Webinar Report

Act Now: Protect Our Present, Secure Our Future

Spotlight on Nigeria

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Event Series: World Antimicrobial Awareness Week (WAAW) 2025
Organizer: The AMR Knowledge Hub and Community of Practice, The Global Health Network Nigeria
Language: English
Objective: To provide a platform for sharing ideas and discussing immediate actions needed to address antimicrobial resistance in Nigeria, drawing on global lessons and local innovations

Event Leadership

Chair
Godwin Pius Ohemu, Hub and Media Coordinator, The Global Health Network Nigeria

Opening Remarks
Dr. Azuka Rafael, Steering Committee Coordinator, The Global Health Network Nigeria (representing the Country Centre Coordinator)

Scribe
Nana Osei Bonsu, AfOx Ubuntu Fellow, The Global Health Network

Expert Panel

- Prof. Kome Otokunefor, Molecular and Pathogenic Microbiologist, University of Port Harcourt
- Ugonna C. Morikwe, PhD Candidate, Applied Science and Technology, North Carolina Agricultural and Technical State University, USA
- Dr. Chizaram Onyeaghala, Infectious Diseases Physician, University of Port Harcourt Teaching Hospital

Session Overview

Godwin Pius Ohemu opened the webinar by welcoming participants joining from different time zones across Nigeria and internationally, acknowledging the global relevance of antimicrobial resistance while maintaining a focused examination of Nigeria's specific challenges and opportunities. The session was designed to provide a collaborative platform for sharing ideas, examining evidence-based strategies, and discussing how to protect the present while securing the future through immediate, coordinated action.

Dr. Azuka Rafael delivered the opening remarks, welcoming participants to the 2025 World Antimicrobial Resistance Awareness Week under the theme **"Act Now: Protect Our Present, Secure Our Future – Spotlight on Nigeria."** He outlined the programme structure, which would proceed through a series of expert presentations examining global lessons, technological innovations, and current realities, followed by an interactive question-and-answer session and closing remarks.

Key Presentations

1. Global Lessons for Nigeria: What We Can Learn from AMR Success Stories

Presenter: Prof. Kome Otokunefor, Molecular and Pathogenic Microbiologist, University of Port Harcourt

Defining the AMR Challenge

Prof. Otokunefor began by establishing a clear definition of antimicrobial resistance: the ability of microorganisms to withstand the action of antimicrobial agents, rendering antibiotics and other antimicrobials ineffective for treating infections. A critical observation was that resistance often develops rapidly following the introduction of new antimicrobial drugs, sometimes within years or even months, demonstrating the remarkable adaptability of microbial populations under selection pressure.

The presentation emphasized that antimicrobial use spans multiple interconnected domains including human medicine, animal health, and environmental applications. In animal production systems, antimicrobials serve three primary purposes: treatment of clinical infections, prophylactic prevention of disease in healthy animals, and promotion of growth and feed efficiency. This widespread use across sectors reinforces the fundamental need to address AMR through comprehensive One Health approaches that recognize and respond to the interconnected nature of human, animal, and environmental health.

Global Intervention Frameworks

Prof. Otokunefor outlined comprehensive global intervention strategies to address AMR:

Core Strategic Components

- **Surveillance systems:** Systematic monitoring of resistance patterns and antimicrobial use
- **Antimicrobial stewardship programmes:** Optimizing antimicrobial use while minimizing resistance development
- **Infection prevention and control measures:** Reducing infection incidence to decrease antimicrobial need

- **Policy and regulation:** Establishing governance frameworks for antimicrobial access and use
- **Research and innovation:** Developing new diagnostics, therapeutics, and alternative approaches
- **International collaboration:** Coordinating responses across borders and sectors

WHO Global Action Plan

The WHO Global Action Plan on AMR was presented as the foundational international framework, focusing on five strategic objectives:

1. Improving awareness and understanding of AMR among professionals and the public
2. Strengthening surveillance and research to build the evidence base
3. Reducing infection incidence through improved prevention and control
4. Optimizing antimicrobial use across all sectors
5. Ensuring sustainable investment in AMR response infrastructure

Aligned Action Plans

Prof. Otokunefor noted that complementary action plans developed by the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (WOAH) share core priorities with the WHO framework, including responsible antimicrobial use, good governance structures, capacity building at all levels, and meaningful stakeholder engagement across sectors.

