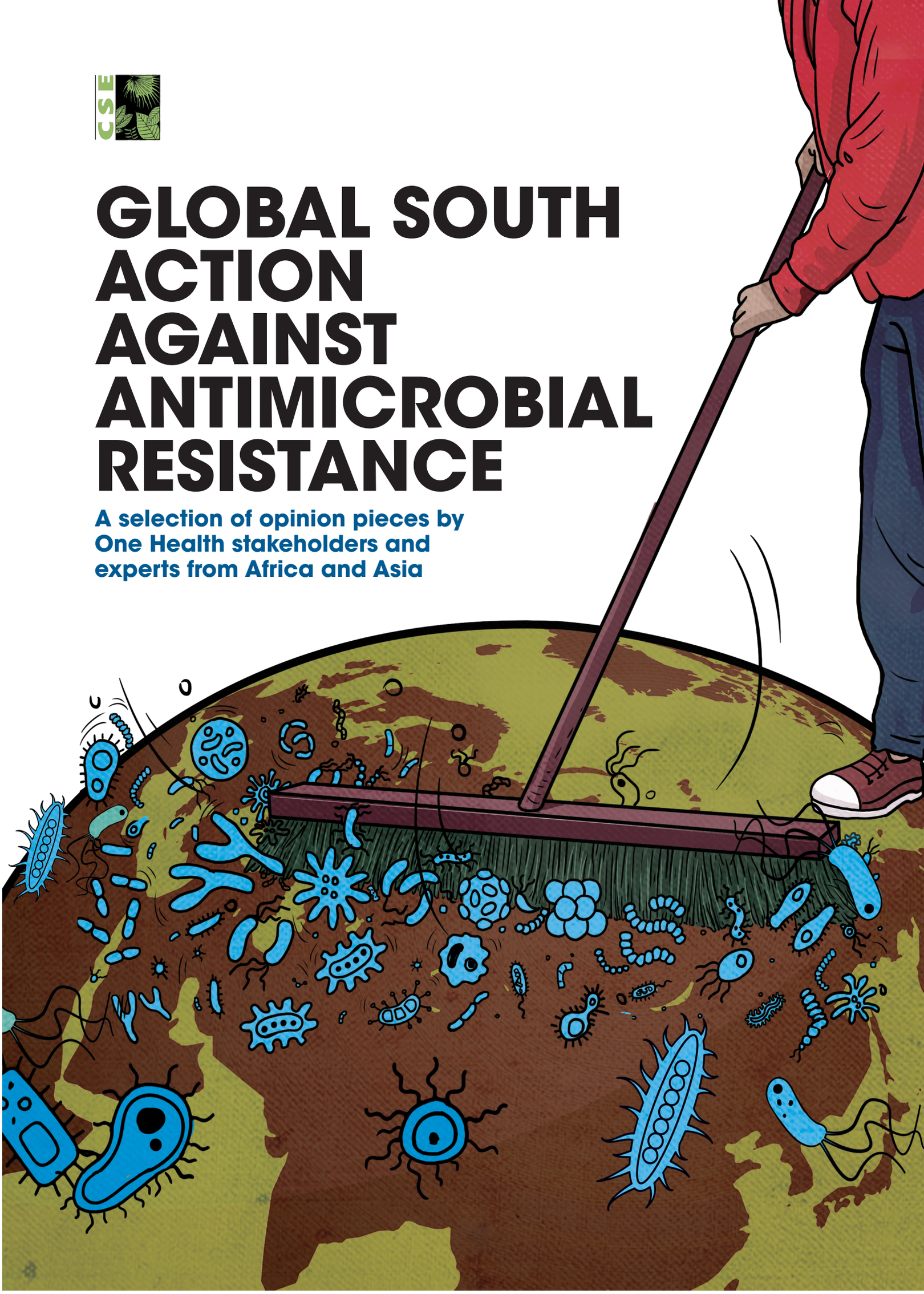
GLOBAL SOUTH ACTION AGAINST ANTIMICROBIAL RESISTANCE

A selection of opinion pieces by One Health stakeholders and experts from Africa and Asia



GLOBAL SOUTH ACTION AGAINST ANTIMICROBIAL RESISTANCE

A selection of opinion pieces by One Health stakeholders and experts from Africa and Asia

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The Centre for Science and Environment is grateful to the Swedish International Development Cooperation Agency (Sida) for their institutional support.

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CSE is also grateful to the MISEREOR/Katholische Zentralstelle fur Entwicklungshilfe e.V. for their support.

Citation: Amit Khurana, Rajeshwari Sinha and Neeraj Kumar, 2025, *Global South Action against Antimicrobial Resistance: A Selection of Opinion Pieces by One Health Stakeholders and Experts from Africa and Asia*, Centre for Science and Environment, New Delhi

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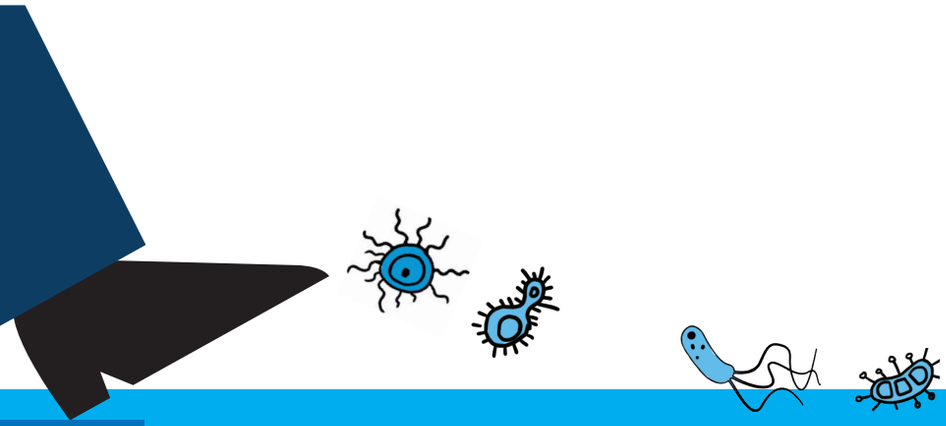

INTRODUCTION

The global crisis of rising antimicrobial resistance (AMR) is known to disproportionately impact the health, livelihoods and economies of countries in the Global South. The ground realities in these countries, such as across the domains of science, policy and practice, are vastly different from those in high-income countries, which are primarily influenced by limited capacity and resources as well as multiple competing priorities in these low- and middle-income settings. Their fight against AMR, therefore, should be rooted in the local context, besides being technologically feasible and cost-effective in the short- as well as the long-term.

Ever since the call for national action by the 2015 Global AMR Action plan, these countries have shown a fair degree of courage and creativity in their fight against AMR. Despite constraints, there are encouraging initiatives and best practices at the national and local government levels as well as non-government stakeholders. There are gaps, but, significantly, an evolved understanding of the challenges and greater clarity on how to overcome these through current and future possibilities. These initiatives and learnings must be brought together to inform future global action, in particular at the level of the Global South.

In this regard, the sustainable food systems programme at the Centre for Science and Environment, India, had reached out to the One Health stakeholders and experts from several African and Asian countries during the World AMR Awareness Week (WAAW) in November 2025.

This report comprises a collection of opinion pieces across the human health, food, animal and environment sectors from those in governments, civil society, the scientific community and industry. We hope that it adequately informs the global community on action against AMR in the Global South.

1. WHY BRIDGING POLICY AND PRACTICE IS ESSENTIAL TO ADVANCE ONE HEALTH AMR ACTION IN THE GLOBAL SOUTH

The future of AMR control lies in combining innovation with scientific, social and policy-driven solutions

Peter Mwale

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Antimicrobial resistance (AMR) has emerged as one of the defining health and development challenges of our time. The silent spread of resistant bacteria, viruses and parasites threatens the effectiveness of essential medicines, undermines food security, and increases poverty and inequality, particularly in the Global South. While the world recognises AMR as a global crisis, its burden and drivers are not evenly distributed.

In Africa and Asia, where the human–animal–environment interface is closely intertwined with livelihoods, antibiotics remain critical not only for saving lives but also for sustaining agriculture and incomes. Yet, misuse and overuse across sectors continue to fuel resistance, calling for more locally driven, integrated and equitable responses.

Since the adoption of the Global Action Plan on AMR in 2015, over 170 countries have developed National Action Plans. Many low- and middle-income countries (LMIC) have embraced the One Health approach, recognising that AMR cannot be addressed in isolation from food systems, animal health and the environment.

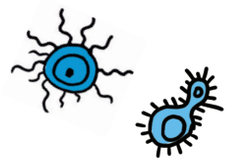
However, translating these ambitious plans into tangible results remains a challenge. Implementation often falters due to limited financing, weak laboratory networks, fragmented governance, and low awareness among prescribers and end users. In several countries, antibiotics are still readily available without prescription, used in animal production for growth promotion, or disposed of in the environment without control.

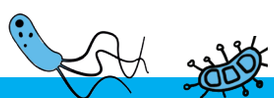
Reliable data is the foundation for effective action. Yet, surveillance of AMR and antimicrobial use remains uneven across LMICs. Many laboratories lack basic diagnostic capacity, reagents and information systems to generate and share data. Where data is available, it often remains siloed within sectors, hindering comprehensive analysis and response.

Regional and global efforts are helping to close these gaps. Initiatives such as WHO's GLASS, FAO's InFARM and WOAH's ANIMUSE platform are enabling countries to submit harmonised data and build capacity for evidence-based decision-making.

While surveillance reveals the scale of the problem, stewardship provides the solution. Antimicrobial stewardship (AMS) must extend beyond hospitals to farms, veterinary clinics, pharmacies and communities. Yet, in many LMICs, stewardship challenges are deeply rooted in systemic constraints.

Farmers and animal health workers often rely on antibiotics as a substitute for good husbandry, vaccination or biosecurity. In the absence of affordable diagnostics, empirical treatment becomes the norm, reinforcing dependence on antibiotics.





Similarly, in human health, limited access to qualified prescribers and diagnostic tools leads to unnecessary or incomplete antibiotic use. These practices are not merely the result of negligence but reflect structural realities, economic pressures, lack of knowledge and limited service delivery options.

Embedding stewardship into systems, therefore, requires a combination of education, regulation and incentives. It starts with integrating prudent antimicrobial use principles into medical, veterinary and para-veterinary curricula, ensuring that future professionals understand both the science and social context of resistance. Continuous professional training and mentorship are equally essential to sustain these practices in the field.

At the same time, private-sector engagement is indispensable. Agrovet dealers, pharmacists and feed suppliers play a central role in antibiotic access and distribution across the Global South. Rather than treating them as part of the problem, they should be equipped and incentivised to become champions of responsible dispensing, record-keeping and client education. Complementary to this, improved access to vaccines, diagnostic services and affordable alternatives can reduce unnecessary reliance on antibiotics and antibiotic resistance.

The future of AMR control lies in innovation, and scientific, social and policy-driven approaches. Promising examples are emerging across the Global South, like community-based surveillance programmes that combine human and animal data, digital tools for tracking antimicrobial use, and pilot initiatives providing farmers with biosecurity starter kits and alternatives to growth promoting antibiotics.

Local production of quality-assured veterinary and human medicines, alongside regional procurement mechanisms, can also improve access and reduce dependence on informal markets. Importantly, innovation must be inclusive, grounded in the realities of smallholder farmers, informal health providers, and under-resourced laboratories.

Collaborations among governments, academia, civil society and private actors are already showing results. These partnerships illustrate that when knowledge and resources are shared equitably, even resource-limited settings can demonstrate leadership in global AMR control.

The AMR crisis is often described as complex, but complexity should not paralyse action. The Global South holds unique strengths, for instance, strong community networks, adaptable local systems, and growing scientific capacity. What is needed now is to connect these assets through stronger One Health governance, steady financing and a renewed culture of stewardship.

As the world remembers World AMR Awareness Week 2025, the Global South must not be viewed merely as a region of vulnerability but as a region of innovation and resilience. Across Africa, Asia and Latin America, countries are generating solutions that blend science, community engagement and policy pragmatism.

–Peter Mwale, Animal Health AMR Focal Point, Malawi

2. THE FUTURE OF AMR ACTION LIES IN DECENTRALISED, TECHNOLOGY-ENABLED STEWARDSHIP

AI-enabled diagnostics and decision-support tools are unlocking new possibilities for safer prescribing in low-resource settings

Shibu Vijayan

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Antimicrobial resistance (AMR) is often described as a global health crisis. But for most countries in the Global South, AMR is not an abstract threat; it is a visible reality in outpatient departments, primary health centres, informal clinics and pharmacies that form the backbone of healthcare for millions. The real challenge lies here, at the last mile, where health workers face overwhelming patient loads, limited diagnostics and enormous pressure to "do something". Too often, that "something" is an antibiotic.

The persistent overuse and misuse of antibiotics are not simply behavioural problems. They reflects a deeper structural gap: Peripheral health systems lack the tools, data and decision-support mechanisms needed to rationalise prescriptions. Without objective measures to guide clinical decisions, the safest and quickest response is to prescribe empirically. This structural vacuum perpetuates AMR.

If the AMR trajectory is to shift meaningfully, our solutions must reach the point of care—where clinical decisions are made within minutes, not in tertiary hospitals or policy rooms. And the most powerful enabler for this shift is technology.

AI-ENABLED TOOLS AS THE NEXT FRONTIER

Over the last decade, digital health has rapidly matured in low- and middle-income countries (LMIC). Telemedicine, electronic medical records and supply chain systems have transformed many aspects of care delivery. Yet AMR has remained stubbornly resistant to decentralisation because diagnostic and clinical decision-support technologies have not penetrated the front lines.

This is now changing.

Emerging AI-enabled tools can provide frontline providers objective signals they never previously had access to, helping them reduce unnecessary antibiotic use, refer patients appropriately and manage uncertainty with confidence.

1. Automated ambient listening and AI-assisted scribing

In primary care settings, clinicians often struggle to balance patient volumes with thorough clinical assessments. History-taking becomes hurried, symptoms are incompletely documented and subtle cues are missed. This leads to defensive antibiotic prescribing.

AI-driven ambient listening tools—already being piloted in LMIC settings—automatically capture, summarise and structure clinical encounters. They ensure that cough duration, fever pattern, comorbidities, red flags and prior antibiotic exposure are recorded reliably.

When combined with simple clinical decision support systems (CDSS), these tools can flag viral syndromes, guide watchful waiting and prompt clinicians when antibiotics are not indicated. Such tools introduce much-needed discipline into clinical reasoning, without demanding extra time from overstretched health workers.

