REPUBLIC OF KENYA

National Antimicrobial Resistance Report 2025

Prepared by the National Antimicrobial Stewardship Interagency Committee (NASIC) Secretariat

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Abbreviations

AH	Animal Health
AMC	Antimicrobial Consumption
AMR	Antimicrobial Resistance
AMREF	African Medical Research Foundation
AMU	Antimicrobial Use
APHL	Association of Public Health Laboratories
ASLM	African Society for Laboratory Medicine
AWaRe	Access, Watch, Reserve
CASIC	County Antimicrobial Stewardship Interagency Committee
CDW	Central Data Warehouse
CPA	Commonwealth Pharmacists Association
DTRA	Defense Threat Reduction Agency
DVS	Directorate of Veterinary Services
FF	Fleming Fund
FIND	Foundation for Innovative New Diagnostics
GLASS	Global Antimicrobial Resistance and Use Surveillance System
GOK	Government of Kenya
HAI	Healthcare Associated Infections
HCF	Healthcare Facility
HH	Human Health
ILRI	International Livestock Research Institute
IPC	Infection Prevention and Control
KALRO	Kenya Agricultural and Livestock Research Organization
KEMRI	Kenya Medical Research Institute
KNPHI	Kenya National Public Health Institute
KVA	Kenya Veterinary Association
KWS	Kenya Wildlife Service
LIS	Laboratory Information System
MALD	Ministry of Agriculture and Livestock Development
MECCF	Ministry of Environment, Climate Change and Forestry
MIBEMA	Ministry of Blue Economy and Maritime Affairs

MOH	Ministry of Health
NAP	National Action Plan
NASIC	National Antimicrobial Stewardship Interagency Committee
NEMA	National Environment Management Authority
NMRL	National Microbiology Reference Laboratory
NPHL	National Public Health Laboratories
NVRL	National Veterinary Reference Laboratories
OHSS	One Health AMR Surveillance System
PPS	Point Prevalence Survey
S, I, R	Sensitive, Intermediate, Resistant
TWG	Technical Working Group
UON-CEMA	University of Nairobi Center for Epidemiology and Modelling Analysis
US DOS	United States Department of State
WHO	World Health Organization
WOAH	World Organization for Animal Health (formerly OIE)
WRA	Water Resources Authority

FOREWORD

Antimicrobial resistance (AMR) continues to pose one of the greatest threats to global health, food security, and sustainable development. Recognizing this challenge, the World Health Organization (WHO), together with quadripartite organizations (FAO, UNEP, and WOAH), have called for sustained action through the Global Action Plan on AMR and strengthened One Health coordination.

Kenya has remained steadfast in this fight since the launch of its first National Action Plan (NAP) in 2017. Guided by lessons learned during its first phase, the Government of Kenya, in partnership with stakeholders, rolled out the second National Action Plan on AMR (2023–2027), with a renewed focus on governance, surveillance, infection prevention and control (IPC), antimicrobial stewardship (AMS), and awareness creation.

Determining the true magnitude of AMR is central to effective containment. Since 2018, Kenya's laboratory-based surveillance has expanded from two pilot sites to 30 across human, animal, and environmental health, alongside strengthened referral/biorepository systems and integration with WHO GLASS and WOAH ANIMUSE. Notably, the expansion of surveillance into the environmental sector reflects Kenya's commitment to a holistic One Health approach.

The 2025 national surveillance report presents consolidated data and implementation updates across sectors, highlighting resistance patterns in human, animal, and environmental health. Findings reveal persistently high resistance to first-line antibiotics in key pathogens, growing prevalence of multidrug-resistant organisms, and concerning increases in methicillin-resistant *Staphylococcus aureus*. At the same time, opportunities exist to preserve the effectiveness of last-line antimicrobials through prudent stewardship.

This progress has been made possible through the tireless efforts of the National Antimicrobial Stewardship Interagency Committee (NASIC), County Antimicrobial Stewardship Interagency Committees (CASICs), NASIC technical working groups, reference laboratories, county governments, and our development partners.

As we advance into the next phase of our response, Kenya remains committed to sustaining multi-sectoral collaboration and scaling public awareness efforts. The evidence presented in this report will guide policy, support diagnostic stewardship, and inform clinical and veterinary practice. Together, these actions bring us closer to safeguarding the efficacy of antimicrobials for current and future generations.

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ACKNOWLEDGEMENTS

The preparation of the 2025 National Antimicrobial Resistance (AMR) report reflects the dedication and collaboration of many institutions and individuals across Kenya and beyond. The leadership of the Ministry of Health, the Ministry of Agriculture and Livestock Development, and the Ministry of Environment, Climate Change and Forestry has been central in guiding the implementation of AMR containment activities. The Kenya National Public Health Institute (KNPHI) is particularly recognized for its pivotal role in coordinating surveillance and providing technical inputs across human, animal, and environmental sectors.

At the county level, we acknowledge the contributions of County Governments, the County Antimicrobial Stewardship Interagency Committees (CASICs), and the County One Health Units (COHUs). Their efforts in expanding surveillance, promoting antimicrobial stewardship, and strengthening infection prevention and control at the subnational level highlight the importance of devolved systems in advancing the national AMR agenda.

We also extend gratitude to the National Public Health Laboratories (NPHL), the National Microbiology Reference Laboratory (NMRL), and the National Veterinary Reference Laboratory (NVRL), as well as the wider network of AMR surveillance laboratories. Their technical excellence in specimen processing, data generation, retesting, and maintaining biorepositories provides the foundation upon which this report is built. Special recognition goes to the members of the National Antimicrobial Stewardship Interagency Committee (NASIC) and its Technical Working Groups covering governance and coordination, surveillance, infection prevention and control, advocacy, stewardship, and research. Their sustained commitment to multisectoral action has been vital to progress achieved in 2024.

We are deeply grateful to development and implementing partners whose financial, technical, and capacity-building contributions have strengthened AMR surveillance and stewardship across the One Health spectrum. In particular, the Fleming Fund, the U.S. Department of State (US DoS), U.S. Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), Food and Agricultural Organization (FAO), the International Livestock Research Institute (ILRI), the African Society for Laboratory Medicine (ASLM), the Commonwealth Pharmacists Association (CPA), AMREF Health Africa, Red Cross, University of Nairobi Center for Epidemiology and Modelling Analysis (UON-CEMA), Cargill Inc., Danish Government, Capacitating One Health in Eastern and Southern Africa (COHESA) project, Heifer International, and the International Poultry Council.

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EXECUTIVE SUMMARY

Antimicrobial resistance (AMR) remains a critical threat to Kenya's public health, food security, and sustainable development. It undermines the effectiveness of life-saving medicines and endangers human, animal, and environmental health. Recognizing this, Kenya launched its first National Action Plan (NAP) in 2017 and rolled out the second NAP (2023–2027), aligned with the Global Action Plan on AMR.

National Response and System Strengthening

Kenya has made substantial progress in establishing AMR governance, coordination, and surveillance systems. By 2024, 30 active AMR surveillance sites had been established across human, animal, and environmental health. Key achievements include:

- **Governance:** Expansion of multisectoral coordination through the National Antimicrobial Stewardship Interagency Committee (NASIC) and County AMR Committees (CASICs), with 21 counties formally launching CASICs.
- **Infection Prevention and Control (IPC):** Establishment of county IPC committees, training of healthcare workers, and audits of medical device reprocessing, though significant gaps remain in hand hygiene and healthcare-associated infection (HAI) surveillance.
- **Antimicrobial Stewardship (AMS):** Launch of the National Antibiotic Use Guidelines on Empiric Treatment and Surgical Prophylaxis, and rollout of the Kenya Surveillance System for Antimicrobial Consumption (KESAC). Veterinary guidelines for prudent antimicrobial use were also validated, alongside training farmers and veterinarians on biosecurity.
- **Surveillance Expansion:** The Central Data Warehouse (CDW) integrated over 20,000 human health cultures, nearly 24,000 animal health isolates.

AMR Surveillance Findings

- **Human health:** *Escherichia coli*, *Klebsiella pneumoniae* and *Staphylococcus aureus* accounted for over 80% of isolates. Resistance to third-generation cephalosporins ranged from 60–85%, carbapenem resistances ranged from 5–36% while Methicillin-Resistant Staphylococcus aureus (MRSA) prevalence increased from 43% to 51% in the period 2023-2024. No vancomycin-resistant *S. aureus* was detected. Subtle decreases observed between 2023 and 2024 in most pathogens (except *S. aureus*) are worth further monitoring and interpretation.
- **Animal health:** Surveillance showed widespread resistance to tetracyclines and commonly used antimicrobials in dairy and poultry pathogens, with evidence of multidrug resistance. However, resistance to cephalosporins and carbapenems remained low compared to trends observed in human health. This reflects their minimal veterinary use.

- **Environmental health:** For the first time, the country made progress in establishing AMR surveillance in the environment sector. Antimicrobial residue monitoring in surface water samples underscores the environment as a potential reservoir for emergence and transmission of resistance. The preliminary risk assessment suggests that four antibiotics - clarithromycin, metronidazole, sulfamethoxazole and trimethoprim - have a high risk of inducing the development of antibiotic-resistant microbial species in the environment.

Antimicrobial Consumption and Use (AMC/AMU)

- **Human Health AMU data:** Point prevalence surveys revealed that up to 44.3% of patients admitted in hospitals around the country had at least one antibiotic prescribed, underscoring high overall use. Prescriptions were skewed toward broad-spectrum agents: Access antibiotics accounted for only 48.7%, while Watch antibiotics made up 43.3% with Reserve antibiotics accounting for 5.4% of the prescriptions. Notably, about 2.6% were uncategorized). This prescription pattern diverges significantly from WHO's recommendation that ≥70% of use should be from Access antibiotics. The findings highlight persistent reliance on empirical prescribing and limited use of culture results to guide therapy.
- **Human Health National AMC data:** Analysis revealed declining reliance on Access antibiotics, with a shift toward Watch and Reserve categories. This trend signals an increasing risk of resistance and divergence from global stewardship targets.
- **Animal health AMC:** Tetracyclines and other broad-spectrum antimicrobials continue to dominate veterinary use, with weak enforcement of prudent use and biosecurity practices.

Key Challenges

- High resistance to first-line and some reserve/last resort antibiotics threatens treatment effectiveness.
- Weak IPC implementation, with hand hygiene compliance averaging only 55% and major gaps in device reprocessing.
- Rising consumption of broad-spectrum antimicrobials in both human and veterinary sectors.
- Non-standard county-level governance and limited harmonization of AMR reporting systems.
- Inadequate public awareness and weak regulation of antimicrobial sales and dispensing.

Recommendations

To contain AMR and safeguard treatment options, Kenya must:

1. Scale up antimicrobial stewardship interventions in human and veterinary sectors, focusing on prescription audits, diagnostic stewardship, and farmer engagement.
2. Strengthen IPC systems, including a consistent supply of hygiene materials, monitoring of HAIs, and safe reprocessing of medical devices.
3. Enhance regulation and enforcement to curb inappropriate antimicrobial sale and use.
4. Harmonize and expand surveillance systems, ensuring timely reporting and use of data at national and county levels.
5. Integrate environmental monitoring fully into AMR strategies to address environmental contamination pathways.
6. Sustain multisectoral coordination and community awareness, embedding AMR activities in county health and development plans.

Kenya has expanded its surveillance, governance, and stewardship frameworks, but high resistance levels and unfavorable consumption trends highlight the urgency of accelerated One Health action. Sustained investment and coordination across human, animal, and environmental health systems are essential to preserve antimicrobial effectiveness for future generations.

INTRODUCTION

Background

Antimicrobial resistance (AMR) is a significant global health threat that is increasing in prevalence and complexity. AMR occurs when microorganisms (e.g., bacteria, viruses, fungi, and parasites) adapt and are then able to multiply in the presence of antimicrobial drugs (e.g., antibiotics, antivirals, antifungals, and antiparasitic drugs). Over time, as microorganisms are repeatedly exposed to antimicrobial drugs, they can evolve to develop resistance to these drugs. This can make infections harder to treat and increase the risk of disease spread, severe illness, and death.

AMR is a complex challenge with many contributing factors, including:

- **Overuse and misuse of antimicrobial drugs**: When antimicrobial drugs are used unnecessarily or inappropriately, it can increase the pressure on microorganisms to develop resistance.
- **Poor infection prevention and control practices**: When infection prevention and control practices are not followed, it can make it easier for microorganisms to spread. Increased infections lead to increased antibiotic use which in-turn drives AMR Limited access to diagnostics to support implementation of sound Antimicrobial Stewardship (AMS) practices
- **Inadequate access to clean water and sanitation:** Inadequate access to clean water and sanitation can promote the occurrence and spread of microorganisms, contribute to overuse of antimicrobials, and make it difficult to control the spread of AMR.[1]
- **Effluent and waste release into the environment:** Environmental releases of active pharmaceutical ingredients from industries and releases of human fecal waste containing antimicrobial-resistant microbes and antimicrobial residues from uncontained sewage treatment facilities.
- **Use of antimicrobial drugs in agriculture and aquaculture[2]:** Overuse or misuse of antimicrobial drugs in agriculture and aquaculture to prevent or control diseases and for growth promotion can contribute to the development and spread of AMR in food animals and in the environment. Resistant bacteria can be transmitted from animals to humans through direct contact, consumption of contaminated food products, or environmental contamination. This transmission can occur on farms, in food processing, and through the consumption of animal products.

Kenya has been implementing coordinated AMR prevention and containment interventions since 2017, across all six national action plan strategic objectives. AMR surveillance efforts began in 2017 and systematic antimicrobial use (AMU) surveillance efforts were later implemented in few healthcare

[1] World Health Organization. (2021). *Antimicrobial resistance factsheet*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance

[2] Aly S. M., & Albutti A. (2014). *Antimicrobials used in aquaculture and their public health impact. Journal of Aquaculture Research and Development*, *5*(4). https://doi.org/10.4172/2155-9546.1000247

facilities (HCFs) through point prevalence surveys (PPS) supported by implementing partners. Initial antimicrobial consumption (AMC) surveillance efforts have focused on national-level data collected from regulators, importers and local manufacturers, with plans to scale to HCFs.

This report provides an overview of progress in the implementation of various AMR prevention interventions in Kenya and an in-depth look into AMR/U/C surveillance data collected in the year 2024. The report delves into the insights regarding the observed AMR rates in national AMR priority pathogens, AMU and AMC trends, and implications for public health. The findings of this report are important for informing policymakers and health care professionals about the current state of AMR in Kenya and the actions needed to address this serious threat, and areas of action to continuously improve the national surveillance system.

SECTION I: IMPLEMENTATION UPDATES

AMR Governance and Coordination Mechanisms in Kenya

Kenya recognizes AMR as a multifaceted challenge that demands a coordinated response across sectors. The governance and coordination of AMR involve multiple stakeholders, including government ministries, departments and agencies at national and county level, health care institutions, civil society and international organizations working in synergy. The One-Health approach is used to develop and implement strategies to address AMR, including promoting responsible use of antibiotics, strengthening infection prevention and control/ biosafety and biosecurity and enhancing surveillance and monitoring.

Kenya developed and launched the first National policy and Action Plan (NAP) in 2017 for the prevention and control of AMR (AMR NAP 2017-2022), which was aligned to the World Health Organization's (WHO) Global Action Plan on AMR. Kenya reviewed its AMR NAP (2017-2022) and developed NAP 2.0 (2023-2027) based on lessons learnt during the 5-year implementation period. NAP 2.0 was launched for implementation in 2023.

AMR One Health Coordination Structures

The National Antimicrobial Stewardship Interagency Committee (NASIC), established in 2017, is a multisectoral, interdisciplinary body mandated to coordinate AMR prevention and containment activities. NASIC has representation from the human health, animal health, agriculture and environment sector and coordinates all AMR interventions.

NASIC coordinates AMR activities through five technical working groups: governance and coordination, awareness and advocacy, AMR surveillance and monitoring, infection prevention and control, antimicrobial stewardship, and research and development (see figure 1).

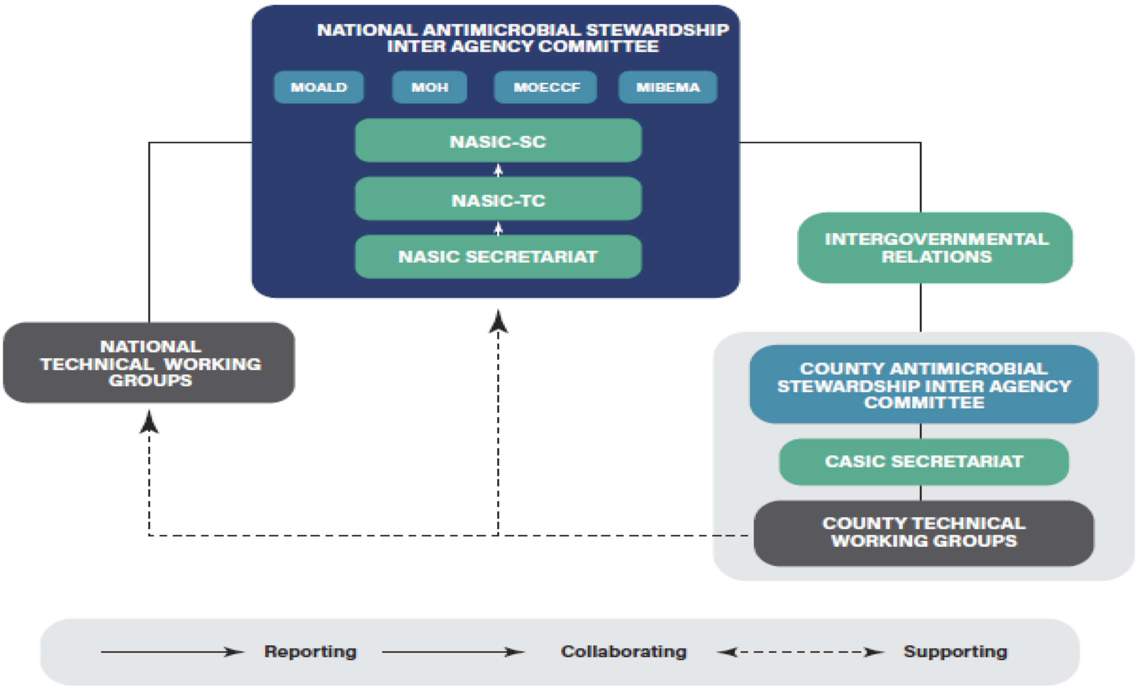


Figure 1. AMR Governance Structure in Kenya

At the county level, multisectoral County Antimicrobial Stewardship Interagency Committees (CASICs) coordinate implementation of AMR activities in line with the NAP and county-specific AMR action plans. As of December 2024, 21 counties had established and formally launched CASICs and developed county-specific work plans. These counties are Bomet, Bungoma, Embu, Kakamega, Kiambu, Kilifi, Kisumu, Machakos, Makueni, Murang'a, Mombasa, Nyeri, Trans-Nzoia, Uasin Gishu, Nairobi, Kisii, Nandi, Kajiado, Busia, Laikipia and Kitui. More counties are in the process of establishing CASICs. NASIC plans to support all 47 counties to establish CASICs, along with supporting county-specific action plans on AMR. However, some of the counties have incorporated AMR activities in the County One Health Units (COHUs). As of 2024, there were 21 COHUs - Turkana, Marsabit, Samburu, Isiolo, Wajir, Garissa, Lamu, Taita Taveta, Kitui, Makueni, Kajiado, Meru, Kiambu, Murang'a, Laikipia, Kakamega, Busia, Siaya, Nandi, Tharaka Nithi and Nakuru. Out of the 21, 13 have incorporated AMR in the COHU workplans (Isiolo, Taita Taveta, Kitui, Makueni, Kajiado, Kiambu, Murang'a, Laikipia, Kakamega, Busia, Siaya, Nandi, and Nakuru)-See figure 2. It is imperative to address these disparities by establishing uniform reporting structures for AMR NAP activities across all counties.

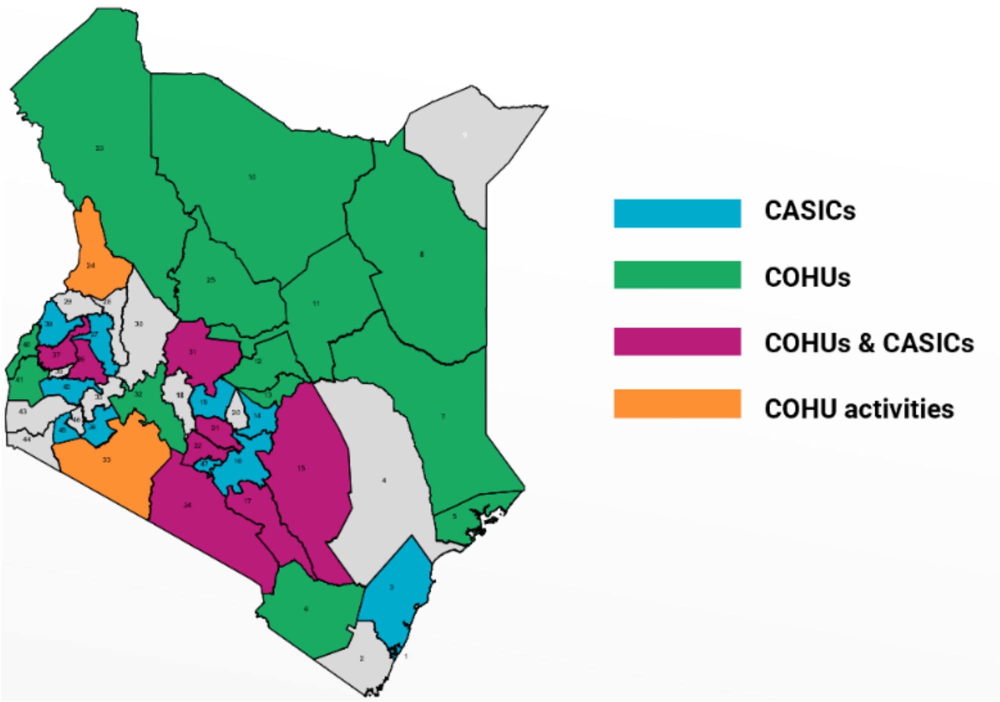


Figure 2. Distribution of CASICs and COHUs in Kenya

Mobilization of technical and financial resources to support the implementation of the AMR policy through development partners

The Government of Kenya, Fleming Fund, United States Agency for International Development (USAID), African Society of Laboratory Medicine (ASLM), International Livestock Research Institute (ILRI), University of Nairobi-CEMA, AMREF Health Africa and ICAP-Kenya and other partners supported AMR mitigation activities in the year 2024. These mitigation activities included, but not limited to, capacity building of laboratory personnel on microbiological techniques from the human, animal and environmental health, quality management systems (QMS), laboratory safety, Infection prevention Control and building a culture of continuous quality improvement through periodic support supervision. Sensitizations to enhance the Clinical-laboratory interface were also conducted to improve Microbiology utilization and appropriate prescribing of antimicrobials.

During the reporting period, NASIC mobilized resources through grant writing to the Global Fund, pandemic fund (World Bank's financial intermediary for prevention, preparedness, and response), and the International Center for Antimicrobial Resistance Solutions (ICARS), awaiting favorable outcomes.

Strengthening and Sustaining AMR Collaborations

AMR presents a major global threat across human, animal, plant, food, and environmental sectors. Collaborations and partnerships are therefore critical to the success of national efforts to tackle antimicrobial resistance. NASIC has prioritized the strengthening and sustenance of collaborations and partnerships across the country through the NAP on AMR (Strategic intervention 1.2). Continuous stakeholders' quarterly meetings on the implementation and monitoring of the NAP have been ongoing. Similarly, some counties have been having periodic stakeholders' meetings with incorporation of the workplans to the County Workplans and County Integrated Development Plans (CIDPS) for sustainability of AMR, AMS and IPC activities. While notable progress has been achieved in streamlining AMR activities within the human and animal health sectors, critical gaps remain in the food, crop, fisheries, and environmental sectors, which call for strengthened multi-sectoral collaboration and investment.

Improving Awareness & Understanding of AMR through Effective Communication, Education and Training

Efforts to improve awareness and understanding of AMR are in progress through communication, education, and training across human, animal, and environmental health sectors. These initiatives include stakeholder sensitization, community engagement, and targeted training of healthcare and laboratory personnel. However, gaps remain in reaching wider audiences and ensuring consistent adoption of best practices.

