The Fleming Fund

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The cost of sustaining AMR surveillance systems in human health: Case Study from Zambia

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Contents

Authored by **Timothy Worth**, **Daniel Whitaker**, **Toby Leslie**, **Adrienne Chattoe-Brown**, and **Heidi Hopkins** at Mott MacDonald, the Fleming Fund Management Agent.

With support from the **Fleming Fund Grantees** and staff at the **Livingstone Teaching Hospital**.

Technical Assistance for Data and Evidence Use Africa (TADE Africa)

Moctar Mouiche
African Society for Laboratory Medicine (ASLM)

Ntombi Nkonde
The University of Zambia (UNZA)

Zambia Country Grantee

Kaunda Kaunda
Centre for Infectious Disease Research in Zambia (CIDRZ)

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Acronyms

AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
AMU	Antimicrobial use
AST	Antimicrobial Susceptibility Test
ASLM	African Society for Laboratory Medicine
DHSC	UK Department of Health and Social Care
IPC	Infection Prevention and Control
LSHTM	London School of Hygiene and Tropical Medicine
LMICs	Low- and middle-income countries
LTH	Livingstone Teaching Hospital
NRL	National Reference Laboratory
PPS	Point Prevalence Survey
UTH	University Teaching Hospital Lusaka
VfM	Value for Money
ZNPHI	Zambia National Public Health Institute

Executive Summary

The Fleming Fund has supported antimicrobial resistance (AMR) surveillance capacity building in Zambia since 2018. In the human health sector, this support contributed to substantial improvements in laboratory infrastructure, equipment, workforce development, quality assurance, governance, and the routine use of data. These investments were associated with measurable gains in diagnostic capacity, sample throughput, laboratory performance, and antimicrobial stewardship (AMS) practices. The example of Livingstone Teaching Hospital (LTH), which has benefitted from the programme, illustrates how targeted investments can mature into functional surveillance systems that support clinical decision-making, influence prescribing behaviour, and inform policy.

Our analysis shows that surveillance capacity can be established relatively rapidly when investments are well-sequenced and aligned with national priorities. However, sustaining and fully realising these gains is significantly more challenging. Recurrent costs, particularly consumables and equipment maintenance, remain heavily donor-dependent, while procurement failures, staff turnover, uneven engagement by clinicians, and reliance on individual champions reduce system resilience and efficiency.

Cost and output analysis across sentinel sites also demonstrated economies of scale, with higher-throughput and more mature laboratories achieving lower costs per sample. Once laboratories move beyond the set-up phase, the principal sustainability challenge is no longer capital investment, but reliable financing for recurrent inputs, particularly consumables, equipment maintenance, and staff time. Without stronger domestic financing and more reliable procurement systems, recent gains risk erosion after donor support ends.

At the same time, the Fleming Fund has created durable assets that provide a strong platform for future AMR-related interventions, including functional laboratories, skilled personnel, governance structures, and routine data flows. The central conclusion of this review is that sustainability is not only a financing issue, but a systems-alignment challenge. The long-term value of AMR surveillance depends on whether countries can embed diagnostic services, procurement, stewardship, and data use into routine, trusted, and financed health-system functions.

Key recommendations

- **Protect core diagnostic and surveillance functions**
  Prioritise domestic funding for recurrent costs, particularly consumables, equipment maintenance, and essential laboratory staff, recognising diagnostics and surveillance as core health-system functions rather than donor-dependent activities.
- **Treat procurement as a stewardship intervention**
  Reliable supply of reagents, blood culture bottles, and appropriate antibiotics is essential not only for laboratory continuity, but also for sustaining appropriate prescribing behaviour and clinician trust in diagnostics.
- **Institutionalise stewardship and data use**
  AMS committees, audit processes, and feedback mechanisms should be embedded within governance, job descriptions, budgets, and performance frameworks, reducing reliance on individual champions.
- **Invest in clinical education and behaviour change**
  Embedding AMR and stewardship principles in pre-service and in-service training offers a more sustainable approach than ad hoc training alone.
- **Consolidate and transition**
  Future support should focus on consolidation, transition planning, efficiency gains, and institutionalisation rather than new infrastructure, to protect and extend the value of the Fleming Fund’s investments.

1. Introduction

Antimicrobial resistance (AMR) refers to the ability of microorganisms, such as bacteria and viruses, to withstand the effects of medications used to treat them. When previously treatable infections become resistant, therapeutic options narrow, clinical outcomes worsen, and health-system costs increase. In 2021, an estimated 1.14 million deaths were directly attributable to drug-resistant infections, with a further 4.71 million deaths associated with AMR, underscoring the scale and urgency of the threat[1].

The burden of AMR is disproportionately concentrated in low- and middle-income countries (LMICs), where access to diagnostics, effective treatment, and infection prevention measures is often constrained. Sub-Saharan Africa and South Asia experience AMR-attributable mortality rates of nearly double those observed in high-income countries[2]. Beyond health impacts, resistant infections impose substantial economic costs through prolonged hospitalisation, increased treatment expenses, and reduced productivity[3]. While there has been growing recognition of the increasing burden of AMR, this phenomenon presents a pervasive and gradually escalating threat to human health and development.

Tackling AMR requires a multifaceted response that includes infection prevention and control (IPC), antimicrobial stewardship (AMS), equitable access to effective antibiotics, and the development of new therapeutics and vaccines. Central to all these efforts is AMR surveillance. Surveillance systems generate the data needed to guide clinical decision-making, inform stewardship policies, detect emerging resistance, and prioritise investment. As such, AMR surveillance is not merely a data-collection exercise; it is a core health-system function that underpins diagnostics, clinical behaviour, governance, and accountability[4].

To help address this complex issue, the UK government committed £475 million between 2016 and 2026 through the Fleming Fund to strengthen AMR surveillance in LMICs in Africa and Asia. The Fleming Fund supported laboratory infrastructure, equipment, workforce development, quality assurance, data systems, and governance across human, animal, food, and environmental health sectors, promoting a One Health approach to AMR surveillance.

However, AMR surveillance is widely perceived as resource-intensive and difficult to sustain, particularly in settings facing competing health priorities and constrained public finances[5]. While donor-funded investments can rapidly establish laboratory and surveillance capacity, far less is known about whether, and under what conditions, these systems become routine, trusted, and sustainably financed once external support ends. Surveillance systems that function intermittently due to resource constraints or are undermined by supply-chain failures and weak clinical uptake, risk delivering limited long-term value despite substantial upfront investment.

As the Fleming Fund approaches its conclusion, this review examines the development of human health AMR surveillance through the lens of value for money (VfM) and sustainability. Using the Fleming Fund's experience in Zambia, and the Livingstone Teaching Hospital as an in-depth case study, this report explores what was achieved, how and why change occurred, where progress proved fragile, and what factors are likely to determine whether surveillance capacity translates into durable health-system gains.

1.1 AMR surveillance in the human health sector

The Fleming Fund invested in strengthening AMR surveillance systems through a portfolio of Country Grants, Regional Grants, and a Fellowship Scheme managed by Mott MacDonald, and Global Projects managed by the UK Department of Health and Social Care (DHSC). This Grants Programme achieved significant progress across One Health sectors, but especially in human health AMR surveillance (Box 1).

Despite the perception that surveillance systems are costly[6], they have a significant impact on health system efficiency and effectiveness[7]. The main investment in AMR surveillance is laboratory capacity, which also provides essential diagnostic services. Availability of accurate and timely diagnostic services enable correct clinical diagnoses and antibiotic prescribing, shorter patient care pathways, and guidance for appropriate IPC measures. When used effectively, these investments deliver tangible benefits: reduced medication waste, fewer clinical complications, lower hospital costs, shorter hospital stays, and ultimately improved patient outcomes and system efficiencies. Furthermore, when laboratory data is shared and collated, locally generated data can inform guidelines at every level local, national, and global, allowing evidence-based enhancements in AMS, IPC, and directing future investments.

1. Naghavi, M. et al. (2024). **Global burden of bacterial antimicrobial resistance 1990-2021: a systematic analysis with forecasts to 2050, The Lancet.**
2. OECD (2023). **Embracing a One Health Framework to Fight Antimicrobial Resistance.** OECD Health Policy Studies, OECD Publishing, Paris,
3. WHO (2015) **Global action plan on antimicrobial resistance**.
4. Painter C, Limmathurotsakal D, Roberts T et al. (2025) **Sustainable antimicrobial resistance surveillance: time for a global funding mechanism**, *The Lancet Infectious Diseases*.
5. Painter C, Limmathurotsakul D, Roberts T et al. (2025) **Sustainable antimicrobial resistance surveillance: time for a global funding mechanism**, *The Lancet Infectious Diseases*.
6. de Lemos, A.N., Aliswag, E.G. (2025). In: Jain, P.R., Khan, U.S. (eds) **Introduction to Public Health and Research**. *Public Health Surveillance.*
7. **African Society for Laboratory Science (ASLM).**

Box 1: Human health AMR surveillance achievements across the Fleming Fund

- Strengthened microbiology capacity in over **218 laboratories** across partner countries.
- Supported routine GLASS reporting across over **20 countries.**
- Invested in **workforce development** through fellowships, mentorship, and Quality Assurance systems.
- Established a Fellowship programme and alumni network for around **400 professionals**.
- **Enabled surveillance data** use for guidelines, stewardship, and procurement decisions.
- Enabled the processing of **over 6,926,000 clinical samples**.

1.2 Methodology

The case study reported here employed a mixed methods approach combining quantitative Fleming Fund programme data with qualitative insights. It examines how investments in human health AMR surveillance translate into operational capacity, behavioural change, and sustainability.

Quantitative analysis drew on programme data, including sample throughput, procurement records, Point Prevalence Surveys of antibiotic prescribing, and cost data (associated with microbiology and AMR surveillance) collected through the Technical Assistance for Data and Evidence Use (TADE Africa[8]) Regional Grant and the Zambia Country Grant[8]. To facilitate analysis, the cost and output data was broken down into five components: the source of funding, and those needed to establish AMR surveillance and those ongoing costs (Box 3 and Box 4).

Qualitative data was collected through a field visit to Zambia in February 2025, including site visits and discussions with laboratory staff, clinicians, hospital managers, and national AMR stakeholders. This facilitated insights that supported an understanding of how surveillance investments influenced clinical practice, governance, and perceptions of value and sustainability. Further details can be found in the Annex.

The case study does not seek to attribute all these changes solely to the Fleming Fund. However, it does seek to assess observed changes that are plausibly linked to Fleming Fund support, given the timings, scale and nature of investments.