2. Cough characterisation through AI: differentiating viral and bacterial illness

One of the most promising technological advances for AMR is AI-based cough analysis. Early studies show that cough acoustics—captured via a mobile phone—carry distinct signatures that can help differentiate viral and bacterial lower respiratory infections.

For primary care, this could be transformative.

Imagine a health worker equipped with a cough-analysis tool on a smartphone. Within seconds, the tool indicates whether the cough pattern is suggestive of a viral infection, reducing the need to initiate antibiotics unnecessarily. Combined with symptom screening, this can create an objective triage layer that has never existed before in rural or low-resource clinics.

Research is underway to validate such systems across diverse geographies, ages and comorbidity patterns. If scaled responsibly, cough-AI could become one of the most accessible diagnostic aids for antibiotic stewardship globally.

3. Ultra-portable X-rays and AI for lung health: moving beyond tuberculosis

Digital radiography has undergone a quiet revolution. Ultra-portable machines weighing less than 10 kg are now deployed in thousands of screening camps across Asia and Africa. When paired with AI algorithms, they have proven highly effective for tuberculosis (TB) triage.

This same ecosystem can now be leveraged for AMR.

Pneumonia remains a major driver of irrational antibiotic use, particularly in children. AI-powered chest X-ray interpretation can support frontline clinicians by identifying radiological patterns suggestive of viral versus bacterial pneumonia. While still evolving, these tools open the possibility of objective differentiation at the point of care, reducing empirical antibiotic use.

Importantly, the infrastructure already exists—TB programmes, mobile vans, district hospitals, community outreach units. Expanding indications from TB to broader lung health is a natural next step.

4. Point-of-care ultrasound and AI-driven lung ultrasound interpretation

Point-of-care ultrasound (POCUS) is now a standard tool in many maternal health programmes. The same technology, when applied to lung ultrasound, has significant potential for AMR stewardship.

Clinical literature already shows that lung ultrasound can help differentiate viral and bacterial pneumonia with high accuracy. What has been missing is scalability: frontline workers are not trained radiologists.

AI-assisted interpretation is closing this gap.

Ongoing research in LMIC settings focuses on building open-source datasets of lung ultrasound images and training AI models for pneumonia differentiation. If successful, POCUS plus AI could become the most affordable, decentralised respiratory diagnostic—usable in primary health centres, conflict settings or internally displaced persons (IDP) camps.

TECHNOLOGY AS A CRITICAL AMPLIFIER

Technology alone will not solve AMR. Stewardship requires regulation, behaviour change, supply chain reforms and strong governance. But without technologies that help peripheral providers make safer clinical decisions, we will continue to treat AMR as a policy problem instead of the frontline emergency it truly is.

The Global South has a unique opportunity: unlike high-income countries, LMICs have rapidly leapfrogged into digital health adoption. If we integrate AI, clinical decision systems and point-of-care diagnostics into primary care pathways, we can fundamentally reshape antibiotic-use patterns for generations.

AMR action must move closer to the patient. Technology can get us there, faster, more cheaply and more equitably than ever before.

–Shibu Vijayan, Chief Medical Officer for Global Health, Qure.ai, India

3. EXTENDING AMR AWARENESS—FROM RHETORIC TO ACTION

In Zambia, messaging about how AMR affects people in a socioeconomic sense is being used to make the point hit home

Ntombi Mudenda

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THE call to action on Antimicrobial Resistance (AMR) really took flight in 2015 when the World Health Assembly adopted a global action plan on AMR. This resulted in many countries developing national action plans (NAPs) mainly focusing on the same objectives. As of 2024, 178 out of 195 countries had developed NAPs.

The first objective mentioned objective in many NAPs is to improve awareness and understanding of AMR through effective communication, education and training. Creating awareness on AMR requires that the message be simplified to the level of a child's understanding of what it is, what drives it and what they can do about it. AMR is really not a new phenomenon. It has just become a problem of epic proportions due mostly to our actions regarding the use of antimicrobials. And the more we investigate it, the more the gravity of the problem is understood.

Many awareness activities have been conducted, yet we still lack clarity on which one is the most effective. In Zambia, medical and veterinary professionals have been well oriented through antimicrobial stewardship programmes rolled out to healthcare facilities, continuing professional development programmes, World AMR Awareness Week (WAAW) national activities in different cities, surveys, scientific conferences, panel discussions, and social media groups highlighting AMR activities and publications. However, one challenge remains: how best to create awareness among the general public.

Creating awareness of AMR among the general public requires determining whose voice is best to use for each section of society. And also, which section of society, when aware, would further spread awareness. In a fast-evolving world, the use of social media as an awareness platform cannot be overlooked. But then again, you still need to identify which 'voice' on social media will attract the most attention. The engagement of local social media influencers is gaining traction, not just for advertising but, more importantly for us, for health advocacy. They understand the audience and the use of local languages and relatable situations. The messages are instantly disseminated and easily shared across platforms and the amount of awareness created can be tracked. It is an avenue that is actively being explored in Zambia and we are hopeful that it will help us turn the page in relation to AMR awareness.

Further, we have learners in primary, secondary and tertiary educational institutions. In tertiary institutions of Zambia, the use of talent has come in very handy and this is because fellow students are usually interested in how other students express their talent. Debate or dialogue societies have proved to be a good entry point. Students are required to research AMR-related topics and compete against other institutions in debate. Other than the best team winning, the teams receive great support from fellow students and their institutions

and the message is shared or at the very least raises curiosity. Curiosity, which is the spark needed to drive inquiry and understanding. Publicity of such events through conventional and social media platforms is an added advantage in broadening reach.

One message that most people cannot ignore is something that affects their finances. The economic case for AMR has been investigated to some extent, but not as much as what antibiotics certain organisms are resistant to. The 'non-scientific' mind is not very interested in the details that intrigue those with a medical or veterinary background and, of course, help us treat both people and animals. As the saying goes, money talks, and very loudly too. We, in Zambia, have joined the bandwagon on exploring how AMR affects us in a socioeconomic sense and to use more of such messages to get the AMR message to hit home. Everyone pays attention to things that touch on their finances.

As we continue this AMR awareness battle, let us be cognizant that we as individuals can also be AMR advocates in our personal circles as well as professional ones.

–Ntombi Mudenda, Dean, School of Veterinary Medicine, University of Zambia, Zambia.

4. PROMOTION OF BACKYARD AND RURAL POULTRY SYSTEMS CAN HELP CONTAIN AMR IN THE LONG TERM

New report by the Centre for Science and Environment highlights co-benefits of improved livelihood, nutrition and biodiversity conservation in these systems

Rajeshwari Sinha

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INDIA'S backyard poultry population, including rural poultry, saw a 46 per cent growth from 2012, even though it accounted for just about a third of the total poultry population in India at that time, according to the 2019 livestock census. The remaining two-thirds were from commercial poultry systems.

In 2023–24, only 15.4 per cent of total eggs came from backyard poultry. It is evident that despite the potential to grow, much of the poultry products came from commercial poultry production systems.

These systems, however, are unsustainable owing to high stocking density of productivity-centric breeds. Poultry in these settings are reared in confined conditions with limited animal husbandry, making them potential breeding grounds for zoonotic diseases, resistant pathogens and pandemics.

In contrast, backyard and rural poultry production systems are more sustainable and play an important role in improving nutrition and livelihood for the rural masses. Being free range, these farming systems need minimal investment and inputs for establishment and operation, thereby being cost-effective. Adverse impact on environment and ecological health is minimal, while ensuring safer nutritious food.

Small and marginal farmers, rearing poultry in backyards or on a smaller scale, can not only use meat or eggs for family consumption, but also sell in nearby markets. Remarkably, these systems are also a potential answer to address another public health crisis—antimicrobial resistance (AMR).

Commercial poultry farming systems, though unsustainable, meet the high demand requirements for poultry products due to the high productivity of the breeds used. But there is a need to rethink how productivity can be maintained while growing sustainably.

A report by Delhi-based think tank Centre for Science and Environment (CSE) on Upscaling Backyard and Rural Poultry Systems in India was released during the World AMR Awareness Week 2025 on approaches to achieve this.

ROLE OF RESILIENT BREEDS IN BACKYARD, RURAL POULTRY SYSTEMS

One way to make India's poultry farming systems more sustainable is by promoting and scaling up such backyard and rural poultry production systems, the backbone of which is formed by India's rich pool of resilient poultry breeds. These breeds typically include native (*desi* or indigenous) breeds and their improved varieties that are characterised by low input needs, high adaptability to harsher conditions and local climate and disease resilience.

The productivity concerns of these native breeds were addressed by 'improved varieties', which have been modified from native breeds by selective breeding or cross breeding for better characteristic traits such as improved body weight and egg production.

These can be low-input technology (LIT) varieties for small-farmer consumption and income generation, or high-input varieties for small-scale commercial purposes. Improved varieties provide productivity that is on par with commercial ones.

The CSE report underscored the benefits of scaling up such systems as a future long-term opportunity to reduce antibiotic misuse and AMR, offering co-benefits such as improved livelihood, nutrition and biodiversity conservation.

The role of resilient breeds in viability and growth of such systems are key, as the researchers noted in the report that also documented challenges in and opportunities for scaling up backyard and rural poultry systems through policy and programmatic support.

REPLICABLE MODELS EXIST

The report captures seven good examples of backyard poultry farming successfully carried out, helping smallholder farmers earn income and also get safe, good food. KeggFarms' Kuroiler model, for instance, has improved the nutrition and livelihood of rural women, in addition to creating micro-entrepreneurs, reducing diseases and the need for antibiotics.

In Maharashtra, a community-led backyard poultry farming initiative is enhancing nutrition and livelihood of landless farmers of migrating community, supported by the Aga Khan Rural Support Programme (India). There is less disease and less need for antibiotics due to native breeds, timely vaccination and use of herbal medication.

Similarly, the WASSAN-led Backyard Poultry Cluster Program for Small Holders across nine Indian states is a women-led micro-enterprise promoting sustainable livelihood by pairing desi poultry with a multi-layer eco-farm and incorporating decentralised breeding farms and poultry healthcare services.

SCALE-UP EFFORTS, CHALLENGES AND POSSIBILITIES

There has been notable government effort to promote backyard poultry. The National Livestock Mission identified 23 LIT (low input technology) birds and promotes their rearing by providing subsidy to establish parent farms, hatcheries and brooder-cum-mother units. The All India Coordinated Research Project on Poultry Breeding focuses on developing location-specific chicken varieties and conserving native germplasm. Backyard poultry for farm livelihoods is also being promoted under National Rural Livelihoods Mission. Many states like West Bengal, Odisha, Maharashtra, Assam and Tamil Nadu have own schemes to promote LIT bird rearing for self-sufficiency among small farmers.

However, despite the advantages and potential, the scale of backyard and rural poultry farming in India remains limited due to several on the ground challenges, which the report identified based on extensive stakeholder engagement and field research.

Disease risk and mortality is high during initial six to eight weeks as farmers often skip vaccination due to limited awareness, resources, cost and poor access/availability. They also lack resources and facility for adequate brooding and nutrition.

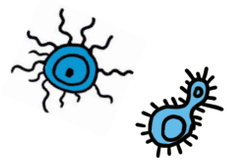
In remote areas, access to the right breed/variety of good quality is a concern as farmers rely on local middlemen. Government stocks, though cheaper, are sometimes perceived as of lower quality. Follow-up from chick distribution centres and the availability of veterinarians to guide farmers is limited.

Farmers are also often reluctant to travel long distances to sell just a few birds, with no vendors to collect birds at a fair price. To enhance farmer uptake and scalability, the most crucial need is to reduce risk and bird mortality in the first six to eight weeks. This can be done by establishing and strengthening 'mother units' to provide day-old-chicks with necessary brooding, management and vaccination until they are stable before distribution.

Public–private partnerships can be considered for sustainable supply of resilient breeds to address the demand–supply gap. Incentivising farmers to set up own breeder farms and small incubators can foster self-sustainability.

Veterinary capacity and guidance need strengthening, such as through training of community animal health workers or para-vets, for areas with limited professional veterinary oversight. There is a need to create dedicated markets for farmers to access and earn remunerative pricing.

–Rajeshwari Sinha, Senior Programme Manager, Sustainable Food Systems Programme, Centre for Science and Environment, India



5. WHY AFRICA'S YOUNG POPULATION COULD BE THE TURNING POINT IN THE GLOBAL ANTIMICROBIAL RESISTANCE RESPONSE

A pathway to owning the AMR response and staying in the game amid the myriad of health challenges is to leverage on young voices. It must be done now, and it has to be done genuinely to protect our present and secure our future.

Oluwatoni Akinola

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THE global health landscape increasingly resembles a game of whac-a-mole—strike down one challenge, and two more emerge. As the world still grapples with pandemic aftershocks and anticipates Disease X, preventable outbreaks such as cholera and measles continue to be fuelled by conflict and misinformation. Concurrently, decades of sustained health investments are at risk as health financing shrinks and long-standing commitments weaken. Amid these, a particular health challenge has remained, sometimes termed 'silent', yet figuratively speaking, speaks volumes through untreatable common infections, extended hospital stays and economic burdens.

More wide-reaching than often understood, Antimicrobial Resistance (AMR), threatens planetary health, pulling the world back to a pre-antimicrobial period. Without decisive action, the next 10 years could see human life expectancies fall by an average of 1.8 and 2.5 years in some low- and middle-income countries. Termed by experts as the misuse of antimicrobials in animal and plant production by farmers it is simply them improving their profit and yield. Yet, the implications jeopardise our health and food security. Unfortunately, the Global South bears the heaviest burden, with South Asia expected to have the highest projected mortality at over 11 million deaths directly attributable to AMR, and sub-Saharan Africa at over 6 million.

As the Nigerian proverb says, "Whenever you wake up, that is your morning"; Africa is waking up to arguably its most abundant resource—its youth. Over 70 per cent of Africa's population are under 30, representing a significant opportunity to strengthen our AMR response. Youth bring energy, creativity, digital fluency, a hunger for recognition, and the courage to challenge norms. The 2024 United Nations General Assembly High-Level Meeting on AMR Youth Manifesto, Africa CDC Youth Advisory Team for Health, and Africa CDC Youth Engagement and Participation in Global Health Strategy (2025–28) all signal increased space for young voices in high-level decision-making.

Ahead of the fourth Conference on Public Health in Africa in South Africa, the Youth Programmes Lead and Senior Technical Officer for Strategic Programmes at Africa CDC, emphasised youth as active participants in shaping and advancing public health on the continent. He noted that youth must move past being passive beneficiaries of health programmes, to becoming co-creators of solutions, driving innovation, accountability, and community-level action.