1. *Enhance Public Awareness, Knowledge, and Understanding of AMR*

   a. AMR One Health Communication Strategy review: The national AMR One Health communication strategy was reviewed to ensure AMR messages are clear, evidence-based, and reach all sectors-human, animal, and environment. Strong communication fosters awareness, behavior change, and strong collaborations for impactful and sustainable AMR interventions. The document awaits validation and finalization for publication.

   b. AMR awareness campaigns – World AMR Awareness Week (WAAW) 2024 celebrations were held between November 18-24, 2024. The theme of the year was "*Educate, Advocate, and Act Now*". Besides the national celebrations, various activities were conducted across 21 counties, led by CASICs with support from county governments and various partners. Activities included: Continuous medical education and patient walks, clean up exercises targeting markets and hospitals, awareness walks of university students, Radio/TV talk shows, road shows, farmers, agrovets, community pharmacies and community health promoter's sensitizations, launching of county AMR and IPC workplans, AMR sensitizations in water and environmental sectors, youth engagement and distribution of IEC materials. In addition, there were National youth engagement webinars, X (formerly Twitter) space engagement reaching over 800 participants, and a National youth AMR innovation competition with 99 entries. Overall, about 3.2 million people were reached using various means of creating awareness. Post activity review emphasized the need for continuous awareness campaigns beyond WAAW.

c. IEC materials development and AMR Bulletins

d. Media engagement-breakfast meeting and brief held

e. IPNET Kenya 2024,

f. AMR Scientific Symposium, where AMR abstracts were shared

2. Promote Education and Training in AMR and IPC

- Training sensitization and mentorship of healthcare professionals on AMR, AMS, IPC evidence-based cases and didactics held biweekly with over 200 participants per session using the ECHO platform
- One Health Biosafety & Biosecurity training to County and Laboratory staff supported by AMREF, DTRA, WOAH and FF
- AMR and AMS workshop and training by various organizations, including ASLM
- Mentorship – physical and virtual of laboratory personnel in surveillance sites using the One Health Curriculum
- AMR modules available in the MOH Virtual Academy with certification
- IPC, AMR and AMS integrated into the pre-service training curriculum (Kenya Medical Training College) and for Animal Health and Industry Training Institute (AHITI) in progress
- Incorporated AMR into the Community Health Promoters Curriculum
- Use of AMR, AMS and IPC champions for continuous advocacy
- AMS and IPC committees in the health facilities spearheading the implementation of AMS and IPC guidelines
- Training in environmental aspects of AMR (to CBOs, environmental personnel from various counties)
- Sensitization on pharmaceutically active compounds (PHAs) in the environment to various stakeholders
- County training on safe use of pesticides and integrated pest management
- Farmer field schools in Nyeri, Nakuru and Machakos Counties

3. Online-based applications for enhanced AMR awareness and behavior change

- Prescribing app on Google Play for accessibility of AMS, AMR and IPC documents
- One Health AMR Surveillance System (OHASS) for public-facing AMR dashboards
- Ministry of Health app for patient and health workers' safety documents

In summary, while many of these activities are robust in training and raising awareness, the focus has primarily been on professionals who already possess some level of knowledge and awareness. There is a need for engagement of the wider public, who remain unaware of the AMR challenge and are a key driver of irrational use of antimicrobials. Consequently, monitoring awareness levels and assessing behavior change within the community has been challenging. In addition, harmonization of AMR NAP activities (CASICS/COHU'S) across all 47 counties should be considered to foster better collaboration, minimize duplication, and establish a uniform reporting structure.

Infection Prevention and Control (IPC)

IPC in Human Health

Infection prevention and control is highly cost–effective and a "best buy" for public health as an approach to reducing infections and AMR in health care settings. The implementation of a package including improved hand hygiene, enhanced environmental hygiene and an antimicrobial stewardship program in health care settings has been shown to reduce the health burden of AMR by 85%. Infection prevention and control, including surveillance of HAIs, should be institutionalized and strengthened.

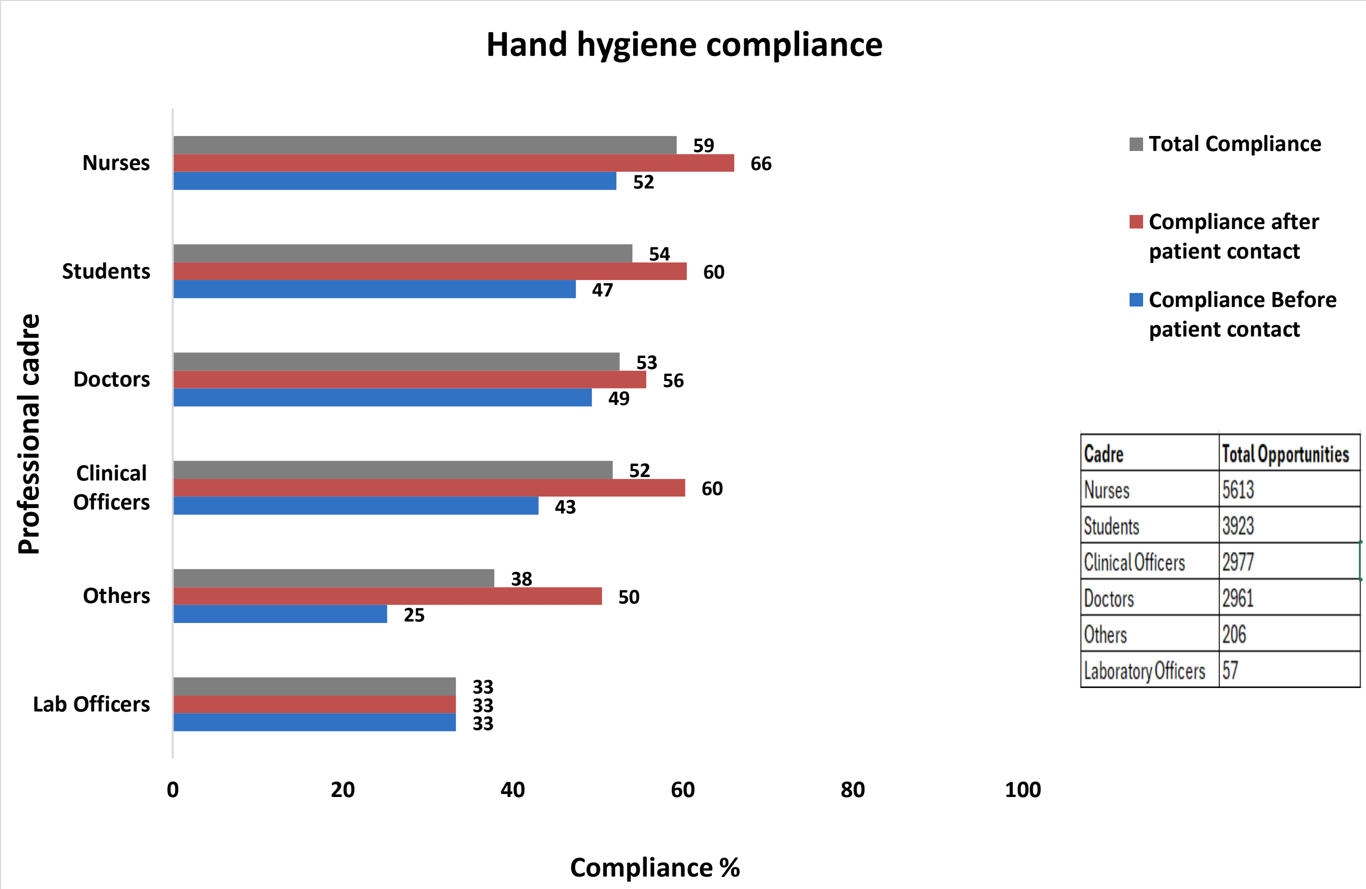
Strengthening of county IPC governance structures

As part of strengthening the IPC governance structures, the County Infection Prevention and Control Advisory Committees (CIPCACs) were established in 23 counties. The CIPCACs develop and implement County IPC workplans while overseeing the implementation of national IPC guidelines. Additionally, 108 healthcare workers from 23 counties were trained as IPC ToTs to build capacity in the implementation of IPC program.

A baseline assessment of the status of IPC programs was conducted in 45 HCFs across the 23 counties using an adapted WHO IPC Assessment Framework tool. Most facilities (93.3%) had IPC committees; however, only 31.1% had a full-time IPC professional, and 26.7% had annual IPC work plans. A dedicated IPC budget was available in just 8.9% of facilities. While 80% of facilities had hand hygiene guidelines, only 40% had surgical site infection guidelines, and 24.4% had guidelines for device-associated infections and multidrug-resistant organisms. IPC training was available in 75.6% of facilities; however, only 48.9% had conducted training within the past six months, and 22.2% evaluated training effectiveness. Most facilities, 73.3% lacked HAI surveillance and dedicated surveillance personnel. Only 40% implemented multimodal strategies for IPC, and monitoring and evaluation of IPC practices were conducted in 24.4% of facilities. Key infrastructure gaps included limited isolation rooms in 46.7% and inconsistent water supply in 20% of the facilities, respectively. Personal protective equipment was consistently available in 73.3% of facilities. Despite the progress in the establishment of IPC structures, major gaps exist in budget allocation, training evaluation, HAI surveillance, monitoring, and evaluation of the IPC practices, bed occupancy and staffing, and built environment and IPC supplies.

Monitoring of IPC practices and capacity building of healthcare workers

Proper hand hygiene is an essential component of AMR reduction. In 2024, four pilot referral HCFs reported hand hygiene data through KHIS. Analysis is shown in Figure 3.



Cadre	Total Opportunities
Nurses	5613
Students	3923
Clinical Officers	2977
Doctors	2961
Others	206
Laboratory Officers	57

Figure 3. Hand hygiene compliance in 2024

In 2024, moderate levels of compliance to hand hygiene standards were observed across the HCFs and healthcare cadres. The average compliance across the 4 pilot HCFs was 55%. For all cadres' compliance was much higher after patient contact than before indications. The consistent gap between before and after patient contact compliance highlights a major behavioral issue: workers focus more on protecting themselves than protecting patients.

Nurses recorded the highest compliance at 59%, followed by the students at 54%. The laboratory officers and others' records were the least compliant at 33% and 38% respectively, indicating a need for targeted interventions.

Compared to 2023, the 4 pilot HCFs reported a reduction in hand hygiene compliance across all the professional cadres as shown in Figure 4.

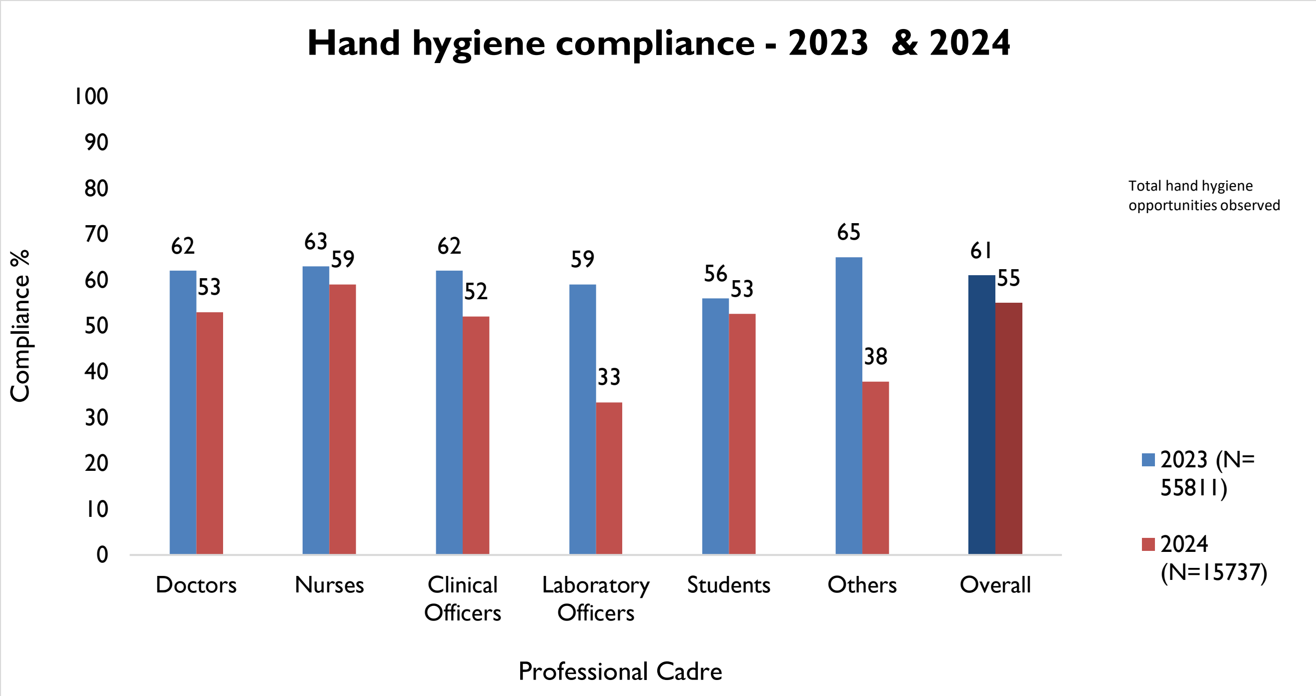


Figure 4. Comparison of hand hygiene compliance 2023 vs 2024

While nurses and students recorded only slight declines, significant declines were observed among laboratory officers (59% to 33%) and others (65% to 38%), representing the greatest areas of concern. The decline in compliance is attributed to the inconsistent availability of hand hygiene supplies, such as alcohol-based hand rub. In 2024, the HCFs recorded a decline in the number of hand hygiene opportunities due to a lack of monitoring tools. There is a need for renewed focus on hand hygiene reinforcement, particularly through targeted training, consistent monitoring, and addressing systemic barriers such as supply availability and workload to reverse the decline and ensure safer healthcare practices.

Effective reprocessing of reusable medical devices is critical for the prevention of HAIs and AMR. Decontamination of reusable medical devices plays a critical role in the prevention of HAI, especially surgical site infection. Colonization of medical devices with microorganisms can lead to HAIs, some of which are caused by MDROs when not cleaned properly and appropriately disinfected or sterilized.

An audit on the status of the current practices in reprocessing reusable medical devices in healthcare facilities was conducted in 36 selected facilities across 13 counties in Kenya, targeting (1 county referral, 1 sub-county & 1 high-volume private/FBO). The aim was to assess compliance with established standards and guidelines, identify areas for improvement, and offer actionable recommendations to enhance the safety and efficiency of reusable medical equipment reprocessing

Among the 36 facilities, 88.9% conducted on-site reprocessing and 83.3% had designated reprocessing areas. Infrastructurally, 87.5% of the facilities had the Central Sterile Supply Departments physically separated from the clinical areas. While pre-cleaning, cleaning, and disinfection were practiced in 29 facilities, only 68.8% had SOPs for pre-cleaning and 75% for cleaning. Additionally, 50% of the facilities had SOPs for disinfection and packaging. Soaking of medical devices in chlorine during pre-cleaning was reported in 62.5% of the facilities. Infrastructure deficiencies included 46.9% lacking high-pressure water outlets and 37.5% lacking deep sinks. Among the audited facilities, 62.5%, 43%, and 28.1% used physical, chemical, and biological indicators, respectively. Hand hygiene audits were conducted at 65.6% of the facilities.

Figure 5 shows performance levels across eight distinct categories in staffing and cleaning. 62% of the health facilities met standards, while less than 35% of the HFCs met standards in storage, dispatch, transportation, layout, supplies, and equipment categories. Six categories of audit indicate they need improvement in 50% of the health facilities, with more than 30% of the HF requiring urgent interventions in the storage, dispatch, and transportation categories.

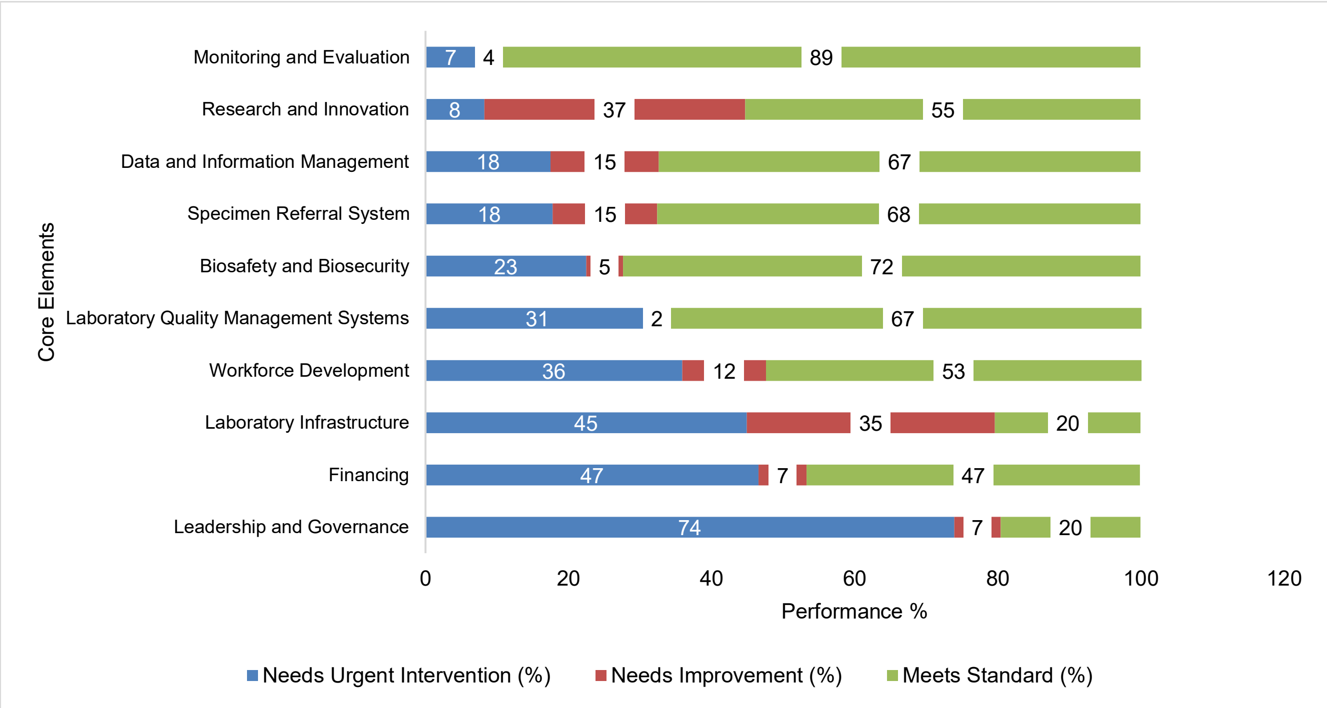


Figure 5. Overall performance on the reprocessing of reusable medical devices

Following the gaps identified from the audit a training package on reprocessing of reusable medical devices was developed and 40 healthcare workers from the 13 counties were trained.

Healthcare-Associated Infections (HAIs) Surveillance

HAIs are among the most frequent adverse events occurring in the context of health service delivery. These infections, many of which are caused by multidrug-resistant organisms, harm patients, visitors and health workers, and place a significant burden on health systems, including the associated increased costs.

To disseminate the national HAI surveillance guide, training modules were developed to build the capacity of healthcare workers to conduct HAI surveillance. The training modules have been uploaded to the MOH virtual academy for self-paced learning.

In conclusion, IPC remains a cornerstone in reducing HAIs, AMR, and safeguarding patients and healthcare workers. While significant progress has been made in establishing IPC committees, guidelines, and training programs across facilities in Kenya, critical gaps persist in financing, HAI surveillance, guideline implementation, monitoring, and infrastructure. Hand hygiene compliance continues to face challenges, particularly before patient contact and among certain cadres, reflecting both behavioral and systemic barriers. Similarly, audits of reusable medical device reprocessing revealed inconsistencies in adherence to standard procedures, infrastructure deficiencies, and limited use of quality indicators, further elevating the risk of HAIs.

Addressing these gaps requires sustained investment in IPC governance, continuous training and evaluation, strengthening HAI surveillance, and ensuring adequate infrastructure and supplies. Scaling up multimodal strategies, promoting behavioral change, and institutionalizing monitoring and accountability mechanisms are essential to achieving safer healthcare delivery.

Key recommendations

- Provide technical assistance to Counties to establish HAI surveillance
- NIPCAC to advocate for sufficient budgetary allocation by county and national governments to fund IPC activities, including procurement and equipment and supplies.
- NIPCAC in collaboration with CIPCACs and facility IPC committees, to strengthen monitoring and evaluation of IPC practices.

Infection Prevention, Control and Farm Biosecurity in Animal Health

Animal disease prevention and control continued to play a central role in addressing antimicrobial resistance (AMR) at its source in 2024-2025. In alignment with Kenya's National Action Plan on AMR (2022–2027), the Department of Veterinary Services (DVS), together with key partners, implemented several initiatives aimed at improving Infection Prevention and Control (IPC) through enhancing biosecurity, vaccination coverage, diagnostic capacity, and responsible waste management, all geared towards reducing the reliance on antimicrobials and strengthening One Health systems.

A key intervention during the year was training workshops on biosafety and biosecurity, which targeted veterinary officers from ports of entry, veterinary farms, and efficacy trial centers, with 21 officers trained. Additionally, a biosafety and biosecurity training encompassing one health approach (MOH, MOALD, Primate Research Institute, KEMRI, KWS and KEPHIS) had 19 officers trained and certified by the International Federation of Biosafety Associations (IFBA). This intervention enhanced capacity for quarantine and isolation, waste management, and risk reduction practices critical to preventing the spread of transboundary and endemic animal diseases that often drive unnecessary antimicrobial use.

Several vaccination campaigns were rolled out nationwide to curb preventable diseases that frequently lead to high antimicrobial consumption. These included rabies vaccination in both animals and humans, coordinated by the Kenya Veterinary Association (KVA), alongside other vaccinations conducted by public and private veterinarians for blackwater, anthrax, hepatitis, parvovirus infection, canine distemper, lumpy skin disease, leptospirosis, infectious bursal disease, fowl pox, fowl typhoid, and Newcastle disease. Such preventive measures are geared towards reducing the incidence of bacterial secondary infections, thereby lowering the need for antibiotic interventions and contributing directly to AMR containment.

Key Highlights

- **40 officers trained** in biosafety and biosecurity.
- More than **2800 dairy and poultry farmers** trained on the prudent use of antibiotics
- **Nationwide vaccination campaigns** implemented for rabies and 10+ other livestock diseases.
- **318 farmers** across **nine FFS sites** in Nyeri, Machakos, and Nakuru counties trained on broiler production, antimicrobial use (AMU) reduction, and biosecurity.
- **NVRL staff trained** on AMR surveillance and quality management.
- **Review of veterinary waste management guidelines** conducted in Machakos.
- **AMR-focused projects implemented in at least 9 counties**, targeting dairy, poultry, and environmental health.

In December 2024, 20 personnel from the National Veterinary Reference Laboratory (NVRL) were trained on AMR-specific competencies, including culture and isolation, quality management systems, quality control, AST, and isolate storage. This training strengthened the country's laboratory surveillance framework and enhanced the generation of reliable AMR data for national reporting and risk assessment.

Further, in May 2024, DVS reviewed the guidelines for safe management and disposal of veterinary practice waste. This review provided a more robust framework for handling sharps, expired drugs and vaccines, and contaminated materials, reducing environmental contamination and the potential development of antimicrobial resistance hotspots within the environment.

Beyond these activities, the GOK, in collaboration with various partners, continued to support the NAP objectives in 2024 - 2025. One of these activities focused on strengthening animal-sourced food systems to prevent AMR, zoonoses, and transboundary animal diseases, with particular attention to dairy and poultry value chains in the counties of Machakos, Kajiado, Nandi, Meru, Kiambu, Nakuru, Nyandarua, Uasin Gishu, and Nairobi. In Kajiado County, under the Transformational Strategies for Farm Output Risk Mitigation (TRANSFORM) project, the "Antibiotics Are Not Always the Answer" initiative under Capacitating One Health in Eastern and Southern Africa (COHESA) project is seeking to improve adoption of farm biosecurity guidelines developed by the Ministry of Agriculture and Livestock Development, to lower broiler morbidity, reduce reliance on antibiotics, and mitigating AMR in line with Kenya's NAP and global One Health priorities.

The Farmers Field Schools (FFS) initiative for poultry farmers was also implemented to strengthen on-farm practices that align with AMR containment goals. A total of 318 farmers across nine FFS sites in Nyeri, Machakos, and Nakuru counties were trained on broiler production, antimicrobial use (AMU) reduction, and biosecurity using the Farmer Field School methodology.

In strengthening the IPC among the dairy farmers, about 2,500 smallholder dairy farmers in Nyeri County were trained with the aim of reducing mastitis incidence and improving antibiotic stewardship in milk production. Complementary to this, the Environmental AMR project involving KALRO - VSRI, KEMRI, the University of Nairobi, and Danish partners is assessing AMR resistance and transmission in dumping sites, generating evidence to guide mitigation strategies at the human-animal-environment interface. Another project, focusing on improving milk and chicken meat quality in Kenyan food systems, is being implemented in conjunction with the MOH, MALD, UON, Kenya Dairy Board (KDB), and the County Government of Kajiado to strengthen food safety, production hygiene, and antibiotic stewardship across key value chains.

