ISSUE #3

AMR ALERT

A Quarterly Bulletin on AMR Surveillance in Nigeria

Theme: Building Comprehensive Surveillance and Stewardship Systems Across All Sectors for Nigeria's One Health AMR Response

BY: Management Sciences for Health (MSH)

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About AMR Alert

AMR Alert is a quarterly newsletter highlighting antimicrobial resistance (AMR) surveillance efforts in Nigeria led by Management Sciences for Health (MSH) in collaboration with key government stakeholders across the One Health sector and funded through the Fleming Fund Country Grant Cycle II. This edition showcases significant progress across the One Health spectrum, from strengthening laboratory quality systems and building research capacity to establishing comprehensive surveillance frameworks spanning human, animal, and environmental health sectors.

Through strategic partnerships with the Nigeria Centre for Disease Control and Prevention (NCDC), federal ministries, teaching hospitals, and diverse stakeholders, MSH has facilitated critical advances in surveillance infrastructure, data management systems, and stewardship programme development. The initiatives featured in this bulletin represent some of the ongoing coordinated, multi-sectoral approaches to combating AMR, ensuring that Nigeria's surveillance and response systems capture the full complexity of antimicrobial resistance across all sectors where antimicrobials are used and resistance develops.

Highlights from Quarter Three

Five-Day AMR Active Surveillance Training Workshop – NVRI, Vom

Due to the risks that AMR continues to pose as a global public health challenge, there is a need for accurate data collection, analysis and strong collaboration across human, animal and environmental health sectors. In response, a five-day intensive field and laboratory training workshop on AMR active surveillance was held at the National Veterinary Research Institute (NVRI) in Vom. The event was facilitated by MSH through the Fleming Fund Country Grant II, with close collaboration with the Federal

Ministry of Agriculture and Food Security, the Food and Agriculture Organization (FAO), and NVRI. Its goal was to strengthen surveillance capacity within Nigeria's animal health sector.

A total of 33 participants attended the workshop, representing six sentinel sites across the country.

The workshop focused on building the technical capacity of field and laboratory personnel involved in AMR surveillance within livestock, particularly cattle and poultry. Participants were trained in sampling design, data collection, biosecurity and biosafety, laboratory isolation and identification of priority pathogens, and safe packaging and transport of samples to national reference laboratories.

They learned proper methods for collecting, preserving and transporting samples, and reviewed livestock data to identify high-risk surveillance points such as farms, live bird markets and abattoirs. Practical sessions enabled them to culture, isolate and test bacterial samples for antimicrobial resistance, while additional modules addressed quality assurance, data integrity, AMR data management, reporting processes and stakeholder communication. Each participant developed an action plan outlining how to apply the skills acquired within their respective facilities.

They included scientists, data officers and heads of laboratories nominated by state Directors of Veterinary Services and veterinary teaching hospitals. The training combined lectures, discussions and practical sessions in both field and laboratory settings to equip participants with the necessary skills for the upcoming nationwide AMR surveillance initiative.

Field activities were conducted at the NVRI Livestock Investigation Department farm, where participants were grouped to collect faecal samples from cattle. The samples were then processed in the laboratory to identify key organisms including Salmonella, E. coli, Enterococcus and Campylobacter. These were analysed using both conventional microbiological methods and automated systems such as the VITEK machine, which helps identify microorganisms and test their antibiotic susceptibility.

The training produced notable outcomes. It significantly improved participants' knowledge and competence in AMR surveillance, as shown by higher post-training assessment scores. Participants gained a stronger understanding of their roles and responsibilities and developed greater confidence in applying surveillance protocols, biosafety measures and reporting standards.

The workshop successfully delivered practical, hands-on experience in field and laboratory work, improved coordination among sentinel sites, and supported the mapping of surveillance locations for cattle and poultry at state level. Teams were also formed and their roles clearly defined to facilitate smooth field operations. Importantly, collaboration between NVRI, FAO and the sentinel site representatives was reinforced to ensure consistent and reliable data collection.

However, some challenges were observed during the field visits. These included irregular use of personal protective equipment (PPE), inadequate sanitisation, poor sample handling, and weak compliance with farm biosecurity practices. Participants were advised to follow the national sampling protocols strictly, use appropriate protective clothing, maintain proper hygiene, improve animal handling techniques and implement clear farm entry and exit procedures. The need for humane treatment of animals and prevention of cross-contamination between farms was also emphasised.