1.2.1 Limitations

This case study has some limitations that shape the scope of its conclusions. First, the analysis is based on observational programme data and does not attempt to establish causal attribution, though it does recognise that the Fleming Fund's contribution is associated with the observed changes. Second, as the Fleming Fund Management Agent, the authors had close access to programme data and stakeholders, which enabled a depth of insight but required careful interpretation to avoid over-claiming impact. Despite these limitations, triangulation of cost data, output trends, and qualitative evidence provides a robust basis for analysing mechanisms of change, efficiency, and sustainability risks.

This case study does not cover animal health or integrated surveillance of AMR. The Fleming Fund operated across all One Health disciplines in Zambia (and elsewhere). This report focuses specifically on the human health sector.

8. The country grantee in Zambia was The Centre for Infectious Disease Research in Zambia (CIDRZ).

2. AMR surveillance system costs and outputs in Zambia

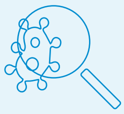
When the Fleming Fund began supporting AMR work in Zambia in 2018, the AMR surveillance system was under-resourced, with minimal microbiology testing, equipment, training, and awareness. Planning work for the National Action Plan was at the final draft stage, but the surveillance strategy was not yet fully defined.

The Fleming Fund, therefore, invested significantly in planning, governance, and laboratory capacity – including infrastructure, equipment, human capital, protocols, guidelines, and institutional capacity – to strengthen diagnostic and surveillance services. These investments were made through three main funding routes: a Country Grant, a Fellowship Scheme to support human resource capacity and sustainability, and a suite of Regional Grants. In combination, these grants provided resources and service improvement across nine sites in the human health sector (eight hospitals and one reference laboratory) while supporting governance through a relatively mature national AMR Coordinating Committee (AMRCC).

Zambia was selected as an in-depth case study because it provides an information-rich context for examining the sustainability of AMR surveillance investments. The recorded achievements (Box 2), together with detailed cost and output data across multiple sites, enabled comparative analysis of efficiency and sustainability.

Box 2: AMR surveillance achievements in the human health sector in Zambia[9]

- Strengthened microbiology capacity at **nine human health laboratories** through capital investment and training. Improvements were recorded against the LSHTM surveillance site roadmap[10], a standardised measure of surveillance site performance (Box 5).



- Supported the collection and testing of **198,995 clinical samples** between 2018-2025 through provision of consumables, equipment, training and support for developing protocols.
  This facilitated regular submission of data to GLASS.

- Established AMR, antimicrobial use and consumption (AMU/AMC) **data collection and analysis** to shape policy for relevant government agencies, such as the Zambian Medicines Supply Agency.

The report examines the costs, inputs, and outputs at selected AMR surveillance sites supported by the Fleming Fund and the Government of Zambia. It analyses costs and outputs across the human health AMR surveillance system in Zambia, followed by an in-depth case study of Livingstone Teaching Hospital (LTH).

LTH was selected because of its reported progress and strong performance. This positive selection enabled exploration of the mechanisms supporting effective surveillance, while cost and output data from six additional sites allowed analysis of cost variation and assessment of the drivers and barriers to sustainability.

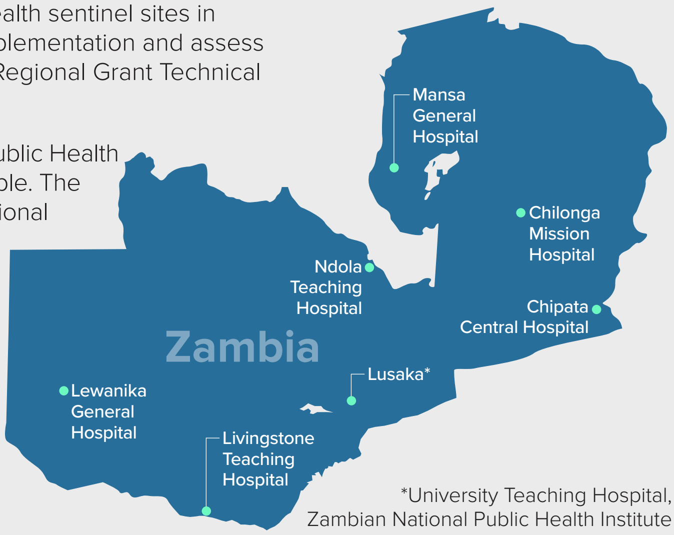
2.1 AMR surveillance system costs and outputs in Zambia

Cost and output data from microbiology services at nine human health sentinel sites in Zambia were analysed to examine variation during programme implementation and assess implications for sustainability. The data was collected through the Regional Grant Technical Assistance for Data and Evidence in Africa (TADE Africa[11]).

From the nine sites supported, Solwezi and the Zambian National Public Health Institute (ZNPHI) were excluded because only 2024 data was available. The University Teaching Hospital (UTH) in Lusaka was excluded from national averages because it represents a structurally different case. UTH was already an established laboratory and functioned as the national reference site before the establishment of the ZNPHI laboratory, resulting in a cost structure that differs substantially.

The remaining six sites[12] represent a range of settings, varying in population catchment, baseline capacity, and geographic location. Data from UTH provided a useful comparison as a mature laboratory for analysis of sample volumes, cost structure, and cost per sample (Table 1, Table 2, Figure 5, and Figure 6).

Human Health sites in Zambia



*University Teaching Hospital, Zambian National Public Health Institute

9. Country grantee in Zambia was **The Centre for Infectious Disease Research in Zambia (CIDRZ)**.
10. Seale AC, et al. **AMR Surveillance in low and middle-income settings – A roadmap for participation in the Global Antimicrobial Surveillance System (GLASS)**. Wellcome Open Res 2017, 2:92
11. **African Society for Laboratory Science (ASLM)**
12. The six remaining sites are in Livingstone, Ndola, Chilonga, Chipata, Mansa, and Lewanika.

Data was collected between 2020 and 2024 and represents AMR-related activities at the sites. Some analysis was restricted to 2021 to 2024 because sites had incomplete 2020 data. Costs were disaggregated into five components (Box 3), and those required for 'set up' vs 'ongoing' services (Box 4). Further methodological details can be found in the Annex.

2.1.1 Costing analysis for Zambia AMR human health surveillance:

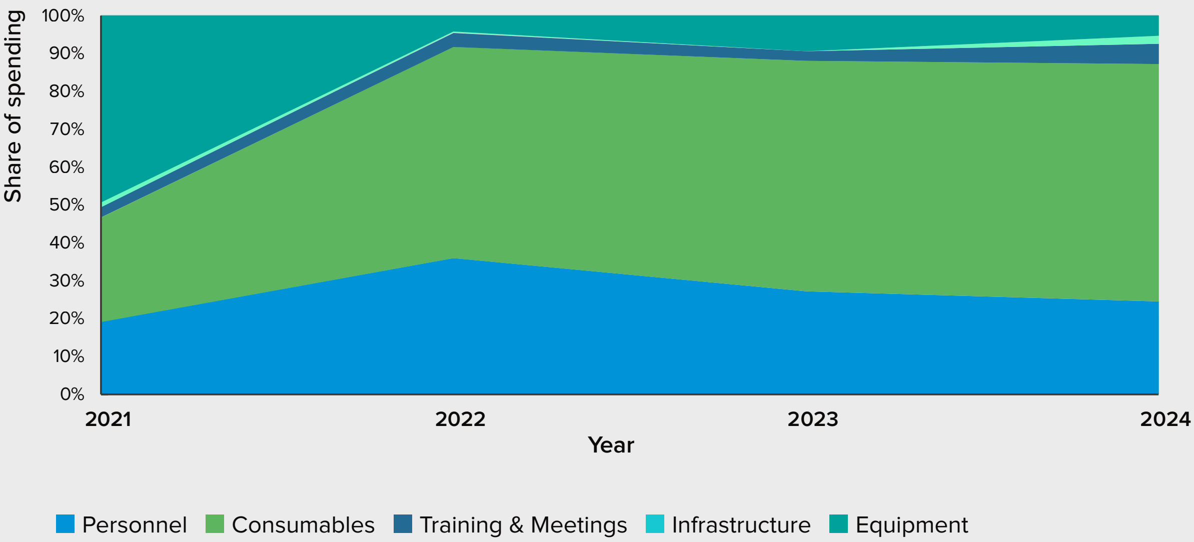
Box 3: AMR surveillance cost components

Costs were collected within five components:

- **Personnel**: Incorporates staff salaries for the laboratory and hospital staff that support the sentinel sites microbiology work.
- **Consumables**: Includes the reagents and antimicrobial susceptibility discs that facilitate microbiology analysis in addition to general supplies such as cleaning products.
- **Training and meetings**: All costs related to training and meetings to strengthen and coordinate laboratory and surveillance activities.
- **Equipment**: Includes equipment purchase and maintenance costs needed to run the microbiology laboratories and offices.[13]
- **Infrastructure**: Includes all furniture and infrastructure investments and maintenance costs to enable the laboratories to function effectively[14].

Between 2021 and 2024, the cost structure across sites remained relatively consistent, with large initial equipment investments followed by a steady 87-92% of expenditure focused on personnel and consumables (Figure 1). This highlights the difference between the one-off costs to establish capacity and the recurrent costs required to sustain routine microbiology diagnostic and surveillance services.

Figure 1: Cost components as a proportion of total spending on AMR surveillance, 2021-2024, Zambia



Source: TADE Africa data

The distinction between set-up and ongoing costs is further illustrated by the cost structure at UTH, which was already a well-established laboratory. Their cost structure was stable over the period and dominated by personnel and consumables (95-100% of costs). This illustrates that mature laboratory expenditure is concentrated on sustaining routine operations rather than establishing capacity.

Figure 2 summarises average per-site costs (over six sites[15]) and cost structures. Ongoing annual costs are approximately 18.8% lower than the total costs between 2021 and 2024 including AMR surveillance setup. Personnel and consumables comprise around 95% of recurrent expenditure.

13. The equipment costs have not included the maintenance contracts that the Fleming Fund paid for, though the ongoing costs have attempted to estimate this.
14. For the Fleming Fund, 'infrastructure' means support for internal fixtures and fittings (such as benchtops, sinks, etc), IT and electrics, and biosafety and security measures (e.g. installation of ducting). It did not involve major works such as construction of new facilities.
15. Livingstone, Ndola, Chilonga, Chipata, Mansa, and Lewanika.

