The political economy of AMR surveillance systems in LMICs

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Contents

Acronyms

ADB	Asian Development Bank
AH	Animal health
AFROHUN	Africa One Health University Network
AMC	Antimicrobial Consumption
AMR	Antimicrobial Resistance
AMRCC	Antimicrobial Resistance Coordinating Committee
AMROH	Antimicrobial Resistance and One Health (grantee)
AMS	Antimicrobial Stewardship
AMU	Antimicrobial Use
ANIMUSE	Animal Antimicrobial Use (platform)
ASEAN	Association of Southeast Asian Nations
CDC	Centres for Disease Control [and Prevention]
DHSC	Department of Health and Social Care (UK)
EPHS	Essential Package of Health Services
EQAS	External Quality Assessment Services
EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GLASS	Global Antimicrobial Resistance and Use Surveillance System
HH	Human health
ICT	Information and Communications Technology
IPC	Infection Prevention and Control
LMICs	Low– and middle-income countries
LIMS	Laboratory Information Management System
MTEF	Medium Term Expenditure Framework
NAP	National Action Plan (on AMR)
NGO	Non-governmental Organisation
NHI	National health insurance
NRL	National Reference Laboratory
ODA	Official Development Assistance
OH	One Health
pc	Per capita
PDR	People's Democratic Republic (of Lao)
PEA	Political Economy Analysis
PNG	Papua New Guinea
PPS	Point Prevalence Survey
SEAOHUN	Southeast Asia One Health University Network

Acronyms Continued

STI	Sexually Transmitted Infection
TACE	Technical Assistance for Clinical Engagement (regional grantee)
TADE	Technical Assistance for Data and Evidence, Africa (regional grantee)
TADEU	Technical Assistance for Data and Evidence Use, Asia (regional grantee)
TWG	Technical Working Group
UK	United Kingdom
UHC	Universal Health Coverage
UNEP	United Nations Environment Programme
USA	United States of America
USAID	United States Agency for International Development
US$	United States Dollars
WASH	Water, Sanitation and Hygiene
WB	World Bank
WHO	World Health Organization
WOAH	World Organisation for Animal Health

Executive Summary

The Fleming Fund aims to support low- and middle-income countries (LMICs) to combat the global threat of antimicrobial resistance (AMR) using a One Health approach. The Fund seeks to improve surveillance through three core grant streams: Country Grants, Regional Grants, and a Fellowship Scheme. This supports Fleming Fund countries to generate, share and use data for improved antimicrobial use.

Fleming Fund country grantees have recently produced 19 political economy analyses (PEAs) to support adaptation of Fleming Fund activities to country contexts. These PEAs cover nearly all programme countries and are representative of the four programme regions.

This report presents a synthesis of findings from the PEA reports. The findings have been verified through triangulation against the Fleming Fund's Country Investment Strategies, secondary data sources, and key informant interviews.

This synthesis report begins with an overview of the underpinning methodologies. We then present a synthesis of the PEA findings on demographic, political, stakeholder, economic, sectoral, and gender and equity contexts, along with reflections on programme implications and responses. The concluding chapter discusses key lessons for sustainability and future programming.

Demographic contexts

There are significant differences in population size, density, distribution and growth rates across the 19 case countries – e.g. World Bank data (2023) shows that Bhutan has a population of just 0.8M, while Indonesia has a population of over 277M. Many case countries have sizeable urban populations; however, over 80% of the populations of Papua New Guinea (PNG), Malawi and Rwanda live in rural areas.

> Demographic factors have implications for the design, scale and scope of AMR surveillance strategies. In response, grantees continue to work with AMRCCs to determine the optimal scale and distribution of AMR sentinel sites across One Health sectors based on the demographic, operational and resource context.

Political and governance contexts

World Bank index data (2023) on political stability and government effectiveness show that, across case countries, Bhutan and Lao PDR score highest for political stability; Bhutan, Indonesia and Rwanda score highest for government effectiveness. Notably, several countries score positively for political stability, but less well for effectiveness: only Bhutan scores positively for both indicators.

> Political and governance contexts shape the enabling environment for the production and uptake of AMR data, and programme sustainability. Regional hubs and grantees continue to monitor political and governance contexts with a focus on risk scenarios at each system level.

Stakeholder landscapes

All the PEA reports describe complex stakeholder landscapes with multiple role-players at each operational level, and across One Health sectors. Power relations are dynamic and can shift within and across sectors over time. Across the board, the PEAs highlight a lack of dedicated resources for convening and coordinating AMR stakeholders, and for complex shared task sets, such as alignment of AMR data systems and policies.

> Regional hub and Fleming Fund grantees contribute to the engagement of stakeholders across One Health sectors by implementing a comprehensive, inclusive, and collaborative approach. Grantee strategies include policymaking engagement, joint problem-solving and institutional strengthening, collaborative research, and multisectoral awareness-raising.

Economic contexts

All case countries meet World Bank criteria for low- and middle-income status; however, there are considerable differences in the economic profile of each country – e.g. World Bank data (2023) show that GDP per capita ranges from US$4,788 in Indonesia to just US$643 in Malawi. There are also differences in the historical contributions of Official Development Assistance (ODA). Amongst case countries, Eswatini has the highest per capita expenditure on health (current US$280 per capita); Uganda, Malawi and Pakistan have the lowest (current US$43-46 per capita). Out-of-pocket expenditure on health per capita is highest in Vietnam and Nigeria (current US$64-69) (World Bank 2021).

Economic context has implications for the availability of financial resources for sustained investments in AMR surveillance. Country grantees' sustainability plans include evidence-based budget advocacy for costed AMR surveillance — this often forms part of support for costing of AMR national action plans. Across the programme, grantees are held accountable for efficient and effective use of programme resources to demonstrate value for money awareness-raising.

Features of human health sectors

There is considerable variation in the effectiveness of health systems across the country portfolio, with potential vulnerability to periodic 'health shocks'. Global Health Security Index scores (2021) for human health systems suggest that across the case countries, they are strongest in Indonesia, Nepal and Bhutan. There are also varying degrees of health system devolution and decentralisation, which can have implications for the targeting of data use interventions for policy and practice. Beyond health financing, common health system weaknesses include health workforce constraints and supply chain challenges. It is rare for National Health Insurance Schemes to fully cover payments for laboratory testing, including antibiotic sensitivity testing.

A strong understanding of structure, strengths and vulnerabilities of local health systems is needed for adaptive delivery of sustainable Fleming Fund interventions. Country grantees continue to support advocacy for the inclusion of laboratory testing in national health insurance schemes and packages of essential health services. Recognising that use of AMR data for policy and practice in the health sector can require specialist skills, the Fleming Fund has engaged additional regional grantee support from TADE, TADEU and TACE in Asia and Africa.

Features of One Health sectors

The PEAs indicate that, in all case countries, the animal health and environment sectors are relatively underdeveloped compared to the human health sector, especially concerning governance, infrastructure, information systems, and AMR surveillance. Global Health Security Index scores (2021) for zoonotic disease capacity suggest that baseline capacity may be relatively good in Indonesia, Bhutan, Vietnam and Bangladesh, but poor in other case countries. A common issue is a lack of access to quality diagnostic testing services for animal owners, with few incentives to pay for these services. There are some opportunities to leverage private sector and commercial interests to strengthen AMR testing and monitoring services in the One Health sectors.

Fleming Fund grantees have made good progress in working collaboratively at all system levels to improve the availability of AMR data from the animal health and environment sectors. However, historical underinvestment in these sectors can hamper the full integration of One Health systems and real-time data exchanges. Country grantees are now working closely with the regional grantee, AMROH, with a particular focus on further extension of AMR surveillance to aquatic species, the environment, and the food safety sectors.

Dimensions of Gender and Equity

Across case countries, inadequate disaggregation of AMR surveillance by sex, age and other social stratifiers continues to limit differentiation of results and targeting of responses. There are also concerns that marginalised populations may be underrepresented in AMR surveillance coverage. Very few AMR National Action Plans explicitly mention gender and equity. However, among country stakeholders, there is growing recognition of the need to understand the structural drivers of AMR, including the role of health inequities and social determinants of health.

Fleming Fund grantees continue to raise awareness of gender and equity themes relating to AMR. They are also tackling gender and equity issues through training, increased analysis of disaggregated data and targeted research. The Strategic Alignment Grantee, GEAR up, is providing additional technical support, including for country situation analyses and development of information resources.

Lessons for sustainability and future programming

Sustainability is a core principle of the Fleming Fund. The PEAs describe how, in tackling sustainability, grantees are trying to find an optimal balance between a highly 'programme-focused' approach and a broader 'systems strengthening' approach. Eight thematic lessons have emerged that are relevant to programme sustainability and future programme design:

Funding for AMR surveillance: Interviews with country stakeholders point to a widespread recognition that, although enhanced AMR surveillance may appear costly, it brings significant added value to systems strengthening and global health security through contributions to improved laboratory services and diagnostics across sectors. Recent shifts in the geopolitical landscape mean that plans for sustainable funding of AMR surveillance need to be revisited.

For future programming: ensure budget advocacy emphasises the catalytic effects of AMR surveillance for improved diagnostics, quality of care, systems strengthening, and public health; contribute to multi-stakeholder dialogue on the changing funding landscape, and the implications for shared global health security.

Economic analyses: Economic and costing assessments for AMR programming can have multiple dimensions, some of which overlap with health financing and financial management themes, burden of disease analyses, pricing and costing for procurement, budget advocacy, and market shaping strategies, and value for money assessments.

For future programming: aim to identify the types of economic and costing studies required for different programme purposes from the outset; build consensus on the standard protocols/tools to be used to facilitate economic / cost comparisons within and across countries over time.

AMR governance: The sustainability of AMR governance mechanisms needs to be considered at each system level across the One Health sectors. Common sustainability challenges across country settings include role ambiguity across governance structures, competing priorities, and resource constraints.

For future programming: combine inputs to national policy development with support for costed strategies for policy implementation at sub-national levels; support clarification of respective roles, and leverage knowledge/skills resources by promoting inclusive participation of mandated private sector and civil society representatives.

Data use for policy and practice: It is useful to distinguish the periodic use of AMR/AMU data for national policy development from the continuous use of data for enhanced practice in human and animal health — a differentiated approach helps tailor data use strategies to the needs and motivations of distinct end users. Customised digital tools can facilitate improved engagement by data users.

For future programming: differentiate data use pathways for policy and practice, while continuing to monitor the sustainable production and use of quality AMR data as a circular system; aim to align digital solutions with wider digital and health information systems, as well as other data use initiatives.

Human resources: Human resource availability and capacity constraints are among the main challenges identified in PEA reports. It has been observed that these challenges are generally rooted in wider health system and budgeting issues.

For future programming: build on experience from the Fleming Fellowship Scheme to ensure training for individuals is linked to further professional development opportunities, institutional and systems strengthening and wider efforts to enhance the enabling environment.

Private sector engagement: Across One Health sectors, the range of private sector stakeholders can vary considerably by sector and system level. Moreover, mechanisms and regulatory frameworks for engagement, collaboration, sharing of infrastructure and data exchanges can be elaborate; there may also be important cross-border factors to consider.

For future programming: ensure appropriate allocation of technical and financial resources for this complex but crucial aspect of AMR surveillance across One Health sectors; prioritise private sector engagement as a key focus area for monitoring, evaluation, and learning by the programme countries and regions.

One Health: Although there has been significant progress in spearheading AMR surveillance in the animal health sector, a key challenge remains how to achieve a cost-effective balance between passive surveillance in the human health sector; active surveillance in animal health and environment sectors; and integrated One Health surveillance across sectors. In selected countries, monitoring of water sources and wastewater outlets is a key entry point for AMR surveillance in the environment sector.

For future programming: customise investments in AMR surveillance for One Health sectors to the maturity of the operational and systems context; monitor the implications of climate change for AMR prevalence and transmission; consider multi-country and cross-border approaches to leverage regional expertise and resources; and what should be done as part of national systems and what should be covered by academia/research studies.

Gender and equity: Four domains of programme delivery are now proving useful for practical mainstreaming of gender and equity in AMR surveillance work across One Health sectors: training in the application of gender and equity concepts; promoting gender and equity principles in AMR governance, policy and implementation practice; data disaggregation – advancing disaggregation of surveillance and burden of disease data and new research – including 'priority patient' and mixed method One Health studies.

For future programming: consider aligning more closely with the conceptual distinctions that underpin WHO's guidance on people-centred approaches to addressing gender and AMR, and its forthcoming (separate) guidance on equity themes in AMR; continue to invest in the four domains for mainstreaming gender and equity in operational practice, while monitoring and consolidating gender and equity outputs to support programme learning at scale.

Introduction

This synthesis report summarises the main findings from the political economy analyses conducted by Fleming Fund country grantees to inform implementation practice.

The Fleming Fund brings evidence and people together to advance action on the global threat of AMR. Under the leadership of the UK's Department of Health and Social Care (DHSC), the Fleming Fund has been working in up to 25 low- and middle-income countries since 2015. By improving laboratory capacity and AMR surveillance systems, strengthening AMR workforce capacity, governance and leadership, and raising AMR awareness, the Fleming Fund seeks to deliver measurable results in priority countries. Outcome-level results include improved quality and analysis of AMR data; better use of AMR data for policy and practice across One Health sectors; and sustainable investments in AMR at the country level. In all its programme activities, the Fleming Fund applies an adaptive management approach and observes the operational principles of One Health, country ownership, alignment, gender and equity, and sustainability.

The Fleming Fund Grants Programme combines three grant workstreams — country grants, regional/strategic alignment grants, and a Fellowship Scheme. These grant workstreams interlock to provide day-to-day support for country counterparts in tackling the threat of AMR. Within this framework, country grantees play a leading role in working collaboratively to advance programme outcomes in assigned countries.

Country grantees are required to conduct a PEA to support adaptation of Fleming Fund activities to country contexts and inform strategic decisions on the sustainable delivery of programme outcomes. Mott MacDonald, the Fleming Fund's Management Agent, has worked with country grantees to agree the scope and structure of the PEAs to ensure a standardised approach. By the end of 2024, country grantees had produced a total of 19 PEA reports covering the Fleming Fund's four operational regions: South East Asia, South Asia, East and Southern Africa and West Africa. Country grantees continue to use their PEA reports as foundational documents for reflecting on the implications of recent shifts in the wider political economy landscape for global health.

This synthesis report provides a summary of the 19 PEAs prepared by country grantees. The report begins with an overview of the methodology used to conduct the PEA studies synthesis exercise. It then presents a synthesis of findings from the PEA reviews of demographic, political, stakeholder, economic, sectoral, and gender and equity contexts, highlighting programme implications. Each thematic synthesis is accompanied by case study examples and reflections on how the programme is responding. The concluding chapter of this report discusses key lessons for sustainability and future programming. Annexes to the report contain the data synthesis tables used for country comparisons and a supplementary gender and equity bibliography.

Methodology

Distinct methodologies were used for the PEA studies and development of this synthesis report. Efforts have been made to mitigate some limitations of these methodologies.

Methodology for the PEA studies

Country grantees used a mixed methods approach to conduct the PEA studies. These methods included: a desk review of relevant country-level data, policies, studies and programme documents; key informant interviews and focus group discussions.

The PEA studies also included 'deep dive' case studies on two key analytical themes relating to the use of AMR data for policy and practice, and sustainable financing for AMR diagnostics and surveillance. These detailed case studies demonstrated how multiple issues can intersect over time, while spotlighting challenges and potential success factors.

Since country grantees brought variable expertise to the process of conducting PEA studies, the management agent provided technical and quality assurance support. This support included a review of the draft PEA reports to ensure a standardised approach and support production of this synthesis report.

To date, 19 PEA reports have been finalised.[1] As shown in the table below, these 'case country' reports provide proportionate representation of all four Fleming Fund regions.[2]

Table 1 Overview of PEA reports received by region and country

Region	Country PEA reports received
South East Asia	Lao PDR, Pakistan, PNG, Timor Leste, Vietnam
South Asia	Bangladesh, Bhutan, Nepal, Indonesia
East and Southern Africa	Eswatini, Kenya, Malawi, Rwanda, Tanzania, Uganda, Zambia, Zimbabwe
West Africa	Ghana, Nigeria

Methodology for the PEA synthesis

To identify the findings for this synthesis report, all PEA submissions have been reviewed systematically against standardised themes and components. The findings presented in the report have been verified and substantiated through triangulation against the Fleming Fund's Country Investment Strategies, secondary data sources and, where necessary, key informant interviews with in-house regional and technical experts.