A powerful example of youth in action is the AMR school program, driven by the Ameyo Stella Adadevoh (DRASA) Health Trust. Supported by the World Health Organization (WHO) in partnership with Lagos and Osun State governments, DRASA established AMR Clubs in 30 public secondary schools across two states. In 2022 alone, 891 student ambassadors

were equipped through interactive lessons and activities, including artwork, debates, essays, poetry and inter-school competitions. These ambassadors reached 8,323 people in six months—teaching in assemblies, discouraging self-medication at home, and sharing messages on hygiene and infection prevention and control in religious institutions. Through their boldness and creativity, they leveraged trust within their communities and translated AMR knowledge to action.

DRASA also partnered with the youth-led AMR Intervarsity Training Program to establish seven new AMR clubs at universities nationwide, and supported activities of 11 existing clubs. To mark World Antimicrobial Resistance Awareness Week (WAAW) 2024, the AMR on the Street project enabled students to reach 29,398 community members through awareness campaigns in farms, markets, religious institutions, health facilities and more. Beyond the numbers, these were lives equipped with knowledge to make better decisions a lesson underscored by the experience of AMR survivor, Pharmacist Mashood Lawal (Member, WHO Task Force for AMR Survivors), whose kidney stone surgery resulted in a severe drug-resistant infection nearly costing him his life.

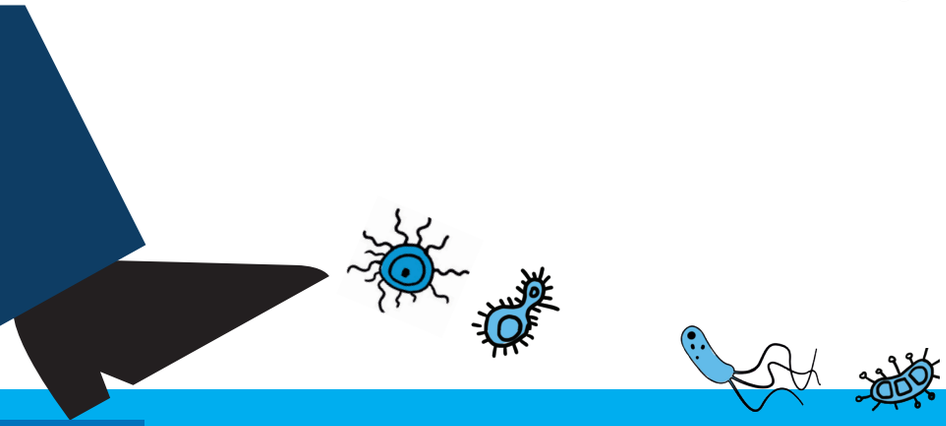
Yet, awareness efforts often face language barriers, and the abstract nature of AMR terminology is no exception. A 2023 paper by Krockow et al. highlights the low memorability and limited public resonance of existing AMR terms. Capitalising on the importance of effective communication of AMR, DRASA with the Nigeria Centre for Disease Control and Prevention, and other partners launched the SayAMR Language Hackathon to engage university students nationwide to translate AMR to four major Nigerian languages—Hausa, Igbo, Pidgin English and Yoruba. This pioneering initiative holds promise towards reaching previously overlooked audiences due to language exclusion. Across the ecosystem, youth-focused organisations like Ducit Blue Foundation and Alliance against Antimicrobial Resistance (Triple A) continue to demonstrate the power of youth-led advocacy, communication and innovation.

Young people are assets in AMR prevention and control, but their involvement must be genuine not tokenistic. Inclusion must extend to national AMR and One Health governance structures to ensure decision-making reflects youth perspectives. DRASA and Alliance for Sustainable Livestock (ASL) in Nigeria are advancing this through the fellowship Youth for Pandemic Alliance (Youth PALLI), which is focused on capacity building on AMR, in preparation for their participation in national One Health decision-making to strengthen health security emergency preparedness and response systems.

Youth engagement is essential, but alone, is not enough. The challenge of our abruptly shifting financing landscape in global health remains. To sustain the youth momentum, there is a need for domestic financing to support the implementation of the National Action Plans on AMR—strengthening surveillance, infection prevention and control, governance, education and awareness, research and development, optimal antimicrobial use, through a One Health approach. At the recent continental meeting on the review of the African Union Framework on AMR Control convened by Africa CDC in Ethiopia, a key takeaway was the need for Africa to own the response and ensure context-specific, locally developed solutions.

A pathway to owning the AMR response and staying in the game amid the myriad of health challenges is to leverage young voices. It must be done now, and it has to be done genuinely to protect our present and secure our future.

– Oluwatoni Akinola, AMR Program Manager, DRASA Health Trust, Nigeria



6. CHALLENGES AND PATHWAYS FOR SUSTAINABLE ANIMAL HEALTH MANAGEMENT IN RURAL INDIA

Community models like Pashu Sakhis are helping farmers adopt preventive care

Dhirendra Kumar

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LIVESTOCK in India is not merely a source of livelihood but also the foundation of nutritional security and social stability, particularly in rural and remote regions.

However, over the past few decades, changing approaches to animal health management and evolving environmental conditions have given rise to new global challenges, notably the increasing resistance of microorganisms and the declining effectiveness of medicines.

RELATIONSHIP BETWEEN AMR AND RURAL LIVESTOCK

Across all regions of India—rural, urban and semi-urban—the rising demand for animal products such as milk, eggs, meat and other derivatives has led to a more commercialised livestock system. In this process, the overuse and misuse of antibiotics have become common, whether for disease prevention or to enhance production.

Antibiotics are frequently administered without veterinary consultation or proper diagnosis, often based merely on visible symptoms. Consequently, incomplete courses, overdosing or the use of inappropriate medicines are standard. As a result, pathogenic microorganisms develop resistance to these drugs.

These resistant microbes pose serious threats not only to animal health but also to human health, while simultaneously contaminating the food chain and the environment. Thus, antimicrobial resistance (AMR) has emerged as a One Health issue—linking the health of animals, humans and the environment.

MAJOR CHALLENGES IN RURAL INDIA

The first challenge is a weak animal health infrastructure. In rural areas, trained para-veterinarians, or *Pashu Sakhis*/*Pashu Salah Karmis*, are few in number. Government veterinarians often serve multiple villages and veterinary centres simultaneously. Due to the lack of immediate medical support, farmers frequently self-medicate their animals or rely on local drug sellers, especially for small livestock such as goats and poultry.

The second is inadequate awareness. Farmers generally lack sufficient awareness of the proper use of antibiotics—their effects, side effects, correct dosage and the withdrawal period (the time required before milk or meat can be safely consumed).

Another challenge is market pressure. Milk cooperatives, private companies (including medicine suppliers) and individual buyers tend to emphasise quantity over quality. This market pressure often pushes farmers—knowingly or unknowingly—to use additional drugs to restore animal health quickly and increase productivity.

The last one is a lack of surveillance and data. AMR surveillance in India's veterinary sector is minimal. There is no systematic mechanism for regular data collection and analysis from rural areas, making it difficult to assess the scale and pattern of antibiotic resistance in livestock.

WHAT ARE SOME POSITIVE INITIATIVES AND PATHWAYS FOR SOLUTIONS?

Community-based animal health management: Organisations such as the Aga Khan Rural Support Programme (India) have expanded access to animal health services at the village level through the *Pashu Sakhi* model. These locally trained women assist farmers in vaccination, parasite control, and basic animal care—including housing, feeding, health, marketing and management. This approach reduces unnecessary drug use and strengthens preventive health measures.

Awareness and training: Regular training sessions should be organised for farmers, livestock advisors, and para-vets. Awareness can also be promoted through banners and wall paintings that highlight the responsible use of antibiotics, biosecurity and hygiene practices.

Promotion of preventive measures: Preventive initiatives such as vaccination, improved nutrition, selective breeding, clean water, and hygienic animal housing help reduce the risk of infection and, consequently, the dependence on drugs.

Strengthening policy and regulatory frameworks: Strict controls should be enforced on the sale of antimicrobial drugs without prescription, along with monitoring of the veterinary drug supply chain and vaccination cold chain. State animal husbandry departments should also prepare local action plans aligned with the National Action Plan on AMR.

Data-based monitoring: In collaboration with veterinary colleges, laboratories and community organisations, a *Rural AMR Surveillance Network* can be developed to track infections and drug usage at the grassroots level.

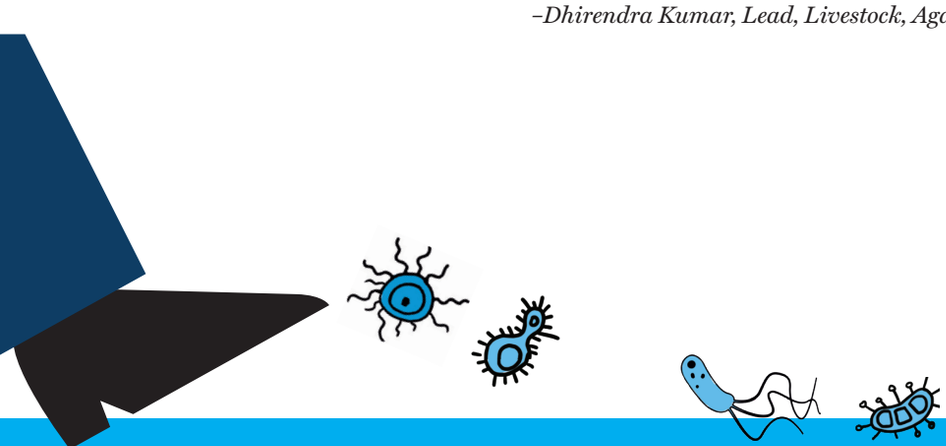
ECONOMIC AND SOCIAL BENEFITS

If these measures are adopted to control AMR, not only will animal health improve, but farmers' wellbeing will also benefit, and the overall cost of livestock rearing will decline. Healthy animals will yield higher and more consistent production, leading to stable income. Moreover, livestock-related ecosystems will become more sustainable and secure.

NOT JUST A SCIENTIFIC CHALLENGE

AMR cannot be viewed merely as a scientific challenge—it is a socioeconomic issue intertwined with rural livelihoods, health and the environment. The path to solutions lies in community participation, policy support and local innovation. Prioritising awareness and responsible animal health management in rural India will not only help control AMR but also pave the way for a healthy and sustainable livestock system.

–Dhirendra Kumar, Lead, Livestock, Aga Khan Rural Support Programme, India



7. GLOBAL SOUTH PRIORITIES ARE KEY FOR AN EQUITABLE GLOBAL AMR ACTION PLAN

Access, affordability and veterinary integration are top priorities for a revised plan

Leena Menghaney

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IN the lead-up to shaping the draft Global Action Plan on Antimicrobial Resistance (AMR), the Delhi-based think tank Centre for Science and Environment (CSE) convened a consultation to gather the priorities and perspectives of diverse stakeholders across the Global South. The meeting brought together public health experts, scientists, policymakers, civil society groups, and representatives from the animal health and environmental sectors, creating a platform to articulate shared concerns and propose concrete solutions for a more equitable global AMR framework.

A clear and consistent message emerged from the discussions: the Global Action Plan must move beyond its historic emphasis on stewardship and surveillance to embed strong, enforceable obligations on equitable access. The previous Global Action Plan placed significant focus on responsible use but did not create binding commitments to ensure the availability of essential antimicrobials.

National Action Plans have reproduced this imbalance, often prioritising the control of excess use while overlooking the critical challenge of insufficient access to, and supply of, vital Watch and Reserve antibiotics across low- and middle-income countries.

Shortages and stock-outs of antibiotics and diagnostics, especially at the primary healthcare level, were identified as major barriers. Participants urged stronger national mechanisms to monitor and prevent supply disruptions and called for addressing market failures, particularly for older, less commercially profitable antibiotics, through pooled procurement models such as the SECURE initiative and regional supply arrangements to stabilise supply and improve forecasting and quality assurance.

The SECURE initiative is a joint effort by the World Health Organization (WHO) and the Global Antibiotic Research and Development Partnership to address AMR.

Universal healthcare systems, supported by strong legislation, were identified in the meeting as essential for closing access gaps. Participants stressed that access gaps are particularly acute in fragile, conflict-affected, and resource-limited settings, where humanitarian blockades restrict the flow of medical supplies, including lifesaving antibiotics.

Across discussions, stakeholders emphasised the need to treat antibiotics, diagnostics, vaccines, and related AMR tools as global public goods. Ensuring affordability and availability must be central to publicly funded R&D initiatives. Public financing for the research and development of antibiotics, tests, and vaccines must also incorporate downstream access and knowledge-sharing conditions so that innovations supported by public funds translate into products that are available and affordable to health systems and patients.

Another priority raised was the need for vaccines that reflect regional epidemiology and health priorities, an area where the current R&D ecosystem remains insufficiently responsive to Global South needs. Participants also pointed to the persistent lack of reliable data on access barriers, which undermines evidence-based policymaking.

Member states need to consider that operational research on access and equity, particularly for diagnostics, is urgently needed, as weak diagnostic capacity continues to fuel irrational antibiotic use. Strengthening diagnostic systems emerged as essential. Stakeholders called for the updated Global AMR Action Plan to require member states to adopt the WHO Essential Diagnostics List (EDL) and integrate it into procurement systems and public-health supply chains.

Strengthening national drug regulatory authorities was recognised as another critical priority for member states. Substandard antibiotics continue to undermine treatment outcomes and accelerate resistance. Ensuring the consistent availability of quality-assured medicines must therefore be a cornerstone of the revised Global Action Plan.

High prices of health technologies were also highlighted as structural barriers to access. Stakeholders encouraged member states to adopt policies that curb monopolies, encourage competition, and leverage industrial policy to support domestic innovation and affordability.

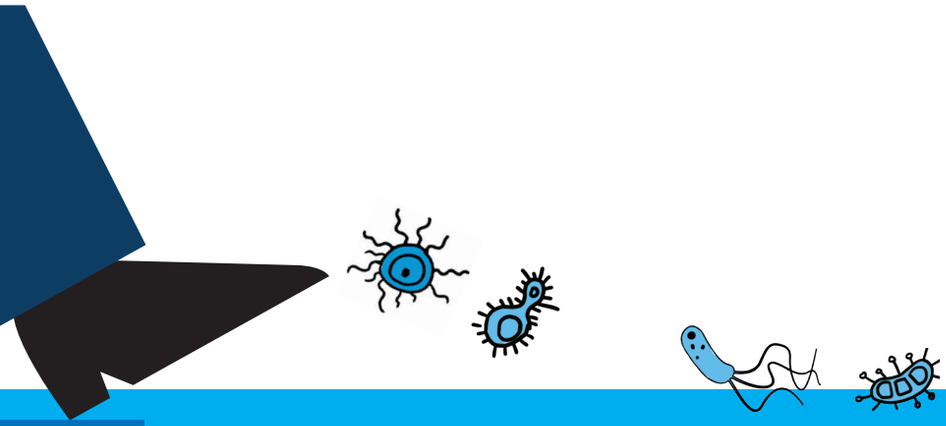
However, emerging funding shortages, including reductions in international financing, threaten the implementation of National Action Plans. Participants urged governments to mobilise domestic resources and secure long-term financing pathways.

