POLICY BRIEF
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Silent yet Devastating: The ongoing Pandemic of Antibiotic Resistance in Bacteria

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Context

Antimicrobial resistance (AMR) is now recognized as one of the most critical global public health and development threats. Defined as the ability of microorganism to resist the effects of anti-infective drugs, AMR leads to ineffective treatments, prolonged illnesses, and increased mortality. In 2019, AMR was directly responsible for 1.27 million human deaths and contributed to 4.95 million. Without coordinated action, the burden is projected to grow dramatically by 2050 (Antimicrobial Resistance Collaborators et al. 2022). In this policy brief, the focus is made on bacteria and antibiotics as one of the major components of AMR.

Often referred to as a «silent pandemic", AMR disproportionately affects low- and middle-income countries (LMICs), where limited access to new treatments, under-resourced health systems, weak surveillance, and low public awareness exacerbate the problem. Hospitals report the highest resistance levels due to intensive treatments and frequent prior antibiotic exposure before hospital admission. However, as nearly 90% of antibiotics are used in community settings, AMR is no longer just a hospital issue, it has become a widespread concern, extending across human, animal (both domestic and wild), and environmental health. Inappropriate antibiotic use in both humans and animals, particularly in livestock production where use now exceeds human consumption worldwide, especially in the Global South, further accelerates resistance. This misuse not only drives the spread of resistant bacteria but also jeopardizes food safety through the contamination of animal-derived food products with antibiotic residues and resistant pathogens. Addressing AMR therefore requires urgent action to strengthen awareness, regulation, and antimicrobial stewardship not only at the community and healthcare facility levels, but also across public health, agriculture, and environmental sectors.

Climate change is an emerging driver of AMR. Extreme weather events such as floods and hurricanes facilitate the spread of resistant bacteria through contaminated water systems. Warmer temperatures have also been linked to increased rates of multidrug resistance, especially in aquaculture. Recent research suggests that antibiotic resistance genes may not only result from global environmental change but also contribute to it (van Bavel et al. 2024).

Addressing AMR requires urgent investment in integrated, multisectoral One Health approaches. While the need for such strategies is increasingly acknowledged, funding and policies remain largely sectoral and top-down, often misaligned with local needs. Global efforts such as the Quadripartite One Health Priority Research Agenda for AMR and the Jeddah Commitments on AMR (November 2024) mark important steps forward; however, implementation at country and regional levels remains decisive but still uneven.

Key messages

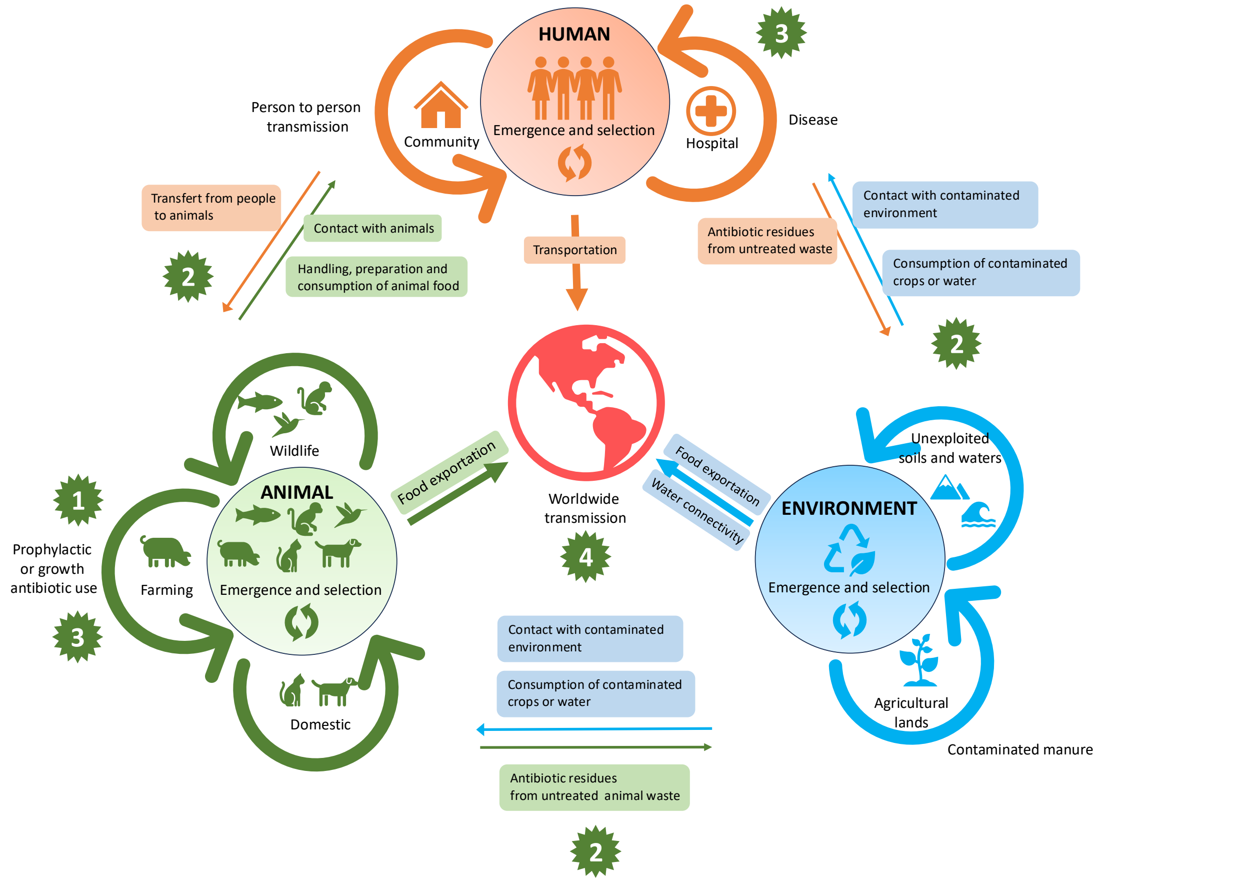
• From hospital-acquired to community-acquired