Figure 1: Schematic showing the methodology used for PA Studies and Synthesis

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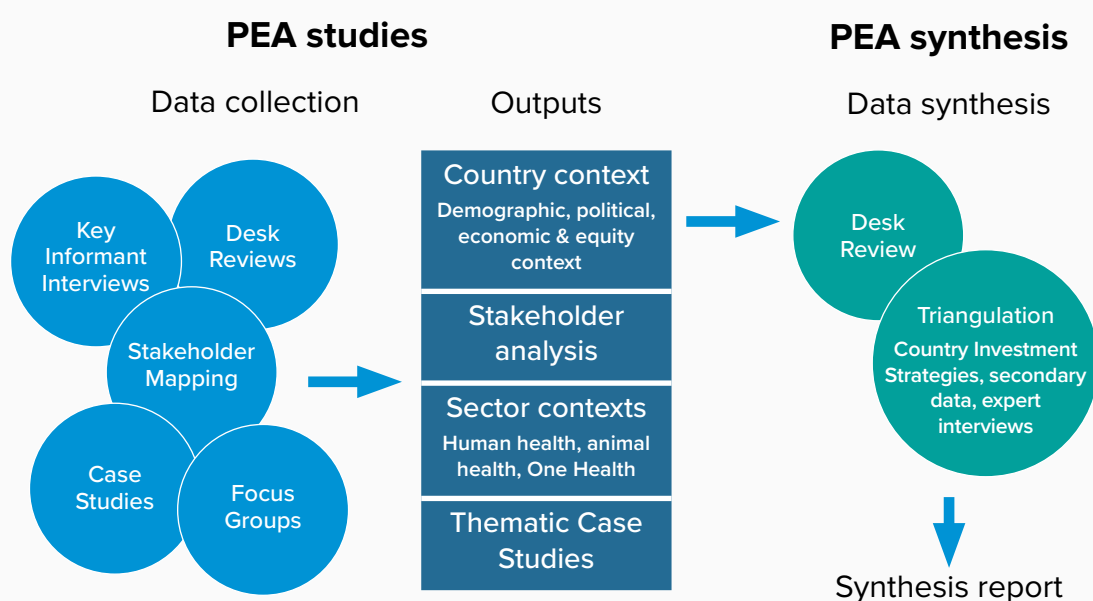
1. PEA reports for Senegal, Sierra Leone and Sri Lanka are not expected imminently due to contracting and inception delays.
2. For operational reasons, the Fleming Fund manages Pakistan grants under its South East Asia hub, and Indonesia grants under its South Asia hub.

Recognising the limitations of some incomplete data and variable report quality and scope, the synthesis exercise involved some additional desk review and triangulation exercises to address data and information gaps, embed a standardised approach and maintain balanced representation across regions.
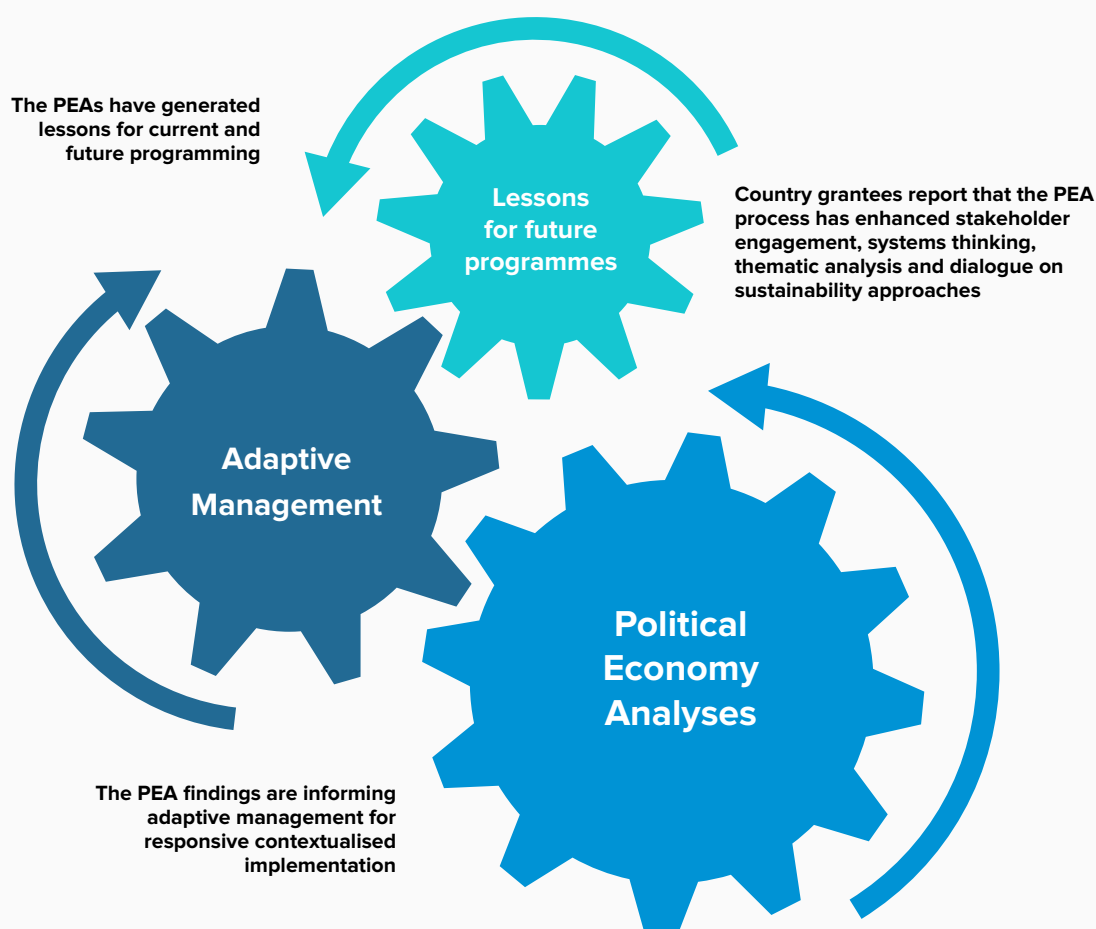
Adding value to programme delivery

The country grantees report that, over and above providing rich descriptions of the implementation context, the PEA process has added value to programme delivery by:

- Providing a structured approach to stakeholder analysis, supporting advocacy and engagement across One Health sectors and system levels.

- Promoting systems thinking.

- Providing a framework for in-country and cross-country thematic analysis e.g. on funding of tests at the facility level.

- Providing an overt focus for dialogue with governments on sustainability and data and evidence use.

These exercises have, in turn, supported adaptive management responses and generated lessons for current and future programme design.

Figure 2: How the PEA process has added value

The PEAs have generated lessons for current and future programming

Lessons for future programmes

Country grantees report that the PEA process has enhanced stakeholder engagement, systems thinking, thematic analysis and dialogue on sustainability approaches

Adaptive Management

Political Economy Analyses

The PEA findings are informing adaptive management for responsive contextualised implementation

Synthesis of PEA findings

This synthesis of PEA findings covers 19 case countries across four geographic regions. It summarises key findings from the case countries on demographic, political, stakeholder and economic contexts, as well as the main features of human health, One Health, and gender and equity settings.

Demographic contexts

The programme operates across a diverse set of countries with differences in population size, density, distribution and growth rates across the sample of case countries *(Annex 1, Table 3)*.

World Bank data (2023) indicates that, across the sample, Bhutan and Eswatini have the smallest populations at 0.8m and 1.2m respectively. Indonesia, Pakistan and Nigeria have the largest populations at 278m, 240m and 224m respectively. Meanwhile, Bangladesh and Rwanda have exceptionally high population densities at 1,300 and 546 people per square kilometre of land area (2021) respectively – Figure 3.

Figure 3: Population size and density by country and region, 2021/2023[3]
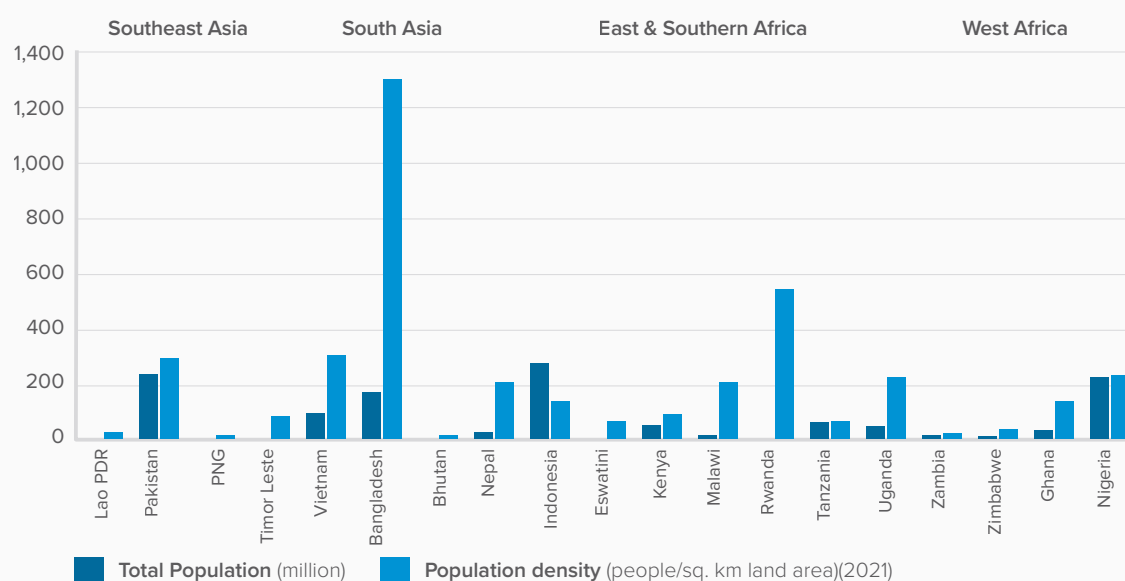
Across the regions, the East and Southern Africa region tends to have the highest population growth rates, with World Bank 2023 data indicating that Tanzania, Uganda and Malawi have annual population growth rates of almost 3%.[4] Overall, Indonesia, Ghana and Nigeria are the most urbanised countries, with nearly 60% of their populations living in urban centres – Figure 4 *(Annex 1, Table 3)*.

Figure 4: Percentage urban and rural populations by country, 2023[5]
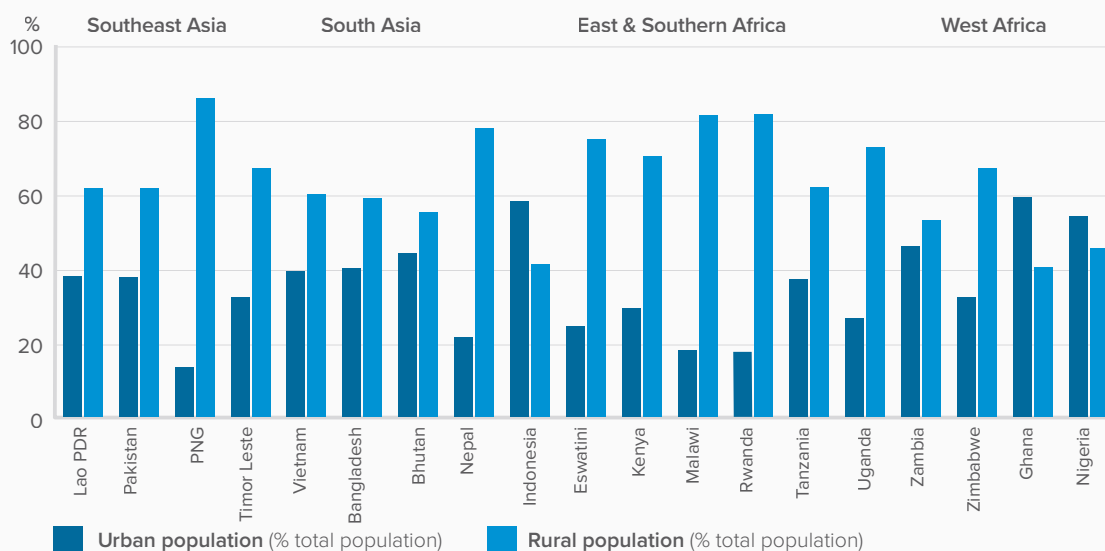
3. Source: **World Bank Open Data | Data Population Size and Density**
4. Source: **World Bank Open Data | Population growth (annual %) | Data**
5. Source: **World Bank Open Data | Urban population (% of total population) | Data**

The range of demographic contexts in the Fleming Fund portfolio highlights that AMR/AMU surveillance strategies are likely to vary considerably in scale and in scope if they are to yield robust and representative data — *see Box 1 for examples*.

Box 1: Implications of the demographic context for AMR/AMU surveillance systems

Demographic factors can play an important role in shaping the design of AMR/AMU surveillance systems. The PEA studies illustrate some key considerations in countries such as Indonesia and Eswatini.

Indonesia has a large population of some 278M people. This population is distributed across the thousands of islands that make up the archipelago. Although almost 60% of the population is urban, there is a significant rural economy and large aquaculture sector. Historically, there has been underinvestment in human and One Health infrastructure for Indonesia's highly dispersed and diverse population. Key AMR / AMU surveillance challenges associated with this demographic environment include governance and regulatory issues; unequal distribution of resources and health workforce capacity; uneven surveillance coverage; fragmented data systems; weak One Health integration and differences in AMR awareness and access to healthcare across population groups.

Eswatini has a small population 1.2M people, of whom 34% are under 15 years. Around 60% of the population lives below the poverty line, and 75% of the population lives in rural areas with limited access to healthcare. There are high levels of population movement to neighbouring South Africa for employment. There is also a high burden of communicable diseases – notably, Eswatini has one of the highest HIV/AIDS prevalence rates in the world. Ongoing challenges for AMR / AMU surveillance include unequal distribution of healthcare and laboratory infrastructure; lack of capacity and poor retention of healthcare staff and veterinary officers; inconsistent data generation, reporting and timely analysis; lack of AMR awareness and competing priorities.

How the programme is responding to demographic contexts

Country grantees continue to work with AMR Coordinating Committees (AMRCCs) and other governance structures to determine the optimal scale and distribution of AMR sentinel sites across One Health sectors given countries' demographic and resource contexts. Key factors in decision-making include factors such as population density and distribution, burden of disease and regional variation, along with findings from laboratory assessments and accreditation (referencing the London School of Hygiene and Tropical Medicine Roadmap). Additional factors include the availability of financial and technical resources to support surveillance activities, the health workforce distribution, and government engagement and commitment. These assessments are regularly reviewed with the AMRCC and key stakeholders against the programme's Country Investment Strategy.

For example, in Malawi the Fleming Fund's investment in the AMR surveillance system took account of the country's relatively small population but high population density and distinctive urban: rural distribution, along with the limited laboratory capacity in public hospitals, but a highly functioning research centre conducting surveillance in the city of Blantyre.

Political and governance contexts

An understanding of the political and governance context is important for country grantees to determine how to secure country ownership and buy-in. More specifically, assessments of political stability and government effectiveness underpin strategies for sustainability approaches.

The World Bank's indicator on political stability[6] provides a useful index for comparing political stability across our case countries based on a scoring scale that ranges from -2.5 (lowest) to 2.5 (highest) *(Annex 1, Table 4)*. For South and South East Asia, World Bank 2023 data for the case countries indicate that Bhutan, Lao PDR and Timor Leste had the strongest scores for political stability; notably, however, scores for Pakistan and Bangladesh were considerably lower. For case countries in sub-Saharan Africa, the 2023 data indicate that Zambia and Rwanda had the highest scores for political stability, whilst Nigeria, Kenya and Zimbabwe received the lowest scores – Figure 5 below.

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6. The World Bank's indicator on Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. See: **Political Stability and Absence of Violence/Terrorism: Estimate | Data**

Using a similar scoring scale, the World Bank's indicator for government effectiveness[7] provides a useful index for comparing the functionality of government institutions across the case countries *(Annex 1, Table 4)*. Findings for this indicator (2023) in South and South East Asia suggest that, among our case countries, Bhutan, Vietnam and Indonesia scored best for government effectiveness, whilst Nepal, PNG, Timor Leste and Bangladesh received the lowest scores. In sub-Saharan Africa, Rwanda received the highest score, whilst Nigeria, Zimbabwe and Malawi received the lowest scores for government effectiveness – Figure 5.