To ensure sustainability, quarterly data quality assurance visits are planned across selected sentinel sites. Overall, the training represented an important milestone in improving Nigeria’s animal health AMR data and advancing the country’s contribution to the wider One Health response to antimicrobial resistance.

Nigeria Validates First-Ever Antimicrobial Use Surveillance Strategy for Plant Agriculture Sector

With support from the Fleming Fund, MSH in collaboration with key government actors, facilitated a landmark three-day validation workshop that finalised Nigeria's first Antimicrobial Use and Antimicrobial Resistance Surveillance Strategy and Protocol for Plant Agriculture. This achievement addresses a critical gap in Nigeria's antimicrobial resistance response framework, recognising that antimicrobial use in crop production poses significant risks to public health through environmental contamination and food chain transmission of resistant pathogens.

The validation workshop brought together 31 experts representing diverse sectors, including the Federal Ministry of Agriculture and Food Security, Federal Ministry of Environment, National Environmental Standards and Regulations Enforcement Agency (NESREA), Federal Ministry of Health, FDA, NAFDAC, Department of Veterinary and Pest Control Services, West and Central African Virus Epidemiology network, academia, and private sector representatives. This multidisciplinary participation ensured a comprehensive review incorporating perspectives from policy-makers, regulators, researchers, and agricultural practitioners.

The workshop aligned strategically with Nigeria's recently launched National Action Plan on AMR (NAP 2.0), which calls for sector-specific strategies combating antimicrobial resistance across human, animal, environmental, and agricultural sectors under the One Health approach. Antimicrobial resistance in agriculture threatens not only sustainable crop production and food security but also poses significant public health risks due to potential transfer of resistant pathogens through environmental pathways and food chains.

This validation exercise was therefore critical for establishing robust frameworks for monitoring and managing antimicrobial use in Nigeria's plant agriculture sector.
Prior to the validation workshop, there was a development of draft surveillance strategy and protocol documents by subject-matter experts, which underwent further rigorous expert review on 14 October 2024. The refined documents, incorporating feedback from extensive expert consultations, were presented at the validation workshop for final review and endorsement.

The workshop methodology combined structured presentations providing document overviews with intensive small-group document reviews, where participants analysed sections most relevant to their expertise. Group rapporteurs presented observations and revision suggestions in plenary sessions, allowing broader deliberations ensuring all insights were captured accurately whilst maintaining focus on enhancing document content.
Significant outcomes included finalising terminology definitions, with participants agreeing "antimicrobials" should be the preferred term over "antimicrobial pesticides," whilst ensuring crucial terms including antimicrobial pesticide, pest, pest management, botanicals, biopesticides, microbes, and microbial pest were clearly defined in the glossary. The documents were refined to align table of contents, ensure introductions covered both antimicrobial use and resistance, maintain consistent referencing styles, and incorporate viral and nematode diseases into disease classification tables. Sustainability sections were strengthened through explicit linkages to Sustainable Development Goals and National Growth and Development goals.

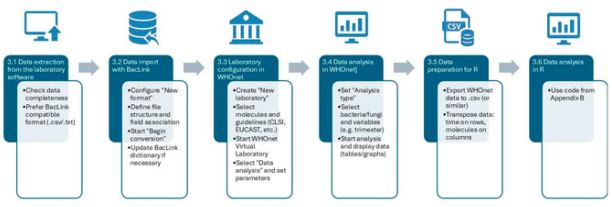
Notable was the significant contribution from the West and Central African Virus Epidemiology network and their Centre of Excellence for Transboundary Plant Pathogens. As key stakeholders operating three laboratories specialising in plant-related diseases, WAVE participated with three self-funded experts who played major roles in shaping discussions and outcomes. Their involvement strengthens future integration of reference services for antimicrobial resistance surveillance in the plant sector, demonstrating proactive inclusion of critical players for future implementation.

Both documents—the Antimicrobial Use and Resistance Surveillance Strategy for Plant Agriculture and the Antimicrobial Use Protocol for Plant Agriculture—were unanimously validated by all participants. This represents Nigeria's commitment to comprehensive One Health approaches addressing antimicrobial resistance, ensuring plant agriculture plays proactive roles in reducing AMR risks whilst supporting sustainable agricultural practices protecting public health and food security.

