Sierra Leone Journal of Biomedical Research

©SLJBR Volume 16. Number 4. May 2026 ISSN (Print), ISSN (Online First)

# Beyond the Clinic: A One Health Qualitative Analysis of Antibiotic Use and Antimicrobial Resistance (AMR) in Sierra Leone

[1]Memunatu Iye Suma, *[2]Jennyfer Radeino Ambe, [3]Mohamed S. Jalloh, [1,2,4]Alhaji U. N'jai
[1]Department of Biological Sciences, Fourah Bay College, University of Sierra Leone, Freetown, Sierra Leone
[2] Department of Public Health, Koinadugu College, Kabala, Sierra Leone
[3]School of Health Sciences and School of Population Health, Faculty of Medicine and Health, University of New South Wales, Sydney, Australia
[4]California University of Science and Medicine, Colton, California, USA

***Corresponding author** J. Radeino Ambe Email: dr.jr.ambe@gmail.com

## ABSTRACT

This study utilizes a One Health framework to explore AMR drivers across human, animal, and environmental domains in Freetown. Using a qualitative exploratory design, 25 semi-structured interviews were conducted, including 17 in-depth interviews with frontline human health, animal health, and environmental professionals, and 8 key informant interviews with One Health policymakers. Data were analyzed using Braun and Clarke's thematic framework. Over 70% of hospital antibiotic prescriptions occur without diagnostic testing, driven by drug shortages and patient demand. In the animal sector, unregulated access to human medications for livestock is prevalent. Environmental pathways, specifically untreated hospital wastewater and pharmaceutical waste, remain unmonitored. Awareness is high in medical sectors but significantly lower among environmental professionals. AMR in Sierra Leone is a multisectoral crisis exacerbated by weak governance and lack of laboratory infrastructure. Effective containment requires translating One Health policy into actionable surveillance, waste management and diagnostic capacity.

**Keywords:** Antibiotics, Antimicrobial Resistance (AMR), Antibiotic Stewardship, Environmental Health, One Health, Global Health Policy, Hospital Wastewater, Qualitative Research, Sierra Leone.

©SLJBR Volume 16. Number 4. May 2026 ISSN (Print), ISSN (Online First)

## INTRODUCTION

Antimicrobial Resistance (AMR) is recognized as one of the most significant threats to global health, undermining the effective treatment of infectious diseases and increasing morbidity, mortality, and healthcare costs (WHO, 2023). While AMR is a universal concern, low- and middle-income countries experience disproportionate impacts due to structural constraints, including limited diagnostic infrastructure, weak pharmaceutical regulation, and widespread informal access to antimicrobials (O'Neill, 2016). This is particularly acute in Sierra Leone, where the burden of AMR threatens not only public health but also national food security and other long- term economic stability.

In Sierra Leone, antibiotics are commonly dispensed without prescription, and access to laboratory-based diagnostic testing remains limited. This study reveals that over 70% of hospital inpatients receive antibiotics, most notably broad- spectrum agents such as ceftriaxone and fluoroquinolones, entirely through empirical prescribing, driven by drug shortages and patient pressure. Although the country has established a national One Health platform to address AMR across human, animal, and environmental sectors, implementation has been uneven, and empirical evidence on multisectoral drivers of resistance remains scarce (Government of Sierra Leone [GOSL], 2022). Current governance structures face critical barriers, including insufficient sustainable funding and a lack of point-of care diagnostic support to translate policy into practice.

Existing AMR research has largely focused on clinical prescribing practices, often neglecting the interconnected roles of animal antimicrobial use and environmental contamination. In the animal sector, the unregulated use of human medications in livestock occurs with minimal veterinary oversight, while the environmental domain remains a significant blind spot categorized by untreated hospital wastewater and unmanaged pharmaceutical waste. Such siloed approaches risk undermining stewardship efforts, as resistant organisms and antimicrobial residues circulate across the human, animal, environment interface. Without addressing these broader transmission pathways, including the stark disparity in AMR awareness among environmental health workers compared to their clinical counterparts, clinical interventions alone are unlikely to achieve sustainable AMR control.

This study is guided by a One Health framework to examine antibiotic use patterns, perceptions, and drivers of AMR across human, animal, and environmental sectors in Freetown. By generating locally informed, cross-sectoral qualitative evidence, through thematic analysis of frontline professionals and policymakers' perspectives, the study aims to inform more integrated and contextually appropriate AMR containment strategies that bridge the gap between high-level policy and actionable environmental and veterinary stewardship.