Collectively, these interventions continue to enhance biosecurity awareness, improve national vaccination coverage, strengthen AMR laboratory surveillance, and reduce environmental contamination risks. They also support the operationalization of Kenya's National Action Plan on AMR (2022–2027) through integrated One Health approaches that safeguard public health, protect animal health, and improve food safety.

Key recommendations

- Upscale the training on IPC and biosafety biosecurity, as well as waste management, targeting more farmers and other actors in the animal health sector.
- Develop a program for monitoring the effectiveness of the implemented IPC measures, especially on the dairy and poultry value chains

Implementation updates on Surveillance and Monitoring of AMR

The National AMR Surveillance System

Establishing surveillance systems to detect and report resistant pathogens plays a critical role in developing evidence-based policies and guidelines. The human health sector conducts passive laboratory-based surveillance, whereas the animal health sector conducts both passive and active surveillance, in which healthy animals are sampled for the detection of antibiotic-resistant bacteria. Laboratories (human and animal) are enrolled voluntarily based on a baseline assessment of their capacity to offer bacteriological culture services and commitment to sharing AMR data with the national central data warehouse (CDW) at the National Public Health Laboratories (NPHL). In 2024, the National Veterinary Laboratories (NVLs), under Kenya's Ministry of Agriculture and Livestock Development and Directorate of Veterinary Services, did passive AMR surveillance in the animal health sector, guided by the National Action Plan on AMR. The NVLs targeted all animal samples submitted to the laboratories for diagnosis. In 2024, the national AMR surveillance network expanded to 30 sites (20 in human health, 9 in animal health, and 1 in the environment). Despite this growth, access to microbiology testing services remains low, and even where capacities exist, demand remains low.

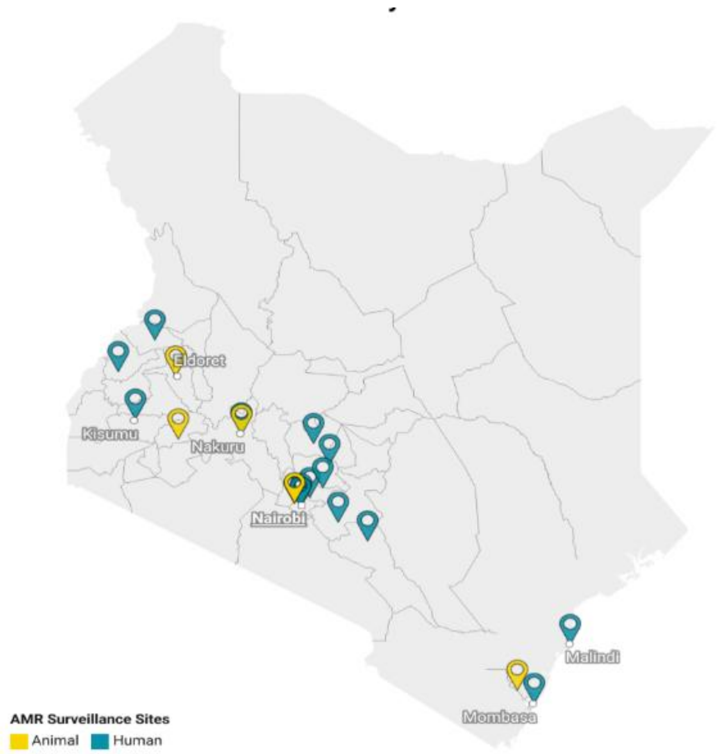


Figure 6. Map of Kenya showing the distribution of AMR surveillance sites in human and animal health

Surveillance Activities Highlight

Expansion of the National AMR Surveillance Network

During this reporting period, the National AMR Surveillance Network was expanded across the animal health, environmental, and human health sectors. In animal health, two additional sites, KALRO and Karatina NVL, were recruited under Fleming Fund Phase II to support the expansion of surveillance in the dairy sector. Both sites benefited from infrastructure upgrades and staff capacity building, with

Karatina NVL commencing active dairy AMR surveillance in 2025. A satellite laboratory in Kisii commenced conducting bacteriology testing with capacity-building support from ASLM. In the environmental sector, the Water Resources Authority (WRA), Nairobi, was incorporated into the network to initiate water-based AMR surveillance. In human health, four additional facilities (Mbagathi County Referral Hospital, The Nairobi Hospital, Mater Hospital, and Kisii Teaching and Referral Hospital) were recruited, further strengthening the representativeness and coverage of the national AMR surveillance system. These initiatives have increased the number of surveillance sites to 30 from 20 reported in 2024.

Laboratory Infrastructure Improvements and Equipment Servicing

Dilapidated laboratory infrastructure poses significant bio-risk threats and hampers efficiency. Between 2024 and 2025, the Fleming Fund, through ILRI and UON, supported comprehensive infrastructure assessments followed by targeted renovations across all AMR surveillance sites. These improvements have enhanced biosafety standards, ensured compliance with quality management systems, and created a safer working environment for laboratory personnel.

Human Resources Capacity Building in Diagnostic Stewardship and Bacteriology

Between 2024 and 2025, significant progress was made in strengthening human resource capacity across the AMR surveillance sites. With support from the Fleming Fund, quarterly on-site mentorship and support supervision visits were conducted to reinforce diagnostic stewardship practices and on-bench technical competencies in bacteriology. Complementary training in data management, biosafety, and biosecurity was delivered to teams at the National Public Health Laboratory (NPHL) and surveillance sites through funding from the Fleming Fund and the US-CDC. In addition, HR support was provided by the Fleming Fund (UON-CEMA, ILRI) and US-CDC (UON-CEMA, WSU) to fill HR gaps that hampered efficiency at the surveillance sites and NMRL. Quarterly Clinical-Laboratory Interface meetings were convened, bringing together multidisciplinary teams to enhance communication between clinicians and laboratory staff, with a focus on improving diagnostic stewardship.

Interactive Public-Facing AMR Dashboards

With technical support from UON-CEMA and funding from the Fleming Fund, NASIC developed interactive public-facing dashboards integrating AMR, AMU and AMC data. These dashboards provide real-time visualization of surveillance data, enhancing access and stakeholder engagement. These dashboards will be scaled to incorporate surveillance data from animal and environment sectors.

Bacterial isolates referral, retesting, and biorepository

The Isolates referral in the human health sector started in 2020 with the development of the National Bacterial Isolates Referral Guide to guide surveillance sites on how to select, package, and transport bacterial isolates to the National Microbiology Reference Laboratory (NMRL) for retesting and biorepository. Over 824 bacterial isolates were referred in 2024 and reports of retesting sent back to surveillance sites to inform continuous quality improvement actions. Isolates referral in the animal health sector commenced in 2024 with biorepository at the National Veterinary Reference Laboratory (NVRL) Kabete. Isolates archived at both NMRL and NVRL are a valuable resource for future research on AMR.

AMR data reporting to Global AMR Surveillance Systems

Kenya enrolled in WHO GLASS in 2017 for human health data reporting and in INFARM for animal health data in 2023. In 2021, the country responded to the annual WHO call for AMR surveillance data and reported to GLASS for the first time. In 2025, NASIC submitted a total of 9,039 data records to WHO GLASS for the reporting year 2024. This was after successful review, validation, and analysis by the surveillance TWG.

Development of National AMR Surveillance Implementation Plan (2025-2027)

The National AMR Surveillance Implementation Plan (2025–2027) seeks to advance the country's AMR surveillance efforts, building on lessons learned in the first phase of coordinated AMR surveillance activities in Kenya. The plan supports a One Health approach to implementing NAP 2023–2027, unlike in the initial phase in which surveillance was disaggregated by sector. This plan builds on the sector-specific strategies of 2018–2022, broadening surveillance scope to encompass the environment sector.

AMR Data Quality Assurance

In bid to assure the quality of bacteriology diagnostics and AMR data generated, NASIC in collaboration with stakeholders in surveillance have been implementing numerous interventions across the national AMR surveillance network. Notable interventions implemented included:

- **Standardization of laboratory standard operating procedures**. NMRL and NVRL provided Standard Operating Procedures (SOPs) to all AMR surveillance sites, to harmonize processes across. Specimen processing, internal quality assurance processes and results interpretations are guided by these SOPs.
- **Enrollment of surveillance sites into external quality assurance programs**. All surveillance sites are enrolled in national microbiology EQA schemes managed by respective sectors reference laboratories. Additionally, sites participate in the EquAfrica program implemented by AMREF, supported by Regional Fleming Fund through ASLM. Reference laboratories are also enrolled in this scheme and other international microbiology EQA schemes such as the National Institute for Communicable Diseases (NICD).
- **Isolates Retesting**. An alternative external quality assessment to support confirmation of resistance profiles detected at surveillance sites at the national AMR reference laboratories. In 2024, 824 bacterial isolates were referred to NMRL, bringing the total number of isolates stored in the national repository to 1456. Results agreement at pathogen identification, AST and drug-bug combination were 88%, 90% and 80% respectively. Equally in the animal health sector, NVRL in Kabete plays a central role in confirming and retesting isolates referred from a network of regional National Veterinary Laboratories (NVLs). These NVLs conduct preliminary testing and send selected samples to NVRL for confirmatory diagnosis, quality assurance, or biobanking. The laboratory network operates within a hub-and-spoke model, supported by systems like the Veterinary Epidemiology and Early Warning Section (VEES), which aggregates surveillance data.
- **Implementation of laboratory quality management system (LQMS)**: Sector appropriate LQMS have been implemented in all AMR surveillance sites within the national surveillance network. Both the NMRL and the NVRL Kabete implemented applicable quality management systems for microbiology testing. NMRL is accredited for bacteriology tests

under ISO 15189:2012 by Kenya National Accreditation Services (KENAS) and national external quality assessment (EQA) program under ISO 17043, while the NVRL Kabete bacteriology tests are accredited to ISO 17025:2017 standard by KENAS. National Veterinary Laboratories (NVL) are off-site testing laboratories and conform to the requirements of the standards and the quality manual, for procedures accredited in the NVRL Kabete. While all the 20 AMR surveillance laboratories in human health are ISO 15189:2012 accredited, only 13 have included bacteriology sections as one of the scopes in the accreditation.

- **AMR data review and validation**: NASIC through its National AMR surveillance TWG has been conducting annual AMR surveillance data reviews, to validate data for use at national level and submission to global surveillance systems. Data review meetings have been convened jointly with representatives from the surveillance sites to enable implementation of interventions at surveillance sites in a timely manner, and to promote data use for AMR prevention and containment decisions. A total of 3 national data review and validation workshops have been convened between 2024 and 2025 bringing together stakeholders from across One Health sectors.

Environmental AMR Surveillance

The environment plays a key role in development, transmission and spread of AMR. As part of plans to mitigate discharges of antimicrobials into the environment, it is essential to measure the impact of antimicrobial pollution on biodiversity and integrate environmental monitoring data (e.g. from monitoring surface water, solid waste and airborne particulate matter) with existing AMR surveillance and pollutants data.

Although environmental surveillance of AMR has not strongly taken root, local studies show occurrence of antibiotics in water resources at elevated concentrations (up to about 100 g/L). Exposure of bacteria to such trace concentration levels may induce development of resistance strains in the environment. As part of the national surveillance on AMR in the environment, the Environment Sector has established a sentinel site for environmental AMR samples. *Escherichia coli* (*E. coli*) and *Klebsiella pneumonia* (*K. pneumoniae*) shall be target organisms for AMR surveillance.

The Central Water Testing Laboratory (CWTL) of the WRA was renovated and equipped with instrumentation, and reagents to undertake detection and resistance tests for environmental water samples. A standard operating procedure for testing and a protocol for environmental AMR surveillance have been developed between 2024 and 2025 with support from FF through ILRI. Additionally, relevant technical officers from WRA and NEMA were trained on environmental surveillance of AMR including sampling, sample handling, laboratory analysis and data and reporting.

Antimicrobial Stewardship (AMS)

Prudent use of antimicrobials is critical to sustaining effective prevention and treatment of microbial diseases. Strategic objective 5 of Kenya's NAP-AMR aims to reduce inappropriate antimicrobial use in human health, veterinary medicine, and food production, while ensuring sustainable access to quality, essential medicines. Key focus areas include the revision and implementation of antimicrobial stewardship (AMS) guidelines, strengthening regulation and supply chain systems, building human resource and laboratory capacity, conducting antimicrobial consumption (AMC) and use (AMU) monitoring to guide AMS interventions, and enforcing quality standards to prevent substandard or counterfeit medicines.

Kenya has advanced the AMS agenda through adoption of the Essential Medicines List with Access, Watch, and Reserve (AWaRe) categorization and the development of national AMS guidelines. In the animal health sector, prudent antimicrobial use is promoted in line with WOAH and Codex standards to safeguard both public health and food security, especially amid rising demand for animal protein and intensifying production systems. Sustained access to quality antimicrobials, coupled with appropriate prescribing and patient use, remains central to combating AMR.

In human health, several activities have been conducted to strengthen the country's AMS implementation, these include:

- Incorporation of AMR, AMS, and IPC indicators into the Kenya Quality of Care Health Facilities Assessment tool (see figure 7), enabling systematic monitoring of stewardship at facility level across the country.

QUALITY OF CARE (QOC) FACILITY TOOL

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Figure 7. Screenshot of the Quality-of-Care Facility Assessment Tool with AMR & IPC Indicators included

- Launch of the *National Antibiotic Use Guidelines on Empiric Treatment and Surgical Prophylaxis* (November 2024), providing direction for rational prescribing in common infections and surgical care.
- Establishment of the Kenya Surveillance of Antimicrobial Consumption (KESAC) tool, a digital

platform launched by the Pharmacy and Poisons Board in October 2024, with phased rollout underway.

- Point prevalence surveys (PPS), and antimicrobial/prescription audits have been conducted in multiple facilities, identifying use patterns and gaps in AMS programs implementation. The findings from these surveys and audits guided the revision of AMS action plans.
- Capacity building of healthcare workers through in-person training, continuous professional development (CPD) sessions by professional associations, and targeted webinars etc. Training emphasized AMS, diagnostic stewardship, and clinical decision-making to optimize antimicrobial use.
- Review of National AMS training modules was conducted and included the adaptation of the modules into virtual self-paced learning.
- Support to hospitals with the establishment and implementation of targeted stewardship measures such as antibiotic timeout, 72-hour prescription reviews, AMS ward rounds, quality improvement (QI) initiatives, and prescriber feedback mechanisms.
- Kenya hosted and contributed to a regional consultative meeting convened by East, Central and South African Health Commission (ECSA-HC) to develop AMS guidance for animal health. The initiative responds to the rising demand for animal-source foods and the associated risk of AMR emergence from intensive production systems, while leveraging lessons learned from human health stewardship initiatives.
- MoH launched a collaborative project for the early introduction of Cefiderocol in Kenya for select tertiary-level hospitals, which includes AMS and IPC capacity building efforts. Cefiderocol is a WHO approved and listed reserve antibiotic for the treatment of multidrug-resistant gram-negative infections such as those caused by carbapenem-resistant Organisms (CPO) where there are no current existing treatment options in the country.

In the animal health sector, antimicrobials support health, welfare, and safe food production but also pose risks of resistance with consequences for humans, animals, and food safety. The rising demand for animal protein is driving intensive production systems that rely more heavily on antimicrobials, underscoring the need for prudent and regulated use across all sectors. The following interventions were implemented towards antimicrobial stewardship in animal health:

- Dissemination of AMR surveillance findings from Fleming Fund phase 1 to farmers in 15 counties namely Kajiado, Kiambu, Nairobi, Nakuru, Baringo, Nyandarua, Kericho, Kisumu, Nyamira, Uasin Gishu, Trans Nzoia, Bungoma, Kilifi, Kwale and Mombasa.
- Development, validation and launch of guidelines for prudent use of antimicrobials.
- Commencement of the development process for the Essential Veterinary Medicines List (EVML).
- Conducted Training of Trainers on prudent use of antimicrobials to staff in the academia and County representatives from 6 counties namely Nyeri, Laikipia, Nakuru, Kisii, Narok and Kajiado.
- Operationalization of farm biosecurity guidelines for poultry, pigs and dairy value chains through dissemination and training of 20 participants from 10 counties namely Kisumu, Mombasa, Kiambu, Bungoma, Kajiado, Nyeri, Uasin Gishu, Trans Nzoia, Nakuru and Kilifi.
- Ongoing antimicrobial consumption data monitoring by the Veterinary Medicines Directorate from importers and exporters through the KenTrade system.

SECTION II: NATIONAL AMR SURVEILLANCE DATA ANALYSIS

METHODOLOGY

Data Review and Validation

The NASIC Secretariat, with support from the Fleming Fund implementing partners (UON-CEMA, ILRI and ASLM), convened a data review, validation, and analysis workshop between March 24-28, 2025. The workshop focused on reviewing and validating data quality and accuracy for the reporting period January to December 2024 and brought together NASIC members alongside representatives from all 20 human and animal health surveillance sites.

AMR surveillance sites submitted data in real time to the NPHL Central Data Warehouse (CDW) through laboratory information systems (LISs) or monthly using WHONET or Microsoft Excel files developed by NPHL. AMR surveillance data from all NVLs was submitted to NVRL through SILAB LIS which is linked to AMR CDW.

Photo 1. AMR surveillance data review and validation workshop, March 2025

Data Analysis and Presentation

AMR data received from both human and animal health sectors was processed in MS-Excel and analyzed using WHONET, and R. Descriptive analysis was conducted for each of the priority pathogens that had sufficient entries reported. Priority pathogens, specimen types and antimicrobials were considered as per the national surveillance Implementation plan-2025-2027. Supplementary analysis was conducted for *S. aureus* reported from skin and soft tissue infections specimen types (human health). The results of descriptive analysis were presented in form of charts and tables to show the most predominant AMR priority pathogen isolated, and the specimen types. The resistance trends of each of the priority isolates are presented.

Report writing workshop

An initial draft of the report was prepared during a workshop convened between September 1-4, 2025, bringing together technical specialists from One Health sectors in Kenya and Fleming Fund implementing partners (Commonwealth Pharmacists Association [CPA], African Society for Laboratory Medicine- ASLM and University of Nairobi Centre for Epidemiology and Modelling Analysis- UON-CEMA). The draft report was shared with the members of the AMR surveillance TWG for reviews and input before finalization and publication.

Photo 2. AMR surveillance report writing workshop, September 2025

RESULTS

A. Surveillance of AMR in Human Health

Culture Workload Received at CDW

AMR surveillance data sharing to the Central Data Warehouse commenced in 2018 with only 64 cultures reported. After building capacity in microbiology laboratories in terms of mentorship, reagents and consumables, an increase in culture reports has been noted over the years as shown in figure 8.

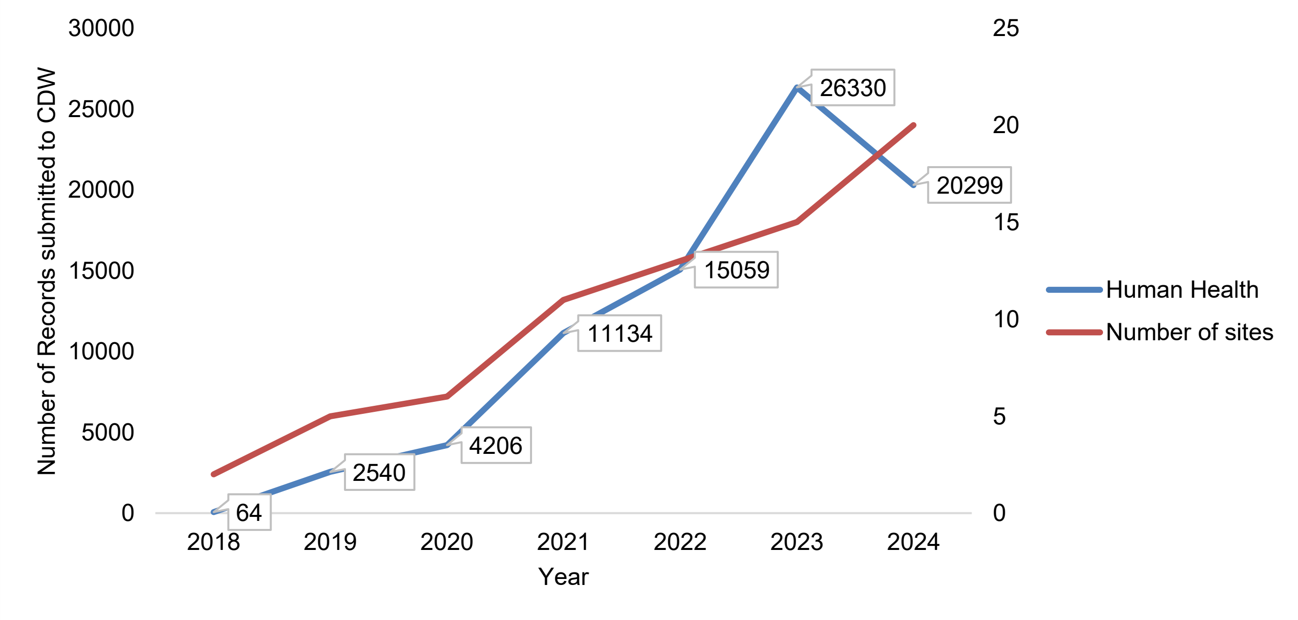


Figure 8. Human health AMR surveillance data submitted to CDW 2018–2024

A total of 20,299 records from 20 surveillance sites were received in 2024 (figure 8), a slight decrease from 26,330 records received in 2023. The decline was attributed to sites submitting positive cultures only and numerous service interruptions reported in the year due to health worker ' strikes. Eight of the 20 human health surveillance sites submitted data to CDW through laboratory information system (LIS) while the rest submitted data in Excel templates or WHONET. These records represent a proportion of total culture workload in each of the surveillance sites as many experienced data capture and transmission challenges.

Blood was the most common specimen type with 6,393 (32%) in 2024, a trend observed in 2023. Figure 9 provides a breakdown of the top 10 specimen types reported in 2024. Skin and soft tissue infections specimen types (Abscess, pus, pus swabs) continued to make up a significant proportion (19%) of total records.

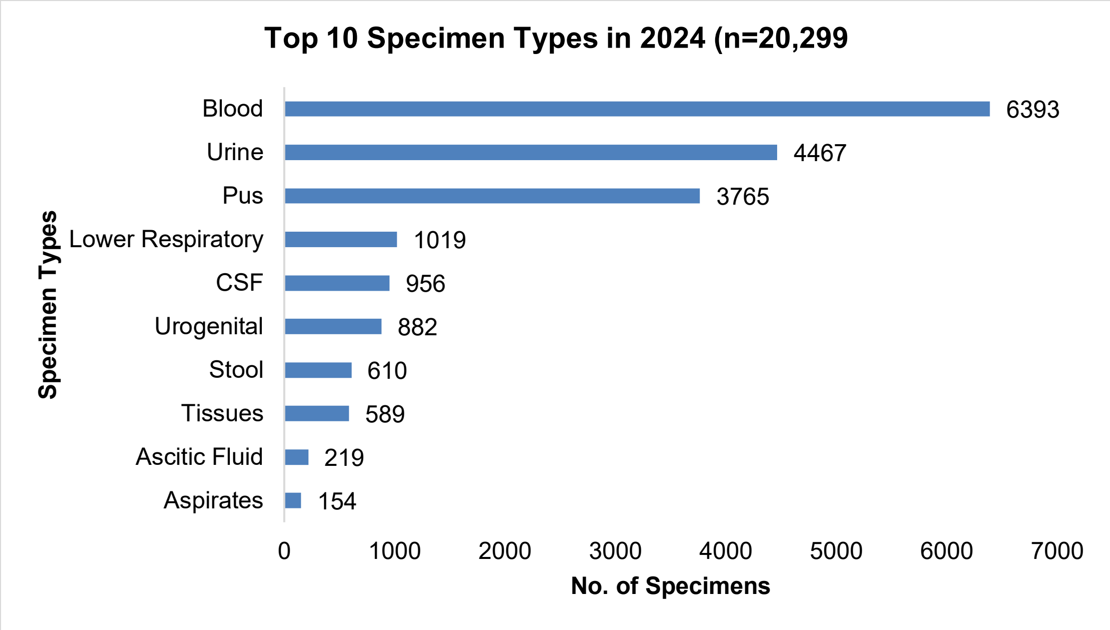


Figure 9. Human health bacterial culture records uploaded to the CDW, January–December 2023

AMR Surveillance Priority Pathogens Cultures in 2024

After data validation, a total of 3946 records had a priority pathogen isolated from a priority AMR surveillance specimen type. The analysis of the 3946 records was structured by: Antimicrobial resistance by pathogen, antimicrobial resistance by specimen and pathogen, and trend of antimicrobial resistance by pathogen for the period between 2021-2024 (figure 10).