Using WHONET to Strengthen Antimicrobial Resistance Surveillance: Training Highlights from Lagos, Nigeria

Robust surveillance systems are therefore vital for effectively managing and combating AMR in countries with high burdens, like Nigeria. Recognising the importance of a standardised approach to AMR surveillance, a four-day training workshop was held from October 28 to 31, 2024, in Lagos, Nigeria. This training, facilitated by MSH with support from the Nigeria Centre for Disease Control and Prevention (NCDC), brought together 23 participants from 10 health facilities, aiming to enhance their knowledge and practical skills in utilising WHONET for high-quality AMR data management.

The four-day training program was structured to gradually build participants' expertise in WHONET, a software designed for managing and analysing microbiology laboratory data with a specific focus on AMR across all One Health (OH) sectors. Day one covered the basics of WHONET setup, data management principles, and the importance of accurate AMR data collection. Day two focused on data entry practices, lab configuration, and introducing data standards essential for AMR surveillance. On day three, participants learnt advanced data analysis techniques, explored resistance profiles, and learnt how to identify alerts for emerging patterns. In a hands-on session, participants applied these techniques to their facility data, reinforcing their understanding. Day four featured an in-depth session on Backlink, focusing on data conversion, quality checks, and GLASS reporting guidelines. Additionally, the Antimicrobial Resistance Information System (AMRIS) was introduced, showcasing its capabilities for data collation and dashboard analysis.



The training resulted in a 10% increase in participants' knowledge, as measured by pre- and post-training assessments. Participants gained the skills to generate, analyse, and report high-quality AMR data using WHONET. Many committed to step-down training in their facilities, routine data entry and analysis, and advocating for WHONET's use. A WhatsApp platform was created to facilitate post-training communication and support among data officers. Optimistically, 75% of participants found the training highly relevant and the resources helpful. Facilities renewed their commitment to using WHONET for data entry and pledged to share data quarterly, fostering a standardised approach to AMR surveillance.

To sustain and expand the impact of the training, several measures are recommended by participants, which have been noted for consideration by MSH. First, refresher training sessions should be organised to advance participants' skills from intermediate to advanced levels. Ensuring interoperability between WHONET and other Laboratory Information Management Systems (LIMS) will further streamline data processes.

Quarterly data quality assurance visits to select sites are planned, along with the provision of timely feedback to facilities. Facilities are encouraged to maintain routine data entry and share data by the fifth day of the subsequent quarter. By adhering to these recommendations, the use of WHONET and the quality of AMR surveillance in Nigeria will significantly improve, contributing to global efforts in combating AMR.

Fleming Fund QMS Mentorship Program Across Four Teaching Hospital Laboratories

Intensive QMS mentorship programs were conducted across four major Nigerian teaching hospitals: the Federal Teaching Hospital Owerri, the University of Port Harcourt Teaching Hospital (UPTH), the University of Maiduguri Teaching Hospital (UMTH), and the Usmanu Danfodiyo University Teaching Hospital (UDUTH) in Sokoto. The mentorship programs, spanning 10-15 days per facility between February and March 2025, combined virtual and onsite engagement to build sustainable quality management systems aligned with ISO 15189:2022 standards and SLIPTA (Stepwise Laboratory Quality Improvement Process Towards Accreditation) guidelines.

The mentorship employed a blended approach combining virtual sessions (Zoom, WhatsApp, Google Drive) with intensive onsite training, facility tours and hands-on document development. Mentors worked directly with quality teams to develop Standard Operating Procedures (SOPs), conduct internal audits, and build staff capacity. Critical to sustainability, deputization systems were established for all key positions, ensuring continuity beyond the mentorship period.

Activity Impact by Numbers

- 4 major healthcare facilities receiving intensive mentorship
- 100+ staff members trained in QMS principles
- 30-45 nonconformities addressed per facility in first quarter (30-33% achievement rate)
- Target: ISO 15189 accreditation by December 2025

At **Federal Teaching Hospital Owerri,** the March 2-14, 2025 mentorship period marked a significant turning point in the laboratory's quality journey. The facility successfully developed a comprehensive Quality Manual with SMART objectives and quality policies, established a robust document control system with unique identification numbers and version control, and created essential tools including impartiality and confidentiality forms signed by all staff. The laboratory appointed Quality Team Officers with Terms of Reference and formal deputization letters, ensuring sustainability.