Crucially, the discussions emphasised that AMR cannot be addressed without fully integrating the veterinary sector. Ensuring farmers' access to free, quality veterinary services and publicly funded veterinary antibiograms is key to guiding responsible antimicrobial use in animals.

The consultation reflected a wide spectrum of institutional and geographical perspectives. Public health authorities contributed insights from national bodies in Oman, the Philippines and Tanzania. Regional and international expertise came from organisations working across Asia, Africa and the Eastern Mediterranean. The veterinary and livestock sectors provided grounded field perspectives from East and West Africa, while civil society and public health experts from India and across Africa emphasised community-level challenges. Global policy coherence was ensured through contributions from the WHO's AMR Division, anchoring national and regional challenges within the broader international agenda.

Together, these diverse voices underscored the urgent need for a Global Action Plan that is grounded in equity, aligned with the realities of the Global South, and capable of delivering meaningful, measurable change in access to life-saving AMR-related health technologies.

–Leena Menghaney, Lawyer, Public Health and Access to Medicine, India



8. AMR WILL CONTINUE TO THREATEN HEALTH, DEVELOPMENT, AND ECONOMIC STABILITY, PARTICULARLY IN LOW- AND MIDDLE-INCOME COUNTRIES

With stronger political commitment, international solidarity, and investment in innovation and infrastructure, LMICs can make substantial strides toward containing AMR

Denis K. Byarugaba

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ANTIMICROBIAL resistance (AMR) is one of the most critical global health challenges of the twenty-first century, undermining decades of progress in the treatment and control of infectious diseases. The World Health Organization (WHO) has identified AMR as one of the top ten threats to global public health. Low- and middle-income countries (LMICs) bear a disproportionate share of this burden because of their high infectious disease prevalence, limited diagnostic and laboratory capacity, weak health systems, and socioeconomic constraints. The burden of AMR in LMICs extends far beyond the immediate clinical impact on patients. A recent modelling by Lewnard *et al.,* 2024 estimated that improving infection prevention and control programmes in LMIC healthcare settings could prevent at least 337,000 AMR-associated deaths, while ensuring universal access to high-quality water, sanitation, and hygiene services would prevent about 247,800 AMR-associated deaths and paediatric vaccines 181,500 AMR-associated deaths, from both direct prevention of resistant infections and reductions in antibiotic consumption. Children in LMICs are particularly affected, with AMR contributing to more than a million deaths each year. The economic consequences are also staggering, with projections suggesting the most severe impacts in LMICs. These losses derive from both direct health-system costs and broader productivity reductions resulting from increased illness and premature mortality. The high prevalence of infectious diseases, frequent empirical antibiotic use, and unregulated access to antimicrobial drugs all compound this growing burden.

Despite its recognised importance, the current status of AMR containment strategies such as surveillance, policy, and stewardship in LMICs remains limited. The WHO's Global Action Plan on Antimicrobial Resistance (GAP), adopted in 2015, spurred many LMICs to develop National Action Plans (NAPs) that align with global objectives to improve awareness, strengthen surveillance, reduce infection incidence, optimise antimicrobial use, and promote sustainable investment. While the existence of NAPs demonstrates growing political recognition of AMR, implementation remains uneven, with minimal enforcement for prescription-only antibiotics or controlling the sale of antimicrobials in informal markets. Over-the-counter antibiotic access remains common, driven by weak governance, economic incentives, and public demand. Antimicrobial stewardship (AMS) programmes, which aim to ensure the rational use of antibiotics, are gradually being adopted in LMIC healthcare facilities. Evidence from a scoping review by Harun et al., 2024 showed that AMS interventions have successfully reduced antibiotic consumption and improved clinical outcomes. Infection prevention and control (IPC) programmes and WASH improvements are equally essential to reducing infection rates and thus antibiotic demand.

Progress toward AMR containment in LMICs has been notable but insufficient. More countries now possess NAPs. Hospital-based AMS initiatives have demonstrated measurable improvements in antibiotic prescribing practices and reductions in resistance

trends. In parallel, national immunisation campaigns and investments in WASH have indirectly contributed to a reduction in infection incidence and curbing antimicrobial use. The One Health framework, which integrates human, animal, and environmental health perspectives, is increasingly being recognised and incorporated into LMIC AMR strategies, reflecting a growing understanding that antibiotic misuse in agriculture and environmental contamination play critical roles in the resistance cycle

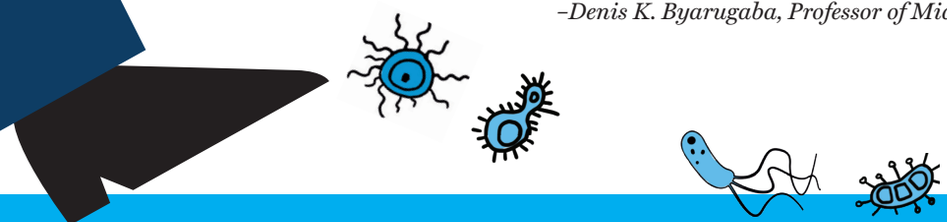
Despite these encouraging developments, LMICs face several persistent challenges. Health system weaknesses remain fundamental barriers. Laboratory capacity continues to be inadequate, with limited quality assurance, inconsistent supplies, and underinvestment in workforce training. Weak IPC systems and poor infrastructure facilitate infection spread within communities and healthcare facilities. Over-the-counter antibiotic use and self-medication remain pervasive, fuelled by the affordability of generic antibiotics and the limited availability of qualified prescribers. In agricultural sectors, antibiotics are frequently used as preventive measures in livestock and aquaculture, often without veterinary oversight. These practices amplify selection pressure and facilitate the dissemination of resistant strains through the food chain and the environment. Although many LMICs have formal policies to regulate antibiotic use, enforcement mechanisms are weak, and surveillance of drug quality and distribution is minimal. Financial constraints are another major obstacle with competing health priorities, limited domestic funding, and reliance on external donors.

Despite this, significant opportunities exist for LMICs to strengthen their response to AMR, including scaling up infection prevention and control measures, improving WASH, and increasing vaccination coverage. Another key opportunity lies in strengthening surveillance and diagnostic capacity through efforts like the Fleming Fund, which played a crucial role in funding laboratory capacity, workforce training, and data-sharing networks that generating reliable data across the human, animal and environmental health sectors. Regional collaborations, such as shared laboratories, training programmes, and pooled procurement of diagnostic reagents, offer cost-effective solutions for resource-limited settings. Expanding antimicrobial stewardship programmes adapted to local contexts can further enhance rational prescribing practices. These programmes should include continuous medical education, feedback systems, and integration with IPC activities. Reinforced regulatory frameworks that restrict non-prescription antibiotic sales and monitor agricultural antimicrobial use are essential. Moreover, developing an international accreditation or benchmarking system for stewardship programmes could help LMICs maintain accountability and attract support. Integrating human, veterinary, and environmental surveillance can provide a more comprehensive understanding of resistance dynamics and promote coordinated interventions. Environmental monitoring of antibiotic residues and resistant organisms in wastewater, soil, and agricultural runoff could also identify hotspots and guide mitigation efforts.

In relation to financing, innovative models such as public–private partnerships, pooled procurement systems, and global AMR funding mechanisms could support sustainable interventions in LMICs. Promoting equitable access to new antimicrobials and encouraging innovation in diagnostics and vaccines will also be critical, in addition to strengthening data systems for monitoring antibiotic use, resistance rates and policy outcomes, which can improve accountability and policy effectiveness. Data-driven decision-making, combined with transparent reporting and international collaboration, will be vital to sustaining progress.

Overall, AMR will continue to threaten health, development and economic stability, particularly in LMICs, amid high competing priorities and therefore will need continuous investments by national governments to implement evidence-based interventions, including WASH improvements, vaccination, IPC and stewardship. With more substantial political commitment, international solidarity, and investment in innovation and infrastructure, LMICs can make significant strides toward containing AMR and safeguarding global health security.

–Denis K. Byarugaba, Professor of Microbiology, Makerere University, Uganda



9. BRINGING NARCOTICS-LEVEL CONTROLS TO ANTIBIOTICS SHOULD DRIVE INDIA'S NEXT FIGHT AGAINST RESISTANCE

New tiered control and digital traceability framework needed to treat antibiotic misuse with urgency

Dharmesh Kharwar

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IT was anticipated, and remains true, that a virus acts quickly and visibly and can be managed, while antimicrobial resistance in protozoa, bacteria and fungi persists subtly, progresses slowly and poses the most significant challenge to address.

While multipronged actions have been ongoing, including standards, regulations, policy support and technical interventions, the big impact expected is elusive.

So what can be done to change public behaviour to achieve desired results? Holistic approaches are complex to design, implement and monitor. Hence it is proposed to take a different pathway this time.

The approach so far has included limiting prescriptions unless sensitivity tests demand, standardised treatment regimens, a ban on over-the-counter (OTC) sales, maintaining personal hygiene, lowering the cost of molecular diagnostics, and funding vaccine development. Newer approaches include next-generation antibiotics, bacteriophage therapy and CRISPR/Cas-based antibacterial strategies, which will all be simulated using artificial intelligence.

The question is, do we expect it to really make the big impact needed? Chronic conditions are often ignored until it's too late, unless we have a situation like the glucagon-like peptide-1 treatment for diabetes and obesity, which has now become the top-selling medication, even surpassing anti-cancer drugs.

The core issue remains easy access in low- and mid-income countries. Unless there is immediate dispensing control on antibiotics like that done for drugs under the Narcotic Drugs and Psychotropic Substances (NDPS) Act, this will continue.

The case is being made because India is among the highest consumers of antibiotics globally, with widespread OTC sales and irrational prescriptions. Fluoroquinolones, cephalosporins and carbapenems are often used without culture sensitivity, driving resistance.

The NDPS Act has successfully restricted access to high-risk substances through licensing, documentation, and penal provisions. A similar framework for Schedule H1 and critical antimicrobials could enforce accountability and traceability.

KEY FRAMEWORK ELEMENTS

Mechanism	Proposed Antimicrobial Control Equivalent
Licensing for manufacture/sale	Mandatory antimicrobial manufacturing /sale license against comprehensive AMR stewardship Audit
Prescription-only access	Strict e-prescription with Aadhaar-linked traceability
Record maintenance with track and trace	Digital prescription logs with real-time audit trail
Penal provisions for misuse	Fines and suspension for unauthorized sale or prescription
Central registry of transactions	National Antimicrobial Use Registry to be constituted

Risk-based control of antimicrobials in India is designed through a tiered framework that classifies drugs according to their spectrum, clinical importance and potential for resistance.

At the highest level, Tier 0 includes the most restricted group of antibiotics, comprising Group A and B multidrug-resistant or extensively drug-resistant tuberculosis drugs such as bedaquiline.

Tier 1 encompasses reserve group antibiotics like colistin and carbapenems, which require stringent NDPS-level (Narcotic Drugs and Psychotropic Substances) control.

Tier 2 covers the watch group of antibiotics, including fluoroquinolones and third-generation cephalosporins, which are semi-restricted and require electronic prescriptions.

Finally, Tier 3 consists of the access group drugs such as amoxicillin, which remain under monitoring but are not restricted for regular use.

The implementation of the Controlled Antimicrobials framework could follow a phased approach. Phase 1 would begin as a pilot program in five high-burden states identified for widespread antimicrobial misuse. This stage would emphasise establishing prescription traceability and antimicrobial stewardship protocols within the Ayushman Bharat Digital Mission, ensuring foundational digital infrastructure and compliance.

In Phase 2, the initiative could expand nationwide, embedding antimicrobial controls into platforms such as eSanjeevani, private electronic medical records and pharmacy point-of-sale systems to enable seamless prescription monitoring and enforcement across public and private sectors.

Phase 3 would then focus on creating real-time data linkages with the Indian Council of Medical Research's Antimicrobial Resistance Surveillance Network and the Central Drugs Standard Control Organization. This final stage would enable dynamic resistance mapping, continuous policy feedback, and adaptive regulatory actions in response to emerging antimicrobial resistance patterns.

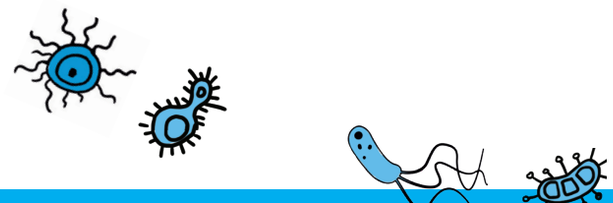
The National Action Plan on Antimicrobial Resistance (NAP-AMR) 2.0 (2021–25) outlines six key strategic priorities to contain AMR in India through a One Health approach. These include strengthening surveillance, improving stewardship, expanding awareness, tightening regulation, enhancing sanitation and infection control and promoting innovation and research. The plan seeks to connect human, animal and environmental health responses under a unified regulatory and institutional framework.

Under the first priority, One Health surveillance will be expanded by strengthening ICMR-AMRSN and integrating it with antimicrobial monitoring systems in the animal, food and environmental sectors. Interoperable data platforms will be developed to link human, veterinary and environmental AMR information while supporting state-level surveillance units and sentinel sites.

The second strategic area focuses on improving antimicrobial stewardship (AMS) by institutionalising AMS programmes across all tertiary and secondary care hospitals. These should advocate for mandatory infection control committees, antibiotic policy audits and widespread promotion of prescription audits and electronic prescribing in both public and private settings.

The third priority emphasises awareness and education through targeted information, education and communication campaigns for prescribers, pharmacists, farmers and the general public. AMR content will be integrated into the curricula of medical, veterinary and nursing institutions, while community engagement will be strengthened through non-governmental organisations and local governance bodies.

The fourth area of focus is to reinforce regulatory frameworks. This can be done by enforcing Schedule H1 compliance, restricting OTC sales of critical antimicrobials, developing digital prescription-tracking and pharmacy audit systems and regulating antibiotic use in food-producing animals by prohibiting growth promoters and prophylactic usage.