©SLJBR Volume 16. Number 4. May 2026 ISSN (Print), ISSN (Online First)

## METHODS

A qualitative exploratory study design was employed, consistent with approaches used to explore complex health system challenges such as AMR (Creswell & Poth, 2018). This design was selected to capture the nuanced, cross sectoral perspectives required for One Health analysis. The study was conducted in Freetown, the capital city of Sierra Leone, serving as the primary hub for healthcare, livestock trade, and pharmaceutical distribution. Participants included frontline healthcare workers, animal health professionals, environmental health officers, and policymakers involved in AMR and One Health coordination. Purposive sampling was used to select participants with relevant professional experience to ensure a comprehensive representation of the human-animal-environmental interface.

Data was collected through 25 semi-structured interviews, comprising both in-depth discussions with frontline practitioners and key informant interviews with high-level policymakers. These were conducted using sector-specific interview guides tailored to probe unique drivers, such as empirical prescribing in clinics and waste management protocols in the environmental sector. Interviews were audio-recorded with consent and transcribed verbatim. Data were analyzed thematically using Braun and Clarke's six-step framework (Braun & Clarke, 2006), which involved iterative coding and the development of themes to identify systemic gaps in stewardship and cross sectoral transmission pathways. To ensure data trustworthiness, findings were triangulated across three One Health domains. Ethical approval was obtained from the relevant institutional review board, and informed consent was secured from all participants, ensuring confidentiality and voluntary participation throughout the studys

## RESULTS

### Clinical and Veterinary Misuse of Antibiotics

Antibiotic use in both human and animal health sectors was characterized by extensive reliance on empirical treatment, creating a significant barrier to effective antimicrobial stewardship.

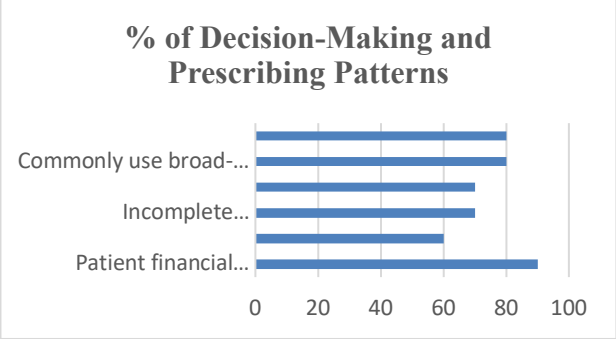


**Figure 1: Decision-Making and Prescribing Patterns**
(Suma, M., pp. 25., 2025)

Figure 1 illustrates that, 70% of hospital antibiotic prescriptions were issued without prior culture or sensitivity testing, primarily due to limited laboratory capacity, delayed results, and frequent stock-outs of diagnostic supplies. Broad-spectrum antibiotics, particularly ceftriaxone and fluoroquinolones, were commonly prescribed as first-line agents for a wide range of infections. The reliance on these

critical antimicrobials as a default measure suggests a systemic vulnerability to the development of multi-drug resistant (MDR) pathogens. Prescribing decisions were often influenced by drug availability and patient demand rather than evidence-based treatment guidelines. 60% confirmed that patients have easy access to drugs. 70% of healthcare workers also stated that most patients stop taking their medication once they start feeling better. Furthermore, 90% of respondents stated that a patient's financial situation often affects prescribing decisions.

| Theme | Frequency (n=4) | Percentage |
|---|---|---|
| Reliance on empirical treatment due to lack of diagnostic capacities | 4 | 100% |
| Use of broad-spectrum antibiotics as the default | 4 | 100% |

Table 1: Diagnosis and Antibiotic Selection in the Animal Health Sector
(Suma, M., 2025., pp. 26).

Table 1 demonstrates that, diagnostic testing was largely absent in the animal health sector, which represents a critical gap in the One Health surveillance chain. All the participants reported routine use of broad-spectrum antibiotics, including oxytetracycline, amoxicillin, penicillin-streptomycin, and enrofloxacin. The use of human antibiotics for livestock treatment was common, particularly among small-scale farmers, facilitating a direct pathway for cross-sectoral resistance transmission. Weak regulatory oversight and the widespread availability of antimicrobials through informal markets further worsened inappropriate use and unregulated exposure.

