clear guidelines to clinical practitioners on prescribing. This is a priority for future programming to ensure that data on observed AMR trends can support clinical antimicrobial use. In the animal health sector, AMC data from all importing, exporting and manufacturing companies is required to report to government on regular basis.

Nigeria: In its second phase, Fleming Fund has contributed to major policies, strategies, guidelines and protocols to guide AMR surveillance in human, animal and environmental health with a focus on multisectoral participation by stakeholders from the outset. Nigeria's political economy analysis established that AMR data is being used to report internationally to GLASS but not yet used substantially to influence national and local facility decision-making. Data generated through routine testing are shared with the NRL and national bodies (Federal Ministry of Livestock Development, Federal Ministry of Environment, National Environment Standards Regulatory and Enforcement Agency, and AMRCC of the (NCDC) and ultimately inform Nigeria's reporting into GLASS.

Despite the existence of AMS committees at sites, there was no evidence of data being used to generate antibiograms to influence practice and communicate feedback to prescribers in most sentinel sites. Clinicians tend not to use AST routinely, because of both out of pocket costs and testing turnaround times, and therefore rely on empirical treatment, using AST only if first- or second-line antibiotics fail. The Fleming Fund is leveraging the multisectoral stakeholder base it has built to address such issues, for example by organising sensitisation workshops with the National Health Insurance Authority (NHIA) and MoH's Department of Laboratories to try to persuade the government to cover AST under its national insurance scheme to reduce the cost barrier. The Fleming Fund has also supported tools to guide the analysis of data. Facility level antibiograms that guide infection treatment have been developed and staff have been trained on how to use these tools. Laboratory personnel are now able to enter data using tablets or laptops and can retrieve, manipulate and process the data.

Plans are in place for data files to be exported from facility level to a central national data management system – AMRIS – that is being developed under the Fleming Fund. These will then feed into a national antibiogram alongside facility-specific antibiograms. While AMRIS is not yet functioning, capacity is being built towards this goal. In the animal health sector, use of data to inform day-to-day activities at the site level was found to be limited. One issue is the absence of feedback to laboratories following their reporting, and no systematic way of using the information to sensitise vets and farmers. Nigeria's large private sector has also not been included in existing structures for generating and reporting surveillance data.

A potential solution identified in the PEA for Nigeria was for NCDC to develop standardised, easy-to-use tools and a central repository into which the private sector can report data on AMR and antimicrobial use surveillance. Since then, one animal health private sector lab has been added to the network, while two human health private sector facilities have been included in AMC training conducted by Fleming Fund last year and one has started contributing routine AMC data to the national pool. These facilities are now part of the network of facilities currently being supported. A One Health private sector inclusion strategy has been developed and validated for human health and animal health sectors, helping ensure the sustainability of current achievements in the private sector space.

Country Cases

Uganda: a significant area of progress under Fleming Fund has been digitising data so that it can be more readily used given that paper-based systems are not practical for data retrieval and use. It was not possible to integrate AMR data within an existing laboratory information system (A-LIS) used by ministries for other One Health purposes as there was no provision in this system for microbiology. The Fleming Fund helped to create a new system within the national reference laboratory for AMR which integrates pharmaceutical and laboratory data. This has now transitioned from external servers to government servers. MoH is proud of the system, which is regarded as crucial to sustainability of AMR surveillance.

More progress is needed, however, on data sharing and use. Government has not been quick to release data. It is important that this data is seen by Emergency Operations Centres (EOCs) so they can detect and monitor AMR outbreaks in hospitals or communities. Ultimately the National Institute of Public Health and EOCs want to use data to make evidence-based decisions on prescribing guidelines and whether any drugs should be discontinued – a test of true integration and sustainability of AMR programming.

In 2024, as a consequence of budget pressures, there were demands from the MoH in Uganda to know whether they should stop importing certain drugs based on the available antimicrobial susceptibility data. The data did not exist, however, to support such consequential decisions as test numbers through passive surveillance were inadequate, and the picture would vary from region to region and from patient to patient. The MoH agreed to support a survey to get a picture of what was happening at district and community levels to enable development of regional and local antibiograms. Augmenting data in this way to support functional decision-making (and potential cost-saving), is important for demonstrating the utility of AMR surveillance, essential for sustainability.