Improving sanitation, hygiene and infection prevention and control (IPC) forms the fifth pillar. To achieve this, it is imperative to integrate AMR goals into national programmes such as the Swachh Bharat Abhiyan, Jal Jeevan Mission and the National Health Mission. This priority includes strengthening IPC standards in both human and veterinary health facilities and expanding wastewater surveillance and effluent treatment protocols, particularly in pharmaceutical manufacturing and healthcare sectors.

Finally, promoting research and innovation should be the sixth strategic focus. This involves funding research and development for rapid diagnostic tools, novel antimicrobials and alternative therapies such as phage therapy. Support must also be extended to operational research on AMR drivers and behavioural change. Alongside, public–private partnerships and global collaborations such as those under the Global AMR Surveillance System and the Fleming Fund need to be encouraged.

While the AMR 2.0 is comprehensive and builds on the learnings from AMR 1.0, public figures need to speak about it consistently to instil a responsible behaviour in every citizen.

The country needs to put its full force behind the above cohesive and enforceable strategy that regulates essential antimicrobials with the same rigour applied to narcotics. This should involve integrating digital tracking and tiered access mechanisms, introducing much-needed accountability, reducing inappropriate use and strengthening the implementation of NAP-AMR 2.0 priorities.

However, regulatory discipline alone will not deliver sustainable change. The pivotal transformation will occur only when antimicrobial resistance becomes part of public consciousness—discussed openly by leaders, reflected in consumer behaviour and recognised as seriously as lifestyle diseases such as diabetes or cancer. Turning this invisible biological crisis into a visible social concern is key to achieving long-term measurable progress.

–Dharmesh Kharwar, Independent Director and Strategy Advisor, India

10. STRENGTHENING ENVIRONMENTAL REGULATION TO ADDRESS ANTIMICROBIAL RESISTANCE IN THE GLOBAL SOUTH

Antimicrobial resistance is increasing in rivers, soils and wastewater systems—stronger well-designed environmental policies are a crucial pillar to address AMR in the Global South

Eunice Ubomba-Jaswa

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ALTHOUGH antimicrobial resistance (AMR) is often framed as a problem of hospitals, livestock, and antibiotic misuse, a wider set of resistance-driving pollutants plays a crucial role. Antimicrobials, metals, biocides, microplastics and chemical residues enter water, soil and air ecosystems through various environmental pathways. Specifically, aquatic environments are both major reservoirs and dissemination routes for AMR.

Given the significant impact of environmental water on human, animal and terrestrial health, understanding the presence of pathogens and AMR determinants in source water has been essential for hazard characterisation and assessing potential risks. As the environment's role in spreading clinically relevant AMR becomes clearer, national strategies can be strengthened by placing greater emphasis on environmental protection.

During World Antimicrobial Resistance Awareness Week 2025 themed "Act Now: Protect our Present, Secure our Future", it is timely to highlight how improvement in environmental regulation, surveillance and accountability can significantly reduce AMR risks now and in the years ahead.

IDENTIFYING THE GAPS IN ENVIRONMENTAL PROTECTION

Following the high-level political attention generated by the United Nations General Assembly High-Level Meeting on AMR, approximately 178 countries have developed national action plans, some with input from environmental regulators. However, less than one-fifth of these plans are funded or actively implemented. Despite increased awareness and environmental representation in national plans, substantial gaps in environmental protection against AMR persist.

AMR efforts have traditionally targeted antibiotics, focusing on hospital effluent and pharmaceutical manufacturing. While important, these sources represent only a fraction of the chemicals driving resistance in the environment. Large volumes of contaminants come from under-regulated sectors, particularly municipal and industrial wastewater. These streams often pass through overloaded or outdated treatment plants, resulting in minimal or no effective treatment.

Heavy metals such as lead, cadmium and arsenic—commonly released from mining, industry and waste streams—further accelerate the emergence and persistence of AMR. Additional contributors include land application of manure and sludge, livestock and aquaculture operations, intensive crop farming, and the improper disposal of medicines and household chemicals. Recognising and regulating these non-antibiotic drivers offers a major opportunity to strengthen national AMR strategies.

EXPANDING AND UPGRADING WASTEWATER TREATMENT FOR AMR PREVENTION

Although wastewater treatment capacity in many parts of the Global South remains limited, expanding access is essential to reduce AMR dissemination. This expansion must be paired with updated and enforced discharge standards (in relation to AMR) that account for local land-use patterns, coastal and aquaculture activities, and support water resource quality objectives. In non-sewered settings, nature-based solutions, bioremediation, phytoremediation and decentralised systems powered by renewable energy offer alternatives that can reduce pollutant loads while remaining financially feasible. These systems can reduce pollutant loads, improve water quality, and create co-benefits such as habitat restoration or increased community resilience.

APPLYING THE POLLUTER-PAYS PRINCIPLE AND EXTENDED PRODUCER RESPONSIBILITY (EPR)

Strengthening environmental regulation also requires clear accountability. Countries can make significant progress by adopting and operationalising the polluter-pays principle and extended producer responsibility (EPR). Adequate financing is also needed to remove micro-pollutants, including pharmaceuticals, personal care products, microplastics, and other contaminants of emerging concern (CEC), that contribute to the development or persistence of AMR. Microplastics in freshwater systems potentially serve as surfaces for microbial biofilms that may contain pathogens and AMR. Their microbial composition and health risks are poorly understood, and if not removed, have the potential to transport AMR to various areas downstream of wastewater treatment works.

EPR schemes can further improve the management of land-based waste and reduce harmful discharges from mining, preventing pollutants from entering water systems in the first place— an urgent need in the Global South where many countries are disproportionately affected by mining impacts. Enhancing or introducing wastewater and environmental surveillance will better track AMR emergence, hotspots and spread.

INCREASING INVESTMENT IN STRENGTHENING DATA, EVIDENCE, AND MONITORING

Currently, most countries in the Global South lack scientific, evidence-based data on culture-dependent and culture-independent AMR surveillance across entire river systems from pristine sources to areas at high risk of faecal contamination and clinically significant pathogens (e.g. ESKAPE pathogens: *Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter* sp., as well as *Escherichia coli*). Risk assessment studies for complete river systems are similarly scarce. Where data exists, temporal comparisons are impossible because most studies provide only a single snapshot and use methods that are not comparable.

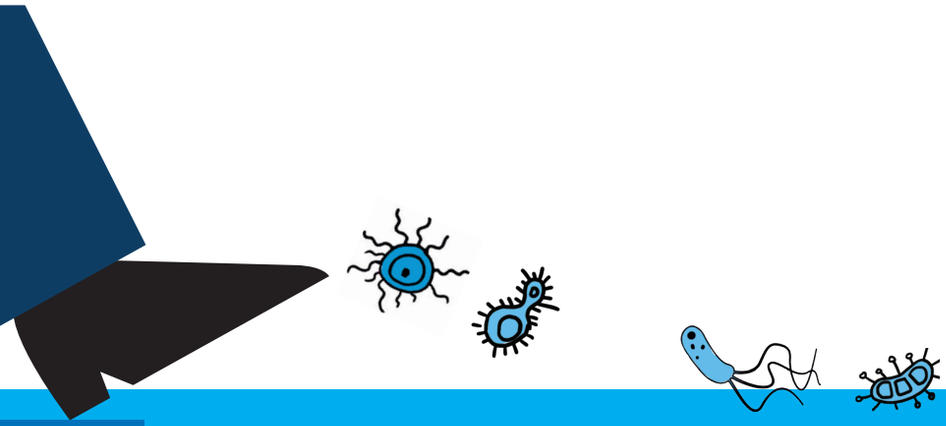
Investment is needed to strengthen data platforms, sharing mechanisms, and analytical tools. A comprehensive and standardised representation of surveillance data across different locations is essential to inform policymakers and cross-sector stakeholders, including environmental authorities. Standardised metadata on AMR in water systems is critical for developing and implementing effective mitigation strategies.

Importantly, cost-benefit analyses should be integrated into environmental AMR research. Policymakers need clear evidence not only of where AMR is emerging in the environment, but also of the economic and ecological costs of inaction. At present, most assessments of the environmental burden of AMR are global estimations. Generating local evidence on how environmental pollution drives AMR (and the long-term costs of failing to address these drivers) can provide a compelling rationale for investing in improved regulation, treatment infrastructure, and pollution control.

ADOPTING A UNIFIED APPROACH TO ENVIRONMENTAL REGULATION AND AMR PREVENTION

Sustainable environmental regulation is a vital part of reducing antimicrobial resistance, and success depends on coordinated action across health, agriculture, mining, water and sanitation grounded in a One Health approach. WAAW 2025 is an opportunity for governments, regulators, researchers and the private sector to commit to strengthening environmental oversight and reducing the environmental drivers of AMR. Protecting ecosystems is not an optional addition to AMR strategies; it is the foundation of long-term antimicrobial effectiveness. With shared commitment and sustained investment, countries can safeguard their natural environments, protect public health, and ensure that life-saving medicines remain effective well into the future.

– Eunice Ubomba-Jaswa, Research Manager—Water Quality and Health, Water Research Commission, South Africa



11. WATER TREATMENT AND BIOSECURITY—TWIN PILLARS OF PROFITABLE POULTRY MANAGEMENT

Clean water and strict biosecurity together unlock healthier, more resilient poultry with less need for antibiotics

Mahendra Singh

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IN today's highly competitive poultry industry, achieving profitable, sustainable and disease-free production hinges on the synergistic strength of two fundamental practices: water treatment and biosecurity. These are not merely optional best practices but rather decisive factors that, when implemented together, safeguard flock health, enhance performance and crucially, reduce the industry's dependence on therapeutic antibiotics, thereby addressing the growing global concern of antimicrobial resistance (AMR).

The industry is recognising that investing in these foundational controls yields far greater returns than constantly managing crises caused by their neglect.

WATER: FORGOTTEN BUT CRITICAL NUTRIENT

Water is perhaps the most critical element in poultry production, yet it is frequently referred to as the "forgotten nutrient". This oversight is particularly concerning given that birds consume up to twice as much water as they do feed, meaning any compromise in water quality has an immediate and direct impact on essential physiological processes, including growth rates, egg production and overall immunity.

The key challenges faced in maintaining optimal water quality are multifaceted and must be addressed systematically: microbial contamination, where pathogens like *E. coli* and *Salmonella* spread rapidly through untreated sources; biofilm formation, which sees organic residues in the pipeline system harbour and protect these pathogens; chemical impurities such as high Total Dissolved Solids (TDS), hardness, iron, or nitrates that negatively affect digestion and overall performance; and, finally, pH imbalance, where water that is too acidic or alkaline can significantly reduce the birds' vital feed intake, leading to poor nutrient utilisation.

Effective water treatment, therefore, demands routine monitoring of TDS, hardness and microbial load, complemented by practices such as pre-filtration, acidification to maintain an optimal pH of 5.5–6.5 (which itself inhibits bacterial growth) and robust disinfection using agents like chlorination, hydrogen peroxide or ozone, alongside regular waterline flushing to mechanically disrupt biofilm build-up.

BIOSECURITY: PREVENTING DISEASE ENTRY, SPREAD

Complementary to internal water health is the external defence provided by biosecurity, which encompasses all measures designed to prevent the entry and subsequent spread of disease on the farm.

Given the global rise in AMR and the industry's necessary shift toward antibiotic-free production models, the importance of a strict biosecurity protocol cannot be overstated.

Biosecurity is structured across three interdependent levels. Conceptual biosecurity involves initial planning, focusing on factors such as the farm's location, ensuring adequate distance from other poultry units and establishing controlled, single-entry points.

Structural biosecurity refers to the physical barriers and fixed systems in place, such as fencing, bird-proof sheds, and, notably, the integrated water sanitation system.

Finally, operational biosecurity covers essential, day-to-day practices, including regular disinfection routines, strict vaccination schedules, controlled visitor policies, and providing necessary equipment like footbaths, hand sanitisers and dedicated farm clothing at entry points.

These protocols must extend to disinfecting all incoming vehicles, crates and equipment, implementing rigorous rodent and wild-bird-control programmes, and maintaining strictly defined mortality disposal methods, such as incineration or composting, all while maintaining meticulous farm records for complete traceability.

CONSEQUENCE OF IGNORING WATER SANITATION

In modern production systems, farmers are often focused on the complexity of feed formulation, incorporating various feed additives—such as water and feed acidifiers, toxin binders and probiotics—and using cost-effective protein sources like rice distillers dried grains with solubles (DDGS) and maize DDGS.

However, ignoring the fundamental role of water sanitation remains a critical mistake. Even the most perfectly balanced and fortified feed will fail if the water supplied to the birds is contaminated; this leads directly to detrimental outcomes, including loose droppings due to microbial load, severely poor nutrient absorption (meaning protein, energy, and vitamins are wasted), an increased incidence of diseases like *E. coli* infections and salpingitis, and a generally weakened immunity that compromises overall production performance.

In stark contrast, farms that prioritise proper water sanitation consistently demonstrate superior results, such as the achievement of "DRY BEAT", or consistently dry droppings, which serves as a clear, visible indicator of excellent gut health and optimal nutrient uptake, proving that success lies not just in what is fed, but how hygienically the environment is managed.

SAFE WATER TREATMENT: CHOOSING RIGHT STANDARD

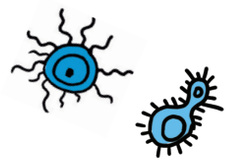
A common issue observed on farms is the reliance on cheaper, substandard chemicals such as chlorine gas, bleaching powder and sodium hypochlorite for water treatment.

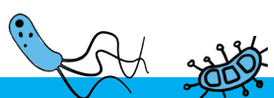
While effective as disinfectants, these compounds are not inherently safe for either poultry or human consumption as they can leave harmful residues, alter the water's taste, reduce consumption rates, and may introduce toxic byproducts.

According to strict WHO guidelines, the only compounds approved and recommended for treating drinking water—for both humans and livestock—must be food and pharmaceutical grade.

The globally recommended and safest option is sodium dichloroisocyanurate (NaDCC), which offers broad-spectrum, highly effective bacterial control without compromising safety. NaDCC ensures zero significant change in taste or odour, provides a stable, long-lasting disinfection residual for up to 48 hours, is eco-friendly, and comes in easy-to-handle effervescent tablet formulations with a superior shelf life of up to three years.

Farmers must understand that the choice of water treatment chemical is not a cost-saving exercise but a foundational investment: compromising on a WHO-recommended, food and pharma grade product like NaDCC risks not only poor poultry performance (loose droppings, higher disease load, chlorine toxicity) but also poses a serious risk to human food safety through residues in the final meat and egg products.