Practical Intervention Examples

Concrete interventions cited included structured training programmes for healthcare workers and veterinarians, systematic hand hygiene initiatives in healthcare and food production settings, improved control of antibiotic prescribing through regulation and stewardship, integration of surveillance systems across human and animal health, public awareness campaigns targeting consumers and professionals, and enhanced waste management to reduce environmental contamination with antimicrobials and resistant organisms.

Evidence of Policy Impact

Prof. Otokunefor presented compelling evidence demonstrating the impact of national policies on antimicrobial consumption patterns.

O'Neill Report Findings (2025)

Analysis showed that countries with strong, well-implemented National Action Plans recorded significantly lower antibiotic consumption rates compared to countries without such

plans. A particularly notable pattern emerged following the COVID-19 pandemic period, where countries lacking coordinated AMR strategies experienced substantially higher antibiotic consumption increases, likely reflecting uncontrolled use during pandemic response efforts.

Lancet Study (2025)

Recent data demonstrated measurable reductions in defined daily doses (DDDs) per 1,000 inhabitants, with the most substantial declines occurring in high-income countries that have invested in stewardship infrastructure, surveillance systems, and regulatory enforcement over sustained periods.

WOAH Data on Animal Health

Global data from the World Organization for Animal Health indicated overall reductions in antimicrobial use in food animal production worldwide. However, critical regional variations exist, with substantially higher antimicrobial use levels persisting in parts of Asia and Africa compared to Europe, where regulatory restrictions and stewardship programmes have been implemented more comprehensively and over longer timeframes.

Country-Specific Success Stories

Prof. Otokunefor shared detailed case studies demonstrating how sustained policy action translates into measurable health outcomes.

Sweden: Comprehensive Regulatory Approach

Sweden emerged as an exemplar of successful AMR containment through integrated policy interventions:

Regulatory Measures

- Complete ban on antibiotic growth promoters in animal agriculture
- Strict restrictions on the use of critically important human antibiotics in veterinary medicine
- Mandatory veterinary prescription for all animal antimicrobial use

Health Outcomes
These measures contributed to dramatic reductions in penicillin resistance, declining from 10% to just 1% over the implementation period.

Success Factors

- Rigorous infection control protocols in healthcare and food production
- Zero tolerance policies for bacterial contamination in food systems

- Strong legislative frameworks with consistent enforcement
- Long-term, systematic data generation enabling evidence-based refinement
- Transparent public information sharing building societal support
- Continuous surveillance providing early warning of emerging threats

Germany: Veterinary Antimicrobial Reduction

Germany achieved a remarkable 57% reduction in veterinary antimicrobial use between 2011 and 2018 through a coordinated national strategy combining regulatory measures, voluntary industry commitments, surveillance systems, and targeted interventions in high-use sectors.

Japan: Healthcare Stewardship

Japan demonstrated substantial reductions in defined daily doses across several major antibiotic classes through comprehensive implementation of antimicrobial stewardship programmes in healthcare facilities, enhanced national surveillance systems, sustained public awareness campaigns, and systematic infection prevention and control in hospitals and long-term care facilities.

India: Tertiary Hospital Interventions

A success story from India illustrated the impact of targeted stewardship interventions in tertiary hospitals, achieving measurable reductions in antibiotic prescription rates, patient exposure to broad-spectrum agents, and inappropriate antimicrobial use through structured programmes combining education, audit and feedback, and prescribing guidelines.

Nigeria's Current Situation and Path Forward

Prof. Otokunefor concluded by examining Nigeria's position in the global AMR response landscape.