Notably, the facility inaugurated its first Antimicrobial Stewardship (AMS) Committee on March 12, 2025, and reconstituted a previously passive Infection Prevention and Control Committee. Staff training on document development and control systems, alongside the creation of technical SOPs for bench work, positioned the laboratory firmly on the path toward ISO 15189 accreditation.

The University of Port Harcourt Teaching Hospital (UPTH) achieved remarkable progress during its February-March 2025 mentorship, developed comprehensive documentation across all six SLIPTA core sections, including policies on impartiality, confidentiality, conflict of interest, deputization, personnel management, competency assessment, and performance reviews.

CMD engagement was secured, with leadership pledging full support for achieving accreditation goals. The facility also established customer complaint management systems, internal audit procedures, and equipment management protocols, all of which are critical elements for sustained quality improvement.

The University of Maiduguri Teaching Hospital (UMTH) demonstrated exceptional commitment during the March 2-14, 2025 mentorship period. Despite challenges including Ramadan fasting schedules and staff absences for MSH training, the team achieved 33% deliverables (14 of 42 nonconformities) within the first quarter. Key accomplishments include establishing legal entity documentation (Decree 10 of 1985), creating mission and vision statements, developing MSDS (Material Safety Data Sheets), defining QMS objectives, producing an updated organizational chart with deputies, and implementing floor plans with proper workflow demarcation.

The facility also developed critical policies on purchasing and inventory management, authorization matrices, routine personnel meetings, equipment management, and patient preparation protocols. Management support was evident through approval of necessary stationary materials and providing air-conditioned seminar facilities with projection equipment.

At **UDUTH Sokoto,** the laboratory's compliance improved dramatically from a baseline audit score of just 8.7% (32 out of 367 points) to addressing 45 nonconformities through intensive 15-day virtual and onsite mentorship (March 7-21). The program successfully established foundational systems including document control with hyperlinked master logs accessible via shared Google Drive, personnel management with complete deputization structures for resilience, equipment verification protocols, and quality indicators with monitoring scheduled for March's final week.

Across all facilities, the common target remains achieving ISO 15189 accreditation by December 2025, with continuous quality improvement embedded through regular internal audits, quality indicator monitoring, proficiency testing programs, and strengthened management commitment to laboratory quality excellence. This initiative therefore represents a critical investment in Nigeria's healthcare infrastructure, directly contributing to the national action plan for antimicrobial resistance while strengthening laboratory quality systems that will benefit patient care for years to come.

Three-Day Workshop on Reference Service Provision for National Reference Laboratories (NRLs)

National Reference Laboratories (NRLs) play a crucial role in Nigeria's fight against antimicrobial resistance (AMR) by supporting surveillance, diagnosis and research. To strengthen their capacity and ensure consistent, high-quality operations, a three-day technical review workshop was held from 11–13 December 2024 at Golden Dabras Hotel, Keffi, Nasarawa State. The event brought together experts to review and finalise *the Operational Guidelines for Reference Laboratory Services in the National AMR Network*.

The workshop was organised to prepare NRL staff for providing standardised reference services to sentinel sites within Nigeria's AMR programme. It was supported by the Nigeria Centre for Disease Control and Prevention (NCDC), the Federal Ministry of Agriculture and Food Security, the World Health Organisation (WHO), and the Fleming Fund Country Grant (FFCG II) implemented by Management Sciences for Health (MSH).

Ten technical experts participated, representing sentinel sites, academia, development partners, NCDC and WHO. Participants joined in different capacities; some attended physically, others reviewed remotely or contributed virtually. The review process was interactive and collaborative, involving detailed discussions led by the consultant, Dr Sabitu Zainu, who presented the draft guidelines and collated feedback from remote reviewers.