Figure 5: Political stability and government effectiveness estimates, 2023[8]
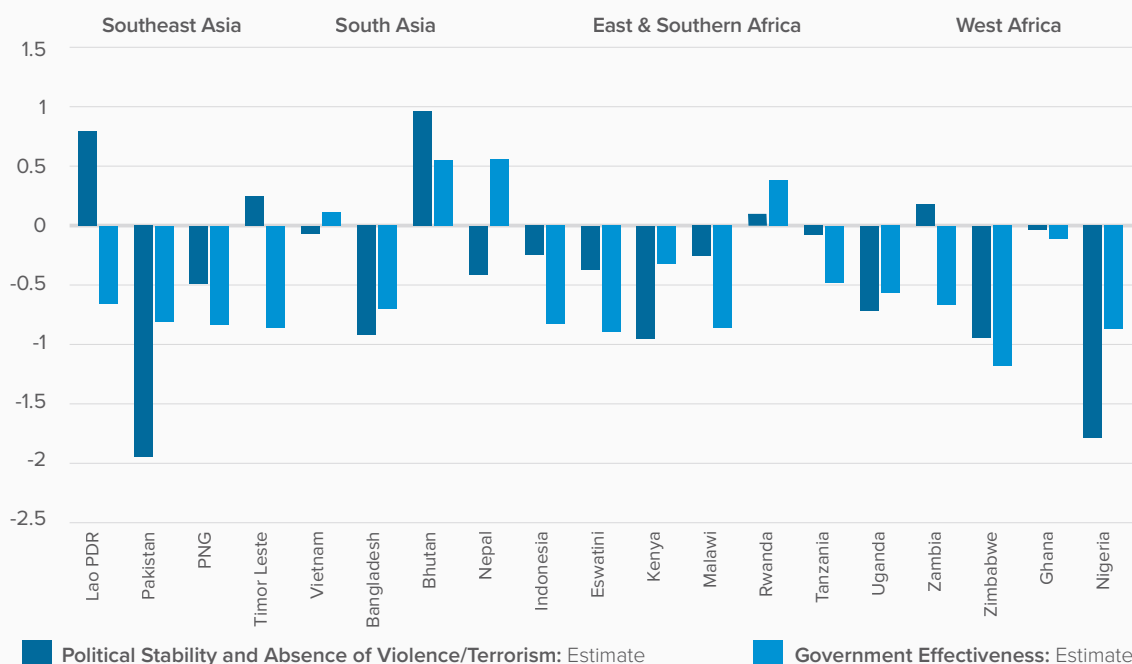
Since the Fleming Fund programme commenced in 2015, all case countries have faced major disruptions due to the COVID-19 pandemic. As illustrated in Box 2 below, the PEAs describe how the effects of the pandemic have combined in different ways with issues of political stability and government effectiveness to shape the enabling environment for programme roll-out and prospects to sustainability.

Box 2: How the political and governance context affects programme roll-out in Bhutan and PNG

Bhutan: The small mountainous kingdom of Bhutan is a relatively stable constitutional monarchy that, since the early 2000s, has been taking steps towards democratisation and parliamentary governance. Throughout this process, government effectiveness has been resilient. Since 2016, there has also been strong leadership and commitment to tackling AMR. Following the significant impact of COVID-19, there have been programme challenges such as regulatory and resource constraints, stretched human resource capacity, and gaps in AMR data and reporting. Nevertheless, overall progress toward results has been consistently positive. High levels of leadership buy-in have also created a conducive environment for sustainability, country ownership and integrated One Health working.

PNG: Although PNG is a small country, it has been characterised by frequent changes in political leadership, weak institutional capacity, economic instability, local conflicts and, more recently, high morbidity rates from COVID-19. For the Fleming Fund, these factors have hindered programme implementation, and disrupted investments in infrastructure, equipment and capacity building. Additionally, the regulatory environment across One Health sectors has remained weak and data collection has been inconsistent. Nevertheless, the country grantee (the Burnet Institute) has applied a collaborative adaptive management approach to make progress. Essential laboratory infrastructure is now in place, along with core microbiology and surveillance capacity. The programme also continues to support strengthening of governance structures for One Health collaboration.

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7. The World Banks indicator for Government Effectiveness captures perceptions of the quality and independence of public and civil services, and the quality of policy formulation and government commitment to implementation. See: **Government Effectiveness: Estimate | Data**.

8. World Bank index indicators, 2023. Op.Cit. For index indicators on political stability and government effectiveness, World Bank estimates provide aggregated country scores on a scale ranging from -2.5 (poorest) to 2.5 (best).

How the programme is responding to political and governance contexts

Assessments of the political and governance contexts are a core element of the Fleming Fund's Country Investment Strategies and form part of the monitoring activities of the programme's four regional hubs. Additionally, all grantees are required to monitor country political and governance contexts with a focus on risk scenarios at each structural level. This, in turn, translates into measures for adaptation, agile working and contingency that are features of implementation and sustainability plans.

For some grantees (e.g. in Pakistan and Indonesia), this approach has been consolidated into a 'thinking and working politically' methodology whereby implementation strategies are informed by assessments of underlying interests, incentives, historical legacies, social trends and factors affecting change processes — for these grantees, the PEA process sits within this overarching methodological framework.[9]

Additionally, all grantees can draw on the expertise of the regional grantee, RADAAR. This regional grantee provides expert advice, support and practical tools (e.g. a Governance and Social Construction Framework) for actively assessing and monitoring the political and social context of programme implementation.
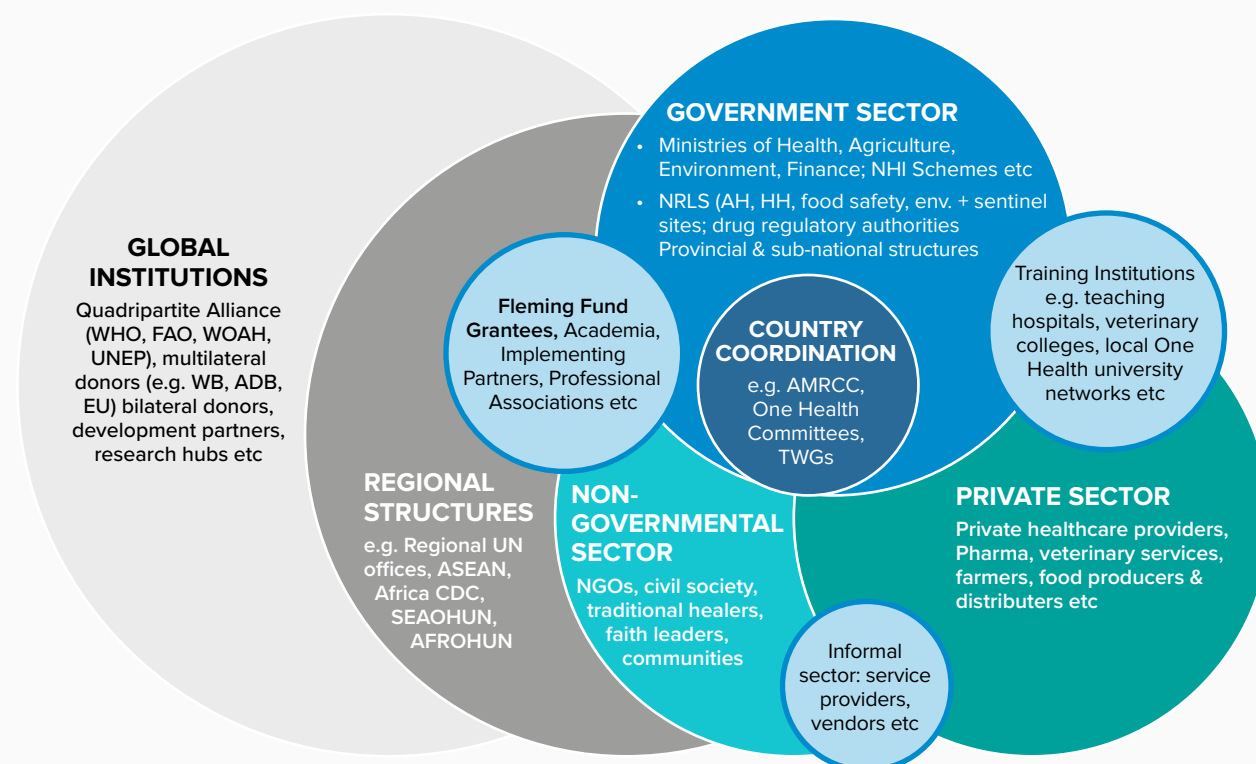
Stakeholder landscapes

As part of their PEA studies, country grantees completed a stakeholder analysis to map the stakeholder landscape across One Health sectors and inform plans for stakeholder engagement. The schematic below *(Figure 6)* shows a typical stakeholder landscape for Fleming Fund grantees showing the indicative stakeholder groupings for One Health working.

Review of the PEA studies showed while specific stakeholders differ by sector and country broad stakeholder groupings are similar. As shown in Figure 6, Fleming Fund grantees sit amid a complex stakeholder landscape. Although grantees can usually facilitate, support and influence other role-players, they may ultimately have limited convening power or decision-making authority. The exception is, perhaps, the small country of Bhutan where the government is also the country grantee.

In principle, country coordinating structures, such as AMRCCs and One Health structures, hold the primary mandate for convening stakeholders within and across sectors, alongside relevant line ministries. Setting up national AMRCCs was a central part of the Global Action Plan process for countries response to AMR. However, several PEA reports observe that there are limited resources for meeting the heavy demands of stakeholder engagement and coordination tasks, such as policy and regulatory alignment, data and system integration, joint monitoring and evidence reviews.

Figure 6: Schematic of key stakeholder groupings for Fleming Fund grantees

GLOBAL INSTITUTIONS
Quadripartite Alliance (WHO, FAO, WOAH, UNEP), multilateral donors (e.g. WB, ADB, EU) bilateral donors, development partners, research hubs etc

REGIONAL STRUCTURES
e.g. Regional UN offices, ASEAN, Africa CDC, SEAOHUN, AFROHUN

Fleming Fund Grantees, Academia, Implementing Partners, Professional Associations etc

GOVERNMENT SECTOR
- Ministries of Health, Agriculture, Environment, Finance; NHI Schemes etc
- NRLS (AH, HH, food safety, env. + sentinel sites; drug regulatory authorities Provincial & sub-national structures

COUNTRY COORDINATION
e.g. AMRCC, One Health Committees, TWGs

Training Institutions
e.g. teaching hospitals, veterinary colleges, local One Health university networks etc

NON-GOVERNMENTAL SECTOR
NGOs, civil society, traditional healers, faith leaders, communities

PRIVATE SECTOR
Private healthcare providers, Pharma, veterinary services, farmers, food producers & distributers etc

Informal sector: service providers, vendors etc

9. DeCastro, N. (2021, April 26). Thinking and Working Politically in AMR Surveillance. Fleming Fund. **https://www.flemingfund.org/publications/thinking-and-working-politically-in-amr-surveillance/**

The PEAs suggest that the relationship between AMR and OH governance structures is sometimes confused. One Health structures generally pre-date AMRCCs, and AMR is just one component of a more comprehensive One Health agenda, which also covers zoonotic viruses, parasites and emerging and reemerging epidemic diseases. This may have implications for respective resource allocations. Indeed, some PEAs point to a need for further clarification of respective roles and authorities within these governance arrangements.[10]

Across the board, sound functioning of AMRCCs and their sub-national counterpart structures is considered to depend on effective leadership, appropriate membership, clear definition of responsibilities, and allocation of adequate/predictable resources *(see Box 3 below)*.

Several country grantees sit within consortium partnerships, and some refer to opportunities to harness networks and affiliations. Additionally, the PEAs acknowledge that regional grantees (such TACE Africa/ Asia, CAPTURA, SEQAFRICA, RADAAR)[11] can leverage specialist networks for programme tasks, such as laboratory quality assurance, advanced testing of pathogens, regional training and policy advocacy. The Fellowship Scheme's Host Institutions also engage partnerships to expand the professional networks of Fleming Fund Fellows.

Both country grantees and country partners recognise the need to work collaboratively with key private sector and civil society actors. For example, significant efforts have been made to improve data exchanges with private sector health care providers in Pakistan and Vietnam, and there are strong examples of collaborative working with not-for-profit providers in Malawi, Bangladesh and Nepal.

The PEA reports refer to multiple linkages to global-level initiatives.[12] Over and above engagement with Quadripartite Alliance partners and GLASS and ANIMUSE reporting mechanisms,[13] country grantees maintain engagement with several other multilateral and bilateral donors.[14] There is also acknowledgement of key role-players and drivers of innovation, such as AMR research hubs and accelerator funds (e.g. Global AMR Research and Development Hub, the Wellcome Trust and the Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator).

Box 3: Case Study – Multi-level stakeholder engagement in Uganda

At the national level, the Government of Uganda has developed a national action plan (NAP) on AMR that is aligned with the National Health Security Plan. These plans also define the stakeholders that need to be engaged and coordinated through a collaborative One Health approach. Under the leadership of the Uganda AMRCC, key stakeholders are working collaboratively to ensure functional systems are in place for the national response to combat AMR. This response is based on a One Health approach that prioritises prevention of AMR in healthcare facilities, food production and the community. The approach is also linked to infection, prevention and control (IPC) measures, with emphasis on appropriate use of antimicrobials and the timely availability of quality medicines.

At lower levels of the health system, multiple stakeholder groups have been consulted in mapping and assessing the health facilities and laboratories with a role in the detection and surveillance of AMR. These include Regional and District Health Officers, Facility Heads of public and private hospitals and health centres, practitioners (e.g. senior laboratory scientists, clinicians, pharmacists), and teams involved in sample transportation and data quality audits. There are also regular consultations with the sub-national structures of the National Drug Authority and Uganda National Laboratory Services.

Stakeholder engagement exercises have also been run in parallel with other One Health sectors, including the subnational structures of the Ministry of Agriculture, Animal Industry and Fisheries, to support the gradual enrolment of veterinary laboratories in AMR surveillance networks. These stakeholder engagement activities have now been extended to the Ministry of Water and Environment.

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10. See also: **Operationalising the One Health approach | Health Policy and Planning | Oxford Academic**

11. See: **Regional Grants | Fleming Fund**

12. See for example: ReAct - Action on Antibiotic Resistance. (2016). AMR stakeholder mapping. Retrieved from **ReAct Group**.

13. GLASS refers to the WHO-LED Global Antimicrobial Resistance and Use Surveillance System. In the animal health sector, the World Organisation for Animal Health (WOAH) has also introduced the ANIMUSE digital platform for monitoring the use of antimicrobials in animals.

14. Donors frequently mentioned in the PEA reports for their support to AMR-related activities include: the European Union, the Global Fund, the Gates Foundation, and bilateral donors such as USAID, Germany, Japan and Australia. However, at the time of writing there were growing uncertainties about continuity of these funding sources – especially with respect to USAID.

How the programme is responding to complex stakeholder landscapes

All Fleming Fund grantees contribute to the engagement of stakeholders across One Health sectors by implementing a comprehensive and collaborative approach. Key strategies include multisectoral collaboration with a wide range of stakeholders, including government agencies, healthcare providers, veterinary services, and environmental organisations; engaging policymakers to create and enforce regulations that address AMR across human, animal, and environmental health; training and institutional capacity building across different sectors to foster the skills and knowledge needed to address AMR effectively; supporting research and innovation to develop new tools and strategies for AMR surveillance and control; and awareness raising on AMR, including the importance of AMR surveillance and responsible antibiotic use among all stakeholder groupings.[15]

Economic contexts

Although all our case countries meet the World Bank criteria for low- and middle-income status,[16] they vary considerably in the size and structure of their economies. As shown in Figure 7 below, World Bank figures for 2023 indicate that gross domestic product (GDP) per capita (current US dollars) was highest for Indonesia (US$ 4,876 pc), and lowest in Malawi (US$ 602 pc).[17, 18]

Figure 7: GDP per capita current US$ (World Bank, 2023)[19]
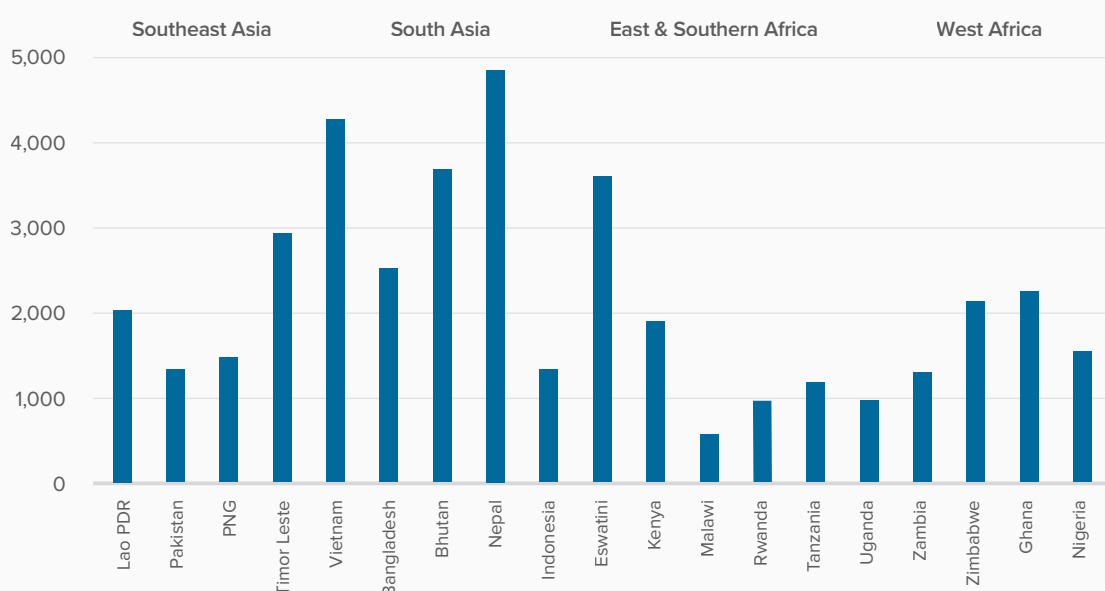
Across all case countries there has been a steady increase in GDP per capita since 2000.[20] This has largely been attributed to economic reforms and liberalisation, investments in human capital and earlier processes of globalisation.[21] However, this overall trend does not take account of the mounting economic pressures reported across all case countries due to COVID-19, geopolitical tensions, higher energy costs, inflationary pressures, and the growing impacts of climate change.[22] All of these intersecting factors mean our case countries are facing resource constraints and economic uncertainties that have implications for government investments in AMR surveillance systems and responses *(see Box 4 for a case study example)*.