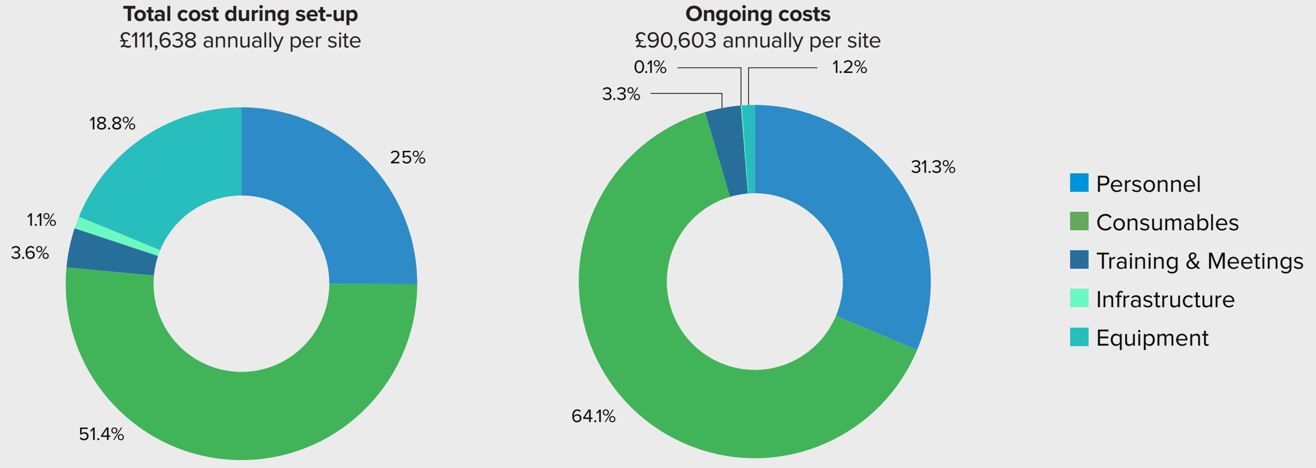
Box 4: Ongoing vs. set-up costs and sustainability

This data estimates the cost of establishing a microbiology and AMR surveillance capacity laboratory, including equipment, refurbishment, and training, as well as the ongoing costs of operation (see Annex for further detail).

- **Set-up** costs are one–off investments to establish AMR surveillance capacity (e.g. infrastructure, equipment, initial training).
- **Ongoing** costs are recurrent expenses required to sustain surveillance (e.g. personnel, consumables, transport, equipment maintenance, routine activities).

This distinction is critical for assessing whether ongoing operational costs can be absorbed into government budgets following the withdrawal of donor funding.

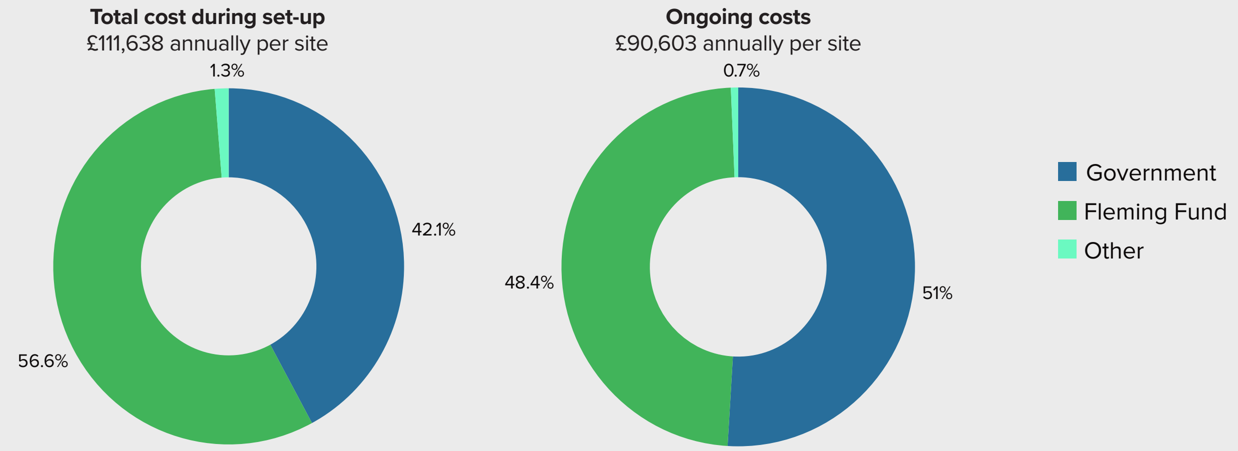
Figure 2: Cost components of AMR surveillance for the total set-up costs and those ongoing, 2021-2024, Zambia in GBP



Source: TADE Africa Data

The Fleming Fund accounted for 48.4% of total AMR surveillance expenditure in Zambia between 2021 and 2024 (Figure 3), rising to 56.6% when considering ongoing operational costs alone (Box 4). This level of donor reliance raises concerns regarding the long-term sustainability of routine microbiology diagnostic and AMR surveillance services.

Figure 3: Source of funding for AMR surveillance, 2021-2024, Zambia in GBP

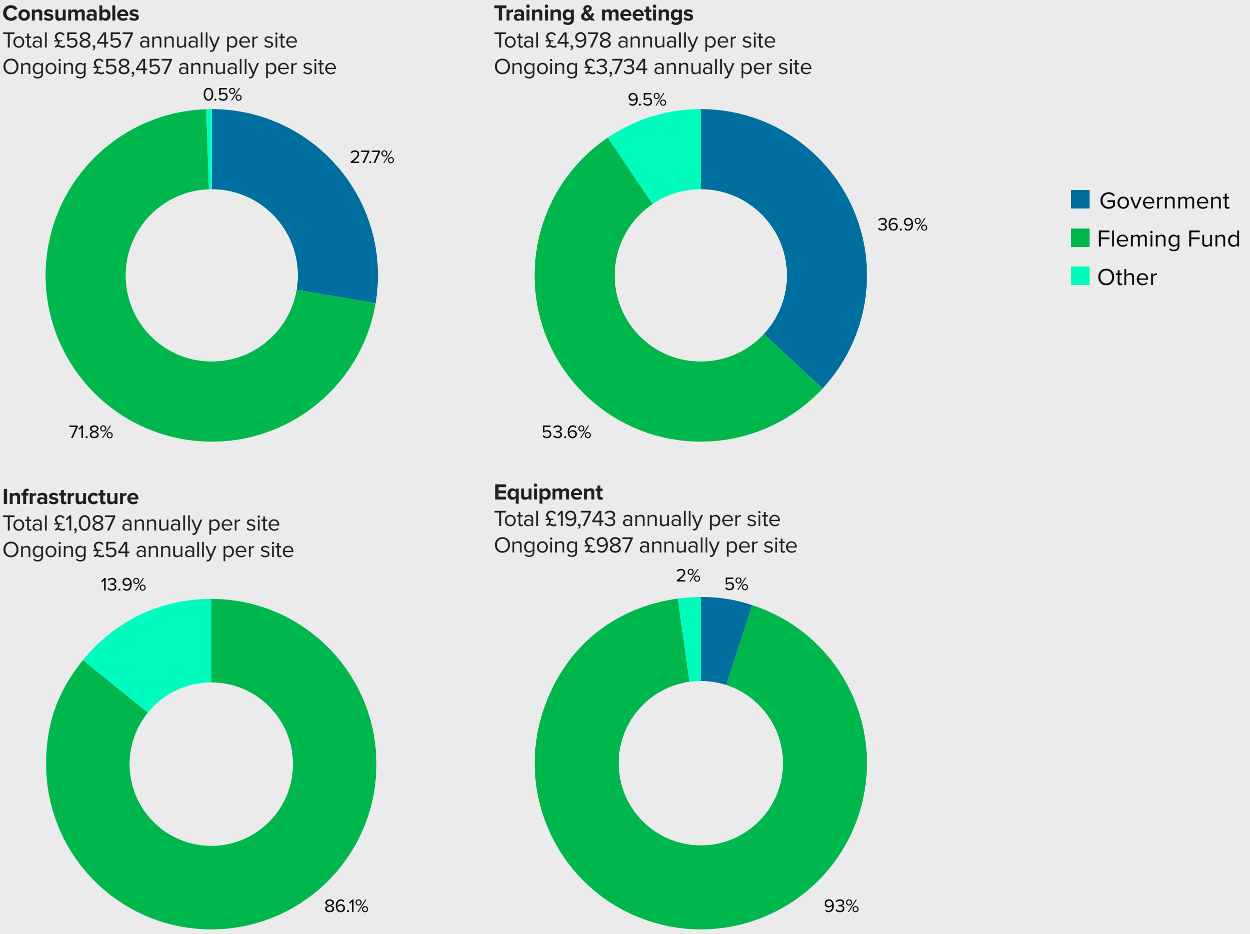


Source: TADE Africa Data

The significance of Fleming Fund financing becomes clearer when expenditure is disaggregated by cost component (Figure 4). The Fleming Fund supported 93% of equipment purchases[16] and 86.1% of laboratory infrastructure (refurbishment). These capital expenditures are largely one-off investments, with most equipment expected to have an operational lifespan of around ten years. However, although the Government of Zambia provided 100% of the personnel costs, the Fleming Fund financed 71.8% of consumables and 53.6% of training and meeting costs. This highlights the challenge facing surveillance sites and the Government of Zambia in absorbing recurrent expenditure previously supported by donor funding.

16. The equipment costs do not included the maintenance contracts that the Fleming Fund paid for, though the ongoing costs have attempted to estimate this.

Figure 4: Source of funding for AMR surveillance by component, 2021–2024, Zambia in GBP



Source: TADE Africa Data

Members of the AMRCC reported that funding is expected to remain broadly stable through 2026 but expressed concern that a significant gap may emerge thereafter. This could reduce diagnostic service availability, with negative implications for patient outcomes and efforts to contain AMR.

2.1.2 Laboratory capability and sample processing

Despite ongoing sustainability challenges, investments over the past six years have improved laboratory capability across the sites. Strengthened human and physical capital are likely to continue supporting patient care and clinical decision-making under a range of future funding scenarios. However, in the context of constrained budgets, the immediate priority is to maintain essential diagnostic and surveillance functions.

Table 1: Site progress on the LSHTM roadmap, 2020-2025, Zambia

Site location	2020				2021				2022			2023				2024		2025	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q4	Q1	Q2	Q3	Q4	Q2	Q3	Q2	Q4
Lewanika	3		8	9				10			11	13				11		15	14
Mansa	3		8	9	8			10			11	12						15	
Chipata	4		8					9			10	12					11	15	14
Ndola	4	6	8					9			10	12				13		15	
Chilonga	6		7	8							9	11				12	14	15	13
Lusaka UTH	8		9							10	12	13				12		14	13
Livingstone	6		8	10							11	12				14		15	13

Source: Self-reported Fleming Fund Quarterly reporting data

Table 1 shows the reported capability of seven sites supported since 2018. The values refer to scores against a set of benchmarks for developing microbiology and surveillance services as discussed in Box 5. The scores are out of fifteen, with higher scores representing better microbiology and AMR surveillance capabilities against these set benchmarks.