**The Environmental Blind Spot in AMR Control**


Figure 2: Challenges in the Environmental Sector(Suma, M., 2025., pp.28)

In figure 2, environmental pathways emerged as a critical but under-recognized component of AMR transmission. Environmental health officers highlighted persistent challenges related to waste management, including untreated hospital wastewater, inadequate pharmaceutical waste disposal, and poorly maintained drainage systems. These conditions create opportunities for the persistence and dissemination of antimicrobial residues and resistant microorganisms in the environment, effectively turning urban infrastructure into potential reservoirs for resistance. Compared to their human and animal health counterparts, environmental health workers demonstrated lower awareness of AMR as a distinct public health issue. AMR was often framed within

broader sanitation concerns rather than as a consequence of antimicrobial contamination indicating a need for targeted multi-sectoral education. Limited funding, weak enforcement of environmental regulations, and the absence of routine wastewater monitoring further constrained effective environmental AMR control and underscored the policy-practice disconnect.

**Socio-Economic Drivers of Antimicrobial Misuse**

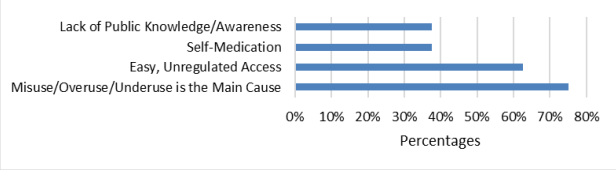


Figure 3: Primary Drivers of Resistance Suma, M., 2025 pp. 31.

Figure 3 illustrates that, socio-economic constraints strongly shaped antimicrobial use practices across sectors. Informal access to antibiotics through unlicensed vendors was widespread, rendering the formal pharmacy supply chain secondary for many consumers. Financial barriers frequently resulted in incomplete dosing, early discontinuation of treatment, or the use of leftover medicines shared within households; practices that directly contribute to the selective pressure for resistant bacterial strains. Delayed healthcare-seeking behavior was commonly attributed to cost considerations, leading individuals to self-medicate before consulting trained professionals. Patient demand for injectable or perceived "strong" antibiotics further pressured clinicians to prescribe unnecessarily. These behaviors were consistently identified as contributing to treatment failure and increased AMR risk, highlighting that clinical outcomes and solutions must be paired with socio-economic interventions to be successful.

**Governance and Policy-Practice Gap**

Participants consistently emphasized a significant gap between AMR policies and their practical implementation. Most participants recognized AMR as a major public health challenge, causing mortality, longer hospital stays, and loss of treatability, with one participant noting, "People are going to die from a condition that should be treated with simple antibiotics". Key barriers included weak law enforcement, limited surveillance, inadequate laboratory capacity, and insufficient funding. All participants emphasized the necessity of a One Health approach, with PS5 stating, "If we solve the problem in the human sector and not in the animal sector, then we have not gone anywhere". The majority also stressed public education and enforcement of existing drug laws as essential strategies.

## DISCUSSIONS

The study highlighted that AMR is a shared problem linking humans, animals, and the environment. The same antibiotics are often used for both humans and animals, and many are sold in informal markets without a prescription. Caudell et al. (2022) made similar observations, noting that unregulated drug markets in Africa make it difficult to

control antibiotic misuse. This overlap allows substandard and counterfeit drugs to circulate widely, weakening efforts to manage AMR.

Another key issue is the lack of diagnostics and surveillance across all sectors. Health workers prescribe antibiotics without laboratory confirmation, animal health officers treat livestock based on experience, and environmental officers lack equipment to test water or soil for resistant organisms. Lakoh et al. (2023) also pointed out that the absence of diagnostic support in Sierra Leone makes most treatments empirical. Without proper data, it is difficult to monitor AMR trends or make evidence-based decisions.

Environmental pollution further connects these sectors. Waste from hospitals and farms mixes with sewage and household waste, creating hotspots for resistant bacteria. Kraemer et al. (2019) also described the environment as a major but often ignored pathway for AMR transmission. When contaminated water or soil comes into contact with humans or animals, resistant organisms can easily spread.

Although policymakers are aware of the need for a One Health approach, implementation remains weak. Many frontline workers reported that they are not involved in any joint activities across sectors. The Government of Sierra Leone (2022) similarly reported that national AMR efforts are poorly coordinated. This shows that while the One Health framework is recognized at policy level, it is not yet effectively applied in practice.