15. Fleming Fund. (2023). One Health: Breaking Down Silos and Driving the Fleming Fund Forward. Fleming Fund. **https://www.flemingfund.org/publications/one-health-breaking-down-silos-and-driving-the-fleming-fund-forward/**

16. **World Bank country classifications by income level for 2024-2025**

17. GDP in current USD refers to Gross Domestic Product measured in the current year's U.S. dollars. This means that the value of all goods and services produced within a country is calculated using the prices that are current in the year being measured.

18. See Annex 1, Table 7 for source data.

19. Data source (2023): **World Bank Open Data | Data**. Figures for Bhutan are for 2022 (latest available). For all other case countries, figures are for 2023.

20. These trends are based on figures corrected for inflation but not for purchasing power parity.

21. **Absorptive capacities and economic growth in low- and middle-income economies - ScienceDirect**

22. Several PEA reports provide detailed descriptions of the economic and fiscal pressures faced by case countries. These are consistent with other commentaries on the economic vulnerabilities being experienced by LMICs - see for example: **Despite Strong Growth, South Asia Remains Vulnerable to Shocks**

Box 4: Case study – Implications of the economic context in Ghana

The PEA Report for Ghana notes that, over the past two decades, Ghana has experienced several economic shifts that have implications for healthcare expenditure and investments in global health security threats, such as AMR.

Since 2000, Ghana's GDP growth has been relatively strong, but there have been notable fluctuations. These fluctuations were mostly due to volatile global commodity prices – particularly for Ghana's primary exports of oil, gas, cocoa and gold. Other issues have included structural factors, such as the shift away from a dependence on agriculture, high levels of public debt and fiscal deficit, and, more recently, external shocks, e.g. the COVID-19 pandemic. These combined disruptions have led to exceptionally high inflation and currency depreciation – all of which were major themes in Ghana's recent elections.[23]

Ghana has long been a recipient of ODA from several multilateral and bilateral donors, including the World Bank, the African Development Bank, the Global Fund, the USA, UK, Canada and Germany. Over time, there have also been significant shifts in the aid modalities of donors – from the project-based inputs of the 1990s, and the general budget support/sector-wide approaches of 2007-12, to the rather fragmented donor investments of recent years.[24] Notably, there has also been a steady decline in the overall amounts of ODA received by Ghana since 2015.

All these factors have combined to influence modes and levels of healthcare financing in Ghana. Although government expenditure on health has shown some improvements, it remains well below the Abuja Declaration target (i.e.15% of total government expenditure). Despite the introduction of an equity-focused National Health Insurance Scheme (NHIS) in 2003, and a National Health Financing Strategy in 2015, available resources for the health sectors have remained uncertain and unreliable – especially for healthcare infrastructure, medical supplies, and personnel. As a result, bacteriology diagnostics and antibiotic susceptibility tests have remained outside the scope of the NHIS. These issues have contributed to a growing role for private sector providers in Ghana and relatively high levels of out-of-pocket health expenditure by households and communities.[25]

All the case countries have been recent recipients of Official Development Assistance (ODA) – Annex 1, Table 5.[26] Across regions, the East and Southern Africa region appears to have been receiving the highest levels of ODA overall, with (historically) the United States, the European Union, UK, and the World Bank reported to be key donors. In the South and South East Asia regions, Bhutan, Timor Leste, PNG and Lao PDR have received relatively large contributions of ODA, with Australia, Japan, China, the European Union and the World Bank reported to be major donors.[27] Our PEA reports suggest that, while there are opportunities for donor partnerships to support AMR surveillance and One Health approaches, there are also country-level concerns about fragmented donor inputs and shifting donor priorities, especially in the uncertain economic climate. These concerns have, of course, been reinforced by recent cuts in aid spending by USAID and other multilateral and bilateral donors. [28]

Focus on government health expenditure

In the human health sector, the resources available for sustainable investments to combat AMR will be shaped by overall government expenditure on health. Below, Figure 8 shows annual health expenditure per capita (current US$) by country based on the latest available World Bank data (2021). From Figure 8, we can see that, across the case countries, the highest per capita expenditure on health was in Eswatini, Vietnam and Indonesia in 2021 (range, current US$ 160-278), while the lowest per capita expenditure on health was in Tanzania, Uganda, Malawi and Pakistan (range, current US$ 37-46) - see Annex 1, Table 6 for full data set. These figures compare to an average per capita expenditure on health of 6,500 current US$ in high-income countries and 1,070 current US$ in upper-middle-income countries in 2021.[29]

23. **Ghana Economic Growth 1960-2024 | Macrotrends**
24. Pallas, S. W, Nonvignon, J., Aikins, M., & Prah Ruger, J. (2015). Responses to donor proliferation in Ghana's health sector: A qualitative case study. Bulletin of the World Health Organization, 93(1), 11-18.
25. **HEALTH FINANCING ASSESSMENT: Ghana**
26. The World Bank describes Official Development Assistance as financial aid flows by official agencies to promote the economic development and welfare of developing countries: **Glossary | Data Bank**.
27. For case country datasets on GDP per capita and ODA per capita see Annex 1, Table 7.
28. Recent feedback from country grantees suggests that cuts in USAID funding are seriously impacting FAO programmes relating to animal health, One Health and AMR in Pakistan, Vietnam and PNG. There are also implications for funding of WHO support to AMR work in Vietnam.
29. Source: World Bank (2021). Retrieved from: **Current health expenditure per capita, PPP (current international $) | Data**

Annex 1, Table 6 summarises additional World Bank data on overall health expenditure as a percentage of GDP, domestic spending on private healthcare per capita, and out-of-pocket expenditure per capita (2021) for the case countries. Additionally, a review of World Bank trend data on health expenditure by case country points to significant disruptions to health expenditure as a percentage of GDP throughout the COVID-19 pandemic. However, overall, there has been a steady increase in government health expenditures as a percentage of GDP since 2000 – the exception being Zimbabwe, where there has been a gradual decline. By 2021, the average health expenditure as a percentage of GDP across case countries was 4.8%. Although this average compares well to the World Bank target of 5% GDP, country figures range from just 2.3% GDP in Lao PDR to 11.4% GDP in Timor Leste. Notably, even the highest figures for case countries are well below the average of 13% GDP (2021) for high-income countries.[30]

Figure 8: Annual health expenditure per capita by country, current US$ (2021)[31]
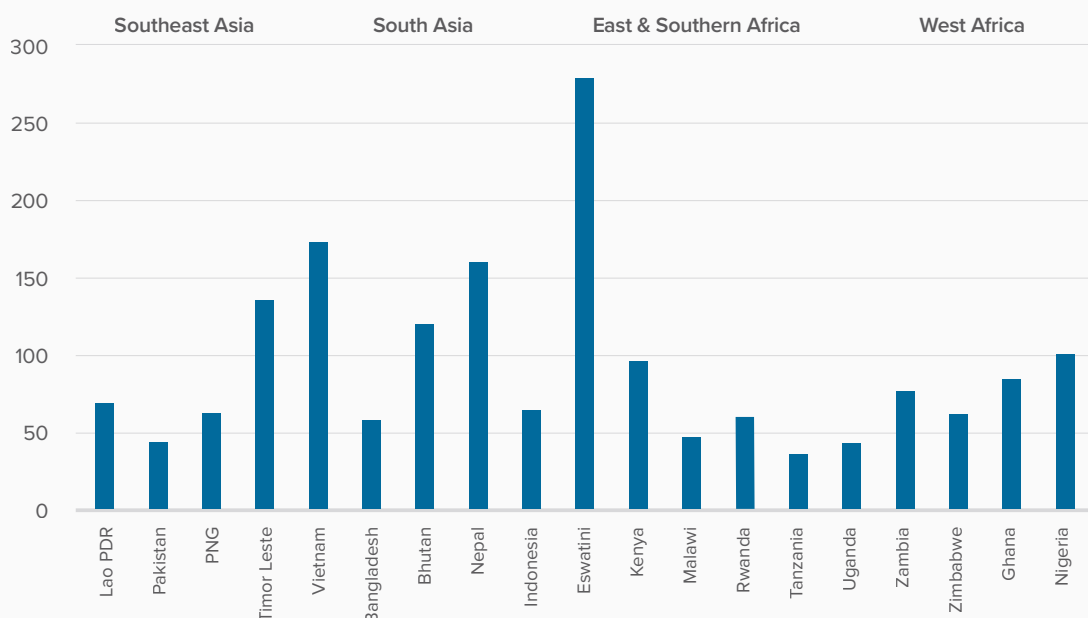
Data triangulation exercises suggest that, in 2021, domestic expenditure on private healthcare across case countries was highest in Vietnam, Indonesia, Eswatini and Nigeria. Out-of-pocket expenditure was highest in Vietnam, Indonesia, Bangladesh and Nigeria *(Annex 1, Table 6)*.

Across the board, the PEAs highlight the links between pressures on government health expenditures and financial commitments to combating AMR. Factors identified in the PEAs to explain shortfalls in government financial commitments to AMR include:

- Limited country resources and perceptions of more immediate health sector and health security priorities.
- Lack of data and understanding of the economic burden of AMR.
- Issues of alignment between programme and government budget cycles.
- Some government concerns about departmental absorption capacity – sometimes attributed to workload pressures (South Asia).
- Scale of investment needed, especially to support more comprehensive One Health approaches.
- Lack of public support/demand for investments in AMR surveillance, laboratory testing, and more rational use of antimicrobials.
- Concerns about creating dependencies on unpredictable donor funding.

Addressing some of these issues and perceptions is a central plank of country grantees' sustainability plans. For example, data on the AMR burden of disease is being generated through studies in Lao PDR, Pakistan, Timor-Leste, Indonesia, Bangladesh, Nepal, Tanzania and Nigeria to support budget advocacy. Across the board, country grantee workplans include a focus on technical and operational support for enhanced multisectoral efforts to raise public, government, and private sector awareness of the threat of AMR, e.g. through educational and media campaigns, local workshops, conferences, data sharing, and research collaborations.

30. Source: World Bank (2021). Retrieved from: **Current health expenditure (% of GDP) | Data**
31. Data source (2023): **World Bank Open Data** | Data (latest available data, 2021).

How the programme is responding to economic contexts

All Fleming Fund Country Investment Strategies take account of country economic and resource flow contexts. All grantees are required to engage with these contextual factors as part of their sustainability plans. They are also held accountable for ensuring programme resources are used efficiently and effectively. Key grantee strategies include: working with AMRCCs/government partners to ensure surveillance strategies are economically feasible and in line with country priorities; working with regional grantees (such as TACE and TADEU Africa/Asia), to build the economic case for investments that address the economic burden of AMR; providing costings for surveillance activities to inform finance planning; and working collaboratively with other partners and donors to identify options for co-financing of laboratory systems strengthening and improved diagnostic stewardship. In Nigeria, for example, the country grantee has supported the development of a second NAP (2023-2028) based on experience and evidence from implementing the first NAP. An explicit objective of the second is to develop the economic case for sustainable investment in-country and increase investment in new medicines, diagnostic tools, vaccines, and other interventions.

Features of human health sectors

The effectiveness of AMR surveillance systems and responses to AMR/AMU evidence are likely to be dependent on the functioning of the wider human health system.[32] In keeping with many PEAs, we have used Global Health Security (GHS) Index scores as a proxy for assessing the maturity and resilience of country health systems. GHS Index scores for health systems are based on set indicators relating to: health facility capacity; functionality of supply chains; healthcare access; infection control practices; and responses to health emergencies and disease outbreaks – including testing and approving new medical countermeasures, and health worker communications and deployment.[33] Figure 9 below is derived from the 2021 GHS Index scores for the health system in each case country (0 = low; 100 = high).[34]

Figure 9: GHS Index scores for health systems by country (2021)
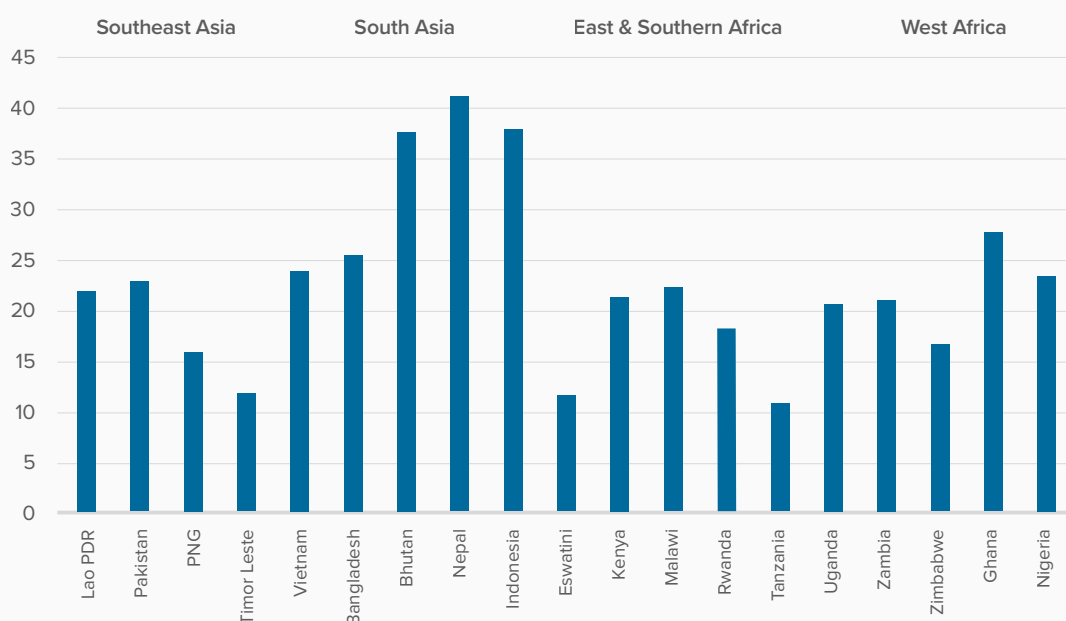
Overall, the 2021 GHS health systems scores for the case countries are low (range 12-41) compared to the scores for high-income countries (range 46-76). Within our sample, Indonesia, Bhutan and Nepal scored highest with scores ranging from 38-41. The lowest scores were found in Tanzania, Eswatini and Timor Leste with scores of 11-12. Several case countries face periodic 'health shocks' such as natural disasters (e.g. flooding and cyclones in Bangladesh and Pakistan; earthquakes in Nepal), and disease outbreaks (e.g. cholera in Zambia and Kenya, Lassa fever in Nigeria, Typhoid in Pakistan, Ebola in Uganda). In keeping with other LMICs, most case countries are experiencing an 'epidemiological transition', with the combined effects of communicable and non-communicable diseases placing additional pressures on already strained health systems.

32. Do, P. C., Assefa, Y. A., Batikawai, S. M., & Reid, S. A. (2023). Strengthening antimicrobial resistance surveillance systems: A scoping review. BMC Infectious Diseases, 23(1), 593.
33. Source: **2021_GHSindexFullReport_Final.pdf** p.42
34. Source: **2021 Report & Data - GHS Index**

Across the board, common health system constraints in the case countries relate to lack of resources and predictable funding, weak health sector and communications infrastructure, and inadequate health workforce capacity. Several PEA reports list some specific health workforce challenges that have implications for sustainable programme interventions. These include:

- Poorly defined roles and responsibilities with respect to AMR stewardship, surveillance and use of AMR data for decision-making – this can translate into inadequate supervision and management support, and weak accountability.

- Lack of standardised or aligned professional development and training in AMR, including fragmented training that is inadequately tailored to different cadres and sectors. Related to this, the PEAs report a lack of accredited AMR continuous professional development, little recognition of training and skills building, and few links to pathways for career progression.

- Poorly equipped workplaces, so that even when practitioners and laboratory staff are trained, they cannot apply their knowledge and skills.

Another health system challenge mentioned by several PEAs relates to chronic supply chain challenges that affect not only supplies of laboratory reagents and consumables but also prescribing practices and the rational use of antibiotics. In some cases, this is due to historic under-investment in supply chain systems, regulatory frameworks and infrastructure, especially at sub-national levels (e.g. Bangladesh, Kenya, Uganda, Nigeria). Meanwhile, countries such as Lao PDR have limited purchasing power and face challenges in negotiating prices and ensuring the quality of supplies. Indonesia, too, has experienced problems with market fluctuations, procurement and distribution, leading to shortages and higher costs for essential medicines and supplies.