Box 5: The LSHTM surveillance site capability roadmap[17]

The LSHTM roadmap outlines a phased, pragmatic approach to establishing surveillance sites in resource-constrained settings. It prioritises sentinel sites, standardised case definitions, and minimum laboratory and data requirements to ensure data quality and comparability. Capacity is strengthened incrementally, enabling countries to generate usable health intelligence and scale surveillance in line with WHO GLASS standards as resources allow. The roadmap covers both surveillance site and reference laboratory functions within the human health sector. Scores are out of 15.

The key measurements tracked are:

Clinical admission assessment and investigations: Identification of eligible patients using standard case definitions and appropriate specimen collection.

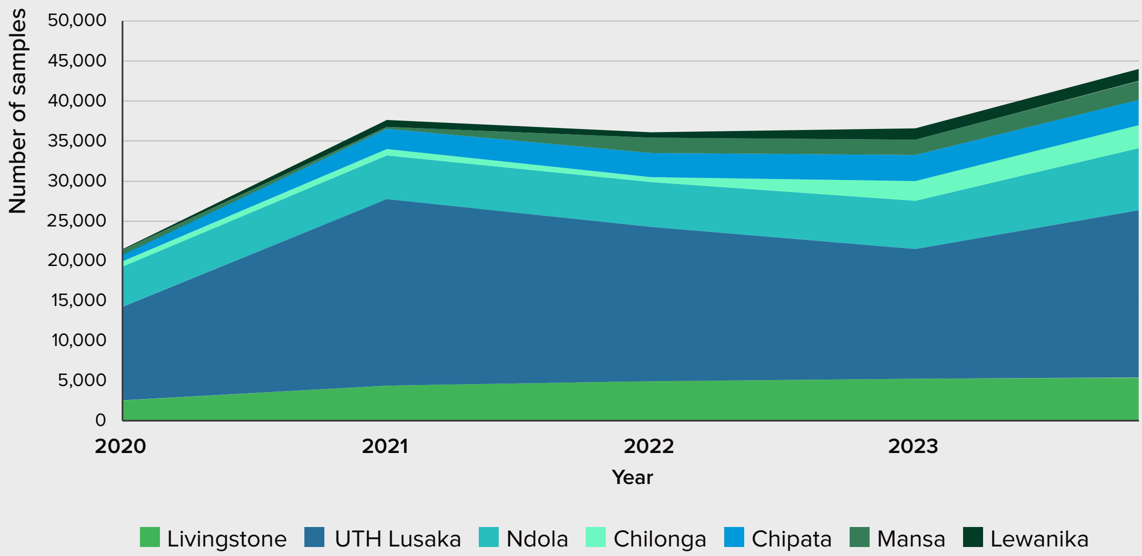
Isolate investigation and susceptibility testing: Safe identification of priority pathogens and antimicrobial susceptibility testing using standardised, quality-assured methods.

Isolate storage and referral to reference AMR laboratories: Local storage of isolates and referral to quality-assured reference laboratories for confirmation, advanced testing, or quality assurance.

Data review, reporting, and use: Routine validation, analysis, and review of data to inform local action and national or global reporting.

These improvements have translated into increased sample throughput over the period (Figure 5 and Table 2). The most pronounced growth occurred between 2020 and 2021, when aggregate throughput increased by 187%, while the average annual increase was 89%. These trends reflect both increasing clinical demand and capabilities of the laboratories to manage higher throughputs.

Figure 5: Annual microbiology sample processing, 2020-2024, Zambia



Source: TADE Africa data

Table 2: Total samples and annual increase of sample throughput, 2020-2024, Zambia

	Livingstone	UTH	Ndola	Chilonga	Chipata	Mansa	Lewanika
Total samples	**22583**	**92446**	**30216**	**7532**	**12751**	**7122**	**4514**
Average annual throughput increase	24%	25%	13%	76%	56%	159%	268%
Average annual set-up budget	£142,959	£277,243	£150,247	£66,297	£143,830	£83,756	£82,743

Source: TADE Africa data

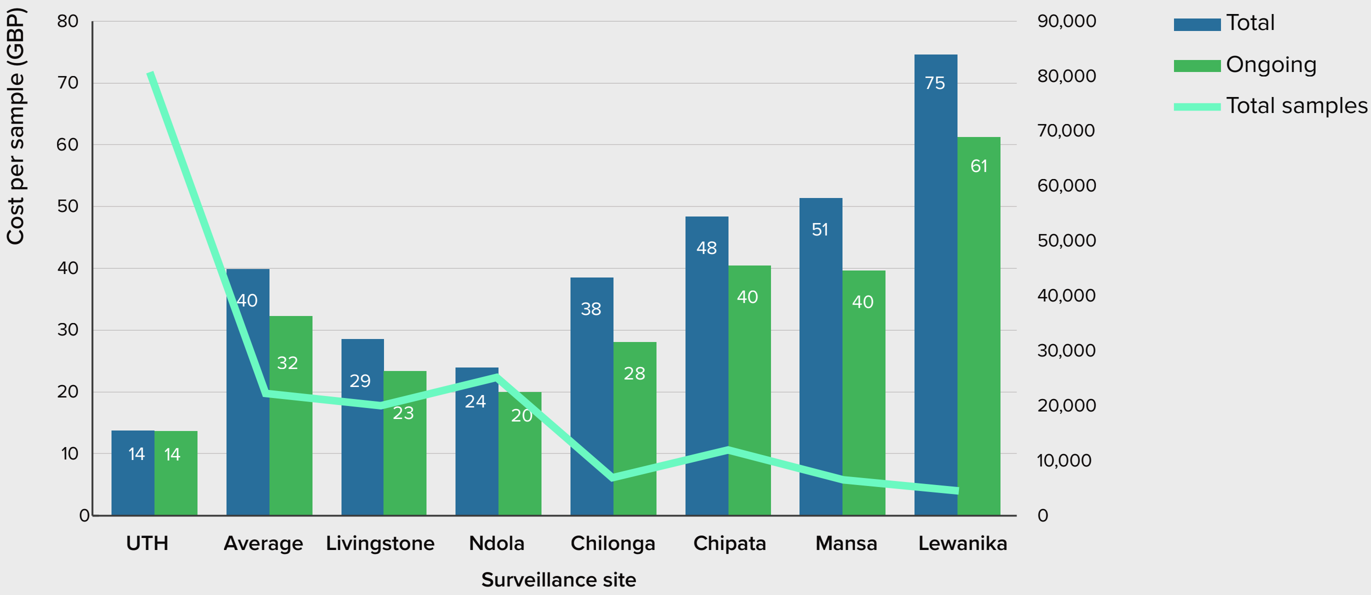
External Quality Assessment (EQA) provided through the EQuAfrica[18] grant further strengthened laboratory performance, including bacterial identification and susceptibility testing proficiency, as well as referral pathways and national EQA capacity. Complementary learning opportunities provided additional avenues for continuing professional development[19].

17. Seale AC, et al. **AMR Surveillance in low and middle-income settings – A roadmap for participation in the Global Antimicrobial Surveillance System (GLASS)**, *Wellcome Open Research*.
18. **African Society for Laboratory Science (ASLM).**
19. Open University curriculum '**Tackling AMR programme**'.

2.1.3 Cost per sample

Sites with higher sample throughput tended to have a lower cost per sample, while those experiencing the largest annual increases in throughput exhibited higher costs per sample (Table 2 and Figure 6). This reflects the high initial costs of establishing AMR surveillance capacity alongside economies of scale that emerge as testing volumes stabilise. As sites mature, productivity gains arise from improved staff proficiency, streamlined workflows, and reduced consumable wastage. UTH illustrates this effect, with a substantially lower cost per sample and a mature cost structure.

Figure 6: Cost per sample, 2021-2024, Zambia in GBP



Source: TADE Africa Data

2.2 The Fleming Fund at Livingstone Teaching Hospital (LTH)

Livingstone Teaching Hospital (LTH) was selected for further analysis within this case study because of its reported progress. LTH is a 325-bed regional referral hospital in Southern Province, Zambia, with a key role in healthcare delivery, staff training, and university medical education programmes. Its dual function as a service and teaching hospital makes it a relevant site for examining how laboratory and surveillance investments influence clinical practice and system-wide capacity.

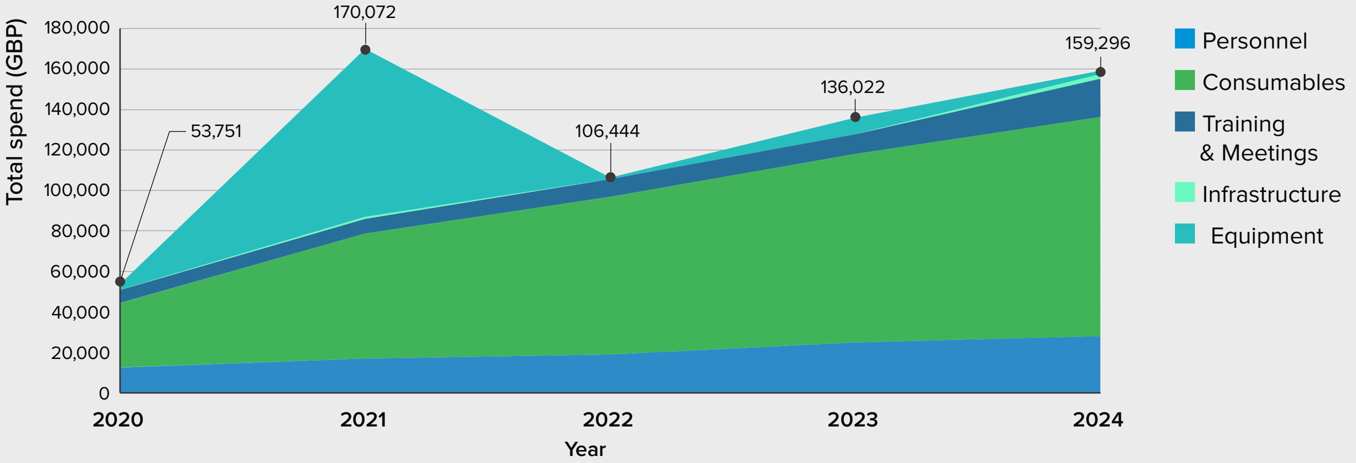
LTH was selected as a Fleming Fund–supported laboratory by the Government of Zambia, in consultation with the Fleming Fund management agent, due to its high patient load and status as a major clinical centre. As a referral hospital, it manages a broad range of clinical presentations where microbiological diagnosis is appropriate, with potential to generate data on more severe and clinically significant forms of AMR. As part of the sentinel surveillance approach, support was initiated in 2018 during the first phase of the Fleming Fund.