INVESTMENT FOR SUSTAINABLE SUCCESS

In the strategic management of poultry, the adage "prevention is always better than cure" holds ultimate truth. Sustainable poultry farming success is not measured solely by the quality of the feed, but critically by the quality of the water birds consume every single day.

While sheds can be modernised and feed formulas optimised, without the dual safeguards of clean water and strict biosecurity, the flock's full genetic and production potential will remain capped.

Water treatment and biosecurity must be viewed not as necessary costs to be minimised, but as non-negotiable investments that yield exponential returns in the form of higher productivity, enhanced bird welfare, reduced reliance on medicine, and long-term, sustainable profitability for the farmer.

Mahendra Singh, Head, Veterinary Division, Hind Pharma and Director,
Mommy's Chicken & Foods Pvt. Ltd, India

12. AMR IN INDIAN LIVESTOCK IS AN ACTUAL CRISIS; AWARENESS IS SEEPING IN, BUT MUCH REMAINS TO BE DONE

Success depends on consistent enforcement, grassroots education, and a unified One Health approach

Anju Kala

Abhishek C. Saxena

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ANTIMICROBIAL resistance is a natural evolutionary process that microorganisms go through, and it can be understood as a process similar to the evolving immune system in higher-order animals on exposure to changing infectious agents. When microbes are continuously exposed to low doses of antibiotics or short-term therapy with high doses of antibiotics, the microbes are pressurised to develop mechanisms to resist drug action in order to survive. This development of resistance to existing antibiotics (antimicrobial resistance, AMR) by various human and animal pathogens jeopardises medical science's achievements posing human and animal health risks in the near future. In India, where livestock farming sustains millions of rural households and contributes significantly to the economy, AMR in animals has emerged as a formidable challenge. According to a study, by the year 2050, bacterial infections will outnumber cancers in terms of human deaths, owing to the fact that currently available antimicrobials will no longer be as effective in treating bacterial infections. Hence, India's livestock sector is facing a mounting crisis of AMR, driven by indiscriminate antibiotic usage, limited veterinary support services, and inadequate policy enforcement mechanisms.

The contribution of livestock products to human nutrition all over the globe is a huge undeniable share. In India, the livestock sector contributes nearly 4.5 per cent to the national GDP and plays a vital role in rural livelihoods. To meet the protein needs of the growing population, the animal production sector uses a variety of scientific approaches such as improved nutrition, disease prevention (vaccination, deworming) and other health management strategies to maximise animal production. In this series, antibiotic growth promoters (AGP) are commonly used to boost animal growth performance and to check the pathogenic infections in animals. Factors such as poor nutrition, sanitation and overcrowding of animals are among the leading causes of infectious diseases. Use of antibiotics in the livestock sector is higher than in human applications. Antimicrobial consumption in food animals is projected to be 200,235 tonnes by 2030. Due to a shift in production systems in Asia, antibiotic use in animal production by 2030 is expected to increase by 46 per cent. For cattle, chicken and pigs, the global average annual consumption of antimicrobials per kilogramme of produce were 451,481,172 mg for cattle, chicken and pig respectively. As per US FDA (United States Food and Drug Administration) Summary Reports 2021, India ranked fourth, with a contribution of 3 per cent global antimicrobial consumption for food producing animals, after China, USA and Brazil, and this figure is expected to rise to 4 per cent by 2030. The most prevalent antibiotics used during this period were tetracyclines (65 per cent), penicillins (10 per cent) and macrolides (9 per cent) in food animals.

As we are getting aware of the silently rising threat of AMR in the Indian livestock sector, the Government of India has implemented the "National Action Plan" (NAP) on AMR 2017–21, with the recommendation of banning clinically important antibiotics and phasing out non-therapeutic antibiotic use in animal production systems, insisting on the necessity of alternative growth promotors. The Government of India has banned certain antibiotics (colistin, chloramphenicol and nitrofurans) in animal feed at all stages of food animal production. The other key measures include implementing withdrawal periods for other antibiotics, and focusing on the judicious use of all antimicrobials. The Food Safety and Standards Authority of India (FSSAI) has also prohibited the use of glycopeptides, nitroimidazoles, carbadox and streptomycin in food animal production. FSSAI has also banned the use of antimicrobials not just in feed processing but also during all husbandry activities of livestock covering milk, meat, eggs and aquaculture. The Department of Animal Husbandry and Dairying, Government of India, is trying to promote judicious use of antibiotics through workshops, training programmes for veterinarians, para-vets, development of treatment guidelines and promoting the use of antibiotic alternatives. In July 2025, India banned the use of 37 antimicrobial drugs—including 18 antibiotics, 18 antivirals and one anti-protozoan—in livestock production, including milch animals, egg-laying birds, honeybees and meat-producing animals. The official bodies involved have also expanded their surveillance range including livestock and humans to estimate the actual situation of AMR status in India.

However, the role and need for awareness among the masses should not be undermined. There is a need to empower the common masses both in urban and rural areas to promote preventive animal health practices like vaccination, hygiene, and responsible antibiotic use. Though we are moving ahead at a steady pace, many hurdles remain, like difficult enforcement of guidelines in informal and small-scale farming, livestock owners prioritising productivity over safety, lack of robust data about actual AMR status, limited public understanding of AMR and food safety issues.

The silently rising AMR in India is an actual crisis. The government and most stakeholders (veterinarians, policy makers) are slowly becoming aware of it and action plans are being prepared and implemented. However, the major hurdles remain. The actual AMR scenario in the Indian livestock sector, its seriousness in various livestock species, creating awareness among the two major stakeholders, the vets and the livestock owners is yet to find pace. The most effective weapon against the AMR threat would be imparting awareness and the dos and don'ts to fight the risk. The year 2025 seems to be a turning point with effective policy moves, fruitful collaboration of stakeholders laying the foundation for sustainable animal health. However, success depends on consistent enforcement, grassroots education and a unified One Health approach.

Anju Kala, Scientist, Division of Animal Nutrition, ICAR-Indian Veterinary Research Institute (IVRI), India; Abhishek C. Saxena, Senior Scientist, Surgery Division, ICAR-IVRI, India

13. SRI LANKA'S ONE HEALTH JOURNEY IN COMBATING ANTIMICROBIAL RESISTANCE—FROM COMMITMENT TO COLLECTIVE ACTION

The country's AMR initiatives increasingly involve joint training, surveillance and research across human, animal and environmental sectors

Hamsananthy Jeevatharan

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ANTIMICROBIAL resistance (AMR) poses one of the greatest threats to global health, food security and sustainable development. It undermines decades of medical progress and endangers the effectiveness of life-saving treatments.

In low- and middle-income countries, the challenge lies in striking a delicate balance between ensuring equitable access to essential antimicrobials and preventing their misuse across human, animal and environmental sectors.

Sri Lanka, a lower-middle-income island nation in South Asia, has taken bold and systematic steps to translate the One Health vision into practice, demonstrating how collaborative governance and evidence-based policymaking can drive meaningful progress against AMR.

BUILDING POLICY FOUNDATION

Sri Lanka launched its first National Strategic Plan for AMR (2017– 22) and established the National Focal Point for Combating AMR under the Ministry of Health, providing the institutional backbone for the country's response. This plan laid the groundwork for a national commitment that extended beyond the health sector.

Building on these foundations, Sri Lanka developed its second National Action Plan for AMR (2023–2028), accompanied by a two-year costed operational plan (2023–25) to guide implementation. The new plan focuses on strengthening AMR surveillance systems, enhancing laboratory capacity, advancing antimicrobial stewardship, improving infection prevention and control, promoting research, environmental safety and evidence-based policymaking.

Grounded in the One Health approach, the plan acknowledges the interdependence of human, animal, agricultural and environmental health. To ensure coordinated action, multi-sectoral mechanisms have been established, bringing together the Ministries of Health, Agriculture, Livestock, Fisheries and Environment, alongside professional bodies, academia, and development partners. This collaborative structure has been key to maintaining policy coherence and shared accountability in AMR containment.

STRENGTHENING SURVEILLANCE, DIAGNOSTICS

Robust surveillance lies at the heart of Sri Lanka's AMR containment strategy. The country has made significant progress in expanding its National AMR Surveillance Network, covering both human and animal health laboratories.

With technical support from the World Health Organization (WHO), the Fleming Fund and the Food and Agriculture Organization (FAO), Sri Lanka is strengthening its capacity to detect, monitor and report resistance trends.

Laboratory networks are being equipped to improve microbial identification and antimicrobial susceptibility testing, while data integration and analysis are increasingly informing national policy decisions, hospital-based stewardship activities and global platform (GLASS and InFARM).

The Ministry of Health is also scaling up infection prevention and control programmes and diagnostic stewardship initiatives to ensure that antimicrobial use is guided by laboratory evidence rather than empirical prescription. These measures are essential to reduce unnecessary antimicrobial use and to preserve the efficacy of existing treatments.

PROMOTING AWARENESS AND BEHAVIOURAL CHANGE

Behavioural change is a cornerstone of Sri Lanka's AMR response. Each year, the country actively participates in World AMR Awareness Week (WAAW) through the Clean Sri Lanka national campaign, a multi-sectoral initiative that reaches communities, schools and professionals alike.

For WAAW 2025, the campaign promotes awareness under the global theme "Act Now: Protect Our Present, Secure Our Future", and the key message "Antimicrobials: Handle with Care". These messages are being amplified through joint communication efforts led by the Ministry of Health in collaboration with other One Health stakeholders through a media briefing session.

The campaign targets diverse groups, including healthcare workers, veterinarians, farmers, pharmacists and the general public. It encourages rational antimicrobial use, vaccination, hygiene, biosafety and biosecurity.

In schools, awareness programmes are integrated into health promotion activities, fostering early understanding among children about the importance of responsible antimicrobial use.

At the community level, health officers, including Medical Officers of Health, Public Health Inspectors and Public Health Midwifes, conduct outreach programmes and local campaigns to promote preventive practices, safe food handling and environmental hygiene, all of which contribute to reducing infection risk and antibiotic demand.

ONE HEALTH IN ACTION

The One Health concept has moved beyond policy in Sri Lanka to become a practical framework for action. The country's AMR initiatives increasingly involve joint training, surveillance and research across human, animal and environmental sectors.

For instance, environmental monitoring programmes plan to assess antimicrobial residues in water sources and effluents from healthcare facilities and farms.

In the animal health sector, farm-level monitoring of antimicrobial use and training of veterinarians promote responsible prescription practices. Engagement with the food and fisheries sectors ensures that food safety standards align with AMR containment goals.

This inclusive, systems-based approach reinforces the principle that AMR is not confined to hospitals; it is a shared societal responsibility. The integration of One Health thinking into education, research, and field operations marks a critical step toward sustainable containment.

LOOKING AHEAD: INVESTING IN SYSTEMS AND PEOPLE

Despite notable progress, challenges persist. Ensuring sustainable financing, workforce capacity and consistent engagement with the pharmaceutical and food industries remain priorities. Behavioural change, though improving, requires continuous effort supported by community engagement and professional accountability.

The next phase of Sri Lanka's AMR strategy aims to institutionalise antimicrobial stewardship programmes across healthcare settings, strengthen data-driven decision-making,

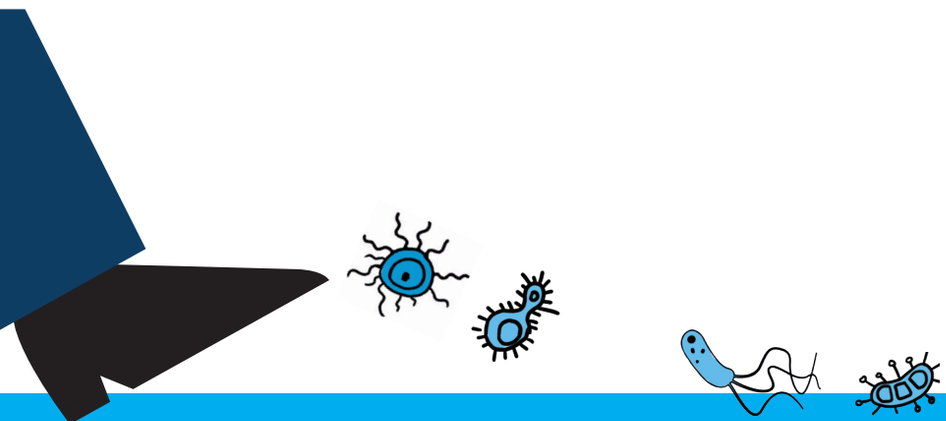
and enhance regulatory frameworks governing antimicrobial importation and distribution and, in parallel, build a culture of responsible antimicrobial use, supported by surveillance data, education, and leadership.

International collaboration continues to play a vital role. Sri Lanka's engagement with regional networks and partners, such as WHO, FAO, WOAH and the Fleming Fund, provides valuable technical and policy support, ensuring alignment with global standards while addressing local realities.

The AMR crisis demands urgent and collective action. Sri Lanka's experience demonstrates that progress is possible when policies are grounded in science, collaboration, and accountability. As global discussions move toward the development of an international AMR treaty and new financing mechanisms, lessons from Sri Lanka's integrated, One Health-based model can offer guidance for other nations navigating similar challenges.

Building resilient systems rooted in One Health collaboration is not only essential to protect our present; it is an investment in securing a safer, healthier and more sustainable for future generations.

–Hamsananthy Jeevatharan, National AMR Focal Point, Sri Lanka



14. AMR IS EVERYONE'S ISSUE AND NEEDS EVERYONE'S ACTION

Keeping AMR relevant in the Global South means bridging science with everyday realities

Annisa Devi Rachmawati

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ONE out of every six laboratory-confirmed bacterial infections globally is now resistant to antibiotic treatment, according to the World Health Organization (WHO). However, although at the global level, international organisations continue to keep antimicrobial resistance (AMR) on the agenda, at regional and national levels, attention is not always consistent.

In many countries of the Global South, including Indonesia, shifting political priorities, limited resources and competing emergencies can hinder the AMR agenda. Therefore, it is important to find inclusive, creative and community-driven ways to keep AMR relevant to the public, beyond technical discussions among experts.

Antimicrobial resistance is often framed as a scientific and clinical issue, discussed in hospitals or laboratories by researchers, doctors, veterinarians and microbiologists. But in truth, it is meant to touch every one of us—our families, our food, our animals and our environment.

AMR is a One Health challenge that can have an impact on human, livestock, wildlife and ecosystem health. It is happening now, and broader public attention as well as sustained action are needed. To reach those goals, we must make AMR personal, relatable and participatory for all.

