A Change Story: The Fleming Fund strengthening AMR surveillance systems in low- and middle-income countries (2018–2022)

The value of surveillance

Antimicrobial Resistance (AMR) is a major global problem, which will result in millions of deaths and great economic cost if nothing is done to address it. **Bacteria** are developing resistance to the antibiotics used widely across all areas of human health, animal health, and agriculture. Addressing AMR requires a cross-sectoral (One Health) and international approach. Improving surveillance of antibiotic use and the drug-resistant bacteria in humans, animals and the environment builds up a surveillance 'map' to track resistance and drive the changes needed to address the problem.

AMR surveillance is an essential component of the global response to AMR and without it the world is '**flying blind**'. Good surveillance relies on quality diagnosis for bacterial infections, which also means patient treatment is improved through AMR testing. In low- and middle-income countries (LMICs), the threat is even more acute. Communities rely heavily on antibiotics for health and economic security but have limited access to diagnosis and effective treatment.

Generating AMR data

The Fleming Fund is working with grantees and local stakeholders to transform surveillance and improve healthcare outcomes. AMR surveillance is the systematic collection, analysis, and interpretation of data on the occurrence and spread of bacteria that have become resistant to antibiotics, and accompanied by data on antibiotic use.

In human health, surveillance typically involves collecting samples from patients with suspected bacterial infections and diagnosing the cause of disease and its antibiotic susceptibility. Samples can also come from environmental and veterinary sources, and are used to detect resistance

trends, identify emerging threats, and support evidence-based policy development. Therefore, it is not possible to generate relevant AMR surveillance data without the required laboratory capacity and systems, a trained workforce, and empowered national AMR leadership.

The Fleming Fund investment

The Fleming Fund, established in 2016 by the UK government, has supported national surveillance systems in LMICs to monitor, track, analyse and share AMR data to inform patient care, and evidence-based policy and regulation. The programme operates in 23 African and Asian countries, building on the Global AMR Action Plan to promote a One Health approach in human health, animal health and the environment. This brief report demonstrates the transformative changes that have occurred across more than 250 laboratories.

The Fleming Fund has been delivered by the UK Department of Health and Social Care, their management agent (Mott MacDonald) and over 100 grantees working in partnership with government decision-makers, health and veterinary professionals, and the academic community. These all deserve full recognition for the collaborative and far-reaching achievements shown.

In 2018 (before Fleming Fund investment):

14
countries had National Action Plans (NAPs) but no surveillance systems in operation

Around 50%
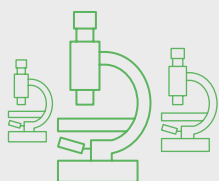of supported laboratories required some level of refurbishment

40
laboratories shared AMR data with National Reference Laboratories
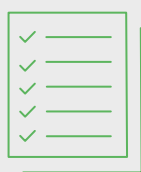
6
countries submitted AMR data to WHO GLASS

The Fleming Fund has supported:

279
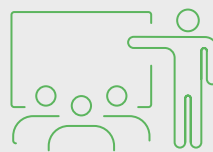human and animal health laboratories in 20 countries

18
countries with functioning surveillance systems

175
laboratories supplied with the necessary equipment

25,452
training attendances completed

181
Fellowships completed

25
free online course modules on tackling AMR globally

Around 2 million
human and animal samples tested for AMR

Around 30,000
whole genome sequences for AMR in Africa

53%
sites that participated in External Quality Assessment, scoring more than 80%

Around 97%
supported laboratories achieved core performance/functions*

*as defined by the London School of Hygiene & Tropical Medicine roadmap

In 2022 (after Fleming Fund investment):

279 laboratories supported

20 countries (global laboratory strengthening for LMICs)

By the end of phase 1 (end of 2022), there were 279 laboratories supported by the Fleming Fund across 20 countries, covering human, animal, environmental, in aquaculture, and food health sectors. In a typical country, there was an average of 1-2 human health National Reference Laboratories; 7-8 human health surveillance sites (hospital laboratories). These worked with a national veterinary laboratory and field veterinary/animal health laboratories. Each surveillance site was assessed in detail to make plans for renovation, improvement in utilities (water, electricity), equipment and training requirements.