Some PEA reports also refer to cultural factors that may have implications for health systems functioning. There is acknowledgment that, in many settings, religious beliefs, traditional practices and social norms influence health-seeking behaviours, including how patients perceive diagnostic tests and treatments.[35] In PNG, traditions associated with the 'Wantok' system are observed to affect working practices, obligations, and relationships between groups and individuals, and influence decision-making at all system levels.[36]

Focus on structural differences in health systems

Across case countries, there are variable levels of decentralisation and devolution within health systems. Although all case countries have made formal commitments to Universal Health Coverage and improving the accessibility of primary healthcare services,[37] operational realities vary considerably.

In some countries, there has been significant *devolution* of health services – especially those with a federal, state, or unitary state system (e.g. Pakistan, Nigeria and Kenya). In these countries, sub-national government structures have significant governance and financial autonomy and often set up AMR and One Health structures that mirror those at federal level (*see Box 5 below*). In other case countries, such as Timor Leste, Zambia and Ghana, health services have been decentralised - this means central government functions have been redistributed to lower levels, but there is more limited governance and budget autonomy.

Across the portfolio, there are varying degrees of health system devolution and decentralisation, along with cross-cutting vertical disease programmes (e.g. for HIV, malaria etc). Both regional hubs and country grantees emphasise that the effectiveness of advocacy on programme sustainability themes depends on a sound understanding of the country health system, including the structural functions, levels of authority and schedules of planning and budgeting at each system level.

Another notable structural variation relates to the role of private healthcare providers. Although nearly all the case countries have mixed healthcare economies, the scale of private healthcare provision varies considerably. Pakistan, Bangladesh, Indonesia, Vietnam and Nigeria are reported to have large private healthcare sectors, while not-for-profit providers play an important role in Bangladesh and several case countries in East and Southern Africa. The PEA reports also alert us to the perspectives of other private sector actors, ranging from drug vendors and pharmacists, private laboratories and diagnostic services, to private practitioners. The roles, influence and interests of large pharmaceutical industries also need to be considered in countries, such as Pakistan, Bangladesh, Indonesia, Vietnam, Kenya and Ghana.

35. Lazaro, G. (2023). When positive is negative: Health literacy barriers to patient access to clinical laboratory test results. *The Journal of Applied Laboratory Medicine*, 8(6), 1133-1147.

36. See also: Walton, G., & Jackson, D. (2020). *Reciprocity networks, service delivery, and corruption: The wantok system in Papua New Guinea*. U4 Anti-Corruption Resource Centre.

37. WHO (2023): **Seventy countries convene to step up primary health care**

Box 5: Case Study – Provincial planning to combat AMR in Pakistan

Pakistan devolved healthcare provision to provincial authorities in 2010. While federal authorities set national health policies and standards, provincial authorities are responsible for their operationalisation and resourcing.

National frameworks, such as the National Strategic Framework for Containment of AMR and the AMR National Action Plan, are now being rolled out at the provincial level with the support of the Fleming Fund. Sindh Province is especially advanced in this respect. In Sindh Province, an AMR Surveillance Strategy has now been adopted, along with innovative One Health surveillance initiatives. Guidelines for responsible antimicrobial use in healthcare settings and prescription guidelines are also in place. A provincial budget of PKR 260 million (~USD 1 million) has recently been allocated for AMR surveillance and containment – although there remain concerns about continuity of health sector leadership and budget priorities.

It is estimated, however, that some 70% of the population relies on private healthcare providers, with around 82% of healthcare encounters occurring in the private sector.[38] Consequently, the country grantee is working inclusively with the private sector across Pakistan to improve AMR surveillance at sentinel sites. Key initiatives include support for the upgrading of key private sector laboratories, plus engagement in multisectoral and One Health coordination efforts.

Despite important progress, the devolved healthcare system creates both opportunities and challenges. Some provinces engage well, but this can be dependent on the presence of committed and consistent provincial leadership. In other provinces, it has proved more difficult to gain traction. This, in turn, creates challenges for achieving national coverage of a standardised surveillance approach, including standardisation of data and indicators, and timely data transfers and reporting to NRLs. There is also considerable potential for duplication of effort in surveillance planning, budgeting and provincial policy development.

Focus on payments for patient laboratory tests

The Fleming Fund recognises that strengthening patient laboratory and diagnostic services is foundational for credible AMR surveillance. However, securing appropriate financial resources for patient laboratory and diagnostic services requires a multifaceted approach that straddles health financing and supply and demand-side issues, along with multilevel stakeholder engagement.

In some settings, government budget allocations extend to free laboratory and diagnostic tests, although this can depend on the type of test and patient income. Alternatively, payments for laboratory tests may fall under national or private health insurance schemes, and/or be subject to direct charges to patients themselves. Types of payment models include fee-for-service, capitation, or bundled payments. These can form part of cost recovery efforts at the hospital level.

Sustainability planning requires country grantees to unpack these financing pathways in different contexts and consider where they may be able to exert influence. Health economics studies may also be needed to evaluate the cost-effectiveness of resource allocations, and the extent to which resources are being used efficiently to maximise health outcomes.

The case study from Nepal in the box below illustrates the converging themes that influence payments for laboratory testing in the case study countries.

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38. See: **6 Facts About Healthcare in Pakistan**

Box 6: Case Study – paying for patient laboratory tests in Nepal

In Nepal, financing of diagnostic tests in the health sector involves a mix of public funding, out-of-pocket expenditures and support from international donors. The country grantee reports that, although government funded health programmes provide free basic health services, patients often seek services from the private sector. The perception of lower quality health services in the public sector is attributed to poorly maintained infrastructure, shortages of staff, equipment and supplies, and long waiting times.[39]

In the public sector, the Government of Nepal allocates some budget for the provision of laboratory services. This is intended to cover the cost of reagents and consumables but is generally insufficient. There is limited funding for equipment maintenance. Hospital committees set the charges for diagnostic tests. Income generated from these charges goes into pooled hospital funds that are allocated by hospital administrations with little transparency.

Nepal's evolving National Health Insurance Programme suffers from low enrolment rates and high dropouts. Many diagnostic tests, including blood cultures, are not classified as 'basic health services' so must be self-funded by patients. This is reported to affect the uptake of diagnostic services, and a tendency for patients to revert to empirical treatments and the purchase of poorly-regulated 'over the counter' antibiotics.[41] Meanwhile, in this mixed health economy, patients sometimes move between public, private and NGO care providers and payment methods – this is especially the case among Nepal's transhumant, migratory and displaced populations.[41]

The PEA reports suggest that most case countries have some form of national health insurance scheme that is designed to reduce financial barriers and extend universal health coverage. However, these national health insurance schemes rarely cover all diagnostic tests or the full cost of laboratory services.

Notably, some countries, such as PNG, Timor Leste, Bhutan, Eswatini, Malawi and Uganda, do not have fully established national health insurance schemes. While these countries do offer access to free primary healthcare services based on an Essential Package of Health Services (EPHS), or equivalent, resource constraints can affect the availability of laboratory testing services. Moreover, there is usually an expectation that patients will contribute to the cost of laboratory tests, especially at secondary and tertiary service levels. Only Bhutan offers a full package of free laboratory and diagnostic tests for all its citizens at all service levels.

The PEA reports suggest that the effectiveness and sustainability of cost recovery schemes can be shaped by patient demand and user perceptions of whether laboratory services are reliable, timely and add value. In countries such as PNG, Lao PDR and Timor Leste, these perceptions may be shaped by the continued shortage of laboratory scientists trained in bacteriology and microbiology, and frequent disruptions to laboratory supplies of reagents, consumables and equipment.

Several country grantees are engaged in advocacy efforts to have key laboratory services covered by established national health insurance schemes and/or the EPHS; advocacy often extends to inclusion of laboratory reagents and consumables in countries' essential diagnostic and medicines lists. In some cases, e.g. Bangladesh and Lao PDR, advocacy efforts also focus on national-level budget allocations to ensure laboratory services are available, functional and accessible. Here, regional grantees, such as RADAAR and TADEU, have provided significant support on advocacy approaches.[42] In many instances, e.g. Indonesia, Pakistan, Eswatini, Uganda, Zambia and Nigeria, 'supply side' budget advocacy has largely been through support for costing of national action plans in line with WHO guidance. [43,44]

Focus on data use for policy and practice in human health

The Fleming Fund seeks to advance programme outcomes on the use of AMR data for policy and practice at three levels: the national policy and governance level; the level of institutional and laboratory systems strengthening; and the level of clinical engagement. Strategies for this outcome area are captured in country grantees' Data Use and Evidence Plans. In the human health sector, there is a particular emphasis on the clinical engagement of hospital and pharmacy services and clinicians to improve antimicrobial stewardship (AMS) and diagnostic practice — this extends to strengthening the laboratory-clinician interface, improving AMU practices, and enhancing infection prevention and control (IPC) measures.

39. This is confirmed by: Saito, E. et al. (2016). Inequality and inequity in healthcare utilization in urban Nepal: A cross-sectional observational study. *Health Policy and Planning*, 31(7), 817-824.

40. Adhikari, B., Pokharel, S., Raut, S., et al. (2021). Why do people purchase antibiotics over-the-counter? A qualitative study with patients, clinicians and dispensers in central, eastern and western Nepal. *BMJ Global Health*, 6, e005829.

41. International Organization for Migration. (2015). Health vulnerabilities of migrants from *Nepal: Baseline assessment*. International Organization for Migration.

42. See: IVI-RADAAR. (2023). Advocacy to Drive AMR Policy: A Country Guide. International Vaccine Institute. Retrieved from **https://www.ivi.int/wp-content/uploads/2023/10/Advocacy-to-Drive-AMR-Policy_A-Country-Guide.pdf**

43. World Health Organization. (2019). Turning plans into action for antimicrobial resistance (AMR): Working paper 2.0: Implementation and coordination. Geneva: World Health Organization.

44. World Health Organization. (2021). WHO costing and budgeting tool for national action plans on antimicrobial resistance: user guide. Geneva: World Health Organization.

Box 7: Case Study – improving data use for policy and practice in Bangladesh

In Bangladesh, the burden of AMR is well recognised by health policy makers – for example, in 2019 around 26,220 deaths were directly attributable to AMR in Bangladesh.[45] The overuse and misuse of antibiotics are seen as key drivers. Under the Fleming Fund, strong synergies have been established between the Country Grant, Fellowship Scheme and Regional Grants to improve AMR data quality and its use of AMR data for policy and practice. Key activities in the human health sector have included:

- Support for improved functioning, coordination and data use capacity of AMR committees and associated TWGs.
- Establishment of centralised NRL data management platform and dashboards to support continuous data generation and analysis.
- With Fleming Fellows, collaboration with the Directorate General of Drug Administration on new policies and regulations for branding and packaging of antibiotics to increase public awareness of AMR.
- With regional grantees, development of a National External Quality Assessment Services (EQAS) Programme and training for National Reference Laboratories to build their capacity as National EQAS providers.
- Review and update of AMR surveillance protocols to ensure adherence to quality standards for surveillance data, along with collaborative work on Point Prevalence Surveys (PPS) and analytical studies.
- Strengthening of AMR reporting and data transmission to the national AMR dashboard by participating laboratories.
- Training for laboratory staff on microbiology, epidemiology, data collection, sampling procedures, and quality management to improve data quality.
- Working with hospital AMS committees, pharmacists, and laboratory staff to develop antibiograms as the basis for prescribing policies and treatment guidance.
- Conducting clinical engagement workshops with medical practitioners and pharmacists to support improved AMR awareness, diagnostic stewardship, and more rational use of antibiotics.
- Updating of guidelines and procedures on taking, labelling, and transporting of specimens and treatment options.

A common challenge mentioned in several PEAs is a perception among surveillance staff and policymakers that AMR surveillance data is most relevant to technocrats and researchers, and is primarily required for global reporting systems, such as GLASS. Experience from Pakistan and Bhutan suggests, however, that AMR data is perceived as most relevant when it is interpreted in local epidemiological and clinical settings.

The PEA reports also identify persistent challenges relating to the timeliness, quality and accessibility of data for decision-making. In countries such as Zimbabwe, Laos PDR and Kenya, these challenges have been linked to issues of poor data management, unreliable data transmission, and inadequate integration of data systems across sectors and system levels, with distinct issues relating to AMR, AMU and AMC data. Although digitalisation of systems offers potential solutions, several PEAs mention the challenges and inefficiencies created by incompatible software and parallel systems. For example, in the Lao PDR and Ghana, several inefficiencies have been attributed to lack of integration between the WHONET software and hospital systems.

Additionally, the PEAs and key informant interviews point to a few widespread barriers to data use for policy and practice that can be grouped around the themes of capacity, resources and motivation. The clustering of feedback responses around these themes is shown in Figure 10 below.[46] Notably, common barriers to AMR data use identified broadly refer to the accessibility of usable data, political processes of decision-making, institutional inertia, and the perceived ramifications of acting on data for resource allocations and organisational change.

45. Institute for Health Metrics and Evaluation. (2023). Retrieved from: **https://www.healthdata.org/sites/default/files/2023-09/Bangladesh.pdf**
46. Synthesis framework for barriers to use of AMR data for decision-making developed by Adrienne Chattoe-Brown.

Figure 10: Common barriers to use of AMR data for policy and practice in the human health sector

Common barriers to use of AMR data for policy and practice

⚠️ **Capacity**

- Policymakers don't always understand the AMR threat; may lack technical knowledge to act on surveillance data
- Lack of institutional capacity to produce, analyse and report quality data in a timely manner
- Leadership/staff turnover disrupts continuity of decision-making processes
- Lack of staff capacity/availability/ skills, at various levels to access, interpret and use data or implement action required
- Weak systems capacity for data management and transmission results in fragmented/incomplete data for decision-making
- Prevailing legislative/policy/ regulatory frameworks do not allow agile responses to evidence
- Gap between political and research capacity – data rarely the only determinant of policy making

⚠️ **Resources**

- No budget to act on what data-driven decision-making
- Health emergencies derail resource allocations for routine clinical services
- Lack of other donor demand for AMR/AMU data
- Budget allocations don't translate into expenditure
- Tight fiscal space to implement evidence-based change

⚠️ **Motivation**

- Implications for change – change perceived as difficult, disruptive, time-consuming
- Political or institutional pressures to ignore data – lack of public demand
- People in charge lack power to change policy and practice
- Staff poorly paid/overstretched/ multiple jobs
- Political instability creates uncertainty – implications for data reporting and action
- Little professional recognition of AMR expertise
- Different incentives and client demand across public/private sectors for using data
- Cost implications of responding to data e.g. for patients, facility budgets
- Competing priorities – AMR/AMU not on political agenda
- Data can highlight an issue, but there may be different perspectives on the appropriate policy/practice response to address it

Across the PEAs, the use of AMR surveillance data is reported to be lowest at sub-national levels, especially where there are limited training opportunities, and where there is little reporting oversight and accountability, or delegation of decision-making authority.

How the programme is responding to human health contexts

Following collaborative country assessments and consultations, the Fleming Fund's customised Country Investment Strategies define priority task areas for strengthening the human health sector's role in One Health AMR surveillance. Common strategies adopted by the Fleming Fund include: strengthening of AMR governance and policy making (e.g. for NAPs and AMR /AMU surveillance strategies) through activities such as stakeholder engagement, data and evidence synthesis and sharing of international best practice; laboratory infrastructure and systems strengthening – e.g. laboratory refurbishment and equipment installation, workforce strengthening, updating of SOPs and guidelines, improved supply chain management; technical support for hospital AMS committees, PPS, and other local research such as burden of disease studies; and clinical engagement for improved diagnostic stewardship and strengthening of the clinical – laboratory interface. Many country grantees are also involved in evidence-based advocacy for the inclusion of laboratory tests and antibiotic sensitivity testing in national health insurance and EPHS cover, and for the inclusion of laboratory reagents and consumables in essential medicines lists.

Delivering these strategies requires aligned working with governments, UN agencies, and other development partners across sectors. Within the programme, there is strong coordination between country grantees, regional grantees and the Fellowship Scheme. For example, country grantees work closely with the regional grantee, TADE Africa and TADEU Asia and Africa, to access specialist technical assistance on evidence use for policy, practice and budget advocacy. In Uganda, the Fleming Fund's costing study provided an important model for assessing the surveillance system's costs and the expected benefits for sustainability planning.[47]

Across the board, country grantees routinely monitor the structural dynamics, strengths, weaknesses and vulnerabilities of the health system to inform adaptive delivery approaches and risk assessments as part of integrated health systems strengthening and global health security approaches.

47. The Fleming Fund. (2022). Fleming Fund Policy Brief: Uganda. Available from: **Fleming Fund Policy Brief Uganda.pdf**

One Health working: Features of animal health and environment sectors

One Health collaboration is a foundational principle in the Fleming Fund's approach to tackling AMR. For the Fleming Fund, One Health is defined a collaborative, multisectoral approach that aims to sustainably balance and optimise the health of people, animals, and ecosystems. Box 8 illustrates the case for supporting a One Health approach to AMR surveillance in PNG.

Box 8: Making the case for a One Health approach in PNG

With an ecosystem that ranges from mangroves, montane, savannah and tropical forests to coral-rimmed sands and sea, PNG harbours some of the world's most biologically rich diversity. The forest provides subsistence for food, building materials, and economic activity for over 80% of the 8.5 million population.