2.2.1 Site costs

The total annual spending, from all sources[20], on microbiology and AMR surveillance at LTH has increased steadily between 2020 and 2024. This is except for a spike in 2021 when several pieces of capital equipment, such as a BACTEC system[21], were purchased (Figure 7). Across the period, a total of £571,834 was spent at LTH, with an average annual spend of £142,959.

20. Sources include the Government of Zambia, the Fleming and Fund and other donors. This is discussed further in section 2.1.
21. A BACTEC is an automated blood culture system that detects microbial growth in blood samples, enabling faster and more reliable diagnosis of bloodstream infections.

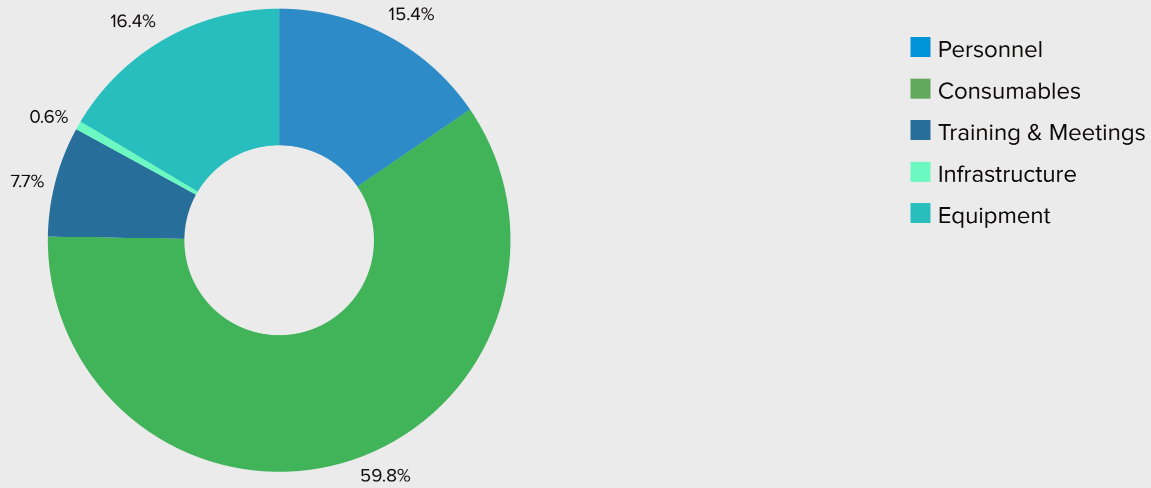
Figure 7: Total spending on AMR surveillance by component, 2020-2024, Livingstone Teaching Hospital, Zambia in GBP



Source: TADE Africa Data

Figure 8 shows that during this set-up period consumables accounted for the largest share of expenditure (59.8%), followed by equipment (16.4%) and personnel (15.4%). The cost structures seen in Figure 7 and Figure 8 reflect an expected pattern, with high capital expenditure followed by recurrent costs such as consumables and personnel.

Figure 8: Cost components of AMR surveillance expenditure, 2020-2024, Livingstone Teaching Hospital, Zambia



Source: TADE Africa data

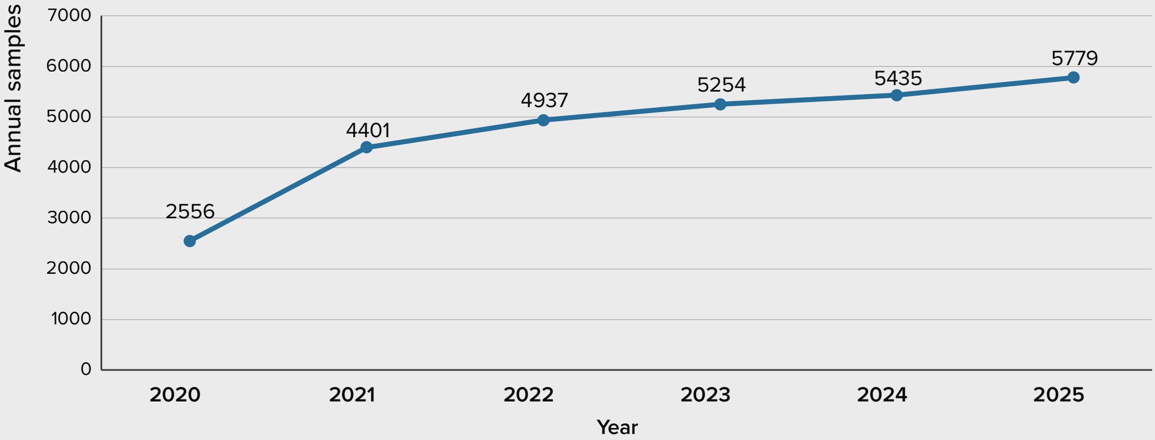
The Fleming Fund provided 65% of all microbiology and AMR surveillance spending at LTH, including 79% of consumables and 95% of equipment costs. While the remaining costs were covered by the Government of Zambia, this highlights both the scale of Fleming Fund investment in strengthening microbiology diagnostics and AMR surveillance services, and the extent to which routine activities relied on external financing. Further analysis of funding sources and sustainability across sites in Zambia is provided in Section 2.1.

2.2.2 Site outputs

From 2020-2025, microbiology diagnostic activity at LTH increased substantially. The number of microbiology samples processed[22] more than doubled from 2,556 in 2020 to 5779 in 2025, (Figure 9). This is despite recurring reports of stock-outs for critical items such as blood culture bottles and Petri dishes every year between 2022 and 2025[23]. Livingstone has also seen an increase in the number of microbiology tests in relation to its patient base (increasing from 4.1% in 2020 to 9.1% in 2024).

22. This includes samples from different sources including blood, sputum, stool, urine, genital swabs and others.
23. Some of these stock challenges originated with the manufacturer.

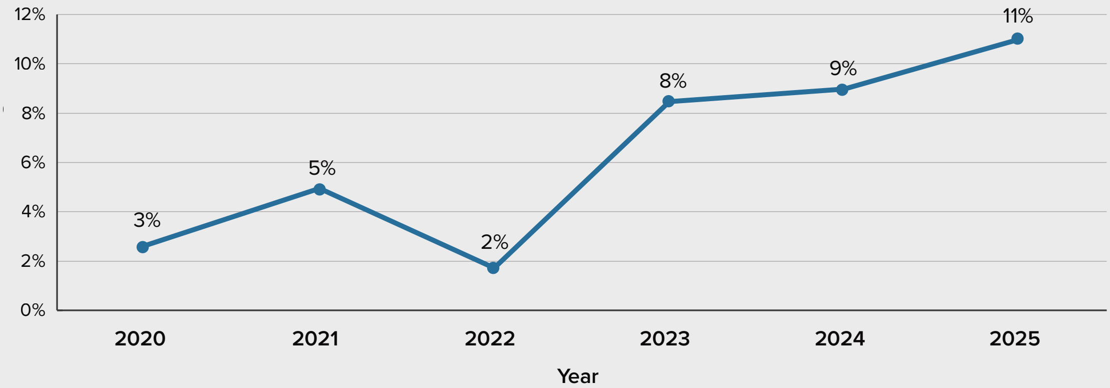
Figure 9: Microbiology samples processed annually, 2020-2025, Livingstone Teaching Hospital, Zambia[24]



Source: TADE Africa and Livingstone Teaching Hospital

Changes were also observed in the composition of testing. The proportion of microbiology samples that were blood cultures increased following the introduction of BACTEC equipment and Fleming Fund–supported training (Figure 10), indicating improved capacity to process blood culture samples, the 'gold standard' for bacteriological diagnosis. A significant reduction in 2022 was driven by a prolonged stock-out of blood culture bottles.

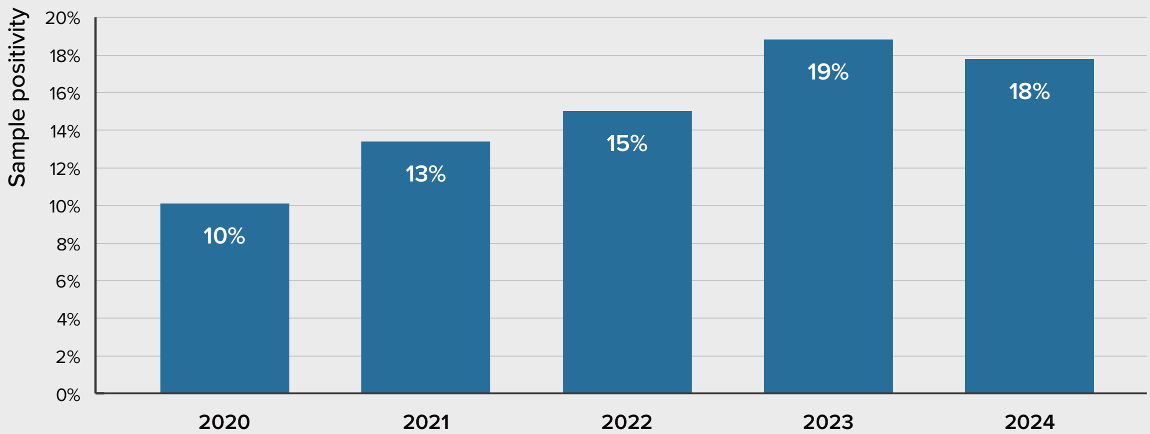
Figure 10: Blood as a percentage of all samples, 2020-2025, Livingstone Teaching Hospital, Zambia[25]



Source: TADE Africa and Livingstone Teaching Hospital

The proportion of all types of sample that were culture-positive increased from 10% to 18% (Figure 11). This may reflect improved case selection, laboratory capability and specimen quality. Though more detail would be needed on the underlying patient population and clinical details to confirm that this was a sign of improved quality, and not due in part to contamination which would indicate further quality assurance efforts were necessary.