Current Achievements

- Enrollment in WHO's Global Antimicrobial Resistance and Use Surveillance System (GLASS)
- Implementation of National Action Plan 2.0 covering the period 2024–2028
- Engagement of selected reference laboratories in surveillance activities
- Development of standardized operating procedures for AMR monitoring

Critical Lessons for Nigeria

Drawing from international success stories, several essential requirements were identified:

1. **Political will:** Sustained high-level commitment beyond document development

2. **Improved funding:** Adequate, predictable financing for implementation
3. **Multisectoral collaboration:** Genuine coordination across human health, animal health, agriculture, and environment
4. **Programme expansion:** Scaling from pilot sites to national coverage
5. **Increased awareness:** Building understanding among professionals and the public
6. **Sustained momentum:** Maintaining focus and resources over the long timeframes required for impact

Key Takeaways

- Resistance develops rapidly after antimicrobial introduction, requiring proactive prevention
- Countries with strong National Action Plans demonstrate measurably lower antimicrobial consumption
- Sweden's comprehensive approach reduced penicillin resistance from 10% to 1%
- Sustainable investment and political commitment are more critical than technical plans
- Nigeria's National Action Plan 2.0 provides the framework, but implementation determines success

2. Harnessing Artificial Intelligence for AMR Surveillance in Nigeria

Presenter: Ugonna C. Morikwe, PhD Candidate, Applied Science and Technology, North Carolina Agricultural and Technical State University, USA

The Global and National AMR Burden

Morikwe opened by contextualizing antimicrobial resistance as a major contributor to global mortality, accounting for approximately 1.27 million deaths annually worldwide. Sub-Saharan Africa bears the heaviest burden of this crisis, experiencing disproportionately high mortality rates compared to other global regions.

Nigeria-Specific Context

High antimicrobial consumption in Nigeria was identified as a significant contributing factor to resistance development. A critical driver is the ease with which antibiotics can be obtained without prescription through pharmacies, patent medicine vendors, and informal markets, resulting in widespread self-medication and inappropriate use that accelerates resistance selection.

Current Surveillance Gaps

Despite the scale of Nigeria's AMR challenge, surveillance systems were characterized as fragmented and inadequately integrated. Current limitations include:

Data Silos

Clinical data, laboratory antimicrobial susceptibility testing results, genomic sequencing information, and environmental surveillance data exist in separate, non-interoperable systems, preventing comprehensive pattern recognition.

Limited Integration

Even where data exists, mechanisms for synthesizing information across sectors and sources remain underdeveloped, fragmenting understanding and delaying recognition of emerging threats.

Detection Delays

Emerging resistance patterns often remain undetected until resistant infections present clinically in healthcare facilities. By this point, resistant organisms may already be circulating widely in communities, animals, or environmental reservoirs.

These gaps fundamentally hinder Nigeria's ability to detect resistance trends early, respond proactively to emerging threats, and implement targeted interventions before resistance becomes widespread.

Artificial Intelligence as a Surveillance Solution

Morikwe presented artificial intelligence as a transformative tool for strengthening AMR surveillance by addressing current system limitations.

Key AI Applications

Machine Learning for Predictive Analytics

AI algorithms can analyze genomic sequences and epidemiological data to predict resistance trends, identify high-risk bacterial lineages, and forecast future resistance patterns based on historical data and current trends. This enables proactive rather than reactive responses.

Natural Language Processing

AI can extract structured information from unstructured clinical notes, laboratory reports, and medical records that would otherwise require labor-intensive manual review. This unlocks valuable data currently inaccessible for surveillance purposes.

Computer Vision Applications

Automated reading of antimicrobial susceptibility testing plates and microscopy images can standardize interpretation, reduce human error, increase throughput, and enable surveillance at scale without proportional increases in specialized laboratory personnel.