The meeting began with opening remarks from Dr Tochi Okwor, Chair of the AMR Coordinating Committee, who emphasised adopting a One Health approach that includes human, animal and environmental health. Over the three days, participants systematically reviewed the entire document, discussing its structure, content and alignment with global standards. Following extensive deliberations, the title *Operational Guideline for Reference Laboratory Services in the National AMR Network* was agreed upon.

During the review, participants examined sections covering the roles and functions of NRLs, capability requirements, and implementation strategies for reference services. They highlighted the need for standardised operating procedures aligned with the Global AMR Surveillance System (GLASS) standards, regular review and dissemination of SOPs, and the use of WHONET software for data reporting. Participants also discussed procedures for sample submission, transport, storage, diagnostic stewardship, and quality management systems.

Key discussions focused on ensuring the guidelines are practical, comprehensive and easy to apply, so they can help operationalise existing AMR policies in Nigeria. The team agreed that the guidelines must clearly define the objectives, scope, infrastructure needs, laboratory roles, training requirements and data management processes necessary for effective AMR surveillance.

By the end of the workshop, the document was thoroughly reviewed, finalised and endorsed by all participants. The group expressed satisfaction with the progress made and commended the collaborative spirit that characterised the discussions. Dr Okwor, in her closing remarks, appreciated the experts for their commitment and confirmed that the finalised document would be shared with WHO for international technical review and recognition.

Although the allocated time was limited, the team worked extended hours to complete the review successfully. The consultant was tasked with harmonising all inputs and sharing the final version with the review team for concurrence.

The next steps include training NRL and sentinel site staff on applying and implementing the guidelines, disseminating the document to relevant authorities, and using future training sessions to develop standardised SOPs.

The successful review and finalisation of the Operational Guidelines for Reference Laboratory Services mark a key step in strengthening Nigeria's AMR surveillance system and ensuring consistent, high-quality reference laboratory support nationwide.

MSH Facilitates Development of National AMR Response Tool: Antimicrobial Consumption Surveillance Framework Validated

MSH successfully facilitated a five-day validation workshop in collaboration with NCDC, that finalised Nigeria's National Antimicrobial Consumption (AMC) Surveillance Strategy and Protocol in Human Health Sector with an accompanying Accountability Framework. This milestone strengthens Nigeria's AMR response addressing escalating resistance threats to public health and healthcare delivery.

Global antimicrobial consumption increased 46% between 2000-2018, with low-middle income countries experiencing 76% increase. Direct relationships exist between antibiotic consumption volumes and bacterial resistance prevalence, making monitoring imperative for mitigating resistant pathogen development. Despite WHO GLASS monitoring global patterns, Nigeria had not submitted AMC data, a gap this strategy addresses.

The validated framework provides comprehensive guidance for monitoring antimicrobial consumption patterns essential for directing use throughout Nigeria's healthcare system. MSH ensured alignment with One Health AMR National Action Plan 2.0 recommending national reporting systems for antimicrobial imports, manufacturing, hospital use (public/private), and community pharmacy sales. The strategy guides AMC surveillance in public hospitals with collected data informing AMR response strategies and antimicrobial stewardship policies nationwide. The surveillance protocol provides standardized methodology using WHO AMC surveillance templates and ensures data submission to National AMCS Team for collation, validation, analysis, and reporting. Importantly, it also supports the integration of One Health data into National AMR Information System for WHO GLASS submission, enabling Nigeria's global AMR surveillance participation, including publicly accessible dashboards enhancing transparency.

The strategy document development was a rigorous process involving detailed review of existing literature and careful alignment with the One Health Antimicrobial Resistance National Action Plan 2.0. To ensure conformity with global reporting standards, there was strict adherence to the GLASS methodology for surveillance of national and hospital antimicrobial consumption and management of antimicrobial consumption data published in 2020.

There was also an extensive stakeholder engagement throughout the development process to ensure inclusiveness and institutional buy-in, organizing the validation workshop where diverse stakeholders provided feedback that were incorporated into the final version.

This system will provide baseline measurements of antimicrobial consumption volume and patterns in facilities, establish benchmarks for monitoring trends and assessing the impact of AMS interventions, and detect variations in AMC patterns that may signal abuse requiring investigation and intervention. Additionally, the framework will guide facility procurement planning and practices, explore relationships between AMC and AMR trends, provide means for comparison across healthcare facilities, and serve as an awareness and advocacy tool among management, prescribers, and healthcare facility members promoting rational antimicrobial use.