Figure 11: Proportion of clinical samples culture-positive, 2020-2024, Livingstone Teaching Hospital, Zambia



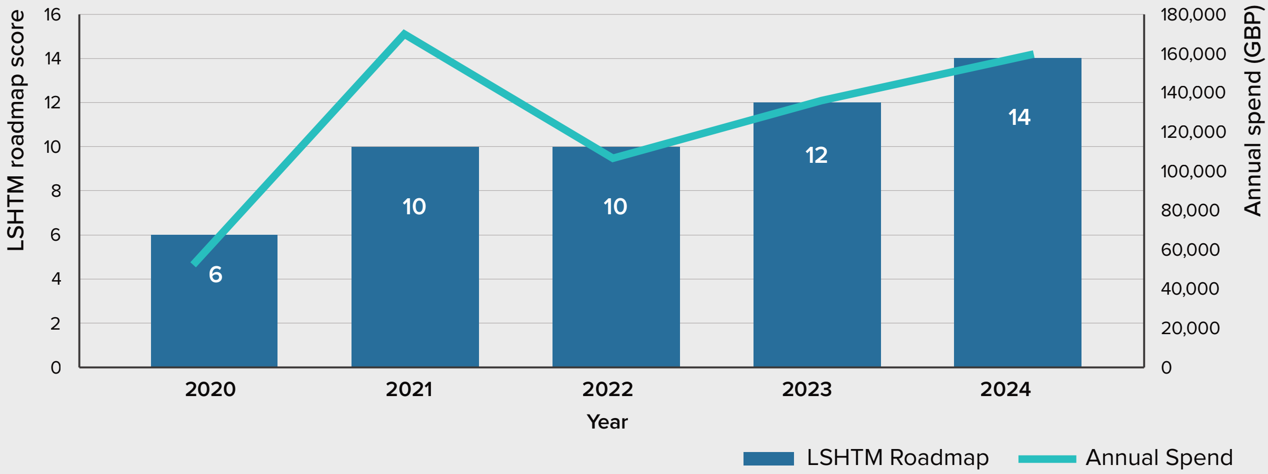
Source: TADE Africa data

24. The samples per month in 2025 are drawn from data between January to October 2025.
25. 2025 data from January and February only.

LTH reported significant progress on the LSHTM surveillance site roadmap[26] (Box 5), reflecting improvements across multiple domains of laboratory and surveillance performance. These gains were consistent with annual expenditure patterns, suggesting that investments supported improved technical capacity and measurable performance gains (Figure 12).

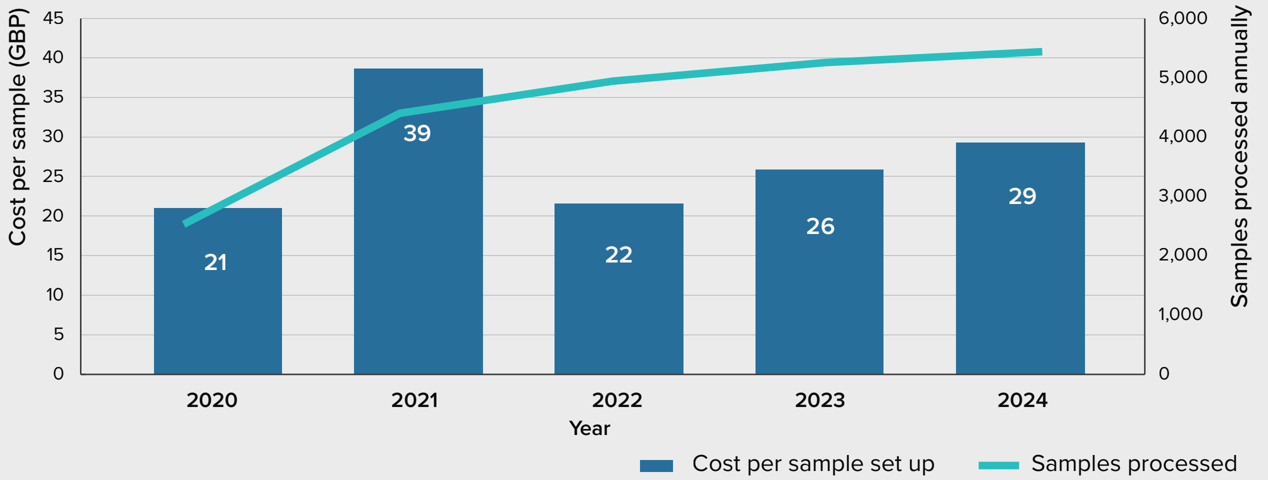
Despite rising throughput and capability, the cost per sample and the total spend remained relatively stable over time (Figure 12 and Figure 13), even as inflation averaged 15% annually between 2020 and 2024[27]. This indicates an ability to manage costs while expanding diagnostic and surveillance capacity.

Figure 12: Progress on the LSHTM roadmap and annual spend, 2020-2024, Livingstone Teaching Hospital



Source: TADE Africa and country grant data, analysed by the management agent

Figure 13: Cost per sample and annual microbiology samples processed, 2020-2024, Livingstone Teaching Hospital



Source: TADE Africa data, analysed by the management agent

2.2.3 Institution level achievements at LTH

Improved laboratory capacity and cost control

LTH demonstrated improvements in sample throughput, laboratory capacity, and microbiology diagnostic performance during the Fleming Fund programme. Progress was observed across multiple independent indicators, including reported laboratory capability (Figure 12). Despite substantial increases in throughput and capability, and average annual inflation of approximately 15%[27], these gains were achieved without disproportionate cost escalation (Figure 12 and Figure 13).

LTH expanded activity while improving the quality, appropriateness, and efficiency of its microbiology diagnostics and AMR surveillance services, demonstrating an ability to absorb increased financing and deliver improved operational performance.

26. Seale AC, et al. **AMR Surveillance in low and middle-income settings - A roadmap for participation in the Global Antimicrobial Surveillance System (GLASS)**, *Wellcome Open Research*.
27. **World Bank (2026) Annual inflation data**.

Improved antimicrobial usage supported by surveillance

An AMS committee was established at LTH with Fleming Fund support, comprising a multidisciplinary group of clinicians who met regularly and received targeted AMS and IPC training. The committee reviewed surveillance and audit data to inform changes in clinical practice, guidelines, and protocols. Stakeholders identified the committee as a key institutional mechanism linking laboratory surveillance to clinical decision-making, while also promoting AMR awareness among clinicians and hospital management.

The presence of an active AMS committee helped to normalise the use of diagnostic and surveillance data in clinical practice, supporting a shift from ad hoc antimicrobial stewardship towards a more structured, institutional approach. Several examples of institutional change are noted below.

Reformed antimicrobial prescription policies

The AMS committee supported the development and reform of antimicrobial prescribing policies across the hospital. In the neonatal unit, alongside guidance on reviewing treatments and adjusting therapy in response to laboratory results, empirical treatment for suspected sepsis is now informed by organisms identified within the preceding six months. This represents a more consistent, evidence-based approach to tailoring empirical therapy to local resistance patterns, ensuring appropriate coverage for high-risk conditions such as neonatal sepsis, while reducing reliance on broad-spectrum antibiotics. Alignment between diagnostic data, prescribing guidance, and stewardship principles supports IPC, as well as outbreak detection and containment.

Revision in antibiotic treatment recording

The AMS committee worked to improve the antibiotic prescription chart, making changes to improve clarity, ease of completion, accountability, and behavioural prompts intended to support AMS (Table 3). The revised chart was implemented in January 2025 alongside training and follow up audits. The committee also agreed that antibiotics should be issued by the pharmacy based on laboratory results and/or a clear treatment plan. This reflects an important shift towards institutionalising stewardship principles within routine prescribing and dispensing processes.

Table 3: Antimicrobial prescription chart improvements

Before	Changes introduced	Expected benefit
Minimal patient details, often left blank	Clear fields for patient demographics added including age, gender, weight, allergies	Improved AMU audit data and patient tracking.
No clinical details	Fields added to record where the infection was acquired (community or hospital) and the type of infection (e.g. bone/joint, pneumonia, UTI, bacteraemia)	Improved information for IPC, AMU, and outcome audits.
No information on the rationale for treatment	Clear indication categories added: prophylactic, empirical, and definitive	Supports AMU audit, improves accountability, and encourages diagnostic testing.
Minimal accountability, unsigned by a pharmacist	Pharmacist signature required	Improved accountability
Unclear clinician details	Clear clinician identification fields added	Improved accountability
No clear senior review	AMS committee review section added	Improved accountability
No testing prompt or guidance	Clear prompt for diagnostic testing, with fields to confirm whether testing was requested and results received	Better linkage between treatment and diagnostics
No end date for prescriptions	Clear review points at days 3, 5, and 7, with automatic stop at day 10 unless a new prescription is issued	Improved treatment review and antimicrobial stewardship

Source: Conclusions were drawn by comparing the original prescription chart directly to the new version

Improved antimicrobial use behaviours

Point Prevalence Surveys (PPS) of antimicrobial prescribing, as outlined in Box 6, were conducted at LTH in 2021 and 2024. The prevalence of antimicrobial use among all inpatients[28] declined from 63% (2021) to 50% (2024). Although this remains above the WHO target of 40%, it represents a substantial improvement in AMS and compares favourably to the national average of 70% reported in 2023[29,30].

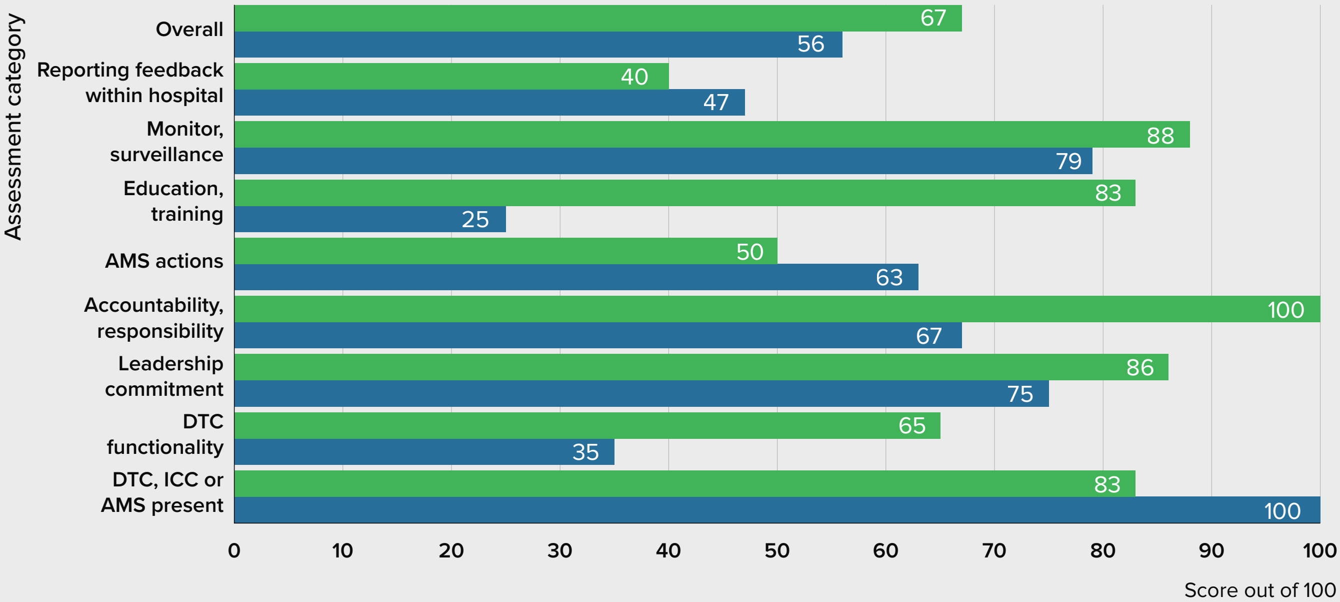
28. Including adult intensive care, surgical, medical, and gynaecology wards, neonatal intensive care and surgical units, and paediatric medical and surgical wards.
29. WHO (2018). **WHO Methodology for Point Prevalence Survey on Antibiotic Use in Hospitals.**
30. Chizimu, J.Y. et al (2024) **Antibiotic use and adherence to the WHO AWaRe guidelines across 16 hospitals in Zambia: a point prevalence survey**, *JAC-Antimicrobial Resistance*, Volume 6, Issue 5, October 2024.