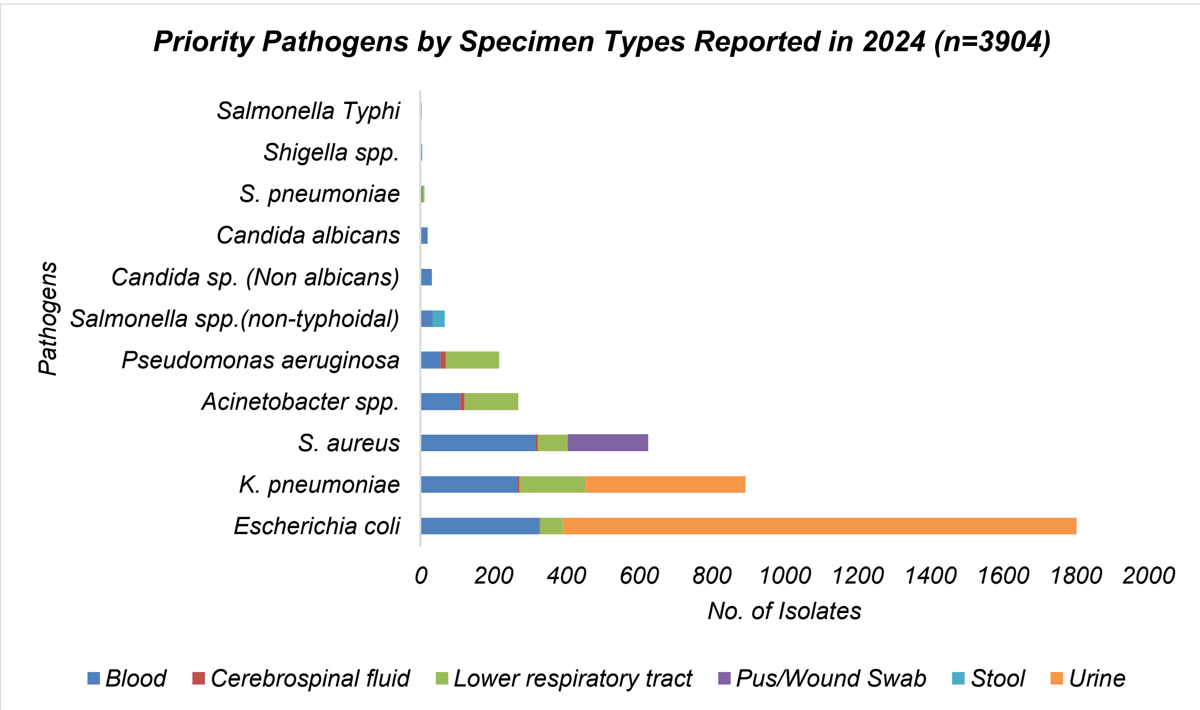


Figure 10. Number of Priority Pathogens Isolated from different Priority Specimens in 2024

Urine and blood cultures dominated, making up 85% of the requests in 2024. The most common isolates were *E. coli*, *Klebsiella pneumoniae*, and *Staphylococcus aureus*, accounting for over 80% of all identified pathogens. This reflects the global trend where Enterobacterales and *S. aureus* remain the most significant contributors to antimicrobial resistance in both hospital and community settings.

Streptococcus pneumoniae, Salmonella sp., and *Shigella* sp. showed smaller numbers but important increases from 2023, particularly for non-typhi *Salmonella* sp. and *Shigella* sp., indicating either increased outbreaks or enhanced surveillance.

Pathogens and their Resistance Profiles (2021-2024)

Antibiotic susceptibility profiles presented in this section are for seven national priority pathogens (six bacterial and *Candida* sp.). Quantitative AST results were interpreted using CLSI M100 S34. Data for *Shigella* sp., *Streptococcus pneumoniae* and *Neisseria* sp. were not sufficient for analysis.

Acinetobacter sp.

In 2024, there were 269 isolates of *Acinetobacter sp.,* from priority specimen types: LRTI (55%, 147), Blood (41%, 110) and CSF (4%, 12). This was a slight increase from 218 received in 2023. *Acinetobacter baumannii* made up 91% of *Acinetobacter* sp. reported.

The source was predominantly from inpatient settings, constituting 87% of the cases. As observed in previous reports, most of the isolates were from tracheal aspirates and may reflect colonization rather than infection.

Figure 11 illustrates the changes in individual antibiotic resistance in *Acinetobacter sp.* from 2021 to 2024. Most antibiotics tested against *Acinetobacter* sp. (Cefepime, Ceftazidime, Ciprofloxacin, Meropenem, Piperacillin/Tazobactam, Co-trimoxazole) had high resistance (>70%), with the trend being consistent over the years. Resistance to Amikacin was found lower than other antibiotics (23–31%), although a slight upward trend was observed between 2023 and 2024. The high resistance to antibiotics including carbapenems (Meropenem) considered last-resort antibiotics in Kenya severely restricts treatment choices.

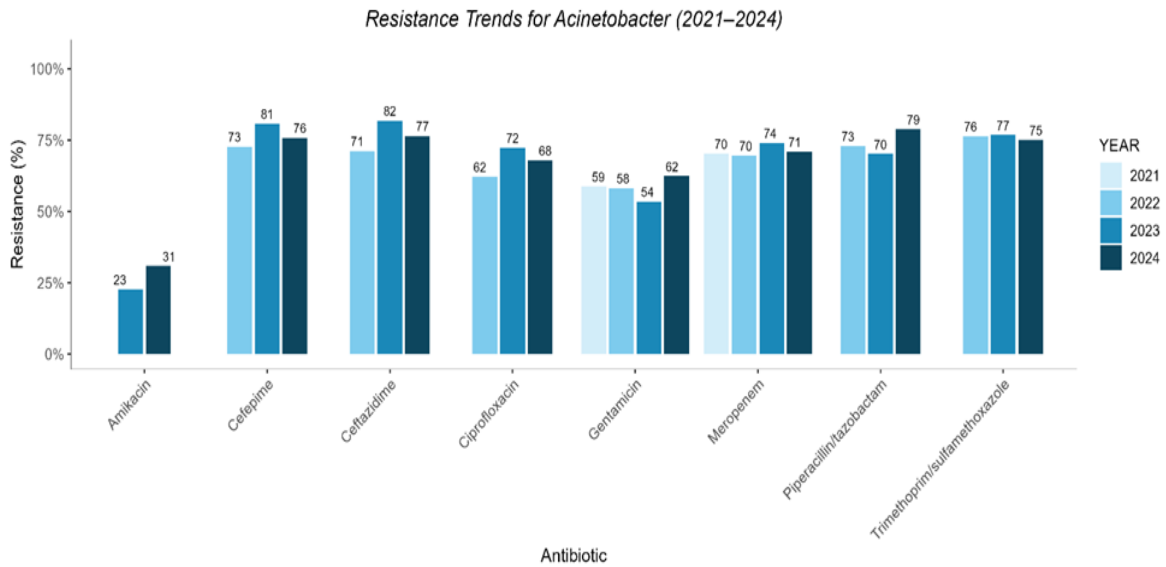


Figure 11. Antibiotics resistance trends of Acinetobacter sp. in human health

Escherichia coli

In 2024, there were 1804 *E. coli* isolates from all specimen types: urine- 1,412 (78%), blood- 326 (19%), LRTS-63 (3.5%) and CSF-3 (0.1%). High resistance to third-generation cephalosporins was observed, with more than two-thirds of isolates affected. Carbapenem resistance, although lower at around 10%, remains concerning, as carbapenems are among the few remaining treatment options for severe *E. coli* infections. Resistance to fluoroquinolones, particularly ciprofloxacin, is also high, further narrowing effective oral treatment options. Notably, resistance to amikacin and colistin remains relatively low, suggesting these drugs are still effective as last-line options, though their use should be strictly controlled (figure 12).

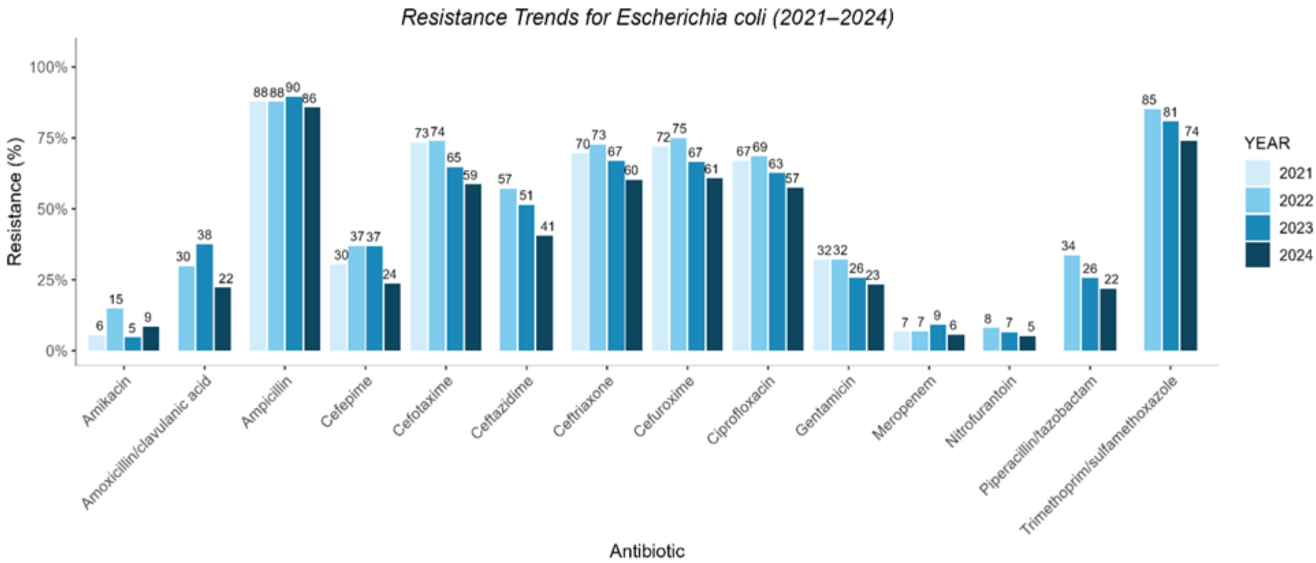


Figure 12. Antibiotics resistance trends of E. coli in human health

Klebsiella pneumoniae

In 2024, there were 894 isolates of *K. pneumoniae* isolated from the AMR surveillance priority specimen types: Urine-439 (49%), Blood-268 (30%), Lower respiratory- 182 (20%) and CSF- 5 (0.5%). Slightly higher resistance rates were observed in *K. pneumoniae* compared to those observed in *E. coli* for all antibiotics reported. Resistance to third generation cephalosporins was between 75-85%, while resistance to carbapenems (Meropenem) ranged between 20-36%. Moderate resistance rates were observed against aminoglycosides (Gentamicin and Amikacin), Penicillin-Beta Lactamase inhibitor combinations, Nitrofurantoin and Ciprofloxacin, as shown on figure 13.

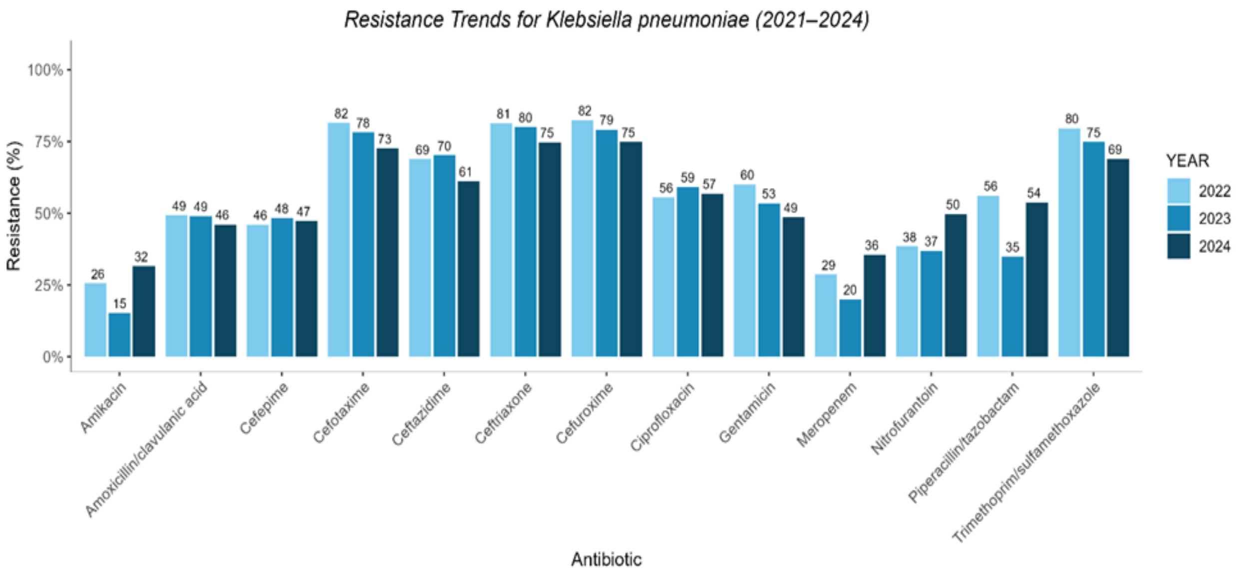


Figure 13. Antibiotics resistance trends of K. pneumoniae in human health

Pseudomonas aeruginosa

In 2024, there were 216 isolates of *P. aeruginosa,* from priority specimen types namely: LRTI-146(68%), Blood-56 (26%) and CSF-14 (6%).

The antibiotic resistance data for *Pseudomonas aeruginosa* from 2022 to 2024 reveals moderate resistance rates against all antibiotics reported. Resistance rates observed in 2023 and 2024 were slightly higher compared to rates observed in 2022 as shown in figure 14.

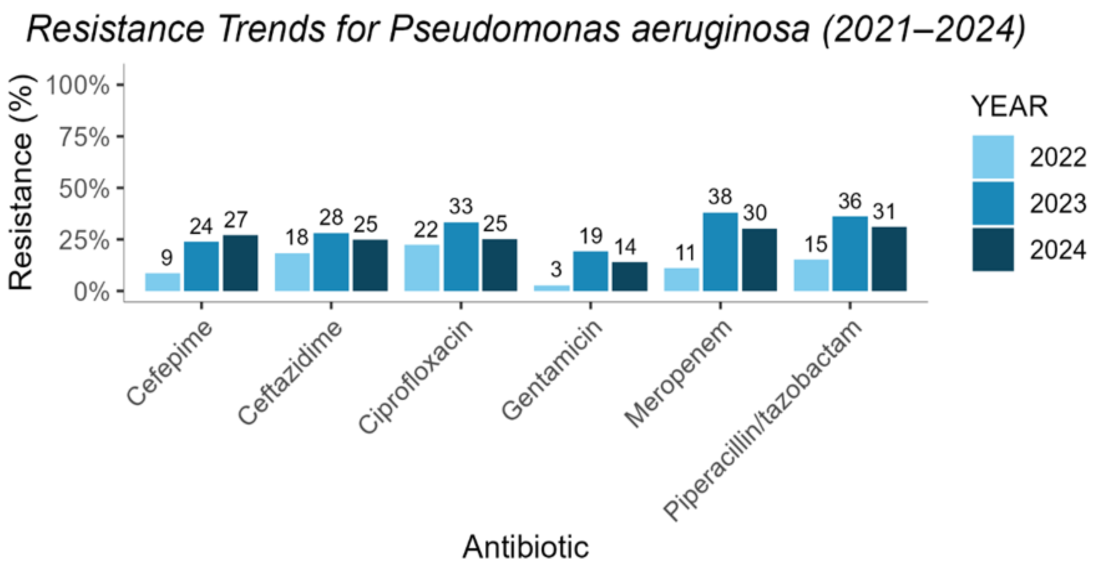


Figure 14. Antibiotics resistance trends of P. aeruginosa in human health

Staphylococcus aureus

In 2024, there were 406 *S. aureus* isolates reported from priority specimen types: Blood-317 (78%), LRTS- 82 (20%) and CSF- 7(2%). Supplementary analysis included 219 *S. aureus* isolates reported from skin and soft tissue infections specimen types. The most notable observation in resistance trend was an increase in *S. aureus* resistance to Methicillin, using Oxacillin as proxy indicator (from 34% in 2022 to 51% in 2024. This has significant implications to clinical management of infections caused by *S. aureus*. Increases in resistance were also observed for Clindamycin, Erythromycin and Gentamicin. No Vancomycin resistant *S. aureus* was reported in 2021 to 2024 as shown on figure 15.

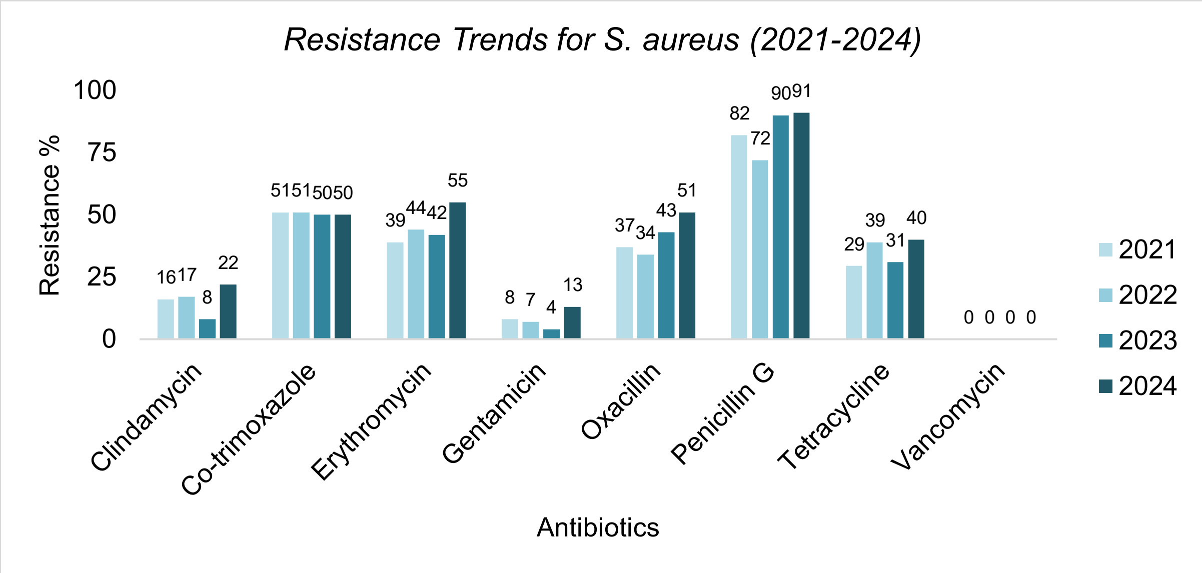


Figure 15. Antibiotics resistance trends of S. aureus in human health

Salmonella sp.

In 2024, there were 70 isolates of *Salmonella sp* isolated from AMR priority specimen types: stool-34 (49%), Blood-35 (50%) and CSF-1 (1%). Only 3 of the 70 were identified as *S.* typhi. Salmonella sp. isolates were found to be highly sensitive to Ciprofloxacin and ceftriaxone at 91% and 97%, respectively as shown on figure 16.

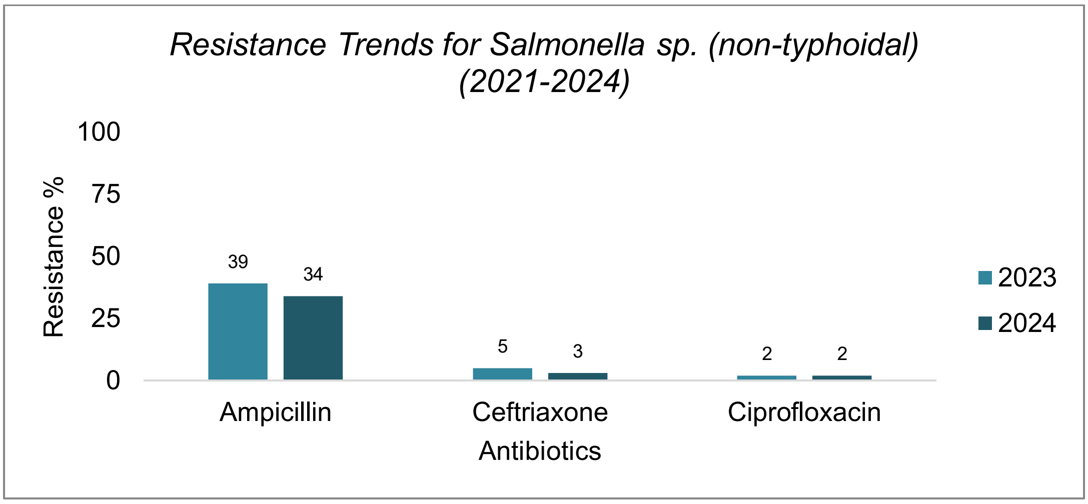


Figure 16. Antibiotics resistance trends of Salmonella spp. (non-typhoidal) in human health

Candida sp.

In 2024, 20 isolates of *Candida albicans* and 32 of non-albicans *Candida* were reported. *Candida albicans* were 100% susceptible to micafungin, flucytosine and caspofungin. Resistance to voriconazole and fluconazole was at 5% (figure 17).

Non albicans Candida were 100% susceptible to flucytosine. Resistance to voriconazole was at 23%, micafungin,3%, fluconazole, 26% and caspofungin, 6% (figure 18).

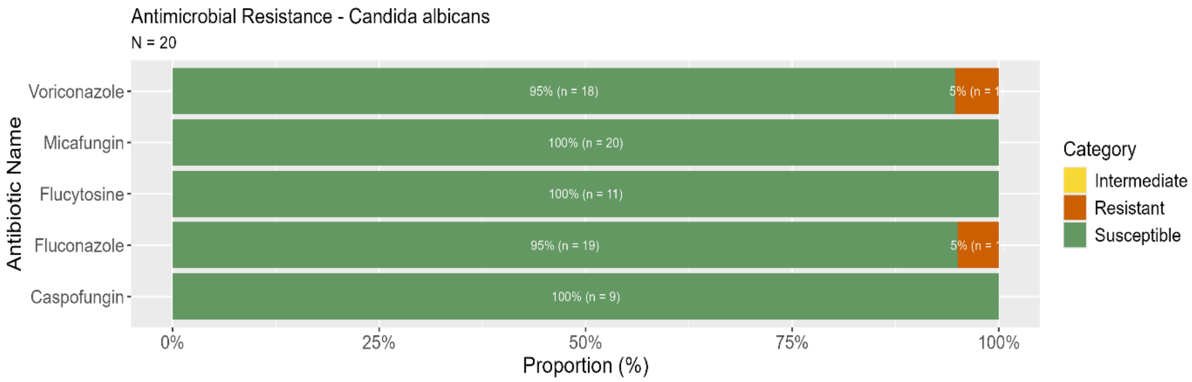


Figure 17. Antibiotics resistance trends of Candida albicans in human health

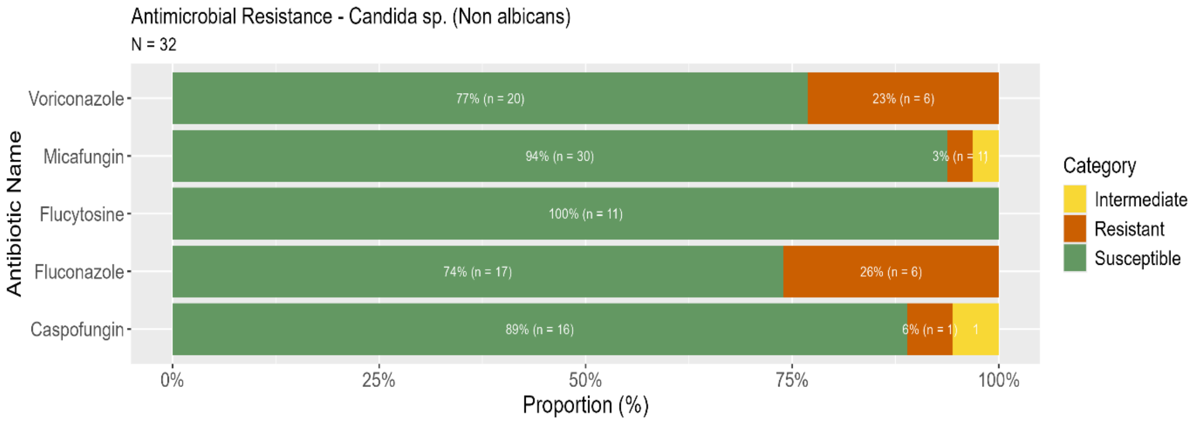


Figure 18. Antibiotics resistance trends of Candida sp. (non-albicans) in human health

Critical and High priority Resistance Profiles in Human Health

The national AMR surveillance plan (2025-2027) defined critical and high resistance profiles for monitoring, aligned to global AMR surveillance priorities as shown in table 1.