Next steps include supporting harmonization of AMCS documents from other stakeholders in the One Health sectors to ensure alignment with NAP 2.0 and WHO GLASS standards. MSH will continue to work closely with NCDC and relevant national authorities for the formal adoption and launch of the validated documents, as well as to organize periodic training and workshops for all stakeholders to ensure proper implementation, alongside supporting activation of monitoring and evaluation systems to track progress toward stated objectives. Additionally, the team will advocate for the development of dedicated budget lines and the incorporation of AMCS processes into standard operating procedures of relevant agencies and institutions, including their key performance indicators, to ensure sustainability.

Establishing Standardized Antimicrobial Use Reporting System for Nigeria's Animal Health Sector

MSH organized a two-day planning meeting (November 27-29, 2024, Lagos) with Federal Ministry of Agriculture and Food Security optimizing WOAH ANIMUSE platform reporting.

This workshop addressed critical gaps in Nigeria's AMR response by establishing standardised antimicrobial use data collection systems from animal health sectors, supporting One Health approaches to combating drug-resistant infections.

WOAH's eighth annual report revealed concerning trends: America and Europe showed decreased antimicrobial usage while Africa experienced increased consumption. Nigeria reports to WOAH since 2017 using NAFDAC data but required enhanced mechanisms for comprehensive distribution chain data capture informing effective interventions and policy decisions.

The planning workshop brought together diverse stakeholders representing complete antimicrobial distribution spectrums including Federal Ministry representatives, Nigeria Agricultural Quarantine Service, NAFDAC, academia, private veterinary practitioners, and farmers. This multidisciplinary engagement incorporated perspectives from manufacturers, importers, distributors, clinics, hospitals, and end-users creating comprehensive, implementable frameworks.

The facilitation focused on four objectives in alignment with NAP 2.0 Strategic Objective Five improving antimicrobial access and optimizing use across One Health sectors:

enhancing WOAH ANIMUSE reporting, mapping distribution channels manufacturer-to-user, developing standardized collection forms for stakeholders, and establishing field-to-center reporting pathways. Through structured presentations, group work sessions, and plenary discussions, participants collaborated to design practical, implementable solutions.

The facilitation focused on four objectives in alignment with NAP 2.0 Strategic Objective Five improving antimicrobial access and optimizing use across One Health sectors: enhancing WOAH ANIMUSE reporting, mapping distribution channels manufacturer-to-user, developing standardized collection forms for stakeholders, and establishing field-to-center reporting pathways. Through structured presentations, group work sessions, and plenary discussions, participants collaborated to design practical, implementable solutions.

Workshop presentations covered NAP 2.0 Strategic Objective Five's nine intervention areas and twenty-eight activities, NAFDAC's veterinary medicinal product processes, eighth WOAH report analysis showing tetracycline as most-used critically important antimicrobial in animals, and marketing/sales channel examinations.

These presentations provided participants with essential context for understanding the complexity of antimicrobial distribution and the importance of accurate data collection.

Key Deliverables: The workshop enabled the participants to develop a comprehensive distribution channel map representing antimicrobial flows from manufacturers/importers through distributors to clinics, hospitals, farms. Mapping clarified data collection touchpoints and identified responsible stakeholders. Most importantly, was the deployment of four unique user-friendly forms tailored to distribution chain actors: two for veterinary hospitals/clinics/farms capturing administration-point use data; two for importers/manufacturers/distributors documenting supply data. These standardized forms ensure consistency in data collection across the sector while remaining simple enough to encourage compliance and accurate reporting.

The workshop's strategic outcomes extend beyond immediate deliverables to establish a sustainable framework for ongoing AMU surveillance. MSH worked with stakeholders to identify next steps including organizing targeted meetings with various stakeholder groups to secure buy-in and commitment to the new reporting system, conducting sensitization workshops for veterinary hospitals, clinics, and farmers to familiarize them with the WOAH ANIMUSE system's importance and functionality, implementing baseline studies to gather data on current distribution channels and establish benchmarks for measuring improvement, and developing aggressive media awareness campaigns to educate the public and professionals about AMR threats and the critical role of data in combating resistance.