The previous deforestation practice and free-range animal production system were not feasible with increased national and global demand. This has been caused by a rising population, pressure on open land with urbanisation, growing domestic and international markets, and increased commercialisation of lucrative crops. In response to these changes, agricultural inputs, including fertilisers, pesticides, fungicides, and veterinary medications, have been introduced to increase production.

The use of agricultural inputs (fertilisers, pesticides and animal medicines) can lead to soil degradation and water pollution, which disrupts the ecosystem. The chemical residues from these inputs are detrimental to the public's health; agricultural teams are exposed through handling, and the public consumes the residues on food produce. If veterinary antimicrobials are not used responsibly, this can lead to AMR.

PNG has joined the global call addressing AMR through the development of its National Action Plan, 2019 – 2023. These efforts are coordinated by the AMR Secretariat, which is mutually facilitated by the National Department of Health, the Department of Agriculture and Livestock, the National Agriculture Quarantine and Inspection Authority, and the Conservation and Environment Protection Authority. However, the AMR challenges in PNG are substantial. The country's health system and animal health field, and laboratory services have limited resources to conduct sample testing and monitoring. In the animal health sector, human resources are focused on managing disease outbreaks, such as African Swine Fever and, most recently, Lumpy Skin Disease and Foot and Mouth Disease.[48]

The PEAs highlight that the agriculture, forestry and fisheries sectors are significant contributors to the economies of all the case countries, accounting for 10-25% of value added to GDPs *(Annex 1, Table 7)*.[49] These sectors are also an important source of livelihoods and food security for the poorest households, especially in rural areas.[50] In the case countries, it is widely recognised that the health of animals, agricultural and food products, and water and soil systems are critical for these populations. However, across the board, systems and infrastructure for the animal health and environment sectors remain relatively underdeveloped. There are also inadequate resource allocations for prevention and biosecurity measures, veterinary and diagnostic services, and disease surveillance.[51]

A review of GHS Index scores (2021) for surveillance of zoonotic diseases/pathogens suggests, however, that some case countries may have relatively good baseline capacity for detecting, monitoring and reporting zoonotic diseases. For example, scores for the GHS zoonotic disease index indicator[52] ranged from 25-42 out of 100 for Indonesia, Bhutan, Vietnam and Bangladesh (this compares to upper scores of ~53 in high-income countries).[53,54] Notably, scores for Lao PDR, Pakistan, Nepal, Eswatini, Kenya, Rwanda, Tanzania, Uganda, Zimbabwe, Ghana and Nigeria were somewhat lower, ranging from 5-19.5 out of 100. All other case countries were scored 0-0.6 out of 100 in 2021, suggesting negligible (or unmeasured) zoonotic disease capacity.[55]

48. Fleming Fund. (2021). One Health, AMR, and biodiversity in Papua New Guinea. Retrieved from https://www.flemingfund.org/publications/one-health-amr-and-biodiversity-in-papua-new-guinea/

49. **Agriculture, forestry, and fishing, value added (% of GDP) | Data**

50. Sekaran, U., Lai, L., Ussiri, D. A. N., Kumar, S., & Clay, S. (2021). Role of integrated crop-livestock systems in improving agriculture production and addressing food security – A review. *Journal of Agriculture and Food Research*, 5, 100190.

51. See for example, Moiane, B. (2024). The role of biosecurity in promoting farm animal welfare in low- and middle-income countries. In J. Bakker & M. Delagarza (Eds.), *From Zoo to Farm - The Quest for Animal Welfare*, **IntechOpen**.

52. THE GHS Index indicator for zoonotic disease covers: national planning and surveillance systems for zoonotic diseases/pathogens; international reporting of animal disease outbreaks; animal health workforce; and role of the private sector in managing zoonotic disease.

53. Source: **2021 Report & Data - GHS Index**.

54. These better GHS Index scores compare well to 2021 scores for many middle-income countries. Notably, the highest scores of ~53 out of 100 were achieved by countries such as USA, Australia and UK.

55. Source: **2021 Report & Data - GHS Index**.

Figure 11: GHS Index scores for surveillance of zoonotic diseases/pathogens (2021)
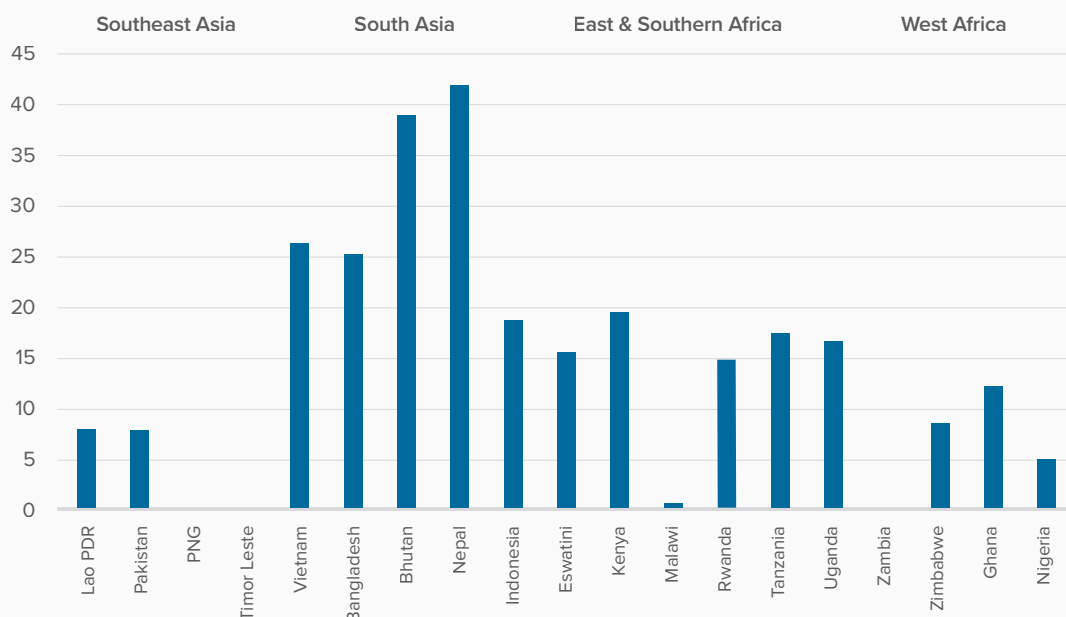
The PEA reports suggest that, across the case countries, the concepts of AMR surveillance and antimicrobial stewardship are relatively new in the veterinary medicine and animal health sectors. Consequently, extensive work is required on practitioner education and awareness-raising. It is also noted that, among animal health practitioners, there are wide variations in levels of professional qualification. For example, in Tanzania, paravets were found to have little in the way of formal qualifications and practical training.[56] In Uganda and Kenya, it has been observed that even when animal health practitioners are well qualified, they lack the resources, transportation, and communication tools to effectively conduct their roles.[57]

Across the board, the PEAs point to a tendency for animal health practitioners to treat cases empirically, often with overuse of broad-spectrum antibiotics. In South and South East Asia, there are concerns about the overuse of antimicrobials in industrial food and animal production, where they may be being used to compensate for poor hygiene and high stock densities.[58] In Tanzania, Kenya and Uganda, the PEAs also highlight a lack of relevant and accessible AMU guidance for animal owners, practitioners and food producers.

Several case countries also have a sizeable aquaculture sector, e.g. Vietnam, Indonesia, Bangladesh, Uganda, Zambia, Ghana and Nigeria. The PEA reports identify several distinctive issues for AMR initiatives in this sector. Over and above generic challenges of capacity constraints and lack of standardised protocols, the PEAs highlight specific sectoral concerns including: the frequent misuse of antibiotics as growth promoters; the 'transboundary' nature of aquaculture and the seafood trade; and a lack of awareness of aquatic environments as potential 'reservoirs' for AMR pathogens.

Given the challenges of rolling out AMR surveillance across One Health sectors, the Fleming Fund has introduced a new regional grant, AMROH (for Antimicrobial Resistance and One Health), to provide specialist support services to countries in the areas of animal health, One Health, environment, and veterinary practitioner engagement. The One Health component is aimed at supporting integrated, multidisciplinary approaches to AMR surveillance and data analysis. Four separate AMROH grants are now providing dedicated support to country grantees and AMRCCs across the four Fleming Fund programme regions, with a particular focus on customisation and piloting of integrated surveillance systems. More specifically, there is emphasis on: technical support and extending protocols for surveillance in new species and sectors (e.g., animal species other than poultry, aquatic animals, environment, and food safety sectors); enhanced support for integrated surveillance in line with the Tricycle protocol; AMR/C/U policy development and practitioner engagement.

One widespread issue identified by AMROH is that AMR is primarily seen as a public health issue. Animal health agencies are generally set up and budgeted to investigate and control important animal diseases, and there is little incentive for them to undertake AMR surveillance unless they receive direct financial support. AMROH is, therefore, exploring alternatives to relatively resource-intensive active surveillance testing – e.g., routine sampling at abattoirs and farms. Additionally, AMROH notes that selling of antibiotics/antimicrobials to farmers is often a key source of income for paravets and agrivets – this means that tailored educational, regulatory and incentivisation strategies are needed to counter this (although such changes to animal production systems which are beyond the scope of disease surveillance interventions).

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56. This finding is consistent with: Frumence, G. et al. (2021). Practices and challenges of veterinary paraprofessionals in regards to antimicrobial use and resistance in animals in Dar Es Salaam, Tanzania. Antibiotics, 10(6), 733.

57. These PEA findings are consistent with: Rutebarika, C., Mutua, E., & Wekesa, C. (2021). Cross-border issues related to the provision of animal health services: Kenya, Uganda, Ethiopia, and Tanzania. Feinstein International Center, **Tufts University.**

58. These concerns are consistent with: Ritchie, H., & Roser, M. (2017). Antibiotics in livestock, **Our World in Data**.

Box 9: Case Study - paying for animal health tests in Indonesia

In Indonesia, large industrial actors (including poultry integrators) have their own veterinary diagnostic laboratories and provide testing for their producers. Elsewhere in the animal health sector, almost all microbiology tests in animal health are paid for by the Government of Indonesia, with some donor support (e.g. from the Food and Agriculture Organization and the Fleming Fund). Recent practice has been for donors to fund the establishment of testing services to transition to funding by the government.

To date, donor funds have supported improved AMR surveillance in the animal health sector through workforce strengthening, as well as material and technical inputs for sample collection, transportation, and laboratory testing at sentinel sites. Although the Ministry of Agriculture has been fully engaged, there have recently been significant budget cuts that have reduced its ability to support surveillance initiatives. The reliability of laboratory testing also remains a challenge. Government-led laboratory testing is usually conducted on an ad hoc basis and is often timed to address annual testing targets. Most recently, the president of Indonesia has announced a new 'Milk for All' policy giving priority to increased milk production. The country grantee is now expanding the scope of AMR/AMU surveillance in cattle to align with the government agenda.

The country grantee notes that, ultimately, uptake of laboratory testing in this sector comes down to incentives. With only intermittent government-led testing and active surveillance, animal owners and farmers are reluctant to initiate testing themselves due to a fear that disease detection will lead to heavy costs and significant reputational damage.

Focus on commercial, export and private sector interests

Many PEAs emphasise the importance of engaging with the private sector in animal health interventions. Across the case countries, a lot of veterinary work is carried out by private vets; meanwhile, abattoirs are often privately owned, large commercial farms are privately owned, and agrivet businesses are privately owned.

Several PEAs refer to the role of multinational corporations in the food and agriculture sector (e.g., large-scale meat producers). If animal products are being exported, these corporations commonly implement stringent pathogen and chemical residue testing protocols to ensure their products meet international standards set by importing countries and international organisations. They may also invest in advanced laboratory facilities and collaborate with national regulatory bodies to monitor antibiotic use.

It is notable that, when animal and food products are intended for export, they are usually subject to stricter regulations and monitoring regarding the use of antibiotics. This in turn prompts formal collaboration and information exchanges between public and private sector bodies. In Vietnam, the Ministry of Agriculture and Rural Development ensures compliance with export standards and implements regulations to control antibiotic use in livestock. This includes certification of exporters, enforcement of regulations on antibiotic use in animal feed and medicines and working with exporters to ensure products comply with the standards set by importing countries.

Focus on data use for policy and practice in animal health

To advance programme outcomes on the use of animal health data for decision-making, Fleming Fund interventions target governance and institutional levels, as well as practitioners, with a focus on vets, paravets, and farmers.

At the level of AMR governance, several country grantees observe a tendency for AMRCCs tend to still be dominated by Ministry of Health agendas and 'siloed' thinking. This is compounded by the fact that, while there has been general progress in the quantity of AMR data generated by animal health sectors, this data is not always shared or analysed promptly or presented in appropriate formats for policy action. Nevertheless, in both Bangladesh and Indonesia, significant progress has been made in establishing an integrated AMR dashboard that has been enhanced to receive data from the human health, animal health, and aquaculture sectors. In Ghana and Nigeria, there has also been good progress in establishing integrated surveillance using the Tricycle protocol.

At the institutional level, investments in improved infrastructure and data systems for animal health laboratories continue to be hampered by wider system issues. For example, in Timor Leste, it is noted that the animal health sector is lagging on the installation of Laboratory Information Management Systems (LIMS), and there remain concerns about additional internet, connectivity, and maintenance costs. More widely, the PEAs refer to data bottlenecks created by hybrid systems, unreliable information and communications technology, frequent power outages, periodic software updates, and incompatible data formats within and across information systems.

At the level of animal health practitioners, where country grantees are supporting data use for diagnostic and treatment decision-making and AMS practice, the most common challenge mentioned in PEAs is the lack of demand for diagnostic services and data from farmers and animal owners. In countries such as Kenya, this is often due to a lack of understanding of the benefits, as well as issues of accessibility and cost, including fears of catastrophic costs and consequences if a disease outbreak is identified. Examples from Bangladesh and Vietnam also highlight issues of inadequate communication between vets and farmers on the results of laboratory tests and their interpretation. Meanwhile, in settings such as rural Zambia, farmers and animal owners still prioritise advice from neighbours and respected community members over that of unknown professionals.[59]

Focus on the environment

Most country national action plans acknowledge that good water, sanitation, hygiene and wastewater management are crucial for preventing infections and reducing the spread of AMR. There is also widespread recognition of the need to reduce the environmental spread of AMR. However, across the board, the PEA reports indicate that environmental surveillance systems for AMR are underdeveloped or functionally siloed from the other spheres of AMR surveillance.

Improved monitoring of AMR in the environment sectors is now included in the scope of work for selected Fleming Fund countries. Some PEA reports (e.g. for Pakistan, Bangladesh, Eswatini, Malawi and Uganda) indicate that priority is being given to improvements in the AMR monitoring capacity of water surveillance laboratories. There is a particular focus on monitoring wastewater from farms, abattoirs, and hospitals, and for environmental laboratories to expand their services from chemical residue testing to bacteriology.

More widely, there is recognition of existing multiple technical, operational and infrastructure challenges that prevent integration of AMR surveillance systems and data exchanges across One Health sectors. It is, therefore, acknowledged that this is a particular area with opportunities for further innovation and sharing of local and regional lessons.

How the programme is advancing One Health working

In keeping with Country Investment Strategies, country grantees work at all system levels to promote more integrated AMR surveillance systems within a coherent One Health approach. At the national level, this generally involves technical support to AMR and One Health governance structures to ensure credible representation from One Health sectors. In Pakistan, the country grantee has supported the establishment of a specific AMR Coordination Unit at the Animal Husbandry Commissioner's Office and provided technical support for the animal health components of a National Antimicrobial Consumption Strategy and a Surveillance Strategy for AMR in Aquaculture. More widely, country grantees routinely support engagement with FAO's InFarm platform and WOAH's ANIMUSE platforms, which are designed to assist AMR data synthesis, monitoring, and data visualisations for sectoral decision-making.

Fleming Fund grantees continue to provide support to animal health laboratories through renovations and refurbishments, joint trainings in AMR bacteriology and antibiotic sensitivity testing, provision of equipment, improved supply chains, and External Quality Assessment (EQA) support. Strong progress has been made in the active surveillance of poultry and pigs. Working with AMROH, country grantees are also exploring options for alternatives to resource-intensive active AMR surveillance, such as routine sampling from abattoirs and farms. There is also emphasis on improving the quality of data production, and improved data use for diagnostic and treatment decision-making and AMS practice with enhanced engagement of farmers, vets, paravets and agrivets. Here, common grantee interventions include development of government-endorsed training packages; improving linkages to FAO's farmer field schools; updating of essential veterinary medicine lists; and streamlining feedback loops between laboratories and practitioners. In Ghana, such initiatives now form part of a new One Health Antimicrobial Stewardship Strategy (2025-2030).