Table 1. Critical and high priority resistance profiles reported in human health

Phenotype	Priority	2023	2024
Carbapenem Resistant Acinetobacter baumannii	Critical	73%(n=218)	75% (n=269)
Carbapenem Resistant E. coli	Critical	9% (n=1046)	6% (n=1804)
Carbapenem Resistant K. pneumoniae	Critical	36% (n=668)	20% (n=894)
E. coli resistant to 3rd generation cephalosporin	Critical	67% (n=1046)	60% (n= 1804)
K. pneumoniae resistant to 3rd generation cephalosporin	Critical	80% (n=668)	75% (n=894)
Carbapenem resistant P. aeruginosa	High	38% (n=93)	30% (n=216)
Methicillin Resistant S. aureus (MRSA)	High	43% (n=275)	51% (n=406)

Limitations

- Geographical representativeness of the data remains low due to diagnostic capacities coverage
- Variability in diagnostic methods, and data collection tools continue to affect the quality of AMR surveillance data
- Some surveillance sites did not submit all data collected in 2024 due to data transmission systems challenges.

B. Surveillance of AMR in Animal Health

Figure 19 shows the distribution of the National Veterinary Laboratories (NVL) with their areas of coverage. All the NVLs are sentinel sites for AMR surveillance activities except Garissa. Karatina NVL had the highest number of cases due to its strategic position in the dairy and poultry farming potential areas. The six sites had selected Counties where samples for AMR surveillance were collected from farmers and analyzed since March 2024. This was carried out after mapping farms in the select counties, training of staff to participate, renovations and supply of reagents and consumables for the activities. This was done in preparation of the Phase II Fleming Fund activities.

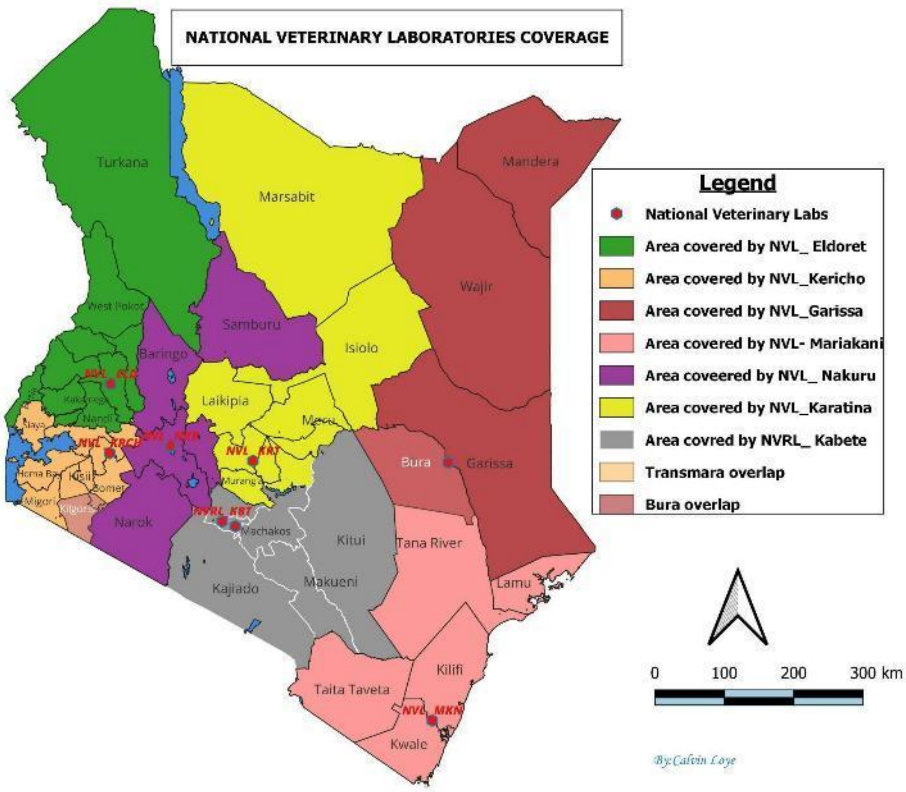


Figure 19. Map of Kenya showing location and geographical coverage of NVLs and NVRL

Bacterial isolates processed at CDW

In 2024, the Central Diagnostic Warehouse (CDW) in Kenya processed a total of 5,425 animal cases from six surveillance sites, reflecting a substantial 91% increase from the 2,840 cases reported in 2023 across seven sites. This significant rise was due to increased active surveillance activities in the sites in 2024 under the Fleming Fund country grant. This emphasizes the critical need for sustained passive and active surveillance to effectively monitor and address animal health concerns on AMR. Notably, the lack of active surveillance activities in 2023 likely contributed to the lower-case numbers reported that year, underscoring the impact of enhanced monitoring efforts in 2024. Table 2 provides a comprehensive breakdown of cases by surveillance site, offering valuable insights into the distribution and trends of bacterial isolates across various regions, which support informed decision-making for animal health disease management.

Table 2. Animal health cases processed and recorded to the CDW, 2022 - 2024

Surveillance Site	**2024**	**2023**	**2022**
NVL Eldoret	733	996	237
NVL Kericho	462	260	323
NVL Karatina	2457	448	492
NVL Mariakani	105	120	117
NVL Nakuru	859	698	686
NVRL Kabete	809	278	251
UON-Vet	0	40	0
Total	**5425**	**2840**	**2106**

Karatina NVL recorded the highest caseload with 2,457 cases, followed by Nakuru NVL (859), the National Veterinary Reference Laboratory (809), Eldoret NVL (733), Kericho NVL (462), and Mariakani NVL (105). The highest number of samples were from bovine from mastitis cases. The high number of processed cases reflects improved responsiveness by farmers and service providers in utilizing laboratory diagnostics to guide antimicrobial treatment, especially dairy farmers. The laboratories continue to play a central role in disease diagnosis and support evidence-based interventions in animal health management.

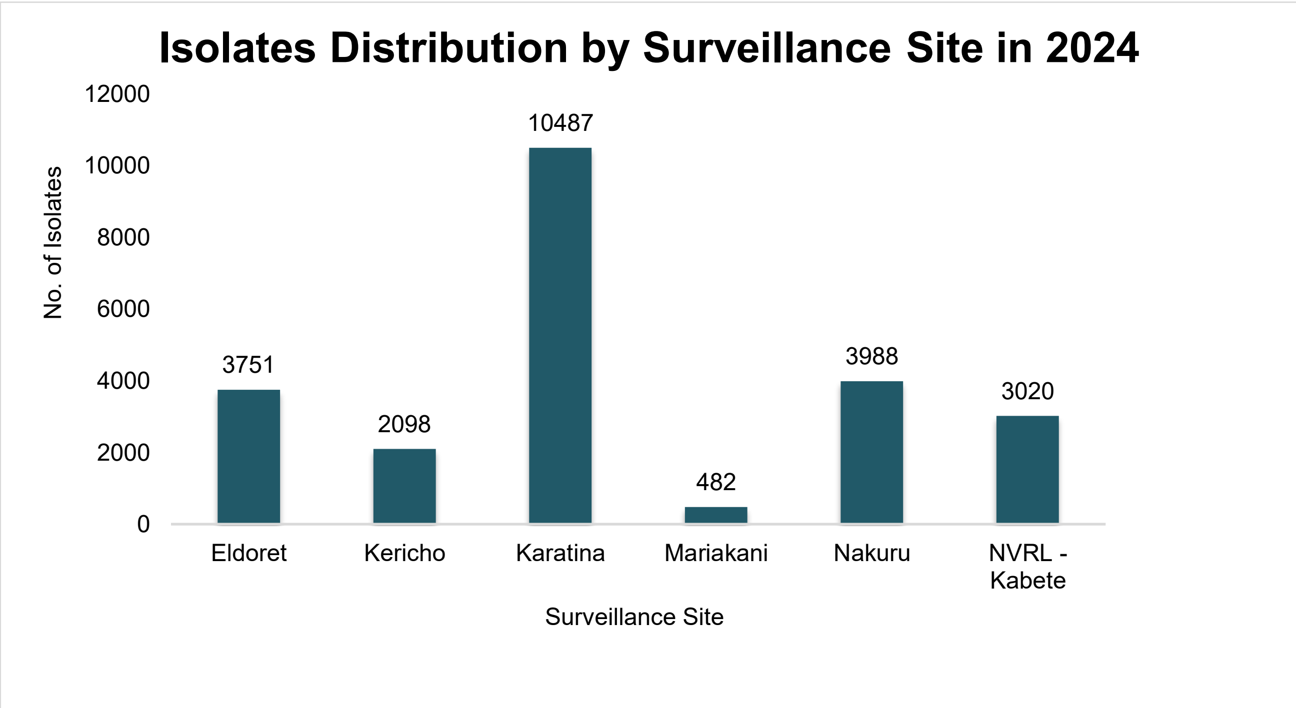


Figure 20. The isolate distribution per surveillance site in 2024

The total number of isolates reported across six sites was 23,826. Karatina accounted for the highest proportion, contributing 44% (10,487 isolates) of the total. Nakuru and Eldoret followed with 16.7% (3,988 isolates) and 15.7% (3,751 isolates), respectively (see figure 20). National Veterinary Referral Laboratory (NVRL) Kabete contributed 12.7% (3,020 isolates), while Kericho accounted for 8.8% (2,098 isolates). Mariakani had the lowest representation, with only 2% (482 isolates). The high number of samples recorded in Karatina can be attributed to the high prevalence of mastitis cases among dairy cattle in the area. As Karatina is a key dairy-producing region, farmers frequently present milk samples for bacteriological analysis and antimicrobial susceptibility testing, leading to a higher caseload compared to other regions.

Specimen Types by Animal Species Received in 2024

Table 3 shows the various sample types submitted for culture from the various animal species. It was noted that the highest number of samples were milk samples (4,598; 85.2%), from Bovine. This was attributed to the mastitis cases which are received from the dairy farming potential areas. Given that milk production is a key economic activity in most of the highland regions, routine health checks and frequent use of laboratory diagnostics are encouraged to avoid cases of milk rejection from the processing plants. Rejection usually leads to huge losses to dairy farm owners.

Tissues and organs constituted the second most common submissions (576; 10.7%), mainly from avian, caprine, porcine, and ovine species. These were largely associated with post-mortem examinations, underscoring their role in disease investigation and surveillance.

Other sample types included swabs (88; 1.6%), fecal samples (87; 1.6%), urine (22; 0.4%), and body fluids (16; 0.3%), which provided additional diagnostic material for both bacterial and systemic infections. Smaller numbers of “other” samples (9) and eggs (2) were also submitted.

This narrow distribution indicates a heavy reliance on milk diagnostics, with relatively fewer submissions from other animal species and sample types. While this supports surveillance in the dairy sector, it also highlights the limited diversity of diagnostic inputs, which may restrict the broader understanding of disease occurrence and AMR patterns across species. Therefore, expanding the diversity of diagnostic sample types would enhance the representativeness of disease data and improve the detection of AMR trends across different animal populations and regions.

Table 3. Distribution of Specimen Types Received from Different Animal Species in 2024

Sample Type	Bovine	Avian-Domestic	Caprine	Porcine	Ovine	Canine	Rabbit	Feline-Domestic	Camel	Others	Grand Total
Milk	4554		32	5	5				2		4598
Tissue/Organs	28	333	68	73	34	11	19		6	4	576
Swab	31	8	14	6	6	18	3	2			88
Faecal Sample	12	21	8	24	5	16		1			87
Urine	4					3		15			22
Body Fluid	6	2	1	1	2	3			1		16
Other	1		5							3	9
Egg		2									2
Grand Total	4636	366	128	109	52	51	22	18	9	7	5425

AMR Surveillance on Bacterial Isolates, 2024

The most frequently isolated bacteria from animal health samples in 2024 was *Staphylococcus epidermidis* with 1360 isolates (25%), followed by *S. aureus* with 1271 isolates (23.4%) and *Escherichia coli* with 772 isolates (14.2%) as shown in figure 21. Other bacterial pathogens of public health and veterinary significance such *Klebsiella pneumoniae* were 421 (7.76%) and *Acinetobacter baumannii* were 89 (1.6%). Other organisms were isolated at lower frequency. Similar trends of bacteria were reported in 2023, however with subtle increases in 2024 for a few organisms. These bacterial pathogens are of public health importance and significant health risks in both humans and animals. Therefore, they should be continuously monitored. *Staphylococcus epidermidis* is an important mastitis pathogen and opportunistic in human health.

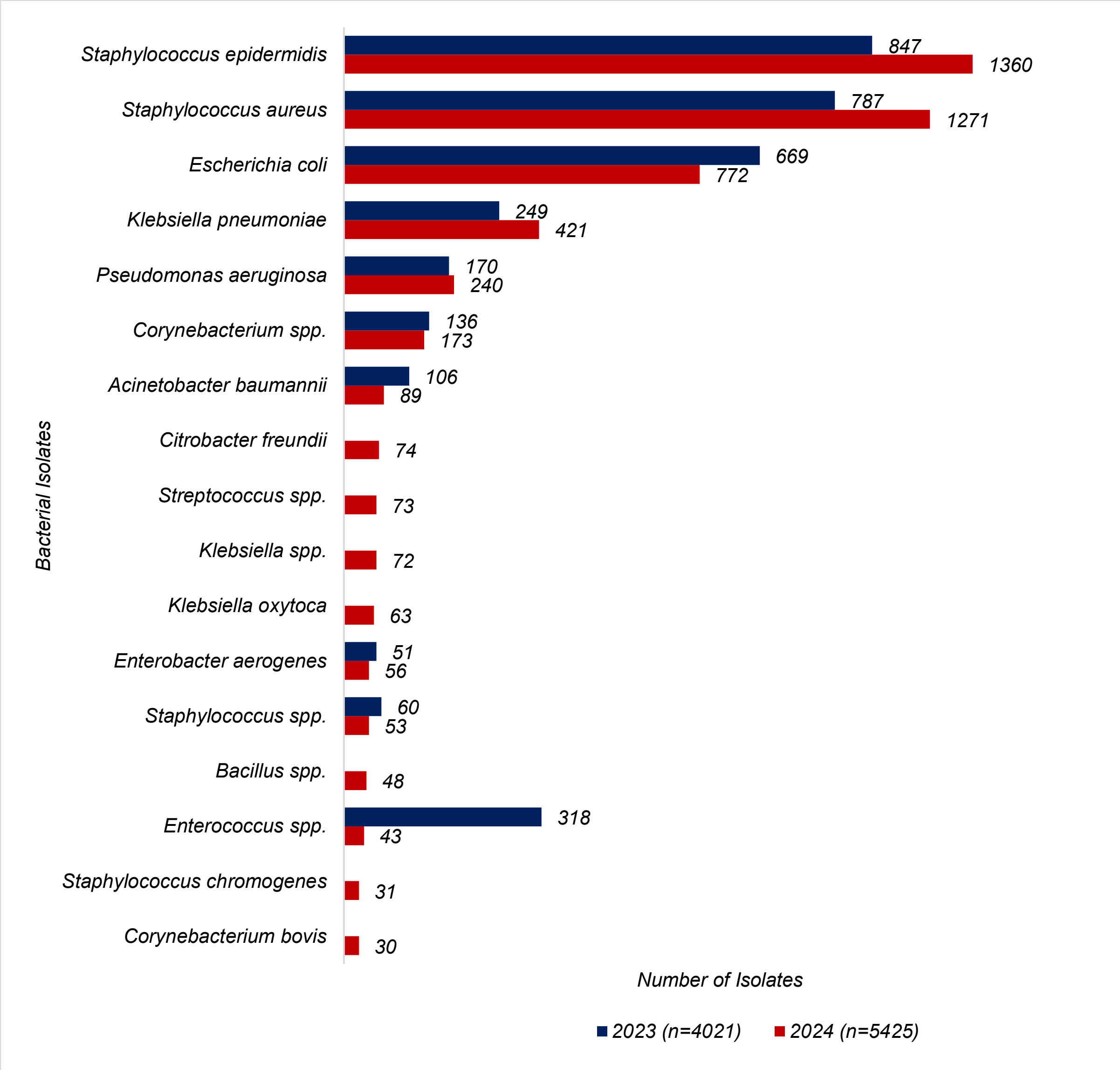


Figure 21. Frequency of bacteria isolated from animal health samples in 2024

Animal Health Priority Bacterial Pathogens Antimicrobial Susceptibility Profiles

AMR Priority Pathogens

The data shows that *S. aureus* and *E. coli* were the dominant isolates in animal health from 2022 to 2024, both rising steadily, reflecting their major role in animal health especially in mastitis cases and domestic avian infections. *K. pneumoniae* and *P. aeruginosa* also increased over time, indicating their growing importance as animal pathogens as well as their public health importance. In contrast, *Enterococcus* sp. peaked in 2023 then declined sharply in 2024, while *A. baumannii* remained consistently low. *C. jejuni* was only reported in 2022, disappearing in subsequent years. These findings highlight the persistent burden of priority bacterial pathogens alongside the growing importance of potentially zoonotic gram-negative and opportunistic bacteria in animal health.

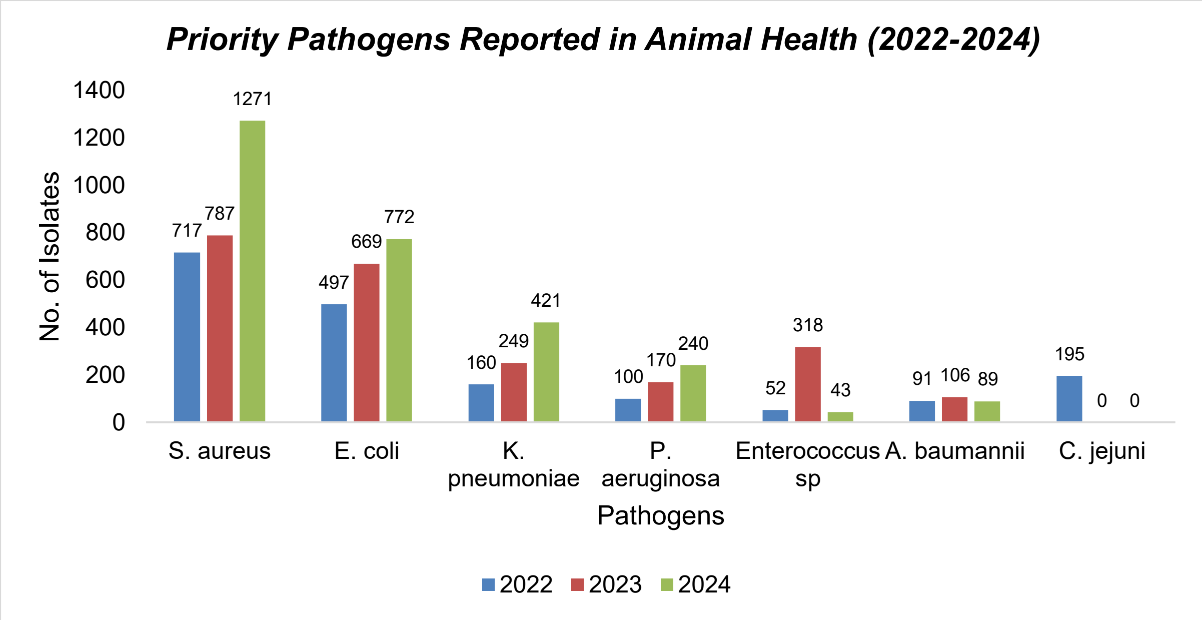


Figure 22. Priority bacterial isolates reported in 2022-2024 in animal health

Staphylococcus aureus was the most abundant priority pathogen with 1271 isolates reported (23.4%), followed by *Escherichia coli* with a total of 772 isolates (14.2%) and *K. pneumoniae* with 421isolates (7.8%). There was marked increase in *Pseudomonas aeruginosa* with 240 isolates (4.4%). Other priority pathogens reported included *Enterococcus spp* and *Acinetobacter baumannii* (figure 22).

Antimicrobial Susceptibility Profiles of priority Bacterial Isolates from Animal Samples, 2024

Escherichia coli

In 2024, *Escherichia coli* isolates demonstrated a high prevalence of resistance to Ampicillin (70.2%), Tetracycline (58.9%), and Trimethoprim-sulfamethoxazole (49%), indicating limited therapeutic value of these agents. Streptomycin also showed considerable resistance at (38.1%), with 41.9% of isolates being susceptible. For Amoxicillin-clavulanic acid, 14.5% of isolates were resistant and 26.6% intermediate, while Kanamycin demonstrated 16.7% resistance and 28.4% intermediate, indicating moderate but declining efficacy for both agents. In contrast, Gentamicin (82.7%) showed a high susceptibility as shown in figure 22 indicating its efficacy in treatment. Notably Ciprofloxacin resistance (15%) was detected, raising public health concern since the drug is restricted in animal use in Kenya and remains critically important for human medicine. The detection of Ciprofloxacin resistance in animal isolates raises public health concern over potential cross-resistance and the risk of compromising treatment options in humans.

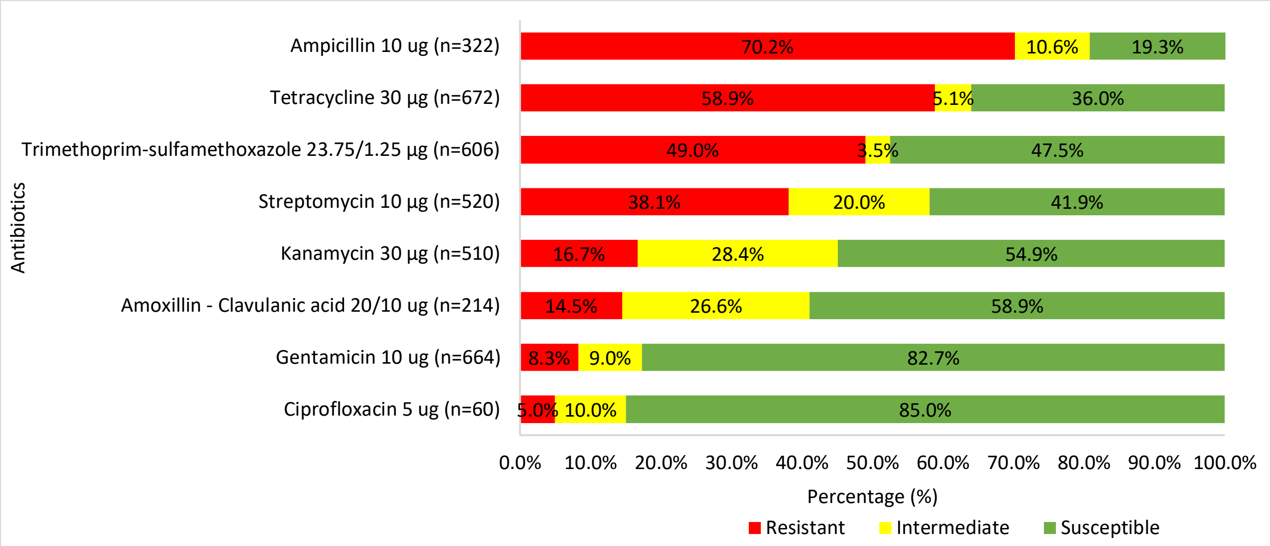


Figure 23. Antimicrobial susceptibility profile for E. coli (2024)

Between 2022 and 2024, *E. coli* showed rising resistance to several antibiotics, with the most increase observed to tetracycline, gentamicin, and co-trimoxazole. Resistance to ampicillin and streptomycin also remained high, while resistance to ceftriaxone, ciprofloxacin, kanamycin, and meropenem were relatively low (Figure 24).

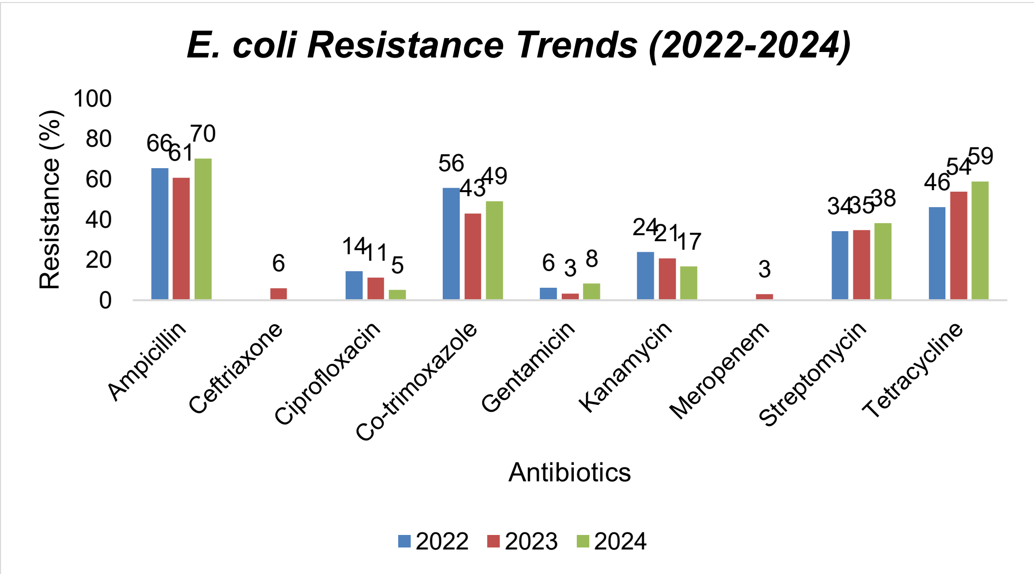


Figure 24. Antibiotics resistance trends of E. coli isolates in animal health (2022-2024)

Klebsiella pneumoniae

K. pneumoniae comprised 7.8% percent of isolates reported by surveillance sites mainly from bovine milk samples. *K. pneumoniae* isolates were tested against a limited number of antibiotics to which they were found highly susceptible to gentamicin (93 percent). Moderate susceptibilities were observed for other antibiotics. High resistance was observed against tetracycline (33.4%), co-trimoxazole (34.1%) and streptomycin (25.2%). Resistance to Amoxicillin-clavulanic acid was at 25% and 20% intermediate were reported suggesting reducing effectiveness (Figure 25). Trends remained consistent to those observed in 2022 (Figure 26).