The AI Value Proposition

Critically, Morikwe emphasized that AI enhances rather than replaces human expertise. AI systems contribute by:

- Learning from existing historical data to identify patterns invisible to manual analysis
- Detecting signals across incomplete or scattered datasets that would be impossible to synthesize manually
- Predicting future resistance trends based on multiple data streams
- Guiding evidence-informed public health response strategies

Data Integration Requirements

Effective AI-driven surveillance requires integration of diverse data sources into AI-ready formats. Essential data streams include:

- **Clinical data:** Patient demographics, diagnosis, treatment, and outcomes
- **Laboratory data:** Antimicrobial susceptibility testing results and pathogen identifications
- **Genomic data:** Whole-genome sequences revealing resistance mechanisms and transmission patterns
- **Environmental data:** Surveillance from wastewater, agricultural settings, and food production

Environmental Surveillance as Early Warning

Wastewater and household surface metagenomic surveillance were highlighted as particularly valuable for detecting resistance signals before they manifest clinically. Environmental surveillance can reveal:

- Community-level resistance patterns across entire populations
- Emerging resistance genes not yet seen in clinical infections
- Agricultural and environmental resistance reservoirs
- Effectiveness of interventions through temporal trend analysis

Current Surveillance Limitations: GLASS 2025 Findings

Using WHO GLASS 2025 data, Morikwe illustrated specific gaps in Nigeria's surveillance completeness. Current reporting focuses primarily on bloodstream infections, with substantial missing data for other critical infection types including urinary tract infections, respiratory infections, gastrointestinal infections, and sexually transmitted infections.

This narrow surveillance scope creates blind spots where resistance may be emerging undetected, preventing comprehensive national understanding and limiting ability to target interventions appropriately.

Phased Implementation Strategy

Rather than attempting nationwide deployment immediately, Morikwe proposed a pragmatic, phased approach:

Phase 1: Pilot Implementation
Begin with two to three pilot states that possess existing laboratory capacity, trained personnel, and institutional commitment. These sites would serve as learning laboratories for refining approaches, demonstrating feasibility, and building evidence.

Phase 2: Gradual Scaling
Based on pilot experience, progressively expand to additional states, adapting implementation to local contexts and capacity levels while building human resources and infrastructure.

Phase 3: National Integration
Eventually achieve nationwide coverage with standardized methods, interoperable data systems, and coordinated analysis at national and regional levels.

Addressing Capacity Constraints

A significant barrier to AI implementation in Nigeria is limited bioinformatics capacity for data processing, analysis, and interpretation. Morikwe proposed AI co-pilot tools as a practical solution—user-friendly interfaces that support non-specialists in conducting sophisticated analyses without requiring deep programming or bioinformatics expertise.

Open-Source and Cost-Effective Tools

Importantly, Morikwe emphasized that many AI tools required for enhanced AMR surveillance are open-source and cost-effective, reducing financial barriers to implementation. Available tools include machine learning libraries, bioinformatics pipelines, data visualization platforms, and analytical frameworks that require minimal licensing costs.

This accessibility presents a significant opportunity for Nigeria to strengthen predictive surveillance capabilities in alignment with national action plan priorities and the WAAW 2025 theme: "Act Now: Protect Our Present, Secure Our Future."

Key Takeaways

- Nigeria faces approximately 64000 AMR-related deaths annually, with sub-Saharan Africa bearing the highest burden
- Current surveillance is fragmented, with limited integration across clinical, laboratory, genomic, and environmental data

- AI can predict resistance trends, extract insights from unstructured data, and automate laboratory processes
- Environmental surveillance through wastewater provides early warning before clinical emergence
- Phased implementation starting with pilot states offers a pragmatic pathway
- Open-source AI tools reduce cost barriers to advanced surveillance

3. AMR in Nigeria: Current Realities, Challenges, and the Way Forward

Presenter: Dr. Chizaram Onyeaghala, Infectious Diseases Physician, University of Port Harcourt Teaching Hospital

Historical Context and Definitions

Dr. Onyeaghala opened by invoking Alexander Fleming's prescient 1945 warning that inappropriate use of penicillin would inevitably lead to resistance, a caution issued at the dawn of the antibiotic era that has proven remarkably accurate. This historical reference underscored that concerns about antimicrobial resistance have existed since the earliest days of antibiotic availability, yet the problem has intensified dramatically despite long-standing awareness.