The shift of antibiotic resistance from healthcare settings to the community represents a growing concern. Initially confined to hospitals—where the intensive use of antibiotics drives the emergence of multidrug-resistant bacteria—resistance is now increasingly found in community settings. Pathogenic strains such as extended-spectrum beta-lactamase (ESBL)-producing *Escherichia coli* or NMC-A-producing *Enterobacter ludwigii* are spreading outside hospitals, notably through asymptomatic carriers, human-animal interactions, and environmental pathways (Conquet et al. 2024, Ouchar Mahamat et al. 2019). For instance, resistant strains have been detected in wastewater, rivers, soil, livestock, and even retail meat products (FSPI OHSEA-ARCIMED, FSPI ARCAHE and CIRCUS AMR-SUD projects financed by the French government and INSERM respectively). This trend significantly complicates the management of community-acquired infections and underscores the urgent need for an integrated One Health approach to contain the spread of resistance across human, animal, and environmental health domains.

• AMR at the human/animal/environment interface

The widespread use of common antibiotics in humans, livestock, and aquaculture contributes to the circulation of multi-resistant bacteria in the three compartments, i.e. humans, animals (wild and domestic fauna) and the environment (Reverter et al., 2020; Aberkane 2015, Vittecoq et al. 2022, 2017). This circulation threatens animal production by reducing treatment efficacy, pollute the environment with antibiotic residues and resistance genes, and endangers human health through direct contact with animal-derived food products. The spread of antibiotic resistant bacteria results from complex interactions between humans, animals, and the environment. However, One Health studies that simultaneously address the spread of AMR across humans, animals and environment remain limited, despite their importance in identifying AMR sources, transmission pathways, and effective interventions to reduce AMR in the community. Several studies have provided compelling evidence of this interconnectedness. Mahmud et al. (2024) showed that microbiomes in dairy farms are enriched with livestock-associated resistant microbes; the NEMESIS project (funded by ANSES) revealed strong overlaps in the resistome and pathobiome between farmers, marine livestock, and surrounding environments in floating farm systems, particularly involving resistance genes to critically important antibiotics; the FSPI ARCAHE project showed that antibiotic resistant genes circulate between human, animal and environment, particularly within households in Cambodia; the comparison of isolates from human clinical samples, domestic animals and even wild birds have shown shared antibiotic resistant strains (Aberkane et al. 2015; Vittecoq et al. 2017; Zeballos-Gross et al. 2021); sanctuaries such as Primatology Center can promote the transmission of Methicilin Resistant *Staphyloccus aureus* (MRSA) strains between host species and can be spread to non-treated wild species (Ngoubangoye B et al. 2023). The FEF DjiboutRAM project (funded by the French Government) highlighted the circulation of carbapenamase-producing Gram negative bacteria (CP-GNB) within and between hospitals as well as across the human-animal-environment interface in Djibouti city (Mohamed et al. 2023, Galal et al. 2024). The most alarming finding, however, is the emergence of epidemic clones of carbapenemase-resistant, hypervirulent Klebsiella pneumoniae, associated with poor clinical outcomes and high mortality rates.

Figure 1 : From a local to a global spread of antibiotic resistance



Source: Adjusted from Djordjevic & Morgan, 2019

Numbers in green: actions to be implemented:

1: Avoid the non-therapeutic use of antibiotics, reduce the density of farmed animals, improve food quality;

2: Monitor the spread of AMR between compartments, improve global population; awareness, access to sanitation & drinking water

3: Avoid antibiotics use when not necessary, select for the appropriate antibiotics;

4: Reinforce surveillance networks at local scale but also at a worldwide scale.

• Local realities and sociocultural frameworks to understand AMR and AMR risk factors

The sociocultural context influences the way in which people cope with illness, as well as on the way they analyse symptoms and are able to respond to them (Harpet, 2022). It is essential to design solutions fit-for-local contexts of vulnerable populations.