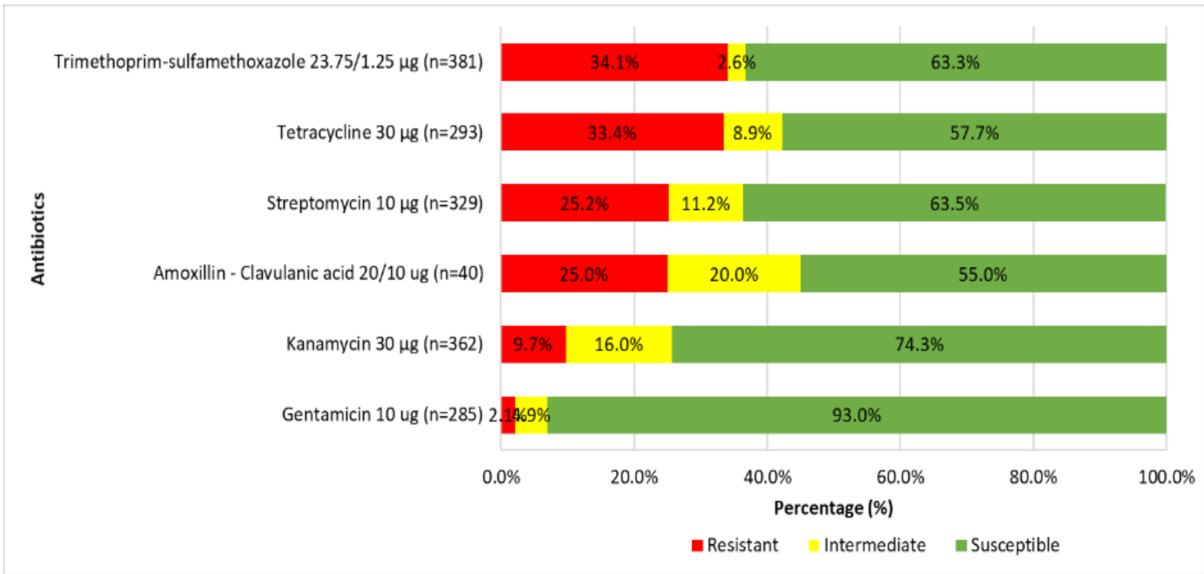


Figure 25. Antimicrobial susceptibility profile for K. pneumoniae (2024)

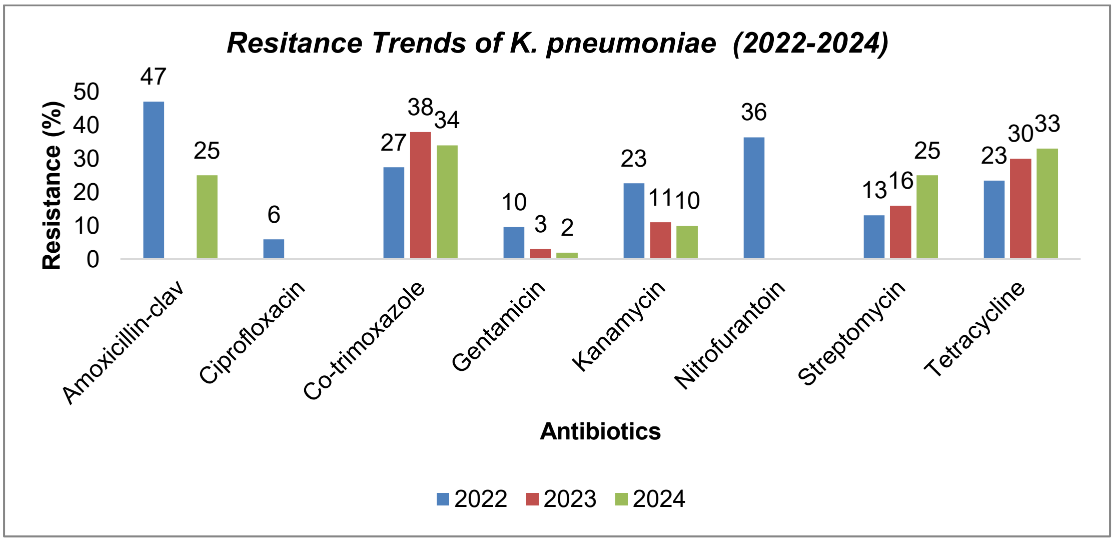


Figure 26. Antibiotic resistance trends of K. pneumoniae isolates in animal health-2022-24

The moderate susceptibility rates suggest that while treatment options are available, careful consideration is necessary when selecting antibiotics, particularly in the context of potential resistance development. The presence of *K. pneumoniae* in bovine milk samples also raises public health concerns, as it can be a source of infections in both animals and humans, particularly in cases where antibiotic-resistant strains are involved. Monitoring and managing antibiotic use in veterinary settings is crucial to mitigate the spread of resistant strains and protect both animal and human health.

Pseudomonas aeruginosa

In 2022-2023, P. aeruginosa isolates made up 5 percent of all isolates reported, mainly isolated from milk samples. The pathogen exhibited high susceptibility to gentamicin (98 percent) and ciprofloxacin (100 percent) (Figure 27). However, in 2024, For *Pseudomonas aeruginosa* isolates resistance to ciprofloxacin (5 µg) was observed at 5.9%, with 13.7% intermediate indicating increasing rising resistance to ciprofloxacin as compared to 2022-2023 where no resistance was reported. Pseudomonas aeruginosa generally exhibits intrinsic resistance to many antibiotics. This makes treatment challenging, as effective therapy, especially in animals often relies on a limited group of agents. Close monitoring is recommended to preserve the limited working drugs.

The prevalence of *P. aeruginosa* observed in dairy settings underscores the importance of implementing stringent hygiene practices during milking and processing to minimize contamination risks and ensure the safety and quality of dairy products.

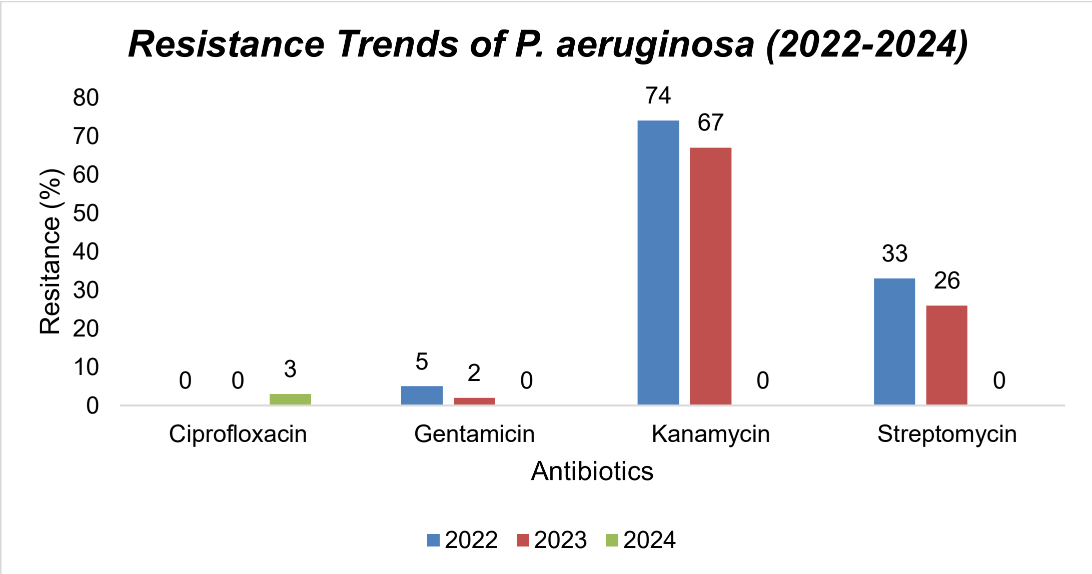


Figure 27. Resistance trends of P. aeruginosa isolates in animal health-2022-24

Staphylococcus aureus

In 2024, *Staphylococcus aureus isolates* resistance was most notable against erythromycin (44.9%), tetracycline (46.6%), and streptomycin (35.9%), with a concerning trend of resistance to ciprofloxacin (8.2% resistant; 36.5% intermediate). High susceptibility was observed to gentamicin (89.3%) and co-trimoxazole (72.4%), followed by moderate susceptibility to amoxicillin-clavulanic acid (67.6%) (figure 28).

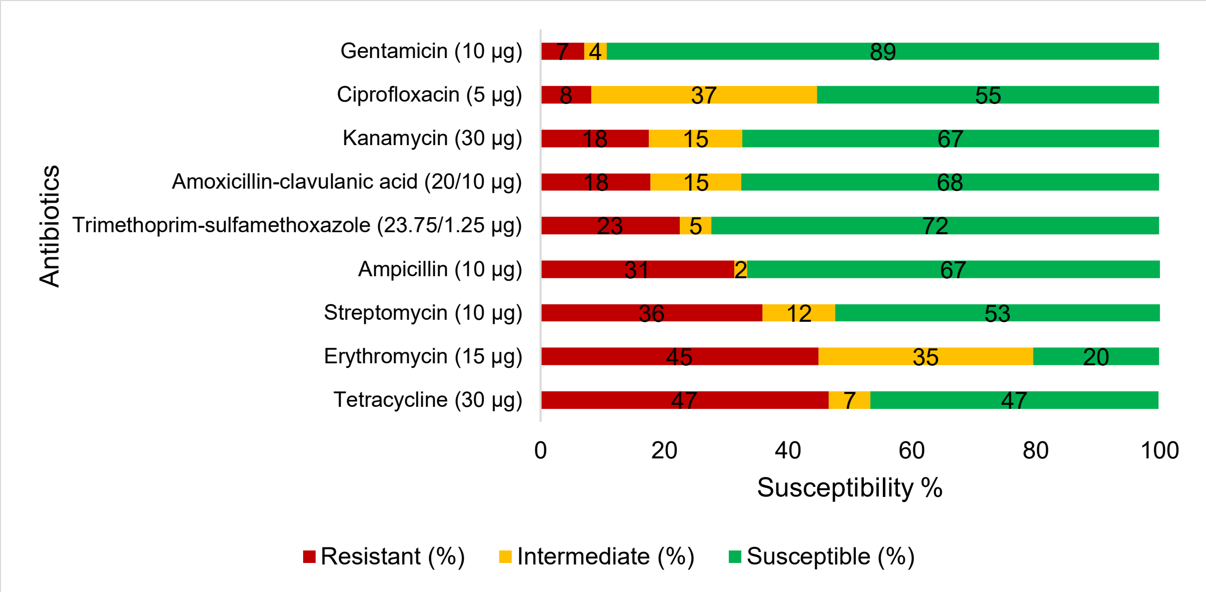


Figure 28. Antimicrobial susceptibility profile for Staphylococcus aureus (2024)

The resistance profile in 2024 was consistent with the trend observed in 2023 and 2022 (figure 29). Only a small proportion of *S. aureus* isolates (2%) were tested against a set of 3 core antibiotics (Co-trimoxazole, gentamicin and tetracycline). This limited testing highlights the need for broader surveillance and testing to better understand the resistance patterns of *S. aureus* in various settings.

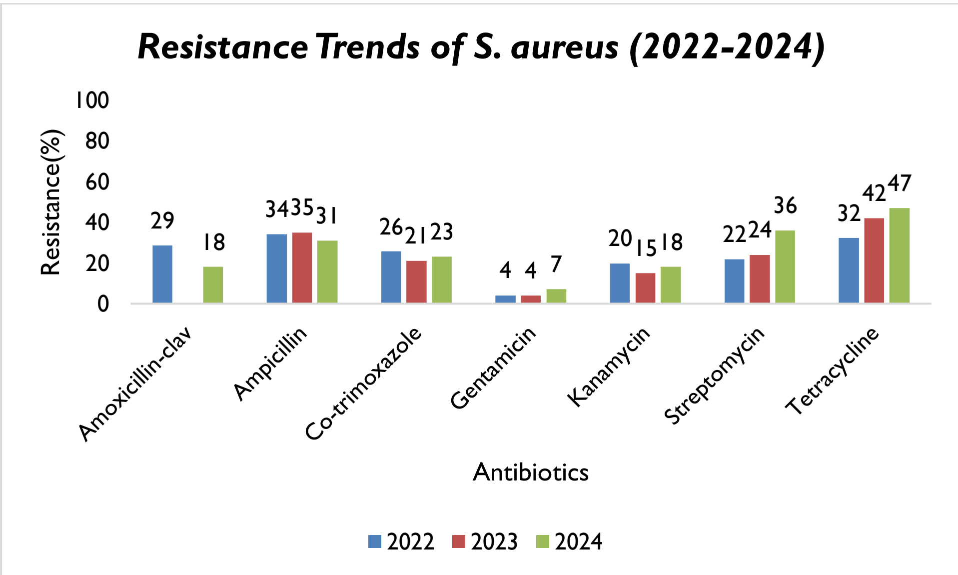


Figure 29. Resistance trends of Staphylococcus aureus isolate in animal health-2022-2023

Enterococcus sp.

Enterococcus sp. was isolated mainly from cloacal swabs (99 percent). In 2024, Among *Enterococcus* spp. isolates, tetracycline showed the highest resistance at 39.5%, while gentamicin recorded the lowest resistance at 4.8%. Increases in resistance to tetracycline and gentamicin were noted in 2024 compared to 2022-2023 (figure 30). Continuous monitoring is recommended especially for resistance to Linezolid and Vancomycin in animal isolates which have been termed as reservoir of this priority pathogen. The two antimicrobial agents were not tested for in 2024 because they are not routinely used in animals' health.

Enterococcus sp. isolates comprised 7 percent of priority pathogens isolated and reported by surveillance sites, the most common species reported was *Enterococcus faecalis*.

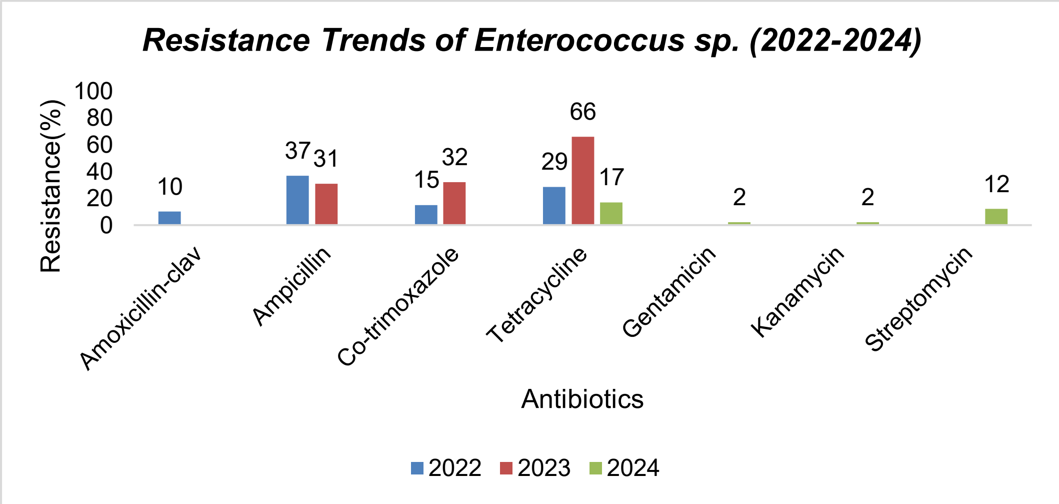


Figure 30,. Resistance profile of Enterococcus sp. isolates between 2022-24

Overall Resistance across Antibiotic Classes used in Animal Health

The data above (figure 31) highlights AMR profiles across major antibiotic classes used in animal health. Aminoglycosides show relatively low resistance at 20.1%, with two-thirds of isolates (67.7%) remaining susceptible, indicating they remain effective options in many cases. Similarly, β-lactam combined with β-lactamase inhibitors demonstrates low resistance (16.0%). In contrast, macrolides exhibit the highest resistance level at 42.0%, with susceptibility dropping to 43.0%, suggesting their effectiveness is significantly compromised. Tetracyclines (30.1% resistant, 63.0% susceptible) and β-lactams (35.3% resistant, 58.2% susceptible) also show concerning resistance levels, reflecting reduced therapeutic reliability. Intermediate resistance, particularly notable in macrolides (15.0%) and β-lactam inhibitor combinations (17.6%), signals ongoing resistance development.

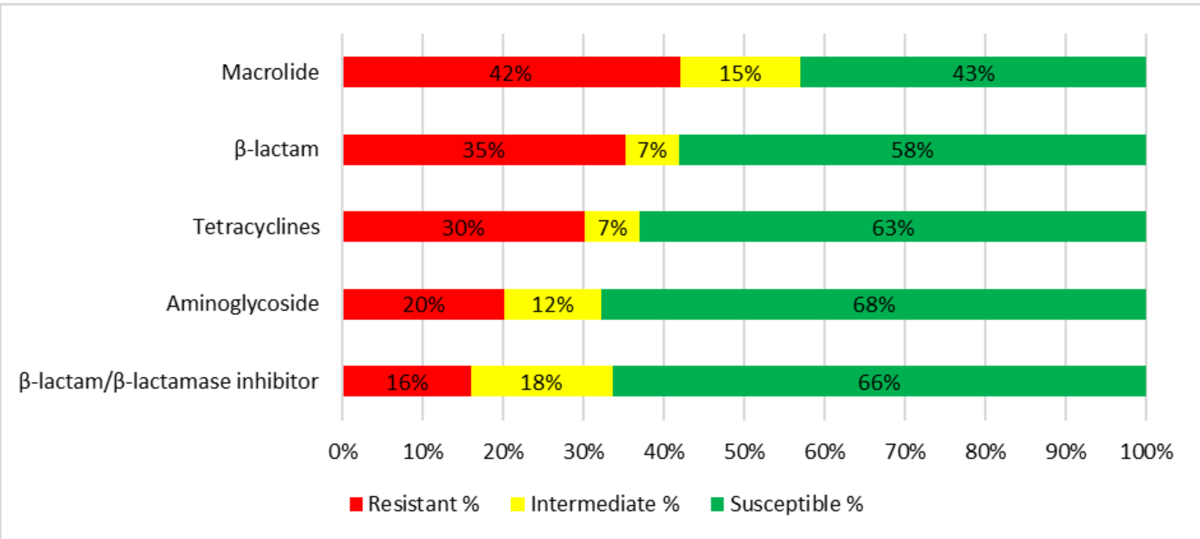


Figure 31. Susceptibility profiles across major antibiotic classes in animal health

Comparison of resistance across organisms

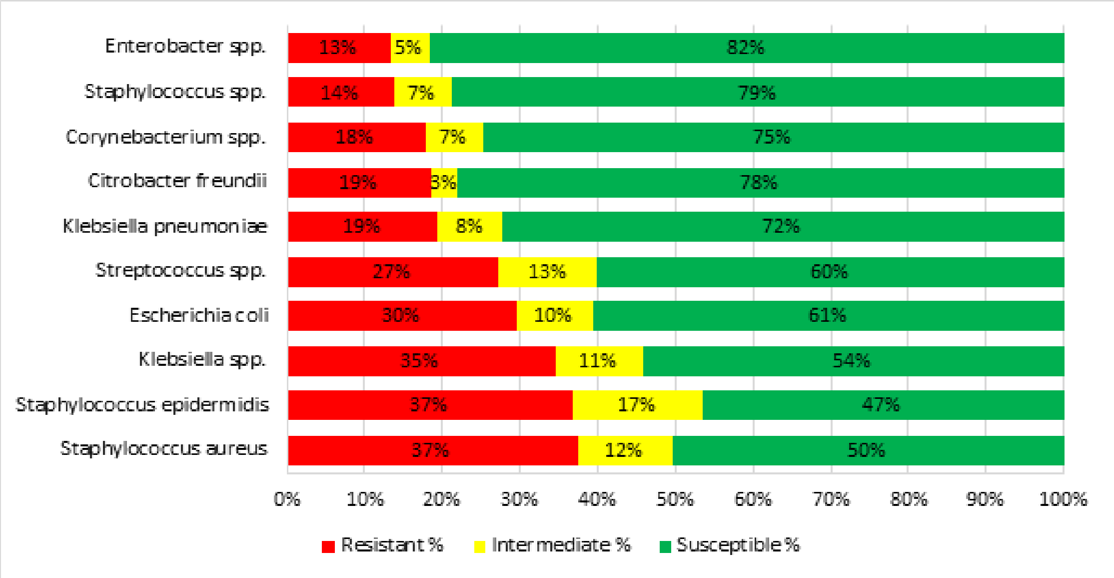


Figure 32. Overall susceptibility profiles of pathogens to all Antibiotics

Most pathogens remain largely susceptible, but significant resistance is evident in some. *Enterobacter spp*. (13% resistant, 82% susceptible), *Staphylococcus spp*. (14% resistant, 79% susceptible), and *Citrobacter freundii* (19% resistant, 78% susceptible) show relatively low resistance (figure 32). *Corynebacterium spp*. and *Klebsiella pneumoniae* also maintain high susceptibility above 70%.

However, resistance is more pronounced in pathogens of clinical relevance. *Escherichia coli* shows 30% resistance with only 61% susceptible, while *Klebsiella* spp. demonstrates 35% resistance. *Staphylococcus epidermidis* and *Staphylococcus aureus* have the highest resistance rates at 37%, with susceptibility dropping to 47% and 50% respectively. *Streptococcus spp*. also presents notable resistance at 27%.

Critical and High Priority Resistance profiles in Animal Health

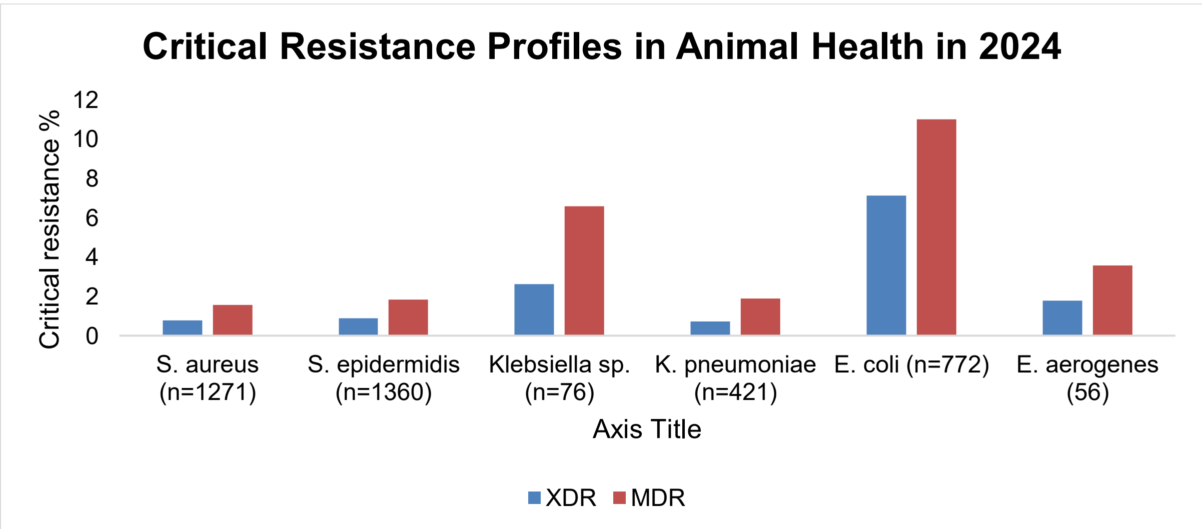


Figure 33. Pathogens with critical and high priority Resistance Profiles in Animal Health

Among the pathogens tested, *Escherichia coli* recorded the highest burden, with over 130 resistant isolates distributed across MDR, and XDR categories (figure 33). This highlights its role as a key reservoir and disseminator of resistance. *Staphylococcus aureus* and *Staphylococcus epidermidis* also showed substantial resistance, with isolates spanning the two resistance categories. In contrast, *Klebsiella spp.*, *Klebsiella pneumoniae*, and *Enterobacter aerogenes* recorded fewer resistant isolates, though MDR, and XDR phenotypes were still evident.