Comprehensive AMR Definition

Antimicrobial resistance was defined comprehensively as the ability of bacteria, viruses, fungi, and parasites to evolve over time and no longer respond to medicines designed to eliminate them. This results in infections that become progressively harder to treat and are associated with increased morbidity (disease severity and complications) and mortality (death rates).

Nigeria's AMR Burden in Global Context

Dr. Onyeaghala presented sobering data from the 2019 Global Burden of Disease study, published in 2022, revealing the staggering human cost of AMR:

Global Impact
Approximately 1.27 million deaths globally were directly attributable to antimicrobial resistance in 2019, with sub-Saharan Africa bearing a disproportionate burden relative to its population size and healthcare resources.

Nigeria-Specific Burden
Nigeria experienced devastating AMR-related mortality:

- Over 64,000 deaths directly attributable to AMR
- More than 263,000 deaths associated with AMR as a contributing factor

- Ranking 19th among 204 countries globally in AMR burden

Data Limitations
Dr. Onyeaghala emphasized a critical caveat: these figures likely substantially underestimate Nigeria's true AMR burden due to limited national surveillance infrastructure, incomplete death registration systems, diagnostic capacity constraints, and gaps in data collection from rural and underserved areas. The actual burden may be considerably higher.

Multifaceted Drivers of AMR in Nigeria

Dr. Onyeaghala stressed that resistance arises from a complex interplay of factors extending far beyond inappropriate prescribing alone. Understanding this complexity is essential for designing effective interventions.

Health System Factors

High Infectious Disease Burden
Nigeria faces substantial infectious disease prevalence, creating high demand for antimicrobials and frequent opportunities for resistance selection.

Infrastructure Deficiencies

- Poor sanitation systems facilitating infection transmission
- Inadequate infection prevention and control practices in healthcare facilities
- Limited access to clean water in many healthcare settings, compromising basic hygiene
- Overcrowded hospitals creating ideal conditions for pathogen transmission
- Severe shortages of healthcare personnel, limiting time for appropriate diagnosis and prescribing

One Health Interface

Animal-Human-Environment Interconnections
Close interfaces between animal production, human populations, and environmental systems facilitate resistance transmission. Widespread use of antimicrobials in animal husbandry for growth promotion and disease prevention, alongside extensive antifungal use in agriculture, contributes to resistance development across sectors with spillover to human health.

Diagnostic Capacity Constraints

Limited Laboratory Infrastructure
Nigeria's severe shortage of functional diagnostic laboratories represents a critical vulnerability. With only a small number of laboratories serving a population exceeding 200 million people, healthcare providers have minimal access to antimicrobial susceptibility

testing. This forces reliance on empirical treatment—prescribing antibiotics based on clinical symptoms without microbiological confirmation—which often leads to inappropriate broad-spectrum antibiotic use.

Access and Regulatory Challenges

Over-the-Counter Availability
Antimicrobials can be obtained easily without prescription through pharmacies, patent medicine vendors, and informal market channels, enabling widespread self-medication and inappropriate use.

Substandard and Counterfeit Medicines
The presence of substandard and counterfeit antimicrobials in the market creates multiple problems: inadequate dosing leading to resistance selection, therapeutic failure, and erosion of public confidence in medicines.

Weak Regulatory Enforcement
Despite existing regulations, enforcement remains inconsistent due to limited resources, competing priorities, and regulatory capacity constraints.

Population Mobility

Extensive population movement within Nigeria and international travel patterns facilitate rapid geographic spread of resistant organisms across regions, countries, and continents, connecting local resistance problems to global transmission networks.

Strategic Response Framework

Dr. Onyeaghala outlined coordinated, multisectoral actions required to strengthen Nigeria's AMR response, grounded in international and national strategic frameworks.