In the environment sector, AMROH South Asia is providing technical assistance to Bhutan, Nepal, and Bangladesh to develop strategies and protocols for initiating AMR surveillance. In Bhutan, this will form part of a nationwide drinking water quality surveillance system, incorporating monitoring of Extended-spectrum-beta-lactamases (ESBL)-producing *E coli*. In Bangladesh, an Institute of Public Health laboratory has been improved with microbiology facilities to carry out testing for environmental AMR surveillance, with a focus on *E coli*, non-typhoidal *Salmonella* and *Vibrio* in river water and wastewater samples. In Nepal, grantees are supporting a government-led AMR environment surveillance initiative that focuses on microbiology testing of river and sewage samples for integrated surveillance under WHO's Tricycle programme. This initiative is also benefiting from the assignment of a dedicated Fleming Fellow and the upgrading of laboratory facilities.

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59. These PEA observations are consistent with: Paul, R. J., & Varghese, D. (2020). AMR in animal health: Issues and one health solutions for LMICs. In *Antimicrobial Resistance* (pp. 135-149). Springer.

Dimensions of Gender and Equity

The Fleming Fund recognises that AMR is driven by many of the same processes that drive infectious diseases of poverty more widely, namely overcrowded living conditions, poor nutrition, lack of access to water, sanitation and essential medicines, and autonomy in accessing healthcare.[60] It is recognised, too, that AMR disproportionately impacts LMICs, where up to 90 percent of deaths from AMR occur.[61] The Fleming Fund thus prioritises mainstreaming of gender and equity as both an underlying principle and a strategic priority.

For the purposes of mainstreaming gender and equity across the programme, the Fleming Fund applies an intersectional approach to health inequity. This intersectional approach recognises the overlapping and interconnected nature of social determinants of health, such as gender, age, class, poverty, disability and marginalised status.[62] It also aligns with One Health framings by viewing the interconnectedness of humans, animals and the environment through the lens of power relations.

The application of gender and equity analyses is still new in the field of AMR, especially in LMIC settings. [63] Indeed, a recent global review of 145 national action plans for AMR found that 125 of these made no mention of sex or gender.[64,65] This reflects significant evidence gaps in research exploring inequities in AMR, as well as a need to regularly synthesise evidence for policymaking.

Based on the PEAs, it is evident that there are significant inequalities in the distribution of income within and across case countries, as measured by the Gini Index.[66] Across case countries, the highest levels of income inequality are found in Eswatini, Zambia and Zimbabwe, while the lowest levels are found in Bhutan and Timor Leste *(Annex 1, Table 8)*.[67]

The PEA reports also point to significant diversity within country populations, as well as disparities between social groups, with the cross-cutting determinants of gender, age, education, income, disability and ethnicity identified as potential key stratifiers. World Bank gender equality ratings (2023) indicate that, among the case countries, Pakistan and PNG received the lowest gender equality rating, while ratings for Lao PDR, Bhutan, Rwanda, Zimbabwe and Ghana were somewhat better *(Annex 1, Table 8)*.[68]

Box 10: Case study – Gender and Equity themes in Timor-Leste

In Timor-Leste, 60% of women have reported problems in accessing health care; barriers to healthcare access are especially challenging for rural women, young women and people with disabilities. Women in Timor-Leste often have roles in caregiving, food processing, and animal husbandry, all of which can increase their exposure to drug-resistant pathogens. High rates of gender-based violence in Timor-Leste can also lead to greater risks of drug-resistant sexually transmitted infections (STIs) for women, while the associated stigma can deter them from seeking timely medical care.[69]

In Timor-Leste, the gendered burden of AMR is seen as an important consideration.[70] The country grantee for Timor-Leste notes that, despite significant progress in laboratory strengthening and AMR surveillance across One Health sectors, there is still insufficient disaggregated data on the burden of AMR across key social stratifiers; moreover, any available data is highly fragmented. The country grantee is seeking to tackle such issues through new approaches on One Health engagement, building microbiology capacity, contributions to a national AMR surveillance strategy for food animals, and enhanced support for gender-responsive and socially inclusive AMR approaches. More specifically, there will be emphasis on strategic alliances to better understand the epidemiology of AMR and STIs in Timor-Leste, including gender-specific barriers to uptake of STI testing and the factors that shape patient-centred care.

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60. World Health Organization. (2020). Incorporating intersectional gender analysis into research on infectious diseases of poverty: a toolkit for health researchers. In: *Incorporating intersectional gender analysis into research on infectious diseases of poverty: a toolkit for health researchers*. 2020.

61. Murray CJ, Ikuta KS, Sharara F, Swetschinski L, Aguilar GR, Gray A, et al. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. The Lancet. 2022;399(10325):629–55.

62. Connell R. Gender, health and theory: conceptualizing the issue, in local and world perspective. Soc Sci Med. 2012;74(11):1675–83.

63. Gautron JM, Tu Thanh G, Barasa V, Voltolina G. Using intersectionality to study gender and antimicrobial resistance in low- and middle-income countries. Health Policy Plan. 2023;38(9):1017–32.

64. World Health Organization. (2024). Addressing gender inequalities in national action plans on antimicrobial resistance: guidance to complement the people-centred approach: web annex A: detailed methods. World Health Organization.

65. Of the published national action plans that did mention gender and equity, only one (Malawi) was within our case country sample.

66. Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

67. Based on latest available World Bank data. Source: **World Bank Open Data | Data**.

68. Based on World Bank Country Policy and Institutional Assessment (CPIA) country gender equality ratings (2023). Source: **World Bank Open Data | Data**

69. Wild, K., Langford, K., & de Araujo, G. (Year). *Gender-based violence and health care in Timor-Leste*. La Trobe University.

70. Institute for Health Metrics and Evaluation. (2024). More than 39 million deaths from antibiotic-resistant infections estimated between now and 2050, suggests first global analysis. **The Lancet**.

To support the Fleming Fund's innovative work on mainstreaming gender and equity in AMR interventions at scale, the management agent has engaged the services of a specialist strategic alignment grantee, GEAR up. The GEAR up consortium is now assisting country grantees to undertake gender and equity assessments that will inform local mainstreaming efforts in line with the Country Investment Strategies.

GEAR up's initial scoping review highlighted that, across the board, AMR surveillance only captures data on individuals who can access health facilities and diagnostic services. Moreover, the WHO GLASS data does not include equity stratifiers. These data gaps can make it difficult to assess who the burden of AMR is affecting most, either by gender, age group, or other stratifiers. It also means there is little contextually specific information about the social processes that are driving AMR. Responding to this challenge, country grantees are now beginning to identify opportunities for collaborative research that investigates, for example, issues of exposure and susceptibility to drug-resistant infections, access to AMR information and quality services, and the differential distribution, impact and burden of AMR.

GEAR up's initial assessments and the PEA desk reviews have generated preliminary country-level findings on the ways people are exposed to resistant infections or antibiotics in their environment, as well as the pressures and constraints that influence access to, and use of, antimicrobials. Table 2 below summarises GEAR up's findings for the case countries *(see Annex 2 for a list of GEAR up citations)*.

Table 2: Preliminary findings on gender, equity and AMR from case countries

Country	Preliminary findings
Kenya	• Studies in Kenya have identified high levels of resistant infections among sex workers. It is argued that sex workers can be pressured to engage in activities (e.g. sex without condoms) that leave them more exposed to STIs (1). • Among pastoralist communities in Kenya, men are particularly exposed to antimicrobials and resistant infections because the bulk of their work involves direct contact with animals, including use of antibiotics to manage livestock diseases (2).
Tanzania	• In Tanzania, women tend to be responsible for administering medicines to sick animals. They thus have higher levels of exposure to infection and antibiotics (3). • Mothers in Northern Tanzania report that lack of financial support from their husbands is a barrier to seeking healthcare for their children (4). This may lead to self-medication and treating children with informally acquired antibiotics (5). • In some rural areas, it is common practice to stockpile medicines during the drier months, then use them to treat both people and animals during outbreaks of vector-borne diseases in the wet season (6).
East and Southern Africa	• In several countries of this region, it is reported that high levels of sexual violence and intergenerational relationships can limit women's reproductive rights and increase their exposure to HIV, and hence drug-resistant infections (7). • Issues of stigma and additional costs associated with drug-resistant infections can become a barrier to follow-up at health facilities. Meanwhile, antibiotics are commonly purchased from the informal providers due to stock-outs in the formal health system (8). • Migrant mineworkers in the region (especially, Eswatini, Zimbabwe and Malawi) are at higher risk of drug-resistant TB due to occupational exposure and mining chemicals that can increase susceptibility (9).
Vietnam	• In Vietnam, it has been found that poverty and uncertain employment, especially among rural and minority communities, can lead to variable ability to pay for medicine, thus becoming a barrier to continuation of treatment (10). • Those working in the agriculture, fishery or forestry sectors were found to have the lowest levels of knowledge about AMR, generally due to limited levels of access to health services and information (11).
Bangladesh	• In Bangladesh, people with longer transport time to health services have been found to experience a higher burden of AMR (12). • Notably, women garment workers in urban Bangladesh have been found to have improved health-seeking agency and access to antimicrobials and other medicines due to higher rates of employment and ability to access drug shops (13).
Pakistan	• In Pakistan, it is reported that deep rooted gender discrimination limits women's health seeking agency and requires them to attend hospitals with male relatives – this can lead to discontinuation of TB treatment (14).
Bangladesh, Pakistan, Nigeria and Uganda	• Case countries such as Bangladesh, Pakistan, Nigeria and Uganda have sizable refugee and minority populations. Refugee camps have been found to have limited or inequitable access to clean water and quality sanitation, creating opportunities for proliferation of resistant bacteria (15). • It has been found that refugees can be exposed to conflict, climate change, displacement, urban informality and infectious disease outbreaks occurring simultaneously, each of which has links to AMR (16).

These preliminary findings provide some pointers for improved data disaggregation and more targeted AMR surveillance and AMU point prevalence surveys. They also spotlight evidence gaps. Indicative themes identified for further intersectional studies include:

Susceptibility – e.g. biological, environmental, societal and behavioural factors leading to differences in susceptibility to drug resistant infections.

Exposure – e.g. gender roles and social norms that may increase exposure to resistant pathogens and antibiotic residues, such as caregiving, food production and antibiotic administration to livestock.

Access to healthcare – e.g. differential health seeking pathways; social determinants of health; impacts of disasters and conflicts on exposure and access to healthcare services.

Antimicrobial use and experience – e.g. inequities in access to information; factors in antimicrobial demand, uptake, use and compliance.

Impact – e.g. the differential socioeconomic impact, burden and stigma associated with drug resistant infections; the effectiveness of AMR interventions by key social stratifiers.

How the programme is responding to issues of Gender and Equity

The programme's response to issues of gender and equity falls into four broad categories: i) training in the application of gender and equity concepts; ii) promoting gender and equity in AMR governance, policy and implementation practice; iii) data disaggregation – advancing the disaggregation of surveillance and burden of disease data; and iv) new research – including on 'priority patients' and mixed method One Health studies.

Training in gender and equity is being provided by the Open University under the programme's global learning grant. A new gender and equity module will soon be available as part of the Open University's online 'Tackling AMR' course. Additionally, GEAR up is providing grantees with multiple training and information resources. All Fleming Fellows now complete a mandatory gender and equity training.

GEAR up, with country grantees, is supporting policy work by bringing a gender and equity analysis to NAP updates (e.g. in Uganda). In Pakistan, the country grantee has led on development of One Health AMR Gender Strategy. All grantees provide quarterly reports on they are applying gender and equity principles (e.g. gender equality, inclusion and empowerment) across programme activities, such as strengthening of AMR governance, training and fellowship opportunities, and awareness raising.

Several country grantees are working closely with National Institutes of Health to produce national surveillance reports and PPS reports that draw on data disaggregated by sex, age and location. These are beginning to inform hospital and treatment guidelines and protocols, including specific guidelines for the treatment of urinary tract infections, and paediatric care.

GEAR up is working collaboratively to complete One Health gender and equity assessments in ten countries. Additionally, four country grantees have recently submitted relevant research protocols for ethical approval. In Pakistan, the country grantee has recently completed data collection for a study on antimicrobial use targeting over 300 pregnant women. Through household surveys, in-depth interviews, and key informant interviews, the study has captured prescribing patterns, self-medication practices, and healthcare access barriers.
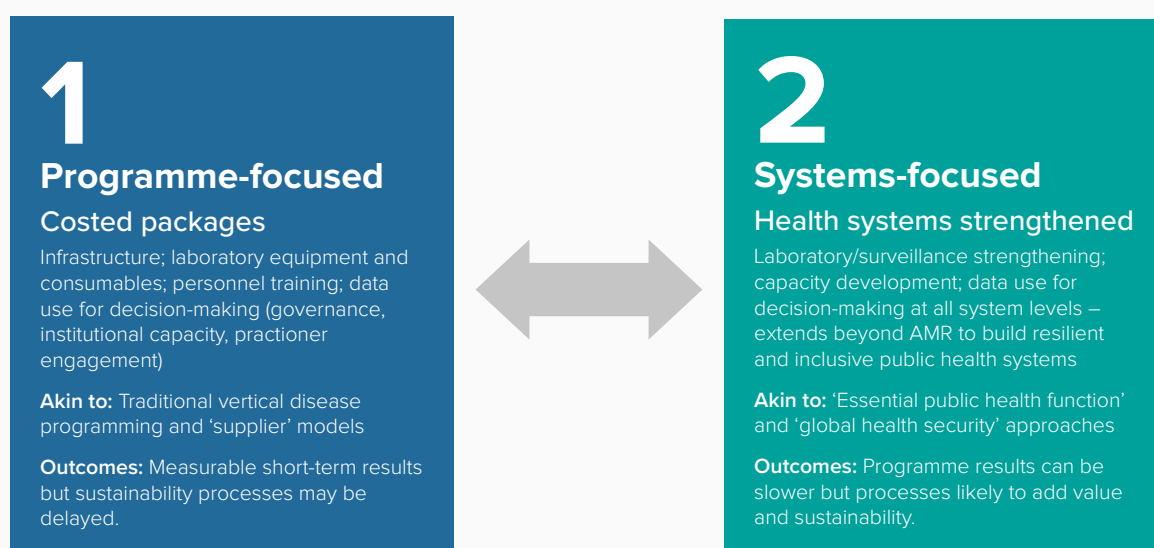
Conclusion: Towards sustainability

The Fleming Fund's PEA reports provide rich descriptions of the implementation context in 19 case countries, as well as lessons for sustainability and future programming.

The PEA consultations have proved a useful mechanism for engaging key Fleming Fund stakeholders across One Health sectors and system levels. The finalised studies are now actively informing programme implementation in all case countries.

Sustainability is a core principle for the Fleming Fund. The PEAs provide descriptions of how the programme actively balances different approaches to sustainability in practice. Two main approaches to sustainability are reflected in the PEAs: The first approach can be described as more 'programme-focused', while the second approach can be described as more 'systems-focused'. The programme-focused approach tends to prioritise intended programme results and addresses sustainability themes as implementation progresses; it is, perhaps, most akin to vertical disease programmes, or contracted 'supplier' models. The 'systems-focused' approach prioritises sustainability from the outset through strengthening of wider health / One Health systems; this approach can be seen as most akin to 'essential public health functions'[71] and 'global health security models'– see Figure 12 below.

Figure 12: The PEAs reflect two approaches to programme sustainability

1

Programme-focused

Costed packages

Infrastructure; laboratory equipment and consumables; personnel training; data use for decision-making (governance, institutional capacity, practioner engagement)

Akin to: Traditional vertical disease programming and 'supplier' models

Outcomes: Measurable short-term results but sustainability processes may be delayed.

2

Systems-focused

Health systems strengthened

Laboratory/surveillance strengthening; capacity development; data use for decision-making at all system levels – extends beyond AMR to build resilient and inclusive public health systems

Akin to: 'Essential public health function' and 'global health security' approaches

Outcomes: Programme results can be slower but processes likely to add value and sustainability.

The PEA process has supported a deeper conceptualisation of what sustainability means for AMR surveillance programmes, such as the Fleming Fund. Eight key thematic lessons have emerged that are relevant to programme sustainability. These are itemised below — they include lessons for the programme's recent 'strategic shifts', as well as considerations for future programme design.

Lesson 1:
Funding for AMR surveillance

Some 80% of Fleming Fund-supported countries have made a commitment to AMR surveillance either in the form of budget allocations, staff salaries and/or utilities. Stakeholder interviews point to widespread recognition that, while AMR surveillance can appear costly, it adds significant value through contributions to improved laboratory services and diagnostics across One Health sectors. This, in turn, supports improved quality of care, more effective and rational use of antibiotics, and wider systems capacity for detection and control of communicable diseases – in short, AMR surveillance contributes directly to wider health systems strengthening. To date, the Fleming Fund has endeavoured to advance the sustainability of funding for AMR surveillance through alignment and complementarity with other government and donor inputs. However, recent shifts in the geopolitics of global health funding mean that a reconsideration of current approaches is likely to be required.