Box 6: Point Prevalence Survey (PPS) of AMU[27]

A PPS collects information on antibiotic prescribing practices and other aspects of infectious disease management among hospitalised patients, complementing routine surveillance of antimicrobial consumption. As a comparatively low?resource and standardised method, PPS is widely used to identify priority targets for stewardship and to benchmark prescribing patterns over time or across sites. In Zambia, PPS has been applied across multiple hospitals to characterise antibiotic use and assess alignment with WHO stewardship frameworks (e.g. AWaRe, see Box 8)[27].

The PPS indicated overall improvements in AMS behaviours and institutional structures between 2021 and 2024 (Figure 14). Though the 2024 PPS report highlighted several areas for improvement. These included limited awareness of AMS principles among clinicians, suboptimal adherence to treatment guidelines (63.8% against a 100% target), and a high reliance on ceftriaxone, a 'watch' category antibiotic[31], which reflected constraints in the availability and use of 'access' group antimicrobials (WHO antimicrobial classification discussed in Box 8). Together, these findings highlight persistent structural and supply-chain barriers to optimal stewardship practice, as discussed further in Box 7.

Figure 14: Point Prevalence Survey results of antimicrobial prescribing behaviour and practices, 2021 and 2024, Livingstone Teaching Hospital, Zambia[32]



Source: Livingstone Teaching Hospital PPS surveys 2021 and 2024

Box 7: Stock outs 'afterglow'

Recurrent stock-outs of laboratory consumables, blood culture bottles, and antibiotics were observed at LTH and across other sites during the Fleming Fund programme. The effects of these disruptions often persisted after supplies were restored.

A 2024 stock-out of benzylpenicillin (Access antimicrobial; Box 8) illustrates the impact on prescribing practice. During the shortage, ceftriaxone ('Watch' antimicrobial) was used as an alternative. However, after supply was restored in 2025, ceftriaxone prescribing remained elevated, likely reflecting habit formation, clinical inertia, or insufficient communication regarding stock restoration and treatment guidelines. This pattern was also identified in PPS findings, which highlighted high ceftriaxone use and weaknesses in feedback mechanisms.

Although the AMS committee recognised the issue and initiated mitigation actions, this example highlights the need for active stock management, AMU surveillance, and timely communication following supply changes. It demonstrates an 'afterglow effect' of stock-outs, whereby temporary disruptions produce lasting changes in prescribing behaviour. Similar dynamics may affect diagnostic use following stock-outs of blood culture bottles, potentially undermining clinician confidence in diagnostics and stewardship guidance after services recover.

> It demonstrates an 'afterglow effect' of stock-outs, whereby temporary disruptions produce lasting changes in prescribing behaviour.

31. WHO (2025) **The selection and use of essential medicines, 2025: WHO AWaRe (Access, Watch, Reserve) classification of antibiotics for evaluation and monitoring of use**.
32. DTC: Drug and Therapeutics Committee, ICC: Infection Control Committee.

Influencing and strengthening the broader health system

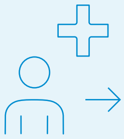
Fleming Fund investments at LTH generated benefits beyond the facility itself, contributing to the wider health system in two main ways:

Workforce development through internship and staff rotation

As a teaching hospital, LTH hosts interns and rotating clinical and laboratory staff from public hospitals across the region. Increased sample throughput, improved workflows, and strengthened laboratory capacity enhanced the learning environment for trainees, supporting improvements in microbiology and diagnostic services beyond LTH. This training function was further reinforced by two laboratory staff completing a microbiology training-of-trainer's course in 2025. While the direct impact on peripheral facilities was not measured, stakeholders identified this as an important mechanism for long-term system strengthening.

Box 8: AWaRe antibiotic classification[34]

The WHO AWaRe classification categorises antibiotics into Access, Watch, and Reserve groups based on their potential to drive antimicrobial resistance. It is used to monitor antibiotic consumption and support stewardship policies that optimise use and reduce resistance.

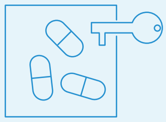


Access

First or second line empiric treatments for common infections with lower resistance potential.

Watch

Antibiotics with higher resistance risk, recommended for limited indications and prioritised for stewardship monitoring.



Reserve

'Last resort' antibiotics for suspected or confirmed multidrug-resistant infections, to be used in highly specific cases with strict stewardship.

Other facilities leveraging diagnostic capacity

LTH also functions as a regional diagnostic hub, processing samples from other public and private facilities upon request. This informal referral role extended access to microbiology services for facilities without in-house capacity, increasing the effective catchment of the strengthened laboratory. Although LTH did not charge for these services during the review period, stakeholders noted that formalising referral arrangements could provide a modest revenue stream to help offset operating costs, if designed to avoid restricting access.

34. WHO (2025) The selection and use of essential medicines, 2025: WHO AWaRe (Access, Watch, Reserve) classification of antibiotics for evaluation and monitoring of use.

3 Sustainable AMR surveillance

The Zambian case study demonstrates that laboratory and surveillance capacity can be strengthened relatively rapidly when investments in infrastructure, equipment, training, and governance are combined. However, sustaining and fully realising these gains depends less on further technical inputs and more on addressing the behavioural, institutional, and supply-chain constraints that shape how capacity is used in practice.

> … sustaining and fully realising these gains depends less on further technical inputs and more on addressing the behavioural, institutional, and supply-chain constraints that shape how capacity is used in practice.

While the Fleming Fund supported the establishment of functional surveillance systems and improved diagnostic performance, persistent challenges remain. Staff turnover, uneven clinical engagement, supply-chain constraints, and limited feedback mechanisms reduce system resilience and efficiency. Additionally, at LTH and across sentinel sites in Zambia, microbiology and AMR surveillance have relied heavily on donor funding, raising concerns about the long-term continuity of these services without reliable domestic financing.

The following section examines the key enablers and barriers affecting the sustainability of microbiology and AMR surveillance capacity in Zambia.

3.1 Enablers of change and sustainability

Each of the enablers outlined below represents a necessary step towards sustainability; however, no single factor is sufficient to achieve sustainable system change. Together, these elements are required and should be considered as part of future sustainability planning.

3.1.1 National and hospital leadership

Strong leadership is a critical low-cost enabler of progress. At the national level, the AMRCC provided a focal point for coordination, advocacy, and accountability. Surveillance data, generated with Fleming Fund support, equipped the AMRCC with credible evidence to engage ministers and other decision-makers and advocate for resources, while technical and secretariate support enabled the committee to act on that evidence[35].

At a facility level, LTH demonstrated how managerial prioritisation can translate national policy into operational change. Senior management's support included ring-fencing laboratory revenues, protecting diagnostic services from wider budgetary pressures. This signalled institutional commitment to clinical diagnostics as a core function rather than a discretionary activity.

The LTH case study also illustrates the use of data by an active AMS committee. With senior endorsement, the committee was able to influence substantial change.

3.1.2 Clinical engagement and training

Training supported by the Fleming Fund was consistently cited as instrumental in improving demand for AMR data and supporting its use in clinical decision-making among clinicians and laboratory staff. Formal training and mentorship strengthened technical capability, reinforced good laboratory and stewardship practices, and improved confidence in diagnostic services.

Fleming Fund fellowships played an influential role in advancing the AMR agenda in Zambia, including at LTH. Fellows were described as champions who raised awareness, supported training, and led initiatives to strengthen surveillance, stewardship, and data use at both facility and national levels. Across the two phases of the programme, eighteen fellows were supported in Zambia, contributing to momentum, innovation, and leadership at both facility and national levels.

Embedding AMR and stewardship principles in pre-service and in-service training will be important to sustain these gains. Existing curricula, such as the Open University Tackling Antimicrobial Resistance programme[36], could provide a foundation for wider pre-service institutionalisation, although ongoing engagement and refresher training will remain essential to maintain standards and practice.

3.1.3 Catalytic role of donor investments and support

The Fleming Fund-supported LTH through three complementary grant streams, combining investments in laboratory infrastructure and equipment with consumable support, training and mentorship, quality assurance, and policy development. These components were mutually reinforcing, supporting both technical capability and institutional change, rather than operating in isolation.

35. Country grantee in Zambia was **The Centre for Infectious Disease Research in Zambia (CIDRZ)**.
36. **The Tackling antimicrobial resistance programme is a free comprehensive curriculum, toolkits and set of resources that individuals and institutions can use to learn about AMR**.

External funding enabled surveillance systems to be established, evidence to be generated, and national and local ownership to develop. Investments in sentinel sites were also perceived to benefit the wider health system by developing a cadre of trained individuals who supported change across institutions. As one implementing partner noted, these investments created the capacity required to implement existing AMR policies rather than redefining policy direction.

> As one implementing partner noted, these investments created the capacity required to implement existing AMR policies rather than redefining policy direction.

However, during this period, external financing also played a substantial role in covering operational costs. While the Government funded 100% of personnel costs, the Fleming Fund financed 71.8% of consumables and 53.6% of training and meeting costs, highlighting the extent to which routine surveillance operations were donor-dependent.

3.2 Barriers to sustained change

Even where key enablers are present, progress can remain fragile due to persistent constraints. Despite substantial improvements in laboratory capacity and stewardship practices, several barriers continued to limit the effectiveness and sustainability of AMR surveillance and AMS at LTH and across Zambia.