Previously, AMR education efforts mostly focused on direct users of antimicrobials such as farmers, patients and doctors who prescribe antibiotics. This made the issue feel limited to certain groups and situations, so it often seemed distant from people's daily lives. We need to make the public aware that they also play an important role in fighting antimicrobial resistance through their everyday actions.

Besides continuing to promote the prudent use of antimicrobials, it is also important to raise public awareness about knowing and choosing their food sources wisely. For example, when buying chicken meat, are we sure that the chicken was raised responsibly by farmers who use antimicrobials properly? Was the meat processed with good hygiene and sanitation standards? These small reflections can help people realise that their daily choices can influence the occurrence of AMR.

Another way to bring AMR awareness closer to the public is by addressing companion animals. Pets such as dogs, cats, birds or hamsters live very closely with humans, creating opportunities for microorganisms to spread between species. Educating pet owners about maintaining their animals' health by providing regular vaccinations, cleaning pet waste properly and avoiding self-medication (especially with antimicrobial products) is essential and should always be part of community education efforts.

At first, these actions may seem focused only on protecting our families from unsafe food or keeping our pets healthy. However, as more people become aware of these practices, they can influence broader changes, such as improving market standards, ensuring that antimicrobial use in agriculture and farming is rigorously monitored, and reducing over-the-counter sale of antibiotics that still commonly happens in pet shops and online marketplaces. These everyday connections show that AMR is not exclusive, it is inclusive. Everyone's small decisions can contribute to a bigger change.

In Indonesia, creative engagement has proven effective. Last year's fun run event was held to celebrate World AMR Awareness Week (WAAW). It gathered hundreds of participants and turned awareness into celebration; it witnessed runners, families and communities joining together under one cause.

By pairing health messages with social and cultural activities, the campaign reached people who might never otherwise think about drug-resistant bacteria. Similar ideas, such as art exhibitions or even cooking competitions, can bring AMR into everyday spaces where people already feel connected.

PHOTO CREDIT: COINCIDE

Photo exhibition with AMR theme as part COINCIDE, an AMR research group, dissemination event in 2025.

However, awareness alone is not enough. Public engagement must go hand in hand with structural change: informed consumers choosing responsibly; farmers and veterinarians practising good antimicrobial stewardship; and governments strengthening surveillance, monitoring systems and access to effective medicines. The misuse and overuse of antimicrobials in humans, animals and plants remain among the main drivers of resistance worldwide.

By transforming AMR from a distant technical problem into a shared community story, we build bridges between human, animal and environmental sectors. We shorten the gap between policy and practice and move towards greater equality across the One Health spectrum.

Starting today, let us reimagine AMR as everyone's issue and everyone's action. Let us help households, farmers, students, artists and policymakers understand their roles in combating antimicrobial resistance. During the third week of November, as we celebrate World AMR Awareness Week, let us bring this message into our daily activities through art, photography, social media posts or simple conversations that inspire awareness. The closer AMR comes to people's hearts and everyday lives, the stronger our collective response will be. Remember, our choices matter. In the fight against AMR, every action counts, and together, small steps can lead to big change.

–Annisa Devi Rachmawati, Program Manager, Centre for Indonesian Veterinary Epidemiological Studies (CIVAS), Indonesia

15. RAISING AWARENESS ON THE ANTIMICROBIAL RESISTANCE SURVEILLANCE PROGRAM IN THE PHILIPPINES

By highlighting AMR in various sectoral contexts, the programme underscores that the fight against antimicrobial resistance is a collective journey

Department of Health (DOH) Antimicrobial Resistance Surveillance Program (ARSP), Research Institute for Tropical Medicine (RITM), Philippines

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ANTIMICROBIAL resistance (AMR) is one of the most pressing public health challenges of our time, affecting millions globally. In the Philippines, where the nation is spread across many islands and healthcare access varies widely, AMR is not just a hospital concern; it impacts communities from major urban centres to the most isolated regions. Against this backdrop, the country's AMR surveillance efforts are housed within the Department of Health—Research Institute of Tropical Medicine (RITM) at the Antimicrobial Resistance Surveillance Reference Laboratory (ARSRL). The laboratory implements the Antimicrobial Resistance Surveillance Program (ARSP), a key component of the national AMR response by tracking resistance patterns, raising awareness, guiding policy, and shaping practical interventions.

The latest Institute for Health Metrics and Evaluation data shows that in 2019, approximately 15,700 deaths in the Philippines were directly attributable to AMR, with an additional 56,700 associated deaths, illustrating AMR as a serious public health crisis. While these are the most recent published burden estimates, the COVID-19 pandemic posed challenges for continuing surveillance—highlighting the need for renewed investment and innovation in AMR monitoring. These realities reinforce the urgency behind the Philippines' newly launched National Action Plan on AMR (2024–28), which adopts a strong One Health strategy to mobilise coordinated action across human health, agriculture and the environment.

At its core, the ARSP is more than just data collection. While the programme primarily gathers phenotypic data from nationwide surveillance laboratories to create a snapshot of national resistance trends, it has now incorporated structured genomic surveillance efforts for a more in-depth analysis. This genomic component sheds light on the transmission of antimicrobial resistance genes (ARG), enabling a greater understanding of how AMR spreads. Beyond these laboratory reports, the ARSP acts as a bridge between scientific knowledge and public awareness, helping stakeholders understand how AMR spreads in real-world settings and how communities, clinicians and policymakers can respond.

Awareness and education form a key focus area for the surveillance efforts, which must counter the significant challenge of antibiotic misuse in the Philippines, including self-medication and unregulated over-the-counter access. The programme addresses this by ensuring healthcare providers receive updated resistance data to optimise prescribing and strengthen infection prevention control measures. Concurrently, public education initiatives promote responsible antibiotic use, hygiene and vaccination, empowering communities to actively participate in slowing the spread of AMR.

However, implementing surveillance across an archipelago presents several challenges. Laboratories in resource-limited or remote settings may lack sophisticated diagnostic tools or consistent supply chains. Challenges persist among some laboratories regarding the isolation of samples and the submission of surveillance data. Yet the Philippines has demonstrated resilience and adaptability through the use of regional laboratory networks, capacity-building programs and digital reporting platforms ensuring data remains meaningful despite limitations.

Beyond clinical settings, the ARSRL's work directly supports the Philippines' broader One Health commitment, recognising that AMR is influenced not just by human medicine, but also by agriculture, veterinary practice, and environmental factors. To facilitate this multisectoral approach, the DOH RITM-ARSRL spearheads the Tricycle project, which unites the collective efforts of these different sectors against AMR. Surveillance insights encourage the agriculture sector to reduce unnecessary antibiotic use in livestock, guide environmental monitoring of wastewater and food systems, and promote inter-sectoral collaboration across all stakeholders. This cross-cutting approach is crucial in a country where agriculture and community-based livelihoods are deeply intertwined with daily life.

Despite the obstacles, the reference laboratory's initiatives offer a hopeful narrative. It demonstrates that effective AMR surveillance and public awareness efforts are both possible and impactful, even in resource-constrained environments. By shifting AMR from a technical scientific issue to a visible public health priority, the program enables policymakers, healthcare workers, and communities to understand their roles in preventing resistance.

While surveillance data remains a critical backbone, its true value lies in transforming that data into actionable awareness, action and sustained commitment. By highlighting AMR in various sectoral contexts, the programme underscores that the fight against antimicrobial resistance is a collective journey—one requiring vigilance, education and collaboration across sectors, communities and future generations.

The Antimicrobial Resistance Surveillance Reference Laboratory (ARSRL) is an aerobic bacteriology lab and the coordinating centre for the Department of Health (DOH) Antimicrobial Resistance Surveillance Program (ARSP), the Philippines, established in 1988

16. CITIZEN SCIENCE TO DRIVE AMR CONTAINMENT

Citizen science is an inclusive approach that engages people in collecting, analysing and sharing data on scientific phenomena; it democratises science, allowing the community to play an active role in environmental stewardship

Rama Vaidyanathan

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BACTERIAL antimicrobial resistance (AMR) is often seen as an issue faced only in hospitals. An awareness about rising levels of AMR in the near environment and real threat to community health is essential. It has to be realised that community behavioural patterns in antimicrobial usage, disposal and other practices such as sanitation play a very important role in the development and spread of AMR.

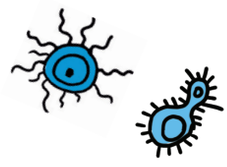
The scientific programmes on surveillance on AMR genes (ARGs) and antimicrobial resistant bacteria (ARBs) are conducted on clinical bacterial, veterinary and environmental isolates to understand how the ARGs in each are connected and how they may evolve. The drivers for ARGs and ARBs are many and the relative importance of each driver is still being contested. Overuse and misuse of antibiotics in human and veterinary healthcare, agriculture; antimicrobial disposal methods from hospitals, manufacturing plants and heavy metals disposal all play a role in driving up AMR dispersal.

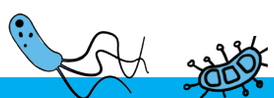
The surface- and groundwaters in the country are an important source of drinking water and a primary route for the transmission of ARGs. Protecting the waterbodies from sources of ARGs such as untreated or partially treated raw sewerage, heavy metals from industry effluents, disinfectants, and dumping of veterinary and agricultural waste is an important effort. This can be done only in coordination with the community, government policies and implementation mechanisms.

To involve communities and to encourage them to think scientifically, citizen science programmes can be very effective. Citizen science is an inclusive approach that engages people in collecting, analysing and sharing data on scientific phenomena. It democratises science, allowing the community to play an active role in environmental stewardship. Scientists also benefit by increasing the scope of data collection and, in addition, get historical and local data on waterbodies. This can lead to more robust and informed decision-making.

The Citizen Science 4 Water programme was launched on World Water Day on March 22, 2024, by the Director of IIT Madras. It was funded under the alumni Corporate Social Responsibility Funding from “APA Engineering”, which gave a grant of Rs 38.61 lakh for two years.

Our research team has engaged with numerous citizen communities and has sampled waters from 11 waterbodies in Chennai and its outskirts. The pollution parameters and the presence of faecal coliforms and ARGs in these water samples are analysed and the results are shared with the community. We also conduct stakeholder workshops on developing community-based approaches for lake reclamation and protection.





To scale up the scientific laboratories for robust methodology for pollution parameters, we have identified nine colleges from Chennai, Coimbatore and Thiruchengode and have trained faculty and a cohort of students in these methods. Their methodology will be validated. Further, the students will be given an internship at our laboratory. The students will get an opportunity to learn to analyse and interpret the results from the analysis of water samples. This will help set up robust centres for water testing in the country.

AMR research needs to multifaceted and some challenges that remain are detection of low concentrations of antibiotics in water samples. The changes in microbial diversity and the dominant species in different water samples also needs to be documented and analysed to understand the impact of increasing pollution, changes in the climate and other anthropological activities. Possibly, the game-changer in challenging the spread of AMR will be the involvement of the community in understanding its impact and driving the research spend towards identifying key drivers and pathways of AMR spread.

–Rama Vaidyanathan, Head, Department of Industrial Biotechnology,
Dr M.G.R. Educational & Research Institute, India

17. HOW LMICs CAN LEAD THE WAY IN FINANCING AND IMPLEMENTING AMR PLANS

With donor assistance shrinking, low- and middle-income countries are redefining global health collaboration for a sustainable AMR response.

Theresa Høgenhaug

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THE global health and development financing landscape is undergoing a transformative shift. As traditional development assistance diminishes and economic pressures mount, low- and middle-income countries (LMIC) face a critical juncture in addressing antimicrobial resistance (AMR)—one of the most pressing yet significantly underfunded health threats of our time. Within this crisis lies an unprecedented opportunity to shape new pathways and governance mechanisms, grounded in local realities and led by countries, forging innovative partnerships and collaborations that transcend conventional donor-recipient dynamics.

RISING RESISTANCE, BUT LIMITED RESOURCES AND ACTION

The urgency of addressing AMR amid the current turbulent times cannot be overstated. Forecasts show that if we do not act now, AMR will cause 39.1 million deaths between 2025 and 2050, with an additional 169 million people dying from illnesses associated with AMR. AMR also has the potential to negatively impact economies worldwide, halt development and drive up poverty levels. Despite widespread development of National Action Plans (NAP) on AMR, only 29 per cent of 186 countries have costed or budgeted their NAPs and are monitoring their implementation.

Last year, Official Development Assistance (ODA) dropped by 7 per cent, and this year a decline of 17 per cent is expected as traditional donors pull back commitments. This contraction sends tremors throughout LMICs, compounded by an unprecedented global debt crisis that constrains national budgets precisely when they are needed most. Global government debt is projected to exceed 100 per cent of the world's gross domestic product (GDP) by 2029—its highest level since 1948—heavily affecting LMICs at a time when conflict, migration, inequality and health vulnerability are on the rise. On top of this, there are cuts to multilateral organisations, further impacting the ability of LMICs to sustain essential health and development programmes. Public health institutions and governments are being asked to accomplish more with less. This convergence of crises demands a fundamental reframing of how we approach governance and financing for AMR across the One Health continuum.

THE CASE FOR LMIC LEADERSHIP

While the current financing landscape presents genuine challenges, it also creates an imperative for change that has long been needed. For too long, LMICs have been overly reliant on a narrow base of wealthy donor countries and foundations, perpetuating dependency relationships that often prioritise donor agendas over national priorities.

A year after the Political Declaration on AMR was adopted, the global community stands at a crossroads between aspiration and action. The question is no longer whether AMR deserves attention, but rather how we ensure that commitments translate into measurable action and progress. The call for greater self-reliance and leadership in LMICs must be matched by innovation in the way countries structure governance and financing for action towards AMR, as well as in their approach to partnerships.

The International Centre for Antimicrobial Resistance Solutions (ICARS) provides funding and technical support to governments and research institutions in LMICs to implement AMR interventions. ICARS partners with governments and research institutions in LMICs and brings funding and technical support for implementation of solutions that are context-specific and determined by national priorities. The current portfolio entails 60 projects across 28 LMICs, working with more than 170 partners and supporting 50 Master and PhD students. Working closely with local partners, ICARS supports the co-development of projects that are driven by national AMR priorities rather than donor agendas and broader global AMR objectives.

Examples of country research efforts illustrate such partnerships in practice: in Colombia, a partnership with Porkcolombia to improve colostrum management and vaccination and introduce antibiotic-free feed in pig farming has led to a 91 per cent reduction in antibiotic feed use, while improving piglet health outcomes. In Kyrgyzstan, a trial involving 1,204 children tested point-of-care diagnostics to guide antibiotic prescribing for acute respiratory tract infections, resulting in a 24 per cent reduction in antibiotic use with no difference in health outcomes—demonstrating that safe, scalable and effective approaches to stewardship in primary care are possible. Projects are designed for sustainable impact from the very start by including capacity-strengthening, behavioural change and economic components.