Limitations

- Limited utilization of regional veterinary laboratories: Despite high livestock production in some areas, sample submissions remain low. Only Karatina regional laboratory recorded submissions that closely matched the KNBS 2019 livestock population density.
- Restricted data sources: Current data only captures tests from national veterinary laboratories. It excludes valuable data from other sources such as University of Nairobi (UoN), KALRO, private laboratories, veterinary clinics and hospitals, pharmaceutical laboratories, and livestock product processing firms (milk, meat, and eggs companies).
- Narrow pathogen focus: The analysis has mainly concentrated on priority veterinary bacterial species. However, other organisms, though considered of limited veterinary importance, have also shown resistance trends that are not captured.

Recommendations

- Enhance public awareness: Sensitize farmers, stakeholders, and the public on the availability and importance of using regional and national laboratories for disease diagnosis.
- Expand surveillance coverage: Incorporate data from additional surveillance sites to provide a more holistic and representative picture of antimicrobial resistance trends.
- Widen pathogen scope: Include datasets covering more bacterial pathogens beyond priority species to capture emerging resistance patterns.

C. Surveillance of AMR in Environmental Health

Occurrence of antibiotic resistance microbes in environmental matrices can be driven by discharge of resistance species from human and agricultural waste. Additionally, exposure of microbes to traces of antibiotic residues in environmental matrices particularly water and soil may trigger development of resistance. Between 2021 and 2023, a study was carried out within the upper Athi River Basin targeting 22 sampling sites along Athi River and its tributaries (majorly Nairobi, Mathare, Ngong, Mbagathi, Ruaraka, Thirika, Kamiti and Ruiru) to assess the occurrence of pharmaceuticals including antibiotics. Further, a preliminary risk assessment of antibiotics was done, based on risk quotient (RQ) and predicted no effect concentration (PNEC) for the selected compounds. When the RQ value is below 0.1, there is no (or low) risk posed, while values between 0.1 and 1 represent medium risk, and values above 1 imply high risk. The preliminary risk assessment suggests that four antibiotics - clarithromycin, metronidazole, sulfamethoxazole and trimethoprim - have high risk of inducing the development of antibiotic-resistant microbial species in the environment (figure 34). The results agree with the findings of the AMR surveillance in human and animal samples (see Sections II A & B) which show resistance of selected bacterial species to Co-trimoxazole (sulfamethoxazole and trimethoprim). This is a strong indication of the significant potential role the environment may play as a sink for and in the spread of

AMR in the country.

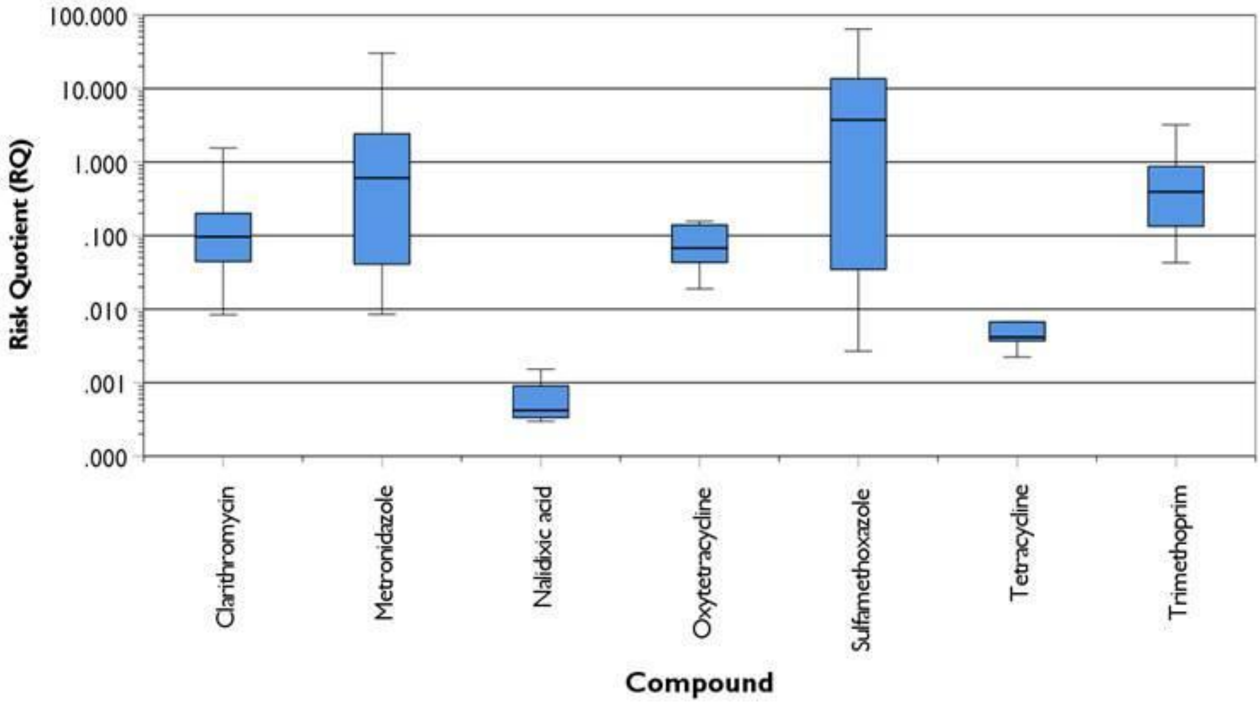


Figure 34. Antimicrobial Resistance development risk within the upper Athi River Basin

Source: Chebii et al., 2024

Limitations

1. Limited environmental AMR surveillance program, hence inadequate availability of data for informed decision making.
2. Inadequate analytical infrastructure for sustainable environmental AMR surveillance
3. The data presented captures narrow scope both spatially and temporally.

Recommendations

1. There is a need to comprehensively integrate environmental AMR data into the National AMR surveillance program.
2. Enhancement of the environmental AMR analytical infrastructure to improve surveillance capacity.
3. Expand environmental AMR surveillance scope to cover spatial, temporal and matrix diversity.

SECTION III: NATIONAL AMC & AMU SURVEILLANCE DATA ANALYSIS

The misuse and overuse of antimicrobials in human health, animal health, and agriculture are among the key drivers of AMR. Inappropriate use exerts selective pressure, enabling resistant microbes to thrive and spread, with consequences that cut across health sectors and the environment. To mitigate this threat, close surveillance of antimicrobial consumption (AMC) and use (AMU) is critical, as recommended by WHO and WOAH within a One Health framework.

AMC provides a quantitative measure of the volume of antimicrobials used within a given setting (e.g., hospitals, community facilities, veterinary practices, food production systems) over a specified period. It is typically derived from aggregated data sources such as import, wholesale, procurement, dispensing, or prescription records. AMU provides a qualitative perspective by assessing whether antimicrobials are prescribed and used appropriately, ensuring the right drug, at the right dose, for the right duration, and in line with treatment guidelines.

Tracking both AMC and AMU across the human, animal, and environmental interface is central to AMS programs, informing policies that safeguard the effectiveness of antimicrobials for health and food and environmental security.

A. AMC and AMU Surveillance in Human Health

AMC Methodology

The national AMC surveillance was undertaken by PPB and UON-CEMA under the coordination of the NASIC to monitor antimicrobial use in alignment with the NAP-AMR (2023–2027) and the WHO GLASS-AMC framework. Data were collected from importation records obtained from the Pharmacy and Poisons Board (PPB) for the years 2023 and 2024. All import permits containing antimicrobials were extracted and uploaded into the KESAC tool.

The resultant dataset was standardized by calculating total amounts of active agent, assigning WHO AWaRe groups (Access, Watch, Reserve), Anatomical Therapeutic Chemical (ATC) classification, and WHO Defined Daily Dose (DDD) values.

AMC was quantified using the WHO DDD methodology. Consumption was expressed as DDD per 1,000 inhabitants per day (DID), based on population estimates from the Kenya National Bureau of Statistics (KNBS) for 2023 and 2024.

Descriptive and comparative analyses were performed, including total DID and stratification by AWaRe group, ATC class, route of administration, and formulation. Findings were summarized using proportions and percentages and presented in tables and figures to support trend interpretation.

Photo 3: AMC Data Review & Validation Meeting at GEM Suites Hotel, Nairobi, May 2025.

AMC Analysis Findings

Overall AMC trend

National AMC increased from 22.7 DID in 2023 to 23.5 DID in 2024, indicating a modest rise in per capita antimicrobial use. The oral route remained dominant, accounting for 91.6% of all consumption in 2023 and rising to 93.3% in 2024. See figure 35

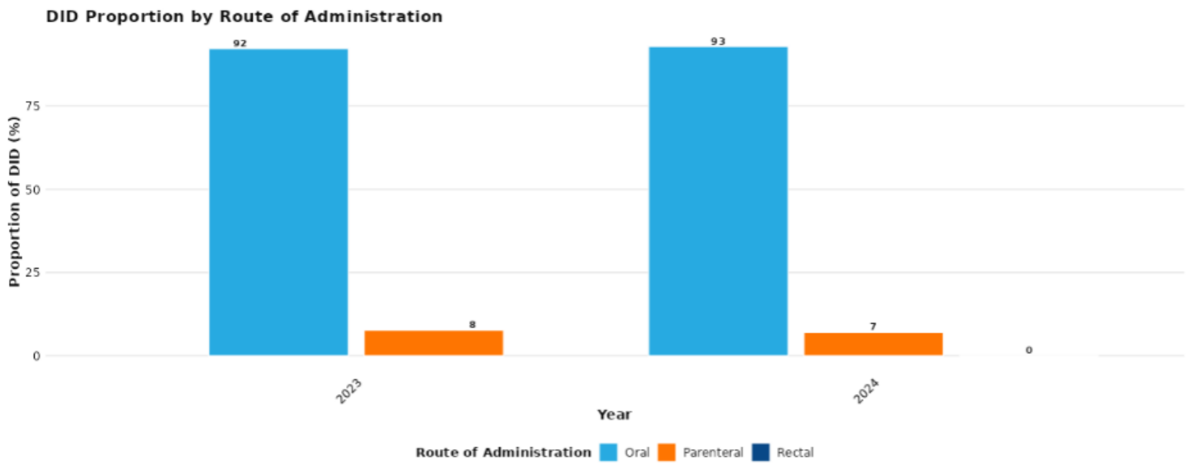


Figure 35. AMC by Route of Administration

AMC by WHO AWaRe Categorization

Access antibiotics represented **52%** of total use in 2023 which slightly declined to **50%** in 2024, still below the WHO target of 70%. The **Watch** category antibiotics were consumed at high levels: **46%** in 2023, decreasing to **41%** in 2024, representing a substantial proportion of national AMC. Notably, Reserve antibiotics showed a worrying increase, from <0.1% (131,389 DDDs) in 2023 to 0.1% (274,691 DDDs) in 2024, signaling potential escalation of last-resorte antibiotic use. See figure 36.

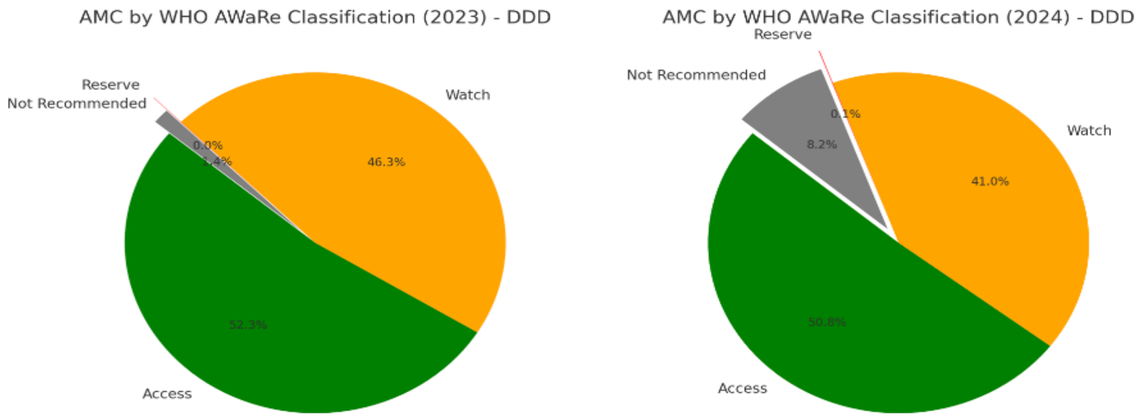


Figure 36. AMC (DDDs) by WHO AWaRe Categorization

The top antibiotics in each class were as follows:

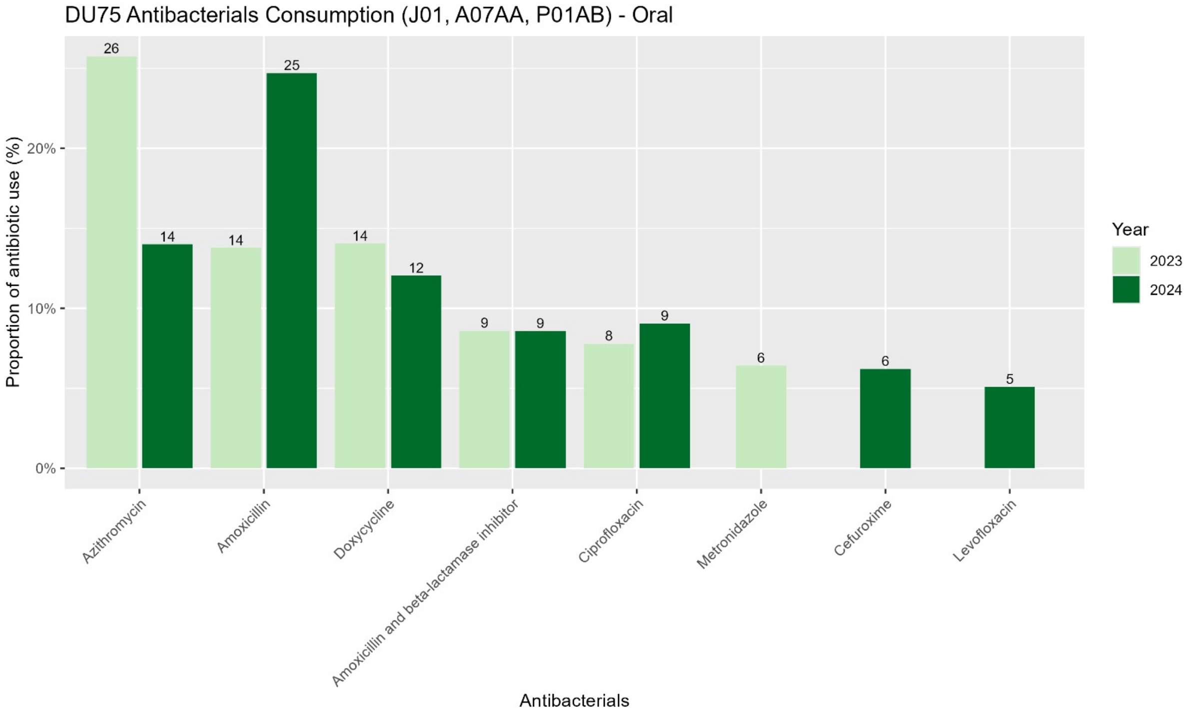
WHO Access Category: Amoxicillin, Doxycycline, Amoxicillin-clavulanic acid, Metronidazole, and Gentamicin.

WHO Watch Category: Azithromycin, Ciprofloxacin, Clarithromycin, Erythromycin, and Cefuroxime.

WHO Reserve Category: Linezolid, Fosfomycin, Meropenem, Vancomycin, and Teicoplanin.

AMC by Molecule - Most Frequently Consumed Antibiotics

Amoxicillin was the most consumed antimicrobial, accounting for 22% of total AMC, followed by Azithromycin (13%), and Doxycycline (11%). Collectively, the eight (8) most consumed antimicrobials represented 78% of overall national consumption. Figure 37 shows AMC disaggregated by oral and parenteral routes for the year 2023 and 2024.



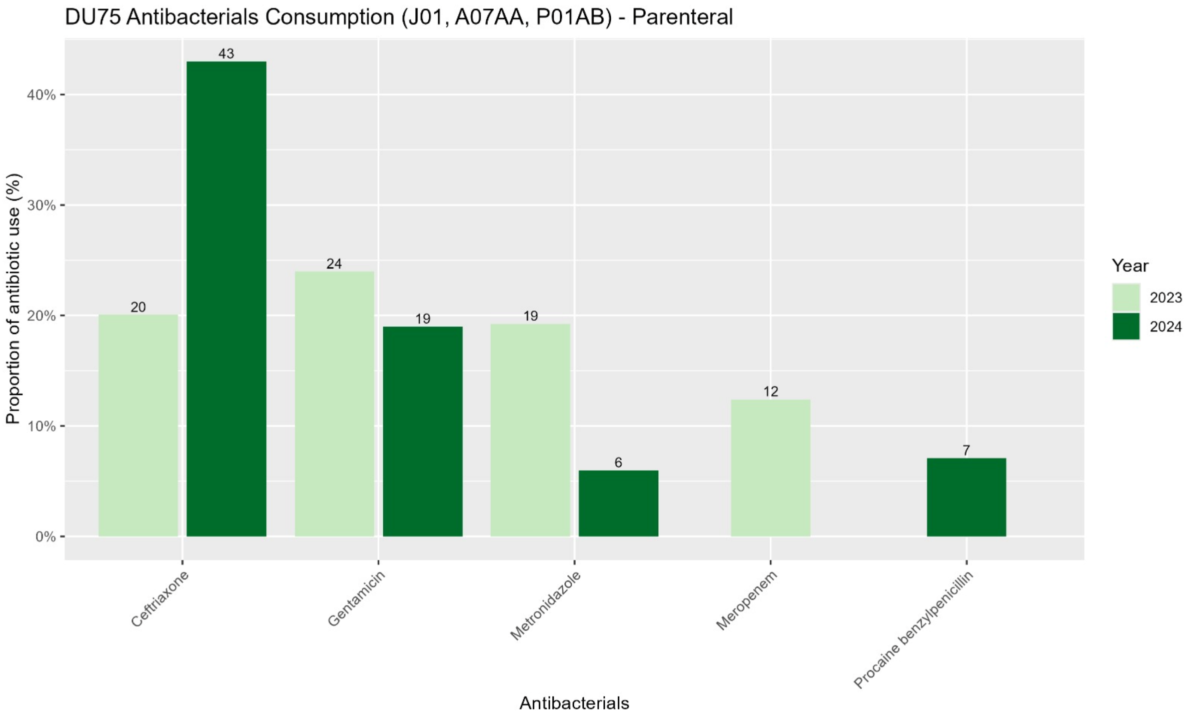


Figure 37. Antimicrobial Consumption (DDDs) by individual molecule

AMU Methodology

In 2024, AMU data was derived from conducting PPS across 11 hospitals in Kenya, including national referral, county referral, private and mission hospitals (see table 4). Data was collected at a single point in time for all inpatients admitted before 8:00 a.m. on the day of the survey. The key areas the survey assessed included the prevalence and patterns of antibiotic use; indications for antibiotic prescribing; availability and use of microbiology services; and implementation of AMS practices. The study followed the WHO PPS methodology and was implemented through trained data collected in the facility and validated by AMS experts.

Table 4. Participating facilities, their level of service and ownership

Facility	Level of Service	Ownership
Kenyatta National Hospital	6	Public
Nakuru County Referral Hospital	6	Public
Coast General Teaching & Referral Hospital	5	Public
Jaramogi Oginga Odinga Teaching and Referral Hospital	6	Public
Kisii Teaching and Referral Hospital	6	Public
Machakos Level 5 Hospital	5	Public
Thika Level 5 Hospital	5	Public
Mbagathi County Referral Hospital	5	Public
The Nairobi Hospital	5	Private
Nyeri County Referral Hospital	5	Public
Mater Misericordiae Hospital	5	Mission

AMU Analysis Findings

Prevalence of antibiotic use

On average, 44.3% (2102/4742) of the patients surveyed across the participating facilities, were on at least one antibiotic. Of these most were adults at 62.5%, while neonates accounted for 12.9%.

AMU patterns

Ceftriaxone, a Watch category antibiotic, was the most commonly prescribed antibiotic at **23%**, followed by **metronidazole** (**16%**) and amoxicillin/clavulanic acid (8%). Meropenem, categorized as a reserve antibiotic in the Kenye EML, was prescribed in t 4.3% of patients (see figure 38).

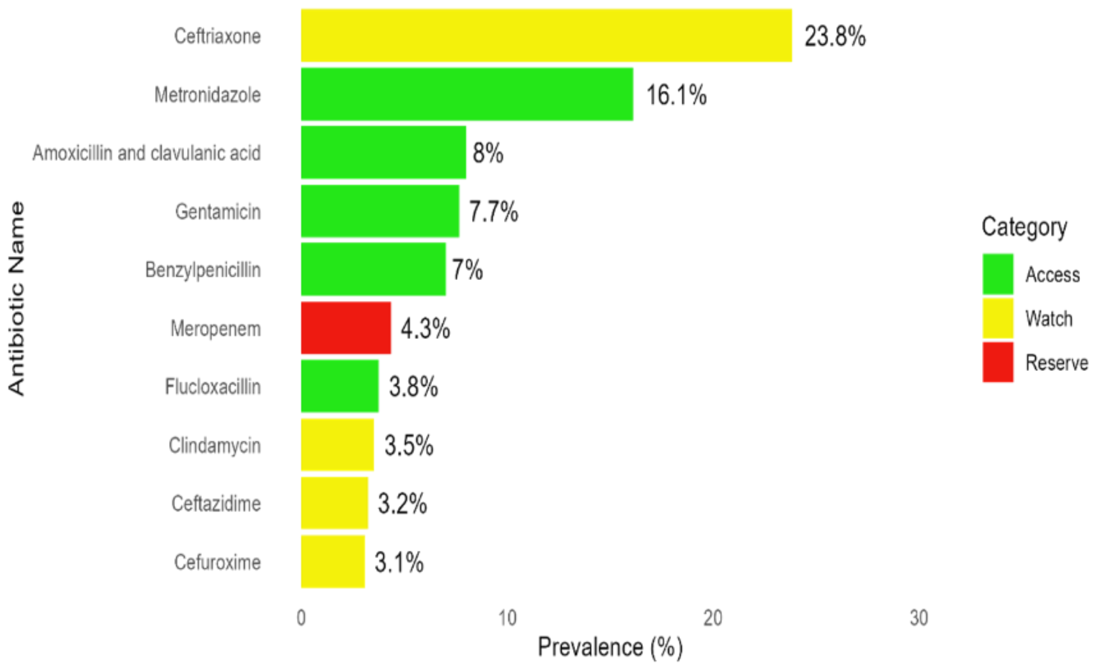


Figure 38. Graph showing the top 10 prescribed antibiotics across the 11 hospitals.

Only **48.7**% of the antibiotics prescribed were from the Access category, as per the Kenya Essential Medicines List (KEML) 2023, **43.3**% from the Watch category and **5.4**% from Reserve (see figure 39).

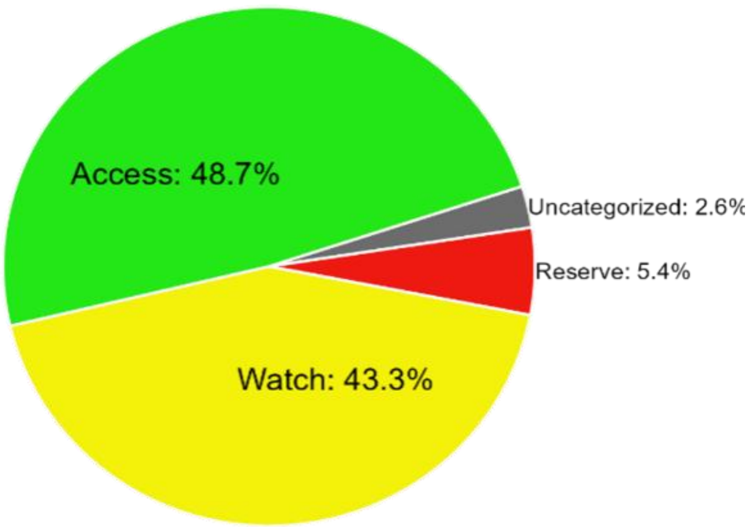


Figure 39. Graph showing antimicrobial use by KEML AWaRe categorization.

Microbiology Utilization

The use of microbiology services for culture and susceptibility testing was minimal with only 11% of patients with samples requested, of these the most common samples were blood (49%) and urine

(22%).