Guiding Frameworks

- WHO Global Action Plan on AMR
- Nigeria's National Action Plan 2.0 (2024-2028)

Strategic Priorities

1. Improved Awareness and Education
Building understanding among healthcare professionals, veterinarians, agricultural workers, and the general public about AMR risks and appropriate antimicrobial use.

2. Strengthened One Health Surveillance
Establishing integrated surveillance systems connecting human health, animal health, and environmental monitoring to enable comprehensive resistance tracking.

3. Enhanced Infection Prevention and Control
Reducing infection incidence across healthcare, community, and agricultural settings to decrease antimicrobial need and transmission opportunities.

4. Optimized Antimicrobial Use
Implementing stewardship programmes ensuring antimicrobials are used only when necessary, with appropriate selection, dosing, and duration.

5. Sustainable Investment
Ensuring adequate, predictable funding for diagnostics infrastructure, research and innovation, surveillance systems, and workforce development.

Surveillance Through GLASS

The Global Antimicrobial Resistance and Use Surveillance System (GLASS) was presented as central to guiding evidence-informed interventions. However, current implementation gaps limit effectiveness:

Current Limitations

- Limited national representativeness, with surveillance concentrated in a few urban centers
- Insufficient funding for laboratory supplies, personnel, and data management
- Weak private-sector engagement, missing data from private facilities where many Nigerians receive care

Addressing Gaps
Expansion requires increased investment in laboratory infrastructure, broader geographic coverage including rural areas, engagement of private healthcare sector in surveillance, and strengthened data management and analysis capacity.

Antimicrobial and Diagnostic Stewardship

Antimicrobial Stewardship Programmes
Systematic approaches to optimizing antimicrobial use were emphasized as critical, combining education, guidelines, audit and feedback, and prescribing restrictions where appropriate.

Diagnostic Stewardship
Optimizing diagnostic test ordering to ensure appropriate use of limited laboratory resources while maximizing clinical value.

WHO AWaRe Classification
The WHO AWaRe classification system—categorizing antibiotics into Access (first-line, narrow-spectrum), Watch (broader-spectrum, requiring monitoring), and Reserve (last-

resort), was presented as a practical tool for guiding prescribing decisions and stewardship efforts.

The Urgency of Action

Dr. Onyeaghala concluded with a stark reminder emphasizing the existential nature of the AMR threat: without coordinated action today, effective treatments for common infections may cease to exist in the near future. This requires sustained leadership commitment at the highest political levels, improved coordination across human health, animal health, agricultural, and environmental sectors, expanded laboratory and genomic surveillance capacity, and collective action involving government, healthcare providers, researchers, industry, and civil society.

The presentation reinforced that ensuring antimicrobials remain effective for future generations demands immediate, comprehensive, and sustained response—embodying the WAAW 2025 theme: "Act Now: Protect Our Present, Secure Our Future."

Key Takeaways

- Nigeria ranks 19th globally in AMR burden with over 64,000 direct deaths annually
- Actual burden likely underestimated due to surveillance limitations
- AMR drivers include high infectious disease burden, poor sanitation, limited diagnostics, and weak regulation
- Only a small number of laboratories serve Nigeria's 200+ million population, forcing empirical treatment
- National Action Plan 2.0 provides strategic direction, but implementation requires sustained funding
- Without action today, effective treatments may not exist tomorrow

Interactive Question and Answer Session

The webinar concluded with an extensive discussion addressing practical implementation challenges, resource constraints, and strategic priorities.

Closing Remarks

The closing remarks extended appreciation to all speakers for dedicating their time and sharing their expertise, and to participants for their active engagement throughout the session. Recognition was given to the quality of questions submitted and the thoughtful discussions they generated.

The session was contextualized within the broader World Antimicrobial Resistance Awareness Week 2025 activities, with webinars held across multiple regions including

Africa, Asia, and the Middle East and North Africa. Participants were encouraged to engage with upcoming sessions and support ongoing regional