## CONCLUSION

### Recommendations

### Strengthening Diagnostic Infrastructure

Improving access to affordable and timely diagnostic testing is critical to reducing empirical antimicrobial use. Investment in laboratory infrastructure and point-of-care diagnostics would support evidence-based prescribing and strengthen antimicrobial stewardship across sectors, moving the clinical response from reactive to predictive.

### Enhancing Regulatory Enforcement

Stricter regulation of pharmaceutical supply chains is necessary to control informal antibiotic sales and inappropriate veterinary drug use. Enforcing prescription-only policies and strengthening oversight of veterinary drug retail would reduce unregulated antimicrobial exposure and protect the efficacy of existing first- line treatments.

### Advancing Environmental Stewardship

Environmental AMR control must be integrated into national containment strategies, as a primary pillar rather than a secondary concern. Routine treatment and monitoring of hospital wastewater improved pharmaceutical waste management, and environmental surveillance should be considered essential components of One Health implementation to safeguard the environment as a shared resource.

©SLJBR Volume 16. Number 4. May 2026 ISSN (Print), ISSN (Online First)

### Strengthening Awareness and Cross-Sectoral Collaboration

Public education campaigns should be done to promote responsible antibiotic use, adherence to prescribed courses, and avoidance of self-medication, utilizing schools, community networks, media platforms, and religious or cultural leaders. Furthermore, regular joint trainings for clinicians, veterinarians, and environmental health workers, combined with coordinated monitoring and shared systems, are essential to bridge the policy-practice gap and reduce the risk of AMR in Sierra Leone.

### Conclusion

Antimicrobial resistance in Freetown is a multisectoral public health challenge driven by systemic weaknesses rather than isolated behaviors. As the few, if not the only, qualitative studies to offer a locally informed, cross-sectoral analysis of Freetown's One Health interface, this research demonstrates that the burden of AMR is deeply embedded in the intersection of clinical necessity, economic survival and environmental challenges. Without coordinated action to address diagnostic limitations, regulatory gaps, and environmental neglect, AMR will continue to circulate across human, animal, and environmental domains, threatening national food security, economic stability, and the long-term efficacy of the healthcare system. Translating One Health policies into well-resourced and enforceable interventions, specifically through targeted investment in laboratory capacity and pharmaceutical waste infrastructure, is essential for sustainable AMR control in Sierra Leone. Ultimately, the transition from empirical to evidence- based practice is not merely a clinical goal but a fundamental requirement for public health resilience in the face of a growing global crisis.

### REFERENCES


- Braun, V. & Clarke, V., 2006. Using thematic analysis in psychology. Qualitative Research in Psychology, Volume 2.
- Caudell, M. A. et al., 2022. Farmers, Para-Veterinarians and Veterinarians Views on Antimicrobial Use, Resistance and Policy in Kenyan Dairy Farming: A Qualitative Study. PLOS One, 24 January.
- Creswell, J. W. & Poth, &. C. N., 2018. Qualitative Inquiry and Research Design: Choosing Among Five Approaches.
- Government of Sierra Leone [GOSL], 2022. National Strategic Plan For Combating Antimicrobial Resistance 2018-2022.
- Kraemer, S. A., Ramachandran, A. & Perron, G. G., 2019. Antibiotic Pollution in the Environment: From Microbial Ecology to Public Policy. Microorganisms, 22 June, 7(6), p. 180.
- Lakoh, S. et al., 2023. Establishing an Antimicrobial Stewardship Program in Sierra Leone: A Report of the Experience of a Low-Income Country in West Africa. International Journal of Infectious Diseases.
- O'Neill, J., 2016. Tackling drug-resistant infections globally: Final report and recommendations, London: HM Government and Wellcome Trust.

- Suma, M. I., 2025. Antibiotic Use Patterns, Perceptions and Burden of Antimicrobial Resistance (AMR) in Human, Animal, and Environmental Sectors in Freetown, Sierra Leone. Undergraduate Dissertation, [Fourah Bay College].
- WHO, W. H. O., 2023. Global Antimicrobial Resistance and Use Surveillance System (GLASS)

©SLJBR Volume 16. Number 4. May 2026 ISSN (Print), ISSN (Online First)

©SLJBR Volume 16. Number 4. May 2026 ISSN (Print), ISSN (Online First)