Other key results included:

- Most of the antibiotic prescriptions at 92% were given intravenously.
- There was poor documentation noted, with the data showing that 24% of prescriptions had no indication documented. Stop dates were recorded for 80% of prescriptions.
- Majority of the patients, 92% (1937/2102) on antibiotics had been catheterized during the hospital admission with Peripheral catheters (IV cannula) alone being the most prevalent 70% (1348/1937).
- The top indications for antimicrobial prescriptions were for respiratory tract infections (20.8%), surgical prophylaxis (19.6%), and skin/soft tissue infections (12.2%) (see figure 40).

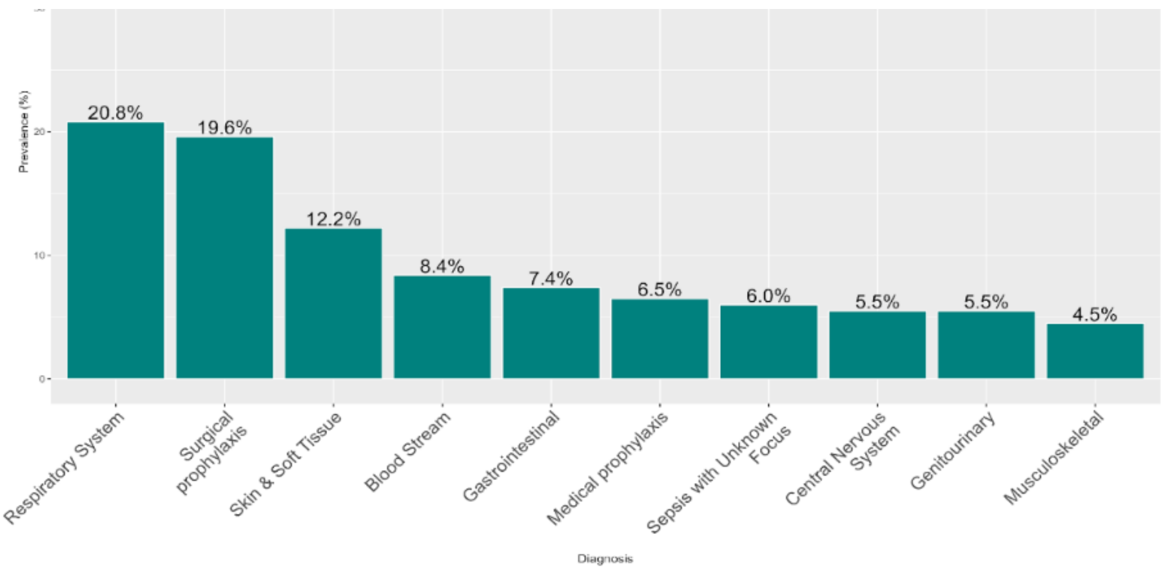


Figure 40. Graph showing the top 10 indications for antimicrobial prescriptions.

AMS Program Implementation

All surveyed facilities reported having a recognized AMS program in place, as well as access to clinical microbiology laboratory capacity. The majority (91%) had board-certified microbiologists and established IPC committees, underscoring the presence of strong governance structures to support stewardship.

Despite this foundation, important gaps remain. Culture tests workload varied considerably across facilities, ranging from 139 to 4,160 tests within a three-month period, with a mean of 1,157 tests. While most facilities (82%) had ward-level antimicrobial use and empirical guidelines, just over half (55%) had access to the current KEML. Training on AMR patterns was reported by only 64% of facilities in the past year, highlighting a significant capacity gap in sustaining stewardship practices and ensuring consistent application of evidence-based approaches.

Discussion of AMC, AMU and AMS Program findings - Human Health

The combined AMC, AMU, and AMS findings highlight both progress and persistent challenges in

Kenya's AMR response.

At the national level, AMC remained concentrated in a small number of molecules, with a shift away from Access category antibiotics towards Watch and Reserve agents. While overall DID increases were modest, the class distribution suggests heightened risk of resistance and misalignment with WHO AWaRe benchmarks.

At facility level, PPS results revealed widespread reliance on broad-spectrum empiric therapy, dependence on IV route, prolonged surgical prophylaxis, and limited diagnostic stewardship. These practices compound the risks already suggested by national AMC trends and point to critical areas for intervention.

Encouragingly, stewardship structures are in place across surveyed facilities, with strong laboratory and governance capacity (AMS programs, microbiologists, IPC committees). However, uneven implementation was evident: fewer facilities had access to the current KEML with AWaRe categorization, empirical prescribing standards, or routine training on AMR patterns. Limited use of culture results to guide prescribing, further undermines stewardship efforts.

Overall, these findings suggest that while Kenya has made notable progress in institutionalizing AMS, urgent action is needed to:

1. Realign national antibiotic use towards the Access group
2. Strengthen diagnostic capacity and integrate microbiology into routine care, implementing key interventions to drive utilization of microbiology services.
3. Enforce compliance with surgical prophylaxis standards.
4. Implement key AMS interventions at the facility level, particularly IV to oral switch, ward rounds, and 48–72-hour review of antimicrobial prescriptions.
5. Expand continuous training and access to updated KEML with AWaRe and treatment and practice guidelines.

Addressing these gaps will be essential to sustain the effectiveness of first-line antimicrobials, reduce inappropriate use, and align national practices with global AMR containment goals.

B. AMC and AMU Surveillance in Animal Health

Methodology

AMC is monitored by the Veterinary Medicines Directorate through the consolidation of import and export data from the Ken trade system. The AMC data obtained is then analyzed and reported to the World Organization for Animal Health (WOAH) through a global platform known as Animal Antimicrobial Use (ANIMUSE) where Kenya is ranked amongst other participating countries globally.

Results and Discussion

In 2024, the data obtained from the KenTrade System constituted total quantities of Active Pharmaceutical Ingredients (API) from import and export categories as indicated in figure 41. The AMC data was obtained by getting the difference between the quantities imported and exported. The total AMC for 2024 was **566,145.88kg.** This may be an overrepresentation of the actual AMC data since not all imported API categories will translate into the actual AMU data.

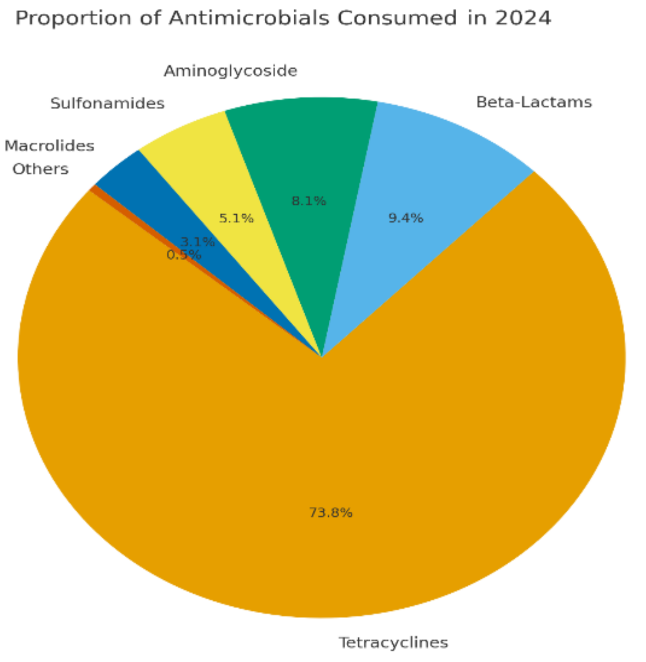


Figure 41. Proportion of Antimicrobials Consumed in Animal Health Sector in 2024

Tetracyclines were the highest consumed at 73% whereas the least proportion was 0.5% comprising nine API categories with AMC quantities of below 10,000 kgs i.e. (Polymixins, Fluoroquinolones, Nitrofurans, Amphenicols, 1st and 3rd Gen Cephalosporins, Pleuromutilins, Phosphonic acids and Polypeptides. Specific API quantities are as shown in Appendix IV.

All the 5 API categories with the AMC proportions of between 3.1% and 73.8 % together with the 3rd Gen Cephalosporins and Fluoroquinolones in the other proportion of 0.5% were under the category of Veterinary Critically Important Antimicrobials. Six of the API categories in the others with an aggregate proportion of 0.5% were under the Veterinary Highly Important Antimicrobials. Nitrofurans which were imported are not available in the WOAH list of Veterinary Important Antimicrobial agents.

Categorization of antimicrobial agents of Veterinary Importance

The categorization was based on the published WOAH list of antimicrobial agents of veterinary importance (June 2021). The list addressed antimicrobial agents for use in food-producing animals and does not include antimicrobial classes/subclasses only used in human medicine or those only used as growth promoters. Two criteria were used for categorization: 1) More than 50% of response rate to the questionnaire regarding Veterinary important antimicrobial agents and 2) Treatment of serious animal disease and availability of alternative antimicrobial agents. Based on the criteria three categories were established:

- **Veterinary Critically Important antimicrobial agents (VCIA):** those that meet BOTH criteria 1 AND 2.
- **Veterinary Highly Important antimicrobial agents (VHIA):** those that meet criteria 1 OR 2.
- **Veterinary Important antimicrobial agents (VIA)**: those that meet NEITHER criteria 1 OR 2.

Currently the general national AMU data is available in ANIMUSE platform where Kenya was ranked number 174 out of 265 participating countries with a total consumption of 27,766mg/kg biomass in 2023.

Kenya's AMC and AMU surveillance in animal health faces challenges due to absence of a national monitoring system for quantification of the data. This leads to scarce robust data, limiting the understanding of the trends and scope for these AMR drivers as well as hindering an accurate and comprehensive understanding of this issue.

Animal Health AMC and AMU Recommendations

- To enhance accuracy of the AMU data collected in the country, there is a need for the Veterinary Medicines Directorate to make it a mandatory requirement for the retail veterinary medicines outlets to submit specific AMU data.
- The Veterinary Medicines directorate in liaison with the Directorate of Veterinary Services to develop a national data collection and monitoring tool for AMC and AMU to make quantification and determination of purpose of use in livestock easier.
- Capacity building of veterinarians, para-vets, and agro-vet staff on record-keeping and reporting requirements for AMU.
- The VMD to review the importation of Nitrofurans as part of Veterinary antimicrobials for use, as it is not listed as a VIA and it is a critical antimicrobial in human health.

SECTION IV: ONE HEALTH INTERPRETATION AND KEY FINDINGS

The 2024 surveillance results confirm that AMR in Kenya is a cross-sectoral challenge requiring coordinated action.

- **Human health:** High levels of resistance to first line and critical antibiotics, particularly third-generation cephalosporins, fluoroquinolones, and carbapenems, continue to threaten treatment outcomes. The rise of MRSA highlights growing risks in hospital settings.
- **Animal health:** Widespread resistance to tetracyclines and other commonly used antimicrobials reflects heavy reliance on these drugs in food production. This threatens livestock productivity and poses risks for food safety and zoonotic transmission.
- **Environmental health:** The detection of resistant organisms and antimicrobial residues in surface water underscores the role of environmental contamination in emergence and spread of resistance.

Cross-cutting insights:

1. **AMC/AMU** patterns show an over-reliance on Watch and Reserve antibiotics in human health and continued heavy use of broad-spectrum antimicrobials in veterinary practice, diverging from WHO's AWaRe targets.
2. **Diagnostic Stewardship and Surveillance:** Strengthen diagnostic capacities and expand access to quality-assured microbiology services at all levels of the health system to continuously generate reliable AMR data
3. **IPC** remains inconsistent, with low hand hygiene compliance, gaps in medical device reprocessing, and weak surveillance of healthcare-associated infections.
4. **Governance and coordination:** National structures in place, county coverage expanding but still suboptimal; 21 out of 47 counties (45%). Reporting systems remain fragmented, and some sectors (e.g., environment and food systems) are under-represented.
5. **Awareness and regulation** remain insufficient, with limited public engagement and weak enforcement of antimicrobial sales and prescribing practices.

What this means for Kenya (Policy & Operations)

- **Stewardship first:** Rebalance consumption/use toward Access antibiotics; enforce prescription review and diagnostics-first pathways.
- **Prevent infections:** Fund IPC basics (hand hygiene, HAI surveillance, medical device reprocessing) in hospitals and biosafety/security in farms.
- **Regulate & monitor:** Enforce veterinary AMU rules; integrate AMR/AMC/AMU data streams; publish routine dashboards for all sectors.
- **Protect the environment:** Mandate pharmaceutical/hospital waste controls and routine residue monitoring in priority basins.

Sustainable containment requires an integrated One Health response under strong governance, supported by regulation, stewardship, and public engagement.

Conclusions and Recommendations

Kenya has laid strong One Health foundations for addressing AMR, evidenced by the expansion of surveillance to 30 sites spanning human, animal, and environmental health. Key milestones include the launch of the National Antibiotic Use Guidelines, the roll-out of the digital AMC surveillance system (KESAC), the strengthening and establishment of county-level AMR coordination structures, and the initiation of environmental monitoring. Together, these investments have generated robust evidence on resistance patterns, antimicrobial use, and consumption trends.

Despite these gains, findings from 2024 confirm that AMR remains an urgent public health, food security, and development challenge in Kenya. Resistance to commonly used antibiotics, including third-generation cephalosporins and fluoroquinolones, remains unacceptably high. Carbapenem resistance, though variable, is rising in critical pathogens, while methicillin-resistant *Staphylococcus aureus* (MRSA) continues to increase. In animal health, widespread resistance to tetracyclines and other commonly used antimicrobials threatens livestock productivity and food safety. Environmental surveillance further revealed antimicrobial residues and resistant organisms in water sources, highlighting the role of the environment as a reservoir for AMR.

Equally concerning are the trends in antimicrobial consumption and use. Point prevalence surveys and national consumption data confirm excessive reliance on Watch and Reserve antibiotics in human health, with limited adherence to WHO's AWaRe targets. In veterinary practice, heavy dependence on broad-spectrum antimicrobials continues, with weak enforcement of prudent use. Infection prevention and control systems remain under-resourced, with low hand hygiene compliance, inconsistent monitoring of healthcare-associated infections, and major gaps in safe medical device reprocessing.

These findings underscore that AMR containment requires urgent, coordinated, and sustained action. Kenya's next phase of response must prioritize:

1. Scaling up AMS and diagnostics across all sectors to reduce inappropriate use and strengthen prescription review.
2. Strengthening IPC/biosafety and security in both hospitals and farms, with targeted investment in infrastructure, training, and monitoring.
3. Enhancing regulation and enforcement to curb unregulated sales and misuse of antimicrobials in human and animal health.
4. Expanding and harmonizing surveillance systems, ensuring timely reporting and full integration of human, animal, and environmental data.
5. Investing in community awareness and behavior change, moving beyond professional circles to engage farmers, consumers, and the wider public.
6. Embedding AMR actions in county and national systems, ensuring sustainability through dedicated budgets and integration into health and development plans.

APPENDICES

Appendix I: Human Health Priority Pathogens Specimen Types and Antimicrobials

Target pathogens	Blood	CSF	Urine	Stool	Lower respiratory tract	Urethral, cervical, rectal, pharyngeal swabs
Acinetobacter spp.	●	●			●	
E. coli	●	●	●		●	
K. pneumoniae	●	●	●		●	
P. aeruginosa	●	●			●	
S. aureus	●	●			●	
S. pneumoniae	●	●			●	
N. meningitidis	●	●				
H. influenzae	●	●			●	
Salmonella spp. (non-typhoidal)	●	●		●		
S. enterica serovar Typhi	●			●		
S. enterica serovar Paratyphi A	●			●		
Shigella spp.				●		
N. gonorrhoeae						●

Appendix II: Priority Pathogens Specimen Types and Antimicrobials

Pathogen	Antimicrobial class	Antimicrobial agents that may be used for AST	
		Human Health	*Animal Health*
Escherichia coli and *Klebsiella spp.*	Sulfonamides and trimethoprim	Co-trimoxazole	Co-trimoxazole
	Fluoroquinolones	Ciprofloxacin or Levofloxacin	Ciprofloxacin, Enrofloxacin
	Second-generation	Cefuroxime	Cefazolin, Cefuroxime
	Third generation cephalosporins	Ceftriaxone or Cefotaxime and Ceftazidime	Ceftazidime
	Fourth generation cephalosporins	Cefepime	Cefepime
	Carbapenems	Imipenem or Meropenem	Imipenem or Meropenem
	Penicillins		Ampicillin (for *E. coli only)*
	Nitrofurans	Nitrofurantoin (for *E. coli only, isolated from urine*)	
	Beta-Lactam Combinations	Amoxicillin Clavulanate or Piperacillin-Tazobactam	Amoxicillin Clavulanate or Piperacillin-Tazobactam
	Aminoglycosides	Gentamicin, Amikacin	Gentamicin, Kanamycin, Neomycin, Streptomycin
	Tetracyclines		Tetracycline, Doxycycline
	Polymyxins	Colistin	Colistin
Acinetobacter spp.	Tetracyclines	Tigecycline or Minocycline	N/A
	Penicillin/β-lactamase inhibitor	Piperacillin-Tazobactam	
	Aminoglycosides	Gentamicin, amikacin	
	Third- generation cephalosporins	Ceftazidime	
	Fourth generation cephalosporins	Cefepime	
	Fluoroquinolones	Ciprofloxacin or Levofloxacin	
	Carbapenems	Imipenem or meropenem	

	Polymyxins	Colistin	
Staphylococcus aureus	Penicillinase-stable beta-lactams	Oxacillin or Cefoxitin	Oxacillin or Cefoxitin
	Glycopeptides		Vancomycin
	Penicillins		Ampicillin, Amoxicillin
	Sulfonamides and trimethoprim	Co-trimoxazole	Co-trimoxazole
	Lincomycin	Clindamycin	Clindamycin
	Tetracyclines	Tetracycline or Doxycycline	Tetracycline, Doxycycline
	Aminoglycosides		Gentamicin, Tobramycin
	Macrolides		Erythromycin
	Phenicols	NA	Chloramphenicol
Streptococcus pneumoniae	Penicillins	Penicillin G	N/A
	Penicillinase-stable beta-lactams	Oxacillin (screening for beta lactam resistance)	
	Second-generation Cephalosporins	Cefuroxime	
	Third generation Cephalosporins	Ceftriaxone or Cefotaxime	
	Macrolide	Erythromycin	
	Sulfonamides and trimethoprim	Co-trimoxazole	
Salmonella spp. *Salmonella typhi* *Salmonella paratyphi*	Penicillin with extended spectrum (only for *S. typhi and paratyphi*)	Ampicillin	Ampicillin
	Fluoroquinolones	Ciprofloxacin or Levofloxacin	Ciprofloxacin or Enrofloxacin
	Sulfonamides and trimethoprim	Co-trimoxazole	Co-trimoxazole
	Penicillins	Ampicillin	Ampicillin, Amoxicillin
	Macrolides	Azithromycin	Erythromycin

	Third generation Cephalosporins	Ceftriaxone or Cefotaxime, Ceftazidime	Ceftriaxone or Cefotaxime and Ceftazidime
	Polymyxins		Colistin
	Carbapenems (*Only for Salmonella spp.*)	Meropenem, Imipenem or Ertapenem	Meropenem, Imipenem or Ertapenem
	Amphenicols (only for *S. typhi and paratyphi*)	Chloramphenicol	Chloramphenicol
Shigella spp.	Sulfonamides and trimethoprim	Co-trimoxazole	
	Fluoroquinolones	Ciprofloxacin or Levofloxacin	
	Third-generation cephalosporins	Ceftriaxone or Cefotaxime	
	Macrolides	Azithromycin	
Pseudomonas aeruginosa	Fluoroquinolones	Ciprofloxacin or Levofloxacin	Ciprofloxacin or Enrofloxacin
	Aminoglycosides		Gentamicin, Amikacin
	Penicillin/β-lactamase inhibitor	Piperacillin-tazobactam	Piperacillin-tazobactam
	Third generation Cephalosporins	Ceftazidime	Ceftazidime
	Fourth generation Cephalosporins	Cefepime	Cefepime
	Carbapenems	Imipenem, Meropenem	Imipenem, Meropenem
	Polymyxins	Colistin	
Neisseria gonorrhoeae	Third generation Cephalosporins	Ceftriaxone	N/A
	Macrolides	Azithromycin	
	Aminoglycosides	Gentamicin	
	Fluoroquinolones	Ciprofloxacin	
Neisseria meningitidis	Penicillins	Penicillin G	N/A

	Fluoroquinolones	Ciprofloxacin	
	Third generation Cephalosporins	Ceftriaxone or Cefotaxime	
Hemophilus influenzae	Penicillins with extended spectrum	Ampicillin	N/A
	Combinations of penicillins including beta-lactamase inhibitors	Amoxicillin-clavulanic acid	
	Third generation Cephalosporins	Ceftriaxone, Cefotaxime	
	Sulfonamides and trimethoprim	Co-trimoxazole	
Enterococcus spp. (for active surveillance in poultry value chains)	Penicillins	N/A	Ampicillin, Penicillin
	Phenicols		Chloramphenicol
	Fluoroquinolones		Ciprofloxacin or Enrofloxacin
	Macrolides		Erythromycin, Tylosin
	Glycopeptides		Vancomycin
	Tetracyclines		Tetracycline, Doxycycline
Campylobacter spp. (for active surveillance in poultry value chains)	Fluoroquinolones	N/A	Ciprofloxacin
	Macrolides		Erythromycin
	Tetracyclines		Tetracycline, Doxycycline
Candida spp	Azoles	Fluconazole, Voriconazole	N/A
	Polyenes	Amphotericin B	
	Echinocandins	Caspofungin, Micafungin	
	Pyrimidine Analogues	Flucytosine	

Appendix III: AMR Surveillance Network Laboratories

	Surveillance site	County	Year enrolled
Human Health			
1	Bungoma CRH	Bungoma	2019
2	Nakuru CRH	Nakuru	2020
3	Coast General	Mombasa	2020
4	Kenyatta National Hospital	Nairobi	2020
5	Murang'a CRH	Murang'a	2019
6	Kitale CRH	Trans-Nzoia	2018
7	JOOTRH	Kisumu	2020
8	Machakos Level 5 Hospital	Machakos	2019
9	Malindi SCH	Kilifi	2019
10	Thika Level 5 Hospital	Kiambu	2018
11	Nyeri CRH	Nyeri	2019
12	Makueni CRH	Makueni	2022
13	Kenyatta University Teaching, Research and Referral Hospital	Nairobi	2022
14	Mater hospital	Nairobi	2024
15	Kakamega CRH	Kakamega	2022
16	Moi Teaching and Referral Hospital	Uasin Gishu	2019
17	Mbagathi Hospital	Nairobi	2023
18	Nairobi hospital	Nairobi	2024
19	Kisii Teaching and Referral Hospital	Kisii	2024
20	Mpshah hospital	Nairobi	2023
Animal Health			
21	National Veterinary Reference Laboratory	Nairobi	2018
22	Eldoret National Veterinary Laboratory	Uasin Gishu	2019
23	Karatina National Veterinary Laboratory	Kirinyaga	2019
24	Kericho National Veterinary Laboratory	Kericho	2019
25	Mariakani National Veterinary Laboratory	Kilifi	2019
26	Nakuru National Veterinary Laboratory	Nakuru	2019
27	University of Nairobi Veterinary Services Clinic	Nairobi	2019
28	KALRO - Veterinary Science Research Institute (VSRI)	Kiambu	2024
29	Kisii Satelite Laboratory	Kisii	2025
Environment Health			
30	Water Resources Authority (WRA) laboratories	Nairobi	2025

CRH – county referral hospital, SCH – subcounty hospital, JOOTRH – Jaramogi Oginga Odinga Teaching and Referral Hospital, KALRO - Kenya Agricultural and Livestock Research Organisation

Appendix IV: Active Pharmaceutical Ingredients Imported & Exported (2024) for Animal Health

API CATEGORY	API IMPORT QTY(Kg)	API EXPORT QTY (Kg)	AMC DATA
Tetracyclines	427,561.99	9,755.59	**417,806.41**
Beta-Lactams	54,022.08	1,057.52	**52,964.56**
Aminoglycoside	47,490.46	1,377.43	**46,113.03**
Sulfonamides	44,988.80	16,068.06	**28,920.74**
Macrolides	20,257.95	2,585.46	**17,672.48**
Polymyxins	1,276.43	0.00	**1,276.43**
Fluoroquinolones	1,258.09	0	**1,258.09**
Nitrofurans	50.80	0	**50.80**
Amphenicols	40.00	0	**40.00**
1st Gen Cephalosporin	35.11	12.00	**23.11**
Pleuromutilins	9.60	0	**9.60**
Phosphonic acids	6.40	0.00	**6.40**
3rd Gen Cephalosporin	4.22	0	**4.22**
Polypeptide antibiotics	0.01	0	**0.01**
TOTAL	**597,001.95**	**30,856.06**	**566,145.88**

Appendix V: List of Contributors

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REPUBLIC OF KENYA

National Antimicrobial Resistance Report 2025

Prepared by the National Antimicrobial Stewardship Interagency Committee (NASIC) Secretariat