Although Uganda's government is aiming to increase the volume of testing through passive surveillance, this uses a "hub and spoke" sample transportation system which is currently dependent on external funding. The arrangement serves multiple diseases as well as microbiology; samples are transported from health facilities for testing at regional laboratories. Fleming Fund supports some unmet needs such as movement of isolates from regional to national level while overall the transportation system is largely reliant on PEPFAR funding. In the weeks following the US Stop Work orders, sample transportation fell not just for HIV but for AMR samples, which coincided with a local spike in AMR cases. As government plans to scale up microbiology at lower tiers of the system, there will be a continued need to adequately fund the sample transportation system, especially given the constraints on availability of HRH in microbiology at local levels.

Reluctance or difficulty sharing data – Governments often perceive data as sensitive and can be protective of it which hinders timely data sharing and data use. Similarly, the private sector is often not incorporated into structures for generating and sharing data, both because of capacity but also data concerns. PEA studies highlighted a lack of dedicated resources for complex shared tasks such as alignment of AMR data systems.

Vertical approaches not affordable – Given steep declines in available funding, some 'vertical' approaches – such as active surveillance in animals – may require modified approaches in future. In Indonesia, for example, active surveillance of broiler chickens has challenged Ministry of Agriculture budgets in the recent past. There is a need for more integrated ways of working to reduce transaction costs for single interventions, for example carrying out animal vaccination, farmer education and outreach and AMR/ or disease surveillance in combined visits.

Conclusions

From the country examples highlighted in this paper, it is clear that the Fleming Fund has made a real contribution to putting AMR firmly on the agenda. Transforming AMR from a little understood phenomenon to the existence of robust surveillance systems and effective control of antimicrobials throughout Africa and Asia is arguably a multi-decade, not a multi-year undertaking. Significant gains have been made in establishing quality data generation and use which are increasingly embedded in countries' internal systems and decision-making. While these gains are important to identify and celebrate, so too is the "unfinished agenda", which is important to recognise in support of domestic and external resource mobilisation and policy advocacy.

Integral to the Fleming Fund's design was grant-making to third parties to support building of national systems for AMR surveillance. Enormous efforts were made by the Management Agent and Country Grantees to engage and consult with government. While this design provided a layer of accountability and assurance, there is also arguably a missed opportunity to use funding to leverage commitment from government to sustain investments through national budgets. In Bhutan, the only country where Fleming Fund channelled funds direct to government, the transition to full national ownership is inherent in the design. As inflows from external development budgets shrink, channelling funding with fewer intermediaries and other ways of minimising fiduciary risks should be considered. However technical cooperation between countries will also be important to maintain momentum and services.

Similarly, future investments will need to 'do more with less' through a process of prioritisation – something that surveillance data can and should support. The Fleming Fund has worked with country governments to proactively address sustainability throughout the second phase of the programme using evidence-based approaches and supported by work on the costs of continued AMR surveillance and probable impacts of uncontrolled AMR. This evidence will provide valuable output helping countries make decisions around prioritisation. Furthermore, roundtables planned in eight countries will provide a dialogue platform for governments and funders to take stock of achievements as well as critical sustainability gaps.

Looking at the common sustainability gaps across countries, there are some potential areas for coordinated "optimised" solutions going forward, more effective than vertical approaches or single country actions:

- Given that cost of consumables is a significant issue faced by individual countries, a form of regional pooled procurement mechanism similar to the approach adopted by the Fleming Fund for laboratory equipment and supplies would help significantly with market shaping, to help create lower prices through economies of scale – increased volumes from pooled regional demand. Lower prices would also help drive increased testing within human and animal health systems, establishing a virtuous circle contributing to more robust supply chains.

- Mentoring schemes are a sustainable way for national governments to build and retain capacity. A national or cross-border network of trained personnel would support South-South skills transfer at a greater scale. A regional Fellowship Scheme based on the model designed and implemented under the Fleming Fund would be possible to replicate and could add immense value to initiatives such as the World Bank's Pandemic Fund or the UK ASEAN Partnership for Health Security, which have available resources.
- Improving access to bacterial diagnosis in all sectors will help to strengthen systems, as well as provide evidence for action through surveillance data. Laboratory services that provide bacteriological diagnosis need to be integrated into health sector planning and not overlooked in funding decisions for health sector improvement. In the human health sector, better diagnostics for patients in hospitals will inevitably pay dividends in reducing morbidity and mortality and have direct impacts on health system resilience and strength.
- Taking a more systems approach within countries as in coordinating resources in animal health to cover agricultural extension services, AMR sample collection and vaccination in joint visits. A study is being undertaken on alternatives to active surveillance to carry out AMR surveillance in animals and results will be made available as a global good.

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