175 laboratories supplied with necessary equipment

Infrastructural improvements

Following laboratory assessments, one of the first steps was to refurbish laboratories to safely deliver microbiology services. Half of the sites required infrastructure repair and renovation to provide safe working conditions before AMR data production. Surveillance sites were then equipped with items including automated blood culture capabilities (human health sites), antibiotic sensitivity testing platforms and spectrophotometry, determined by what was considered appropriate for each laboratory's need and function.

25,452 Training attendances

181 Fellowships completed

Human resource development

Workforce development was a core contribution to countries for strengthening AMR surveillance. The programme invested extensively in building the capacity of key personnel required to generate quality-assured data, analyse and use AMR data sustainably. This happened via three main modalities: training of key staff, a Fellowships scheme, and an online curriculum on AMR developed by the UK Open University.

Around 2M Samples processed

Increased AMR data production

Surveillance sites demonstrated incremental improvements in their ability to process different sample types, such as blood, stool, urine and cerebrospinal fluid; and their ability to undertake culture and drug sensitivity testing on a wider range of WHO priority pathogens. Both human and animal sectors significantly broadened the range of pathogen types being tested at the surveillance site level during phase 1.

53% Supported sites record improvements in data quality

Improving AMR data quality

Human resource strengthening efforts supported by the Fleming Fund contributed to improved capacity of laboratory staff across supported sentinel sites. This yielded AMR data quality improvements over time. Comparisons of phase 1 baseline data versus end point data demonstrate improvements for all data quality markers for both human and animal health supported sites.

16 of 18 countries submitted AMR data to WHO GLASS

Improving AMR data sharing

A key pillar of global efforts to improve surveillance is the WHO's Global Laboratory Surveillance System (GLASS) platform. The platform is used to gather data from WHO member states into a large global database. Major progress was made with data submission to GLASS, signifying the strengthening and broadening of AMR surveillance networks. Within countries, there was an increase in the number of surveillance sites submitting AMR data to their respective National Reference Laboratories from 15% of sites in 2018 to 66% in 2022.

Improving national surveillance systems

18 of 20 countries have functioning surveillance systems**

Fleming Fund-supported countries were classified on an 'A-D' scale according to the maturity of their surveillance systems at baseline. At the end of phase 1, countries were assessed against the same categories. Of 20 countries in the initial phase of the Fleming Fund, 18 (90%) countries moved up or improved by one or more categories. These countries now have a better picture of the spectrum of resistance from more patients, and more animal species, more clinical syndromes, more sample types, and can analyse a higher number of GLASS priority pathogens, compared to the beginning of the programme. This has positively impacted the ability to track, review, and analyse AMR data at local, country, regional, and international levels. The two countries that did not change from the baseline catergorisation, progress was made during phase 1, but not enough to move up the classification scale.

**strengthened from baseline classification

The Fleming Fund programme has demonstrated:

- **The power of partnerships:** Close partnership and co-planning with country governments from the outset, and throughout, has been critically important. Change at 'grassroots' surveillance sites) is determined by leadership support from all levels of the system.

- **Change is feasible:** Results show that it is feasible to build AMR surveillance systems in LMICs – and relatively quickly from a very low baseline. Core objectives have been achieved – quality AMR data produced, analysed and shared at domestic and international levels.

- **Change is not a simple or linear process: :** Change takes time, and pace will differ within and across contexts.

  - Change is often not stable (i.e. changing behaviour and systems go forwards and backwards) before stabilising, implying that support over time, and active planning for sustainable change, is vital.

  - Change requires ambition but a readiness to adjust ambition and approach in the face of challenge and adversity.

Wider benefits and broader human and animal health systems change have resulted from the support for AMR surveillance. The benefits include better diagnostic services for patients and in animals; improved access to effective treatment; implementation of preventative measures such as infection prevention and control; improved political will and attention; and the use of data to drive the improved use of antibiotics in human medicine and agriculture. There are also broader benefits of building AMR surveillance capacity in LMICs in reducing the risk of drug-resistant infections spreading across borders and globally.

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MOTT MACDONALD