These LMIC-led projects demonstrate that effective AMR response and governance are not simply about replicating models from high-income countries. Rather, they require context-appropriate solutions that fit within existing national health system architectures, political and economic structures, and implementation capacities. A shift towards domestic ownership is not merely about filling a funding gap; it represents a fundamental reimagining of who drives the global health agenda, and whose priorities shape interventions on the ground.

THE PARTNERSHIP IMPERATIVE FOR SUSTAINABLE ACTION

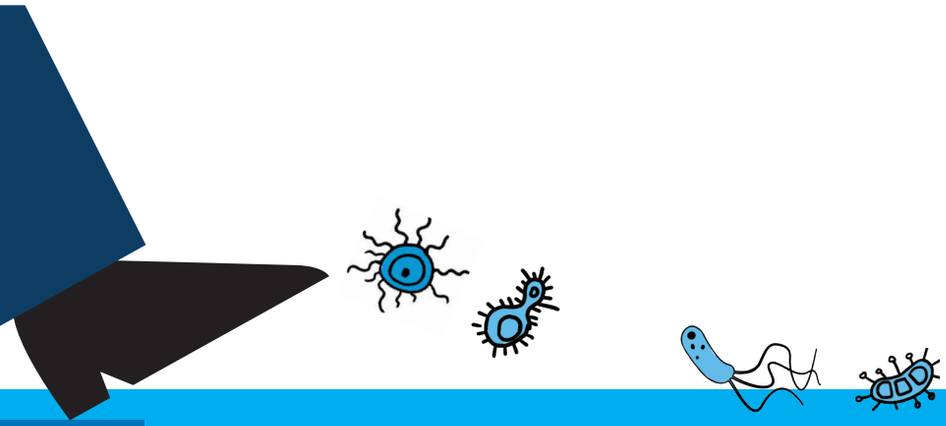
The future of AMR action lies not in waiting for traditional financing streams to recover, but in actively building new models of cooperation grounded in shared challenges and mutual respect. LMICs face similar pressures from drug-resistant infections, comparable resource constraints and analogous governance challenges. These commonalities create natural foundations for collaboration, knowledge exchange and joint problem-solving.

Such collaboration can take many forms: regional surveillance networks that share data and coordinate responses; joint procurement mechanisms that increase bargaining power for quality-assured antimicrobials; technical cooperation that enables countries to learn directly from peers facing similar implementation challenges; and policy advocacy forums that amplify LMIC voices in shaping global AMR policy. At ICARS, we also see great value in bringing project partners from different countries and regions together to share learnings across borders.

Furthermore, AMR cannot be addressed in isolation. A truly horizontal approach must integrate AMR action with pandemic preparedness, health systems strengthening, agricultural and food production system reforms, universal health coverage expansion, primary healthcare delivery and climate action. These are not competing priorities but interconnected challenges requiring coordinated responses.

The current contraction of ODA financing, while painful, may ultimately prove catalytic if it accelerates the transition towards more equitable partnerships rooted in country ownership, solidarity and sustainable financing. The governance and financing frameworks we build today, whether at national, regional or global levels, will determine whether the world rises to meet the AMR challenge or watches decades of medical progress erode. Commitments have been made—now is the time to act. The moment demands leadership, innovation and, above all, partnership. LMICs have both the necessity and the opportunity to lead this transformation.

–Theresa Høgenhaug, Team Coordinator and Senior Programme Manager, Strategic Engagement and Partnerships, International Centre for Antimicrobial Resistance Solutions (ICARS)



18. HOW YOUTH CAN REWRITE THE AMR NARRATIVE

Youth engagement in AMR is not a short-term campaign, but a structural component of the AMR global response

Pablo Estrella Porter

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ANTIMICROBIAL resistance (AMR) is often described as a "silent pandemic", but its impact is loudest in the places with the fewest resources. For communities already facing fragile health systems, climate shocks, food insecurity and pollution, rising drug resistance threatens to push basic care out of reach.

Young people, particularly in the Global South, live at the intersection of these crises. They are often the first to face the consequences of failing antibiotics, but the last to be invited into decision-making spaces. To help change this, the Quadripartite, comprising the Food and Agriculture Organization (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH), established the Quadripartite Working Group on Youth Engagement for AMR in 2023. The group brings together 14 representatives from youth-led and youth-serving organisations, spanning human, animal, plant and environmental health to make youth engagement a core pillar of the global AMR response rather than a symbolic add-on.

Two years on, what have we learned, and what still needs to change?

From manifesto to ministerial halls

Early in its mandate, the working group convened a global online consultation with more than 90 youth leaders from all regions to co-create the *Youth Manifesto for the United Nations General Assembly High-level Meeting on AMR*. The manifesto calls for:

- Formal youth platforms on AMR at national and regional levels,
- Seats for young people in high-level forums such as United Nations General Assembly meetings and ministerial conferences on AMR, and
- Resources for youth-led initiatives across One Health sectors.

It emphasises priorities that are particularly urgent for youth: integrating AMR into school and university curricula; investing in water, sanitation and hygiene (WASH) and vaccination in communities; protecting access to effective antimicrobials for human and animal health; and supporting youth-driven innovation and advocacy.

These demands did not stay on paper. Youth representatives from the working group carried them into the 2024 United Nations General Assembly High-Level Meeting on AMR and the Fourth Global High-Level Ministerial Conference on AMR in Jeddah, Saudi Arabia. In Jeddah, members of the working group co-led an interactive session, presented key youth messages and milestones, and received the *"AMR One Health Emerging Leaders & Outstanding Talents Award"* alongside partners such as the WHO AMR Survivors Taskforce. The working group also had opportunities to present their perspectives at specific sessions during the World Health Assembly.

EDUCATE, ADVOCATE, ACT: STORIES FROM THE FIELD

Another objective of the working group has been to move beyond high-level statements and strengthen awareness and capacity where it matters most: communities, schools and professional training.

This has been done through the promotion of Quadripartite Antimicrobial Resistance Toolkit for Youth Engagement, launched in December 2024. A document that includes 11 tools—templates, worksheets and case studies—to help youth networks design campaigns, training sessions and advocacy initiatives. As well as creating the storybook *Oh no! Leslie got Malaria!*, an illustrated material for children that introduces malaria, its treatment and AMR through the journey of a young girl, her family and their doctor.

Another milestone was achieved during World AMR Awareness Week (WAAW) 2023 and 2024, where youth members created a global database of youth-led AMR events (and participated in several of them), a space that brought together activities from around the world and kept them accessible to young people everywhere.

In 2024, the working group also organised "Your Voice, Your Impact: A Global Youth Consultation on AMR", a virtual event held during WAAW under the theme "Educate. Advocate. Act Now". Bringing together over 80 participants from across regions, the Consultation updated young people on recent milestones and used interactive breakout discussions to co-design priorities on AMR education and youth-led advocacy.

TOOLS, EVIDENCE AND POLICY: INSTITUTIONALISING YOUTH ENGAGEMENT

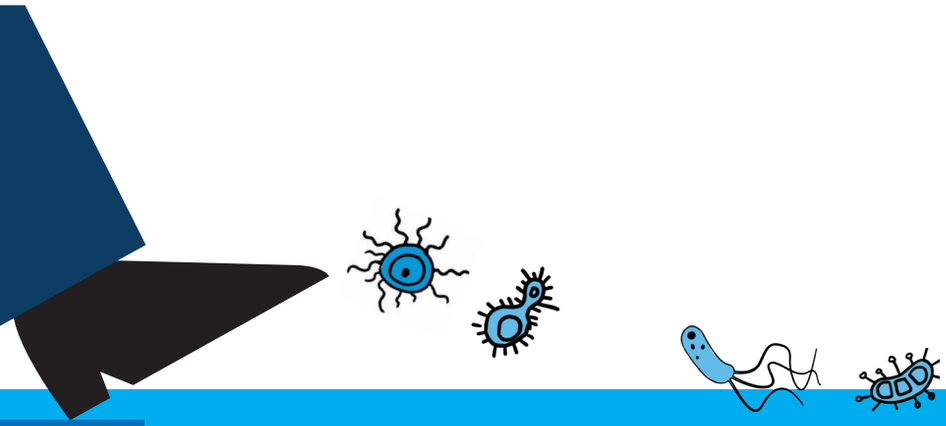
Another pillar of the working group's mandate is knowledge generation and identifying best practices to engage more young people in the global AMR response. Based on the working group's experience so far, members have authored an evidence-based call-to-action on youth and AMR, accepted for publication in *Nature Communications* as "Youth as change makers on antimicrobial resistance: An evidence-based call-to-action". Drawing on data and lived experiences from multiple youth networks and the Youth Manifesto on AMR, the article argues that supporting youth-led action is not an act of charity but a strategic investment in effective, sustainable public health policy.

The next step is translating this momentum into policy. During WAAW 2025, the working group will launch the policy brief *Mobilizing Youth Leadership in Action on Antimicrobial Resistance*, which sets out practical recommendations for governments, multilateral organizations and funders on embedding meaningful youth participation throughout national action plans on AMR and related One Health strategies.

A NEW MANDATE

As the initial two-year term 2023–25 concludes, a renewed mandate is beginning in November 2025. Eight new members are joining the working group, maintaining gender, geographical and sectoral balance. This continuity matters: it signals that youth engagement in AMR is not a short-term campaign, but a structural component of the AMR global response. However, the working group will be truly successful only when similar youth engagement mechanisms take root at the regional, national, and sub-national levels.

–Pablo Estrella Porter, Chair, World Medical Association—Junior Doctors Network and Chair, Quadripartite Working Group on Youth Engagement for AMR



19. WHY THE AMR CHALLENGE MATTERS TO EVERYONE

Because AMR affects food safety, agriculture, trade, and ecosystems, its impact is as much social and economic as it is medical

Pondpan Suwanthada

Basilio Valdehuesa

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ANTIMICROBIAL resistance (AMR) is a complex and evolving challenge. Every action we take today, from improving stewardship, strengthening surveillance, investing in prevention, and fostering collaboration, will safeguard the effectiveness of antimicrobials for the future.

AMR is not only a problem limited to certain groups of people: it affects all of us. While it is often described as a medical issue, in reality, it goes far beyond human health and animal health. Antimicrobials are used not only in humans and clinics, but also in animals, including aquaculture and plants to prevent and treat disease. Resistance itself is a naturally occurring biological process, but human activities, particularly the misuse and overuse of antimicrobials, have dramatically accelerated this phenomenon and are driving the global AMR crisis. When antimicrobials are misused in any sector, resistant microorganisms could emerge and spread among humans, animals and the environment. This interconnectedness makes AMR a true One Health challenge.

In animals, drug-resistant infections can lead to treatment failures, higher mortality and reduced productivity. Farmers may lose income when animals grow more slowly, produce less milk or eggs, or even die from infections that were once easy to treat. These losses disproportionately affect small-scale farmers whose livelihoods depend heavily on livestock production or aquaculture. Reduced productivity also threatens food security, especially in regions where animal-sourced foods are a major source of nutrition. Moreover, this failure may increase production costs, affecting local food systems and the broader economy.

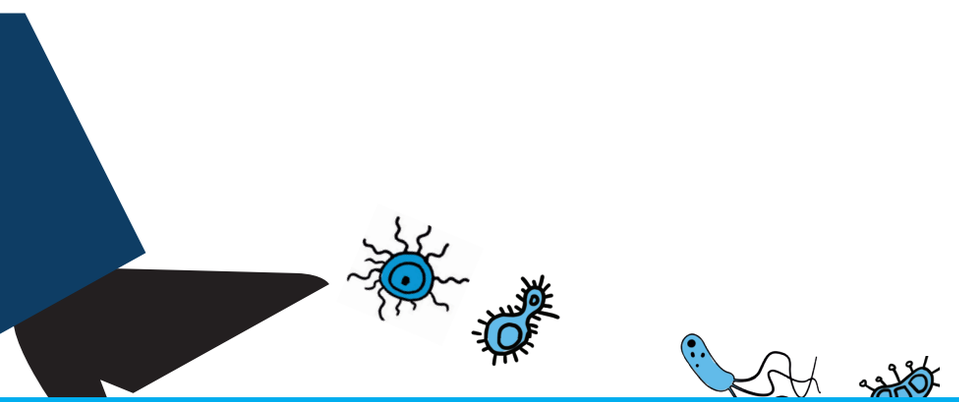
The environment is a critical and often overlooked part of the AMR puzzle. Humans and animals share the same ecosystems; therefore, what enters the environment eventually returns to us. Resistant bacteria and antimicrobial residues may contaminate soil and water through manure, wastewater from farms and hospitals, and discharges from manufacturing. Rivers, irrigation canals, and coastal waters can then become pathways for resistant organisms to circulate back to humans, livestock, wildlife, and crops. These environmental reservoirs can allow resistance genes to spread globally, crossing borders and sectors with ease.

Because AMR affects food safety, agriculture, trade, and ecosystems, its impact is social and economic as much as it is medical. People may face trade restrictions when they cannot meet international standards on antimicrobial use and resistance. Industries may experience productivity losses, and health systems can become strained by longer, more expensive treatments for drug-resistant infections. The consequences extend from households and farms to national economies.

For these reasons, addressing AMR requires coordinated action from all sectors of society—veterinarians, farmers, pharmacists, environmental authorities, policymakers, educators, and the public. By working together, we can slow the spread of this crisis, protect the effectiveness of antimicrobials, and safeguard lives, livelihoods and global health security for generations to come.

–Pondpan Suwanthada, Regional AMR Project Officer, World Organisation for Animal Health (WOAH), Regional Representation for Asia and the Pacific

–Basilio Valdehuesa, Regional Communication Officer, WOAH, Regional Representation for Asia and the Pacific



Countries of the Global South are said to be disproportionately impacted by the rising crisis of antimicrobial resistance (AMR). Given the stark differences in ground realities from high-income countries, the fight against AMR needs to be rooted in the local context, technologically feasible and cost-effective.

Despite constraints of limited capacity, inadequate resources and competing priorities, these counties have stepped up their AMR fight with initiatives, best practices and learnings, albeit while tackling challenges in parallel.

This report attempts to bring together select efforts and insights from Global South experts to inform the global community about their action against AMR. It comprises a collection of opinion pieces from governments, civil society, the scientific community, industry and intergovernmental organisations across One Health sectors.

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