MSH coordination with Federal Ministry through Veterinary and Pest Control Services ensures systematic engagement with state-level veterinary services to obtain comprehensive lists of farms and veterinary clinics. Collaboration with the Veterinary Council of Nigeria will provide access to registries of licensed veterinary premises, while partnerships with farmer associations will enable direct engagement with livestock producers. MSH will also coordinate with the Livestock Productivity and Resilience Support Project (L-PRES) to access updated farm registries, ensuring comprehensive coverage of antimicrobial use points. This advancement positions Nigeria generating quality AMU data informing evidence-based policies, guiding stewardship programs, contributing meaningfully to global surveillance strengthening One Health AMR responses.

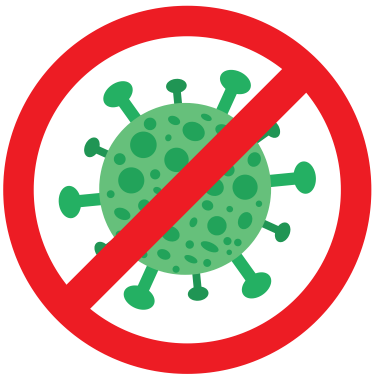
Strengthening Environmental Health Systems: National Laboratory Assessment Establishes Foundation for AMR Detection

A comprehensive baseline assessment of antimicrobial resistance surveillance capacity within the environmental health sector, focusing on the National Environmental Reference Laboratory operated by the National Environmental Standards and Regulations Enforcement Agency (NESREA) in Port Harcourt, Rivers State; represents a critical step in addressing AMR through a One Health approach.

Environmental factors play a crucial role in AMR transmission, as antimicrobial residues discharged into water bodies and soil facilitate the spread of resistant bacteria across ecosystems. Nigeria's One Health AMR National Action Plan 2.0 recognises the need for surveillance across all sectors, yet environmental AMR surveillance remains underdeveloped compared to human and animal health systems. Therefore, this assessment employed a standardised tool evaluating five main pillars of AMR surveillance systems, including governance, epidemiology unit capacity, laboratory capabilities, communications infrastructure, and sustainability mechanisms. External and national assessors worked collaboratively with laboratory staff to generate baseline data on AMR detection capacities and surveillance system functionality. The evaluation focused specifically on the laboratory's ability to detect antimicrobial resistance in environmental samples, analyse data, and disseminate information for public health decision-making.

The laboratory demonstrated strengths, including environmental sample analysis specialisation, industry collaboration on interventions, and chemical analysis platforms valuable for residue research. These capabilities provide foundations for enhanced surveillance systems. Roles extend beyond testing to field sampling/analysis, data generation/management, compliance monitoring, revenue generation, research opportunities, policy support, and capacity-building. However, significant gaps were identified which require urgent attention. These include the need for functional basic bacterial identification and antimicrobial susceptibility testing equipment, as well as essential reagents and antibiotic molecules, relevant guidelines and SOP, proper documentation, bacterial archiving systems, training on proficiency testing, data sharing and molecular characterisation capabilities, among other challenges.

A comprehensive improvement action plan was developed targeting advancement to core level capacity. Priority actions include enhancing laboratory resources through equipment procurement, reagent supplies, and standardised bacteriological methods with regularly updated antibiotic panels and systematic data archiving. Infrastructure improvements encompass installing backup power systems, implementing power surge protection, and establishing robust data management tools, including Laboratory Information Management Systems. The plan emphasises developing and implementing standard operating procedures for bacterial identification and antimicrobial susceptibility testing aligned with international standards, establishing quality control measures including the use of reference strains, and initiating the laboratory accreditation process. Also included in the detailed improvement plans are capacity-building initiatives focused on conducting comprehensive training in microbiology, antimicrobial susceptibility testing, AMR surveillance principles, molecular diagnostic tools, and quality control procedures. The plan includes establishing partnerships with advanced AMR laboratories for knowledge exchange and technical support, participating in proficiency testing programs to ensure result reliability, and creating systems for archiving bacterial isolates and AST data. Communication strategies emphasise developing risk assessment protocols, establishing formal links between laboratories and national epidemiology units, and implementing mechanisms for timely data sharing with relevant stakeholders.