The main factors in the misuse of antibiotics are local people's lack of knowledge about what antibiotics are, and a lack of initial and ongoing training for healthcare professionals (both human and animal) in risk prevention and antibiotic stewardship (Andrianandrasana, 2017; Benavides et al. 2021). This lack of knowledge has led to antibiotics becoming common place in both human and animal health, exacerbated by the sale of antibiotics without prescription as well as individually on informal markets (Baxerres, 2011).

As a knock-on effect, the limited access to medical and veterinary services drives self-medication. In addition, both the legal sale of antibiotics without prescription and the illegal sale of antibiotics further encourages self-medication and the inappropriate reuse of antibiotics for conditions that do not require antibiotics (Raynaud D, 2008; Faiz Ullah Khan et al, 2022). These harmful trends in antibiotic consumption are closely linked to the cost of antibiotic medicines in countries where patients have to pay for their own medicines, and where access to high-quality essential human and veterinary health services remains difficult.

• From Local to Global

One critical issue in the fight against AMR is the local circulation of resistant bacterial strains and resistance genes across human, animal, and environmental compartments. This dynamic remains poorly understood, often due to fragmented, insufficient, or low-quality data. Yet AMR is a global health challenge that needs coordinated international action. To be effective, however, responses must also be tailored to local contexts, where specific constraints, such as limited infrastructure, shortages of trained personnel, and weak surveillance systems, can seriously undermine control efforts.

Strengthening local capacities is therefore essential to ensure that global strategies are grounded in local realities and lead to meaningful and sustainable impact on the ground. In particular, many local laboratories face significant limitations in their ability to accurately identify bacterial species and characterize antimicrobial resistance mechanisms, often due to inadequate equipment, reagents, and trained staff. These limitations directly affect the quality and reliability of the data generated, hindering evidence-based public health interventions and weakening the integration of local findings into national and global surveillance systems.

An AFD-funded project in Guinea (Gret, 2025) offered valuable insights into how the One Health concept can be operationalised at the community level. It showed that, beyond top-down implementation of health security mandates, participatory identification of local One Health issues can effectively mobilize communities to change individual behaviours and adopt collective management rules and investments.

Addressing these gaps is a critical step toward building a robust, context-sensitive, and truly effective response to AMR, one that links local realities to global strategies in a coherent and mutually reinforcing way.

RECOMMENDATIONS

Clear recommendations have been issued by the Quadripartite (WHO, WHOA, FAO, UNEP) to guide global action on antimicrobial resistance. In line with the Quadripartite, this policy brief aims to focus on issues that are particularly relevant to low- and middle-income countries. Based on our collaborative works in these settings, we have identified and prioritized a set of recommendations that are especially critical for countries in the Global South on different topics.

For data collection and analysis

- Promote One Health studies that simultaneously investigate AMR circulation across human, animal, and environmental compartments within the same locations, aiming to identify transmission pathways and their directionality (e.g. WHO Tricycle protocol : https://www.who.int/publications/i/item/9789240021402)

For capacity building

- Strengthen local capacities to monitor and quantify the drivers of AMR emergence and transmission, including microbiological factors, co-selectors (e.g. heavy metals, biocides), environmental reservoirs and socio-behavioral determinants.
- Invest in laboratory and diagnostic capacities, along with training, to process and analyze samples from human, animal, and environmental sources under harmonized protocols, including the detection and characterization of resistant micro-organisms.
- Develop integrated training programs for clinicians and veterinarians that combine biomedical, veterinary, ecologic and social sciences, to improve antimicrobial stewardship in human and animal health.

For surveillance

- Collect AMR data from humans (hospitals and community), animals (wild and domestic fauna) and environments (wastewater, rivers and soils).
- Establish and strengthen One Health surveillance system, ensuring the interoperability with existing AMR global platforms (e.g., GLASS for human health, WAHIS for animal health).

For Infection prevention, control and solutions

- Strengthen sanitation infrastructure to reduce contamination of water sources, especially in underserved rural and peri-urban settings.
- Implement stricter regulation of antimicrobial access and use, including controlling over-the-counter sales and limiting use of WHO-classified "Critically Important" antibiotics in agriculture/aquaculture.
- Ban antibiotic use for growth promotion and discourage prophylactic/metaphylactic use in animal production, which contributes to sustained selection pressure.
- Invest in research and innovation for antibiotic alternatives, such as plant-based treatments, probiotics, the organic acids and enzymes (e.g. Selaledi et al. 2020).

For population raising awareness - from local to global

- Support decentralization of One Health policy implementation, empowering local governments and communities to lead locally grounded solutions to be scaled up and integrated into national policies through sustained financial mechanisms and inclusive governance platforms.
- Raise community awareness through local information workshops across different social settings (e.g., schools, farming communities, and other key groups) in order to reach the widest possible audience using tailored tools that ensure clear understanding of the problem.

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