Considerations for future programming: Ensure budget advocacy for sustained investments in AMR surveillance emphasises the catalytic effects for improved diagnostics, health systems strengthening, public health and global health security. Ensure future programming demonstrates these effects in practice. Revisit plans for sustainable funding of AMR surveillance at the country level. Contribute to multi-stakeholder dialogue on the changing funding landscape, the shifting priorities of international donors, and the implications for shared global health security.

71. World Health Organization. (n.d.). *Essential public health functions*. Retrieved April 11, 2025, from **https://www.who.int/teams/primary-health-care/health-systems-resilience/essential-public-health-functions**

Lesson 2:
Economic analysis

Economic and costing assessments for AMR programming and budget advocacy can have multiple dimensions, some of which overlap with health financing and financial management themes. For example, burden of disease analyses can be undertaken through high-level GRAM studies but may support better practitioner uptake if incorporated into clinical engagement approaches. Budget advocacy for country ownership requires costing of NAPs and programme interventions (including laboratory tests) using standardised activity-based tools. Pricing and cost data may also be needed for programme procurement and market shaping strategies. Value for money assessments provide information on the value derived from programme resources used in terms of economy, efficiency and effectiveness. However, commissioned cost-effectiveness studies may help governments to compare costs and outcomes to identify 'best buys' for sustainable programming.

Considerations for future programming: Aim to identify the types of economic and costing studies required for different programme purposes from the outset. Build consensus on the standard protocols/tools to be used to facilitate economic / cost comparisons within and across countries over time. Aim to ensure all NAPs and sector surveillance strategies are fully costed, and that 'total cost of ownership' assessments are completed for interventions intended to be sustainable at scale.

Lesson 3:
AMR governance

The sustainability of AMR governance mechanisms needs to be considered at each system level across One Health sectors. Common challenges include role ambiguity across governance structures, competing priorities, siloed institutional arrangements for implementation, and resource constraints, especially, for inclusive stakeholder engagement, policy and regulatory alignment, policy implementation and monitoring.

Considerations for future programming: Combine inputs to national policy development with support for costed strategies for policy implementation, monitoring and oversight at sub-national levels. Where relevant, promote good governance principles through clearly defined respective roles and responsibilities, making a clear case for the critical role of animal health and healthy environments in public health. Leverage knowledge and skills resources by promoting inclusive participation of mandated private sector and civil society representatives.

Lesson 4:
Data use for policy and practice

It is useful to distinguish the periodic use of AMR / AMU data for national policy development from the continuous use of data for enhanced practice in human and animal health. It is important to recognise that AMR surveillance systems support both these objectives in distinct ways. A differentiated approach helps tailor data use strategies to the needs and motivations of specific end users across One Health sectors. Digital tools, including tracker systems, dashboards and other data visualisations, can facilitate engagement by data users, but must be timely, supported by quality-assured data inputs, and sustainable within the wider information systems architecture.

Considerations for future programming: In setting data use objectives for AMR surveillance initiatives, consider the distinct data use pathways for policy and practice, and the differentiated motivations of end users. However, continue to monitor the production, transmission and timely use of quality data for decision-making as a circular system. Be cautious of stand-alone digital solutions and reporting systems that require duplication of data entry, or external resources/capacity to sustain – align with the wider digital / information system and data use initiatives.

Lesson 5:
Human resources

Human resource constraints are among the main challenges identified in PEA reports. Specific issues include inadequate training and investments in knowledge, skills and ongoing professional development, as well as institutional factors such as staff shortages, poorly defined roles, lack of appropriate supervision, and limited career development opportunities. It has been observed that these issues are usually rooted in wider health system and budget constraints. The Fleming Fellowship Scheme has demonstrated a cutting-edge approach to a systems-focused approach to workforce strengthening across One Health sectors.

Considerations for future programming: Building on experience from the Fleming Fellowship Scheme, seek to ensure training for individuals is linked to further professional development opportunities, institutional and systems strengthening and wider efforts to enhance the enabling environment. Along with investments in curriculum alignment, accredited training and local mentoring initiatives, these efforts could include the promotion of Essential Public Health Functions and Global Health Security approaches.

Lesson 6:
Private sector engagement

Most Fleming Fund-supported countries have mixed healthcare economies, while the role and interests of the private sector can be highly significant in the animal health and environmental sectors. The range of private sector stakeholders can vary considerably by sector and system level, along with mechanisms and regulatory frameworks for engagement, collaboration, sharing of infrastructure and data exchanges. There may also be important cross-border factors to consider. Specific technical expertise, dedicated resources and a sound understanding of incentives and commercial interests are needed to systematically engage private sector actors in AMR surveillance efforts.

Considerations for future programming: Ensure appropriate allocation of technical and financial resources for this complex, but crucial aspect of AMR surveillance across One Health sectors. Tailor stakeholder engagement strategies to system levels and sectors. Prioritise private sector engagement as a key focus area for monitoring, evaluation and learning by the programme within and across countries and regions.

Lesson 7:
One Health

Across the board, there has been significant progress in spearheading AMR surveillance in the animal health sector (including the aquaculture sector), even though AMR surveillance is often regarded as a public (human) health intervention. Key challenges remain how to achieve a cost-effective balance between passive surveillance in the human health sector; active surveillance in animal health and environment sectors and integrated One Health surveillance across sectors. In most countries, there is still a tendency for AMR surveillance to operate in silos within One Health sectors; however, the ambition of systems integration and collaborative One Health working remains a prominent feature of NAPs. In selected countries, monitoring of water sources and wastewater outlets has provided a key entry point for AMR surveillance in the environment sector. The need for laboratory equipment, infrastructure and supply chains to be climate resilient is now widely acknowledged.

Considerations for future programming: Customise investments in AMR surveillance for One Health sectors according to the maturity of the operational and systems context. Monitor the effects of rising temperature and extreme weather events due to climate change on AMR prevalence and transmission. Consider multi-country and cooperative cross-border approaches that leverage regional expertise, experience and resources; and what should be done as part of national systems and what should be covered by academia/research studies.

Lesson 8:
Gender and Equity

Gender and equity remains a relatively new concept in AMR programming and surveillance work, but is now recognised as an essential consideration. In the context of the Fleming Fund, the conceptualisation of gender and equity mainstreaming is challenging – in part, because some foundational concepts have different implications in the human and animal health sectors and, in part because dialogue on gender and equity themes can challenge established social norms and power relations. Four domains of programme delivery are now proving useful for mainstreaming of gender and equity in practice: i) training in the application of gender and equity concepts; ii) promoting gender and equity principles in AMR governance, policy and implementation practice; iii) data disaggregation – advancing disaggregation of surveillance and burden of disease data by (at minimum) sex and age; and iv) new research – including 'priority patient' and mixed method One Health studies.

Considerations for future programming: Continue to work collaboratively and inclusively to refine the conceptualisation of gender and equity for AMR surveillance across One Health sectors. To reduce conceptual ambiguity, consider aligning with WHO's guidance on people-centred approaches to addressing gender and AMR, and the forthcoming (separate) guidance on equity themes in AMR. Continue to invest in the four domains for mainstreaming gender and equity in operational practice. Maintain monitoring and consolidation of gender and equity outputs to support programme learning at scale.

Annexes

Annex 1 Data Tables for country and sector contexts

Country contexts: demographic data

Table 2 below draws on World Bank data to show how each case country varies by population size, density, urban/rural distribution and annual growth rates.[72]

Table 3: World Bank data on population demographics (2023 / latest available)

Country	Total Population (million)	Population density (people/sq.km land area) (2021)	Urban population (% total population)	Rural population (% total population)	Population growth (annual %)
South East Asia					
Lao PDR	7.6	32.2	38.2%	61.8%	1.4%
Pakistan	240.5	300.2	38.0%	62.0%	2.0%
PNG	10.3	22.0	13.7%	86.3%	1.8%
Timor Leste	7.6	88.8	32.5%	67.5%	1.4%
Vietnam	98.9	311.0	39.5%	60.5%	0.7%
South Asia					
Bangladesh	173.0	1,301.0	40.5%	59.5%	1.0%
Bhutan	0.8	20.4	44.4%	55.6%	0.6%
Indonesia	277.5	144.6	58.6%	41.4%	0.7%
Nepal	31.0	209.5	21.9%	78.1%	1.1%
East and Southern Africa					
Eswatini	1.2	69.3	24.8%	75.2%	0.8%
Kenya	55.1	93.1	29.5%	70.5%	2.0%
Malawi	20.9	211.0	18.3%	81.7%	2.5%
Rwanda	14.1	545.7	17.9%	82.1%	2.3%
Tanzania	67.4	71.8	37.4%	62.6%	2.9%
Uganda	48.6	228.7	26.8%	73.2%	2.8%
Zambia	20.6	26.2	46.3%	53.&%	2.7%
Zimbabwe	16.7	41.3	32.5%	67.5%	2.1%
West Africa					
Ghana	34.1	144.3	59.2%	40.8%	1.9%
Nigeria	223.8	234.3	54.3%	45.7%	2.4%

Country contexts: Data on political stability and government effectiveness

The World Bank indicator of Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Estimates give the country's score on the aggregate indicator ranging from approximately -2.5 to 2.5.[73] The World Bank indicator for Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.[74] The table below captures World Bank estimates for each of these indicators (2023) by case country.

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72. Source: **World Bank Open Data | Data** Retrieved January 2025.
73. **Political Stability and Absence of Violence/Terrorism: Estimate | Data**
74. **Government Effectiveness: Estimate | Data**

Table 4: World Bank indicators for political stability and government effectiveness by case country (2023)[75]

Country	Political Stability and Absence of Violence / Terrorism: Estimate	Government Effectiveness: Estimate
South East Asia		
Lao PDR	0.81	-0.64
Pakistan	-1.93	-0.80
PNG	-0.48	-0.81
Timor Leste	0.26	-0.84
Vietnam	-0.04	0.13
South Asia		
Bangladesh	-0.91	-0.70
Bhutan	0.98	0.57
Indonesia	-0.40	0.58
Nepal	-0.23	-0.81
East and Southern Africa		
Eswatini	-0.36	-0.88
Kenya	-0.94	-0.30
Malawi	-0.24	-0.86
Rwanda	0.11	0.39
Tanzania	-0.05	-0.46
Uganda	-0.70	-0.55
Zambia	0.20	-0.66
Zimbabwe	-0.93	-1.17
West Africa		
Ghana	-1.77	-0.85
Nigeria	-0.02	-0.09

75. Source: **World Bank Open Data | Data** Retrieved January 2025.

Country contexts: Economic data on GDP and ODA per capita

The table below summarises the latest complete data sets available from the World Bank data on GDP per capita (current US$) 2023 and net ODA received per capita (current US$) 2022.

Table 5: Latest complete data on GDP per capita and net ODA per capita by country (World Bank 2022 / 2023)[76]

Country	GDP per capita, current US$ (2023)	Net ODA received per capita, current US$ (2022)
South East Asia		
Lao PDR	2,067.0	72.7
Pakistan	1,365.2	7.8
PNG	1,502.5	65.2
Timor Leste	2,957.7	166.7
Vietnam	4,282.1	0.5
South Asia		
Bangladesh	2,551.0	30.3
Bhutan	3,711.3	248.5
Indonesia	4,876.3	2.4
Nepal	1,377.6	39.5
East and Southern Africa		
Eswatini	3,610.6	80.4
Kenya	1,952.3	44.7
Malawi	602.3	49.1
Rwanda	1,010.3	65.9
Tanzania	1,224.5	91.4
Uganda	1,002.3	40.6
Zambia	1,330.7	47.9
Zimbabwe	2,156.0	78.2
West Africa		
Ghana	2,260.3	20.3
Nigeria	1,596.6	31.2

76. Source: **World Bank Open Data | Data** Retrieved January 2025.

Sector contexts: Healthcare spending

The table below shows, for each case country, the spread of total health expenditure as a percentage of GDP, annual health spending per capita, private health expenditure per capita and total out-of-pocket expenditure per capita. Figures are shown for the latest complete data set (2021).

Table 6: Indicators of healthcare spending (current US$) by country (World Bank 2021)[77]

Country	Current health expenditure (% of GDP)	Current health expenditure per capita (current US$)	Domestic private health expenditure per capita (current US$)	Out-of-pocket expenditure per capita (current US$)
South East Asia				
Lao PDR	2.7%	68.9	24.6	21.3
Pakistan	2.9%	43.1	26.1	24.8
PNG	2.3%	61.4	6.4	6.4
Timor Leste	11.4%	135.0	8.0	8.0
Vietnam	4.6%	172.6	92.3	69.0
South Asia				
Bangladesh	2.4%	57.9	43.7	42.3
Bhutan	3.8%	120.4	24.7	22.6
Indonesia	3.7%	160.6	61.9	44.2
Nepal	5.4%	65.0	35.0	33.0
East and Southern Africa				
Eswatini	7.0%	279.9	63.8	29.2
Kenya	4.5%	94.7	31.8	21.6
Malawi	7.4%	46.6	9.3	6.6
Rwanda	7.3%	60.2	14.0	6.1
Tanzania	3.4%	37.2	9.9	9.5
Uganda	4.7%	43.4	15.2	13.6
Zambia	6.6%	75.3	6.0	5.3
Zimbabwe	2.8%	62.7	13.9	6.4
West Africa				
Ghana	4.2%	100.0	37.1	27.3
Nigeria	4.1%	83.8	66.1	63.9

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77. Source: **World Bank Open Data | Data** Retrieved January 2025.

Sector contexts: Role of the agricultural sector

The table below summarises data on the role of the agricultural sector in case country economies based on standard World Bank indicators (2022).

Table 7: Role of the agricultural sector in country economies (World Bank indicators 2022)[78]

Country	Agriculture, forestry, and fishing, value added (% GDP)	Employment in agriculture (% total employment)	Employment in agriculture, female (% female employment)	Employment in agriculture, male (% male employment)
South East Asia				
Lao PDR	14.9%	69.7%	69.6%	69.5%
Pakistan	22.3%	36.4%	66.6%	27.6%
PNG	16.9%	18.5%	13.5%	23.2%
Timor Leste	10.2%	39.2%	44.8%	35.0%
Vietnam	11.9%	33.6%	34.9%	32.4%
South Asia				
Bangladesh	11.2%	36.9%	55.2%	28.4%
Bhutan	14.7%	44.0%	54.0%	36.5%
Indonesia	12.4%	29.3%	26.5%	31.1%
Nepal	20.9%	61.4%	75.2%	53.3%
East and Southern Africa				
Eswatini	8.6%	13.4%	11.4%	15.2%
Kenya	21.8%	62.1%	67.0%	57.7%
Malawi	24.9%	56.0%	65.3%	47.9%
Rwanda	7.2%	52.6%	58.6%	46.7%
Tanzania	24.0%	66.3%	71.6%	61.1%
Uganda	21.2%	32.6%	34.3%	31.0%
Zambia	24.4%	65.5%	66.6%	64.5%
Zimbabwe	3.1%	57.3%	61.9%	53.7%
West Africa				
Ghana	23.4%	38.0%	28.9%	44.9%
Nigeria	19.7%	39.7%	36.7%	42.5%

78. Source: **World Bank Open Data | Data** Retrieved January 2025.

Dimensions: Data on key Gender and Equity themes

World Bank Country Policy and Institutional Assessment (CPIA) country gender equality ratings assess the extent to which a country has installed measures to enforce laws and policies that promote equal access for men and women in education, health, the economy, and protection under law. Gender equality ratings for 2023 indicate that, across our case countries, Pakistan and PNG received the lowest gender equality rating with a score of 2.5, while Lao PDR, Bhutan, Rwanda, Zimbabwe and Ghana received rather better gender equality ratings of 4 or 4.5.[79]

The Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of zero represents perfect equality, while an index of a hundred implies perfect inequality.

Table 8: Gender Equality Ratings and Gini Index Scores by country (World Bank 2023 / latest)[80]

Country	CPIA Gender Equality Ratings (2023) 1=low; 6=high	Gini index (latest available)
South East Asia		
Lao PDR	4.0	38.8 (2018)
Pakistan	2.5	29.6 (2018)
PNG	2.5	41.9 (2009)
Timor Leste	3.5	28.7 (2014)
Vietnam	4.5	36.1 (2022)
South Asia		
Bangladesh	3.5	32.4 (2022)
Bhutan	4.0	28.5 (2022)
Indonesia	3.0	36.1 (2023)
Nepal	3.5	30.0 (2022)
East and Southern Africa		
Eswatini	-	54.6 (2016)
Kenya	3.5	40.8 (2015)
Malawi	3.5	38.5 (2016)
Rwanda	4.5	43.7 (2019)
Tanzania	3.0	40.5 (2018)
Uganda	3.0	42.7 (2019)
Zambia	3.0	51.5 (2022)
Zimbabwe	4.0	50.3 (2019)
West Africa		
Ghana	4.0	43.5 (2016)
Nigeria	3.0	35.1 (2018)

79. No data was available for Eswatini. Latest data available for Indonesia was 2006 and for Vietnam was 2015 (included in chart).
80. Source: **World Bank Open Data | Data** Retrieved January 2025.

Annex 2 Gender and Equity bibliography

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