The assessment's significance extends beyond identifying gaps to providing a concrete roadmap for establishing functional environmental AMR surveillance in Nigeria. Environmental monitoring represents a critical but often overlooked component of comprehensive AMR response strategies. As such, by detecting antimicrobial residues and resistant microorganisms in water, soil, and other environmental matrices, surveillance systems can identify contamination sources, track resistance dissemination pathways, and inform interventions targeting environmental transmission routes in Nigeria.

Bridging the Private Sector Gap for a Comprehensive National AMR Surveillance and Response

MSH in collaboration with government and private stakeholders in the One Health sector, facilitated a two-day validation workshop that finalised comprehensive antimicrobial stewardship strategies for engaging Nigeria's private sector in both human and animal health. This strategic initiative recognises that previous interventions have focused predominantly on public sector facilities despite the majority of Nigerians accessing healthcare services through private providers.

The private sector's role in antimicrobial resistance surveillance and stewardship is essential for several compelling reasons. In Nigeria, as in most sub-Saharan African countries, a majority of the population accesses healthcare from private sector facilities rather than public institutions, making private sector engagement indispensable for comprehensive AMR surveillance coverage.

Private healthcare providers, veterinary clinics, pharmacies, and agricultural suppliers represent frontline points where antimicrobials are dispensed and used, yet these entities have largely operated outside formal AMR surveillance networks.

Without private sector inclusion, national surveillance systems capture only a fraction of antimicrobial consumption patterns, leaving significant blind spots in understanding resistance trends and transmission dynamics.

The animal health dimension of the private sector also engagement carries particular urgency. Development of drug resistance affecting humans increasingly stems from irrational antimicrobial use in animals, with resistant bacteria transmitted through consumption of animal-origin foods, including meat, milk, and eggs. Private veterinary practitioners, animal feed suppliers, and livestock farmers frequently use antimicrobials without adequate stewardship guidance, contributing to resistance selection pressures that ultimately affect human health through environmental contamination and food chain transmission.

The validation workshop convened diverse stakeholders representing the complete spectrum of private sector engagement in antimicrobial use and healthcare delivery. Participants included representatives from the NCDC serving as the national AMR coordination hub, government ministries and regulatory agencies responsible for

health and agriculture policy, professional and commercial associations representing private healthcare providers and veterinary practitioners, universities and research institutes contributing scientific expertise, and international agencies supporting Nigeria's AMR response efforts.

This multidisciplinary composition ensured that strategies developed reflected practical implementation realities across different private sector contexts while maintaining alignment with national public health objectives.

The workshop methodology combined plenary presentations with intensive small group work to thoroughly review and refine draft strategy documents. Opening sessions provided participants with comprehensive overviews of the national antimicrobial resistance surveillance network, progress toward implementing Nigeria's National Action Plan on AMR supported by the Fleming Fund, and the rationale for developing private sector-specific engagement strategies. Following plenary presentations on the draft strategies for both human and animal health sectors, participants divided into focused working groups to conduct detailed reviews of strategy documents, examining implementation feasibility, identifying potential barriers, proposing modifications to enhance effectiveness, and ensuring alignment with existing regulatory frameworks and professional standards.

The workshop produced two major validated deliverables that will guide Nigeria's expanded AMR response. First, comprehensive strategy documents for engaging the private sector in human health were finalised, providing detailed frameworks for enrolling private hospitals, clinics, diagnostic laboratories, and pharmacies in national AMR surveillance networks.

Second, parallel strategy documents for engaging the private sector in animal health were validated, addressing veterinary clinics and hospitals, livestock farms and agricultural enterprises, animal feed manufacturers and suppliers, and pharmaceutical distributors serving animal health markets.

Critically, the workshop also reviewed and refined draft memoranda of understanding that will formalise partnerships between the national AMR coordination mechanisms and private sector entities. Participants recognised that adapting previously existing MOU frameworks along their governance structures to accommodate private sector peculiarities represented a more pragmatic approach than developing entirely new documents.

Above all, these validated strategies represent paradigm shifts in Nigeria's AMR response systematically incorporating private facilities that will capture more complete, representative consumption pattern data, resistance trends, and stewardship intervention effectiveness. Thus, enabling accurate burden assessments, informed policy decisions, targeted interventions, and meaningful national and global surveillance contributions.

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