3.2.1 Laboratory supply and infrastructure

Procurement weaknesses emerged as a significant constraint on sustaining services. Stock-outs of laboratory consumables, blood culture bottles, and antibiotics interrupted both diagnostic services and AMS activities, with effects often persisting beyond the period of shortage. For example, prolonged stock-outs of blood culture bottles reduced access to a key diagnostic test for severe infections, while stock-outs of antibiotics negatively affected prescribing practice (Box 7).

Limited laboratory space at sites such as LTH further constrained performance by restricting optimal workflows, increasing contamination risks, and limiting the installation of additional infrastructure, such as -80 °C freezers for isolate preservation and biorepository development. These infrastructure limitations imposed a physical ceiling on performance gains, regardless of staff capability or equipment availability.

3.2.2 Bottlenecks in using data in practice

While surveillance capacity improved substantially, the routine use of data for feedback, audit, and behaviour change was slower to develop. Uneven engagement by clinicians remained a barrier to system-wide improvement, with some clinicians continuing to rely on empiric prescribing practices rather than laboratory results and updated protocols.

PPS findings highlighted weaknesses in feedback mechanisms and uneven progress across clinical specialisms, suggesting that governance and behavioural change did not advance at the same pace as technical capacity. Variation between departments underscored the importance of senior clinical leadership in promoting stewardship norms and encouraging junior staff to act on diagnostic results.

This uneven translation of data into practice limited the value for money of surveillance investments and reinforced the need for explicit mechanisms linking data generation to clinical decision-making. These findings highlight that the full value of diagnostic investments depends not only on technical capacity but also on behavioural and institutional change.

3.2.3 A reliance on individuals and staff turnover

Progress at both national and facility levels was frequently attributed to a small number of motivated individuals, including AMRCC leads, AMS committee members, fellows, and senior managers. While effective in the short-term, reliance on individual effort creates fragility. Staff transfers, role changes, and competing workload pressures may erode momentum when surveillance and stewardship activities depend on discretionary effort rather than institutionalised roles. This reliance on individuals represents a risk to sustainability and underscores the need to embed AMR responsibilities within formal job descriptions, budgets, and performance frameworks.

Staff turnover and frequent intern rotation also generated recurrent training demands that are difficult to capture in financial analyses but are likely drivers of inefficiency, contributing to error rates and consumable wastage. While staff rotation supports broader system capacity by diffusing skills to other facilities, it may reduce local efficiency, highlighting a tension between facility-level performance and system-wide workforce development.

3.3 Sustainable financing

Sustaining human health AMR surveillance in Zambia will depend primarily on financing recurrent costs, particularly equipment maintenance, consumables and personnel time. Analysis across sentinel sites shows that ongoing costs are dominated by laboratory consumables, which account for approximately 64% of recurrent expenditure, followed by personnel costs (31%). These cost structures are consistent across sites once laboratories move beyond the initial set-up phase, as illustrated by the stable cost profile observed at the UTH. These recurrent costs mean that sustainability depends on a long-term domestic financing strategy.

Stakeholders reported that government funding is expected to remain at current levels through 2026, despite the planned closure of the Fleming Fund. Beyond 2026, however, a funding gap is widely anticipated, and given cuts to overseas development budgets in Europe and the US, it is unlikely to be filled by external donors. Without mitigation, this could lead to reduced diagnostic availability, service interruptions, diminished clinician trust in laboratory services, and a gradual reversal of AMS gains. These risks are well-evidenced: earlier stock-outs demonstrated how quickly clinicians revert to empiric prescribing when diagnostic services are perceived as unreliable.

Several options for addressing the financial gap emerge from the analysis:

- **Essential prioritisation within government health sector budgets.** Recognising diagnostics and surveillance as core health-system functions rather than donor-dependent vertical activities is needed. Sustaining these services will require more reliable domestic financing and clearer integration into routine planning and budgeting processes.
- **Economies of scale should inform service configuration.** Higher-throughput laboratories achieve lower costs per sample, suggesting that concentrating testing at selected sites - such as sentinel laboratories supported by effective referral networks – may be more sustainable than establishing or maintaining uniform capacity across all facilities. Conversely, reducing throughput to save costs may be a false economy if it increases unit costs and reduces efficiency.
- **Selective consolidation.** Rather than expanding infrastructure, policy should focus on maintaining essential diagnostic and surveillance functions, with explicit consideration of which populations, syndromes, or clinical conditions should be prioritised where resources are limited.
- **Supplementary revenue mechanisms should be approached cautiously.** In the Zambian context, out-of-pocket payments are covered through the National Health Insurance Scheme in Zambia, which supports access to hospital-based diagnostic services, including laboratory and radiology investigations[37]. Any use of out-of-pocket payments in other contexts would need to be carefully balanced to offset the risk of regressive effects. Limited options, such as modest charges for private-facility referrals or structured fees linked to training placements, may be more feasible.

The experience of UTH reinforces these findings. As a mature laboratory, UTH exhibits a stable and predictable cost structure, dominated by personnel and consumables, embedded within broader hospital budgets. This contrasts with less mature sites, where early investments drive higher average costs, and suggests that future investments should prioritise consolidation, efficiency, and institutionalisation rather than new infrastructure development.

AMR surveillance systems in Zambia remain financially fragile, with a substantial share of recurrent costs historically covered by donor funding. Without sustained domestic financing and strengthened procurement systems, there is a real risk that recent gains will erode over time, undermining both patient outcomes and the value for money of prior investments.

Nevertheless, the Fleming Fund has created durable assets, including skilled personnel, functional laboratories, governance structures, and routine data flows, that provide a strong platform for future AMR-related interventions if sustainability challenges are addressed proactively.

Box 9: Key insights

Capacity can be built relatively quickly, but sustainability is much harder.

What enabled change?

- **Surveillance is a behavioural as well as technical challenge:** Diagnostic capacity has value only when results are trusted and acted upon.
- **Leadership matters:** National and hospital leadership created the institutional space for stewardship, data use, and practice change.
- **Catalytic funding works:** Targeted donor investment can rapidly establish capacity, governance, and skills.

What threatens sustainability?

- **Recurrent inputs matter most:** Once laboratories are established, consumables, equipment maintenance, and personnel time determine whether services continue.
- **Stock-outs' afterglow:** Procurement failures can disrupt diagnostics and stewardship long after supplies return.
- **Champion-led systems are fragile:** Gains are vulnerable unless roles and processes are institutionalised.
- **Transition planning is essential:** Without it, donor exit risks service interruption rather than sustainable handover.

37. National Assembly of Zambia (2024) Ministerial Statement by the Minister of Health on the Implementation of the National Health Insurance Scheme (NHIMA).

4 Conclusion and Recommendations

The Fleming Fund has made a substantial and demonstrable contribution to strengthening human health AMR surveillance in Zambia. Investments in laboratory infrastructure, equipment, workforce development, quality assurance, and governance translated into measurable improvements in diagnostic capacity, sample throughput, data quality, and AMS practices. At the facility level, LTH illustrates how these investments can mature into functional diagnostic and surveillance systems that support clinical decision-making, influence prescribing behaviour, and inform policy.

“At the facility level, LTH illustrates how these investments can mature into functional diagnostic and surveillance systems that support clinical decision-making, influence prescribing behaviour, and inform policy.

The analysis shows that surveillance capacity can be established relatively rapidly when investments are targeted and aligned with national priorities. However, sustaining and fully realising these gains is significantly more challenging. Recurrent costs, particularly consumables and equipment maintenance, have been heavily supported by donor funding, while procurement failures, staff turnover, uneven clinical engagement, and reliance on individual champions have reduced system resilience and efficiency.

These findings reinforce that AMR surveillance is not solely a technical intervention, but a complex health system reform. Its long-term value depends on sustained leadership, reliable supply chains, institutionalised stewardship structures, and mechanisms that consistently translate data into action. Without these, there is a risk that recent gains will erode over time, undermining both patient outcomes and the value for money of prior investments.

Nevertheless, the Fleming Fund has left behind durable assets, including functional laboratories, skilled personnel, established governance structures, and routine data flows. This foundation presents a clear opportunity for governments and partners to consolidate progress, improve efficiency, and embed AMR surveillance as a core health-system function rather than a donor-supported vertical programme. The key sustainability challenge is now whether this capacity can be converted into routine, trusted, and domestically financed health-system functions.

4.1 Recommendations

Protect and prioritise core diagnostic and surveillance functions

Government health system planners should recognise microbiology diagnostics and AMR surveillance as essential health-system functions and prioritise funding for recurrent costs, particularly consumables, equipment maintenance, and essential laboratory staff. Where fiscal space is constrained, priority should be given to maintaining essential diagnostic services and surveillance outputs, rather than expanding infrastructure. These are and should be seen as investments, not costs, as the expenditure will prevent future costs related to the impact of AMR.

Prioritise procurement and supply chain as stewardship interventions

Reliable access to reagents, blood culture bottles, and appropriate antibiotics is fundamental to both diagnostics and antimicrobial stewardship. Procurement failures not only interrupt services but also entrench inappropriate prescribing behaviours. Procurement reform should, therefore, be treated as a core AMS intervention, with improved forecasting, clear communication following stock changes, and closer alignment between laboratory, pharmacy, and clinical services.

Institutionalise stewardship and data use

Surveillance delivers value only when data is routinely used. Governments and hospital managers should formalise AMS committees, audit processes, and feedback loops within governance structures, job descriptions, performance frameworks, and budgets. Embedding these functions institutionally, rather than relying on voluntary effort, will reduce dependence on individual champions and improve system resilience.

Invest in clinical education and behaviour change

Embedding AMR, diagnostics, and stewardship principles within undergraduate and pre-service curricula is likely to be more cost-effective and sustainable than relying primarily on in-service training. Complementary investment in behavioural research, can help tailor stewardship interventions and improve uptake across clinical specialities.

Leveraging the opportunities left by the Fleming Fund

With the imminent closure of the Fleming Fund in 2026, it is crucial to ensure that human diagnostics and AMR surveillance continues to receive support. Across all the countries that the Fleming Fund operated, there has been significant progress with awareness raised, a robust baseline of data, strong laboratory systems, and skilled human resources capable of implementing future AMR programmes.

There is a critical opportunity to build on these foundational investments. Future support, whether domestic or external, should focus on consolidation, transition planning, efficiency gains, and institutionalisation rather than capital investment. Targeted catalytic investments, such as fellowships, governance support, and technical assistance for procurement and financing reforms, can help protect and extend the value of the Fleming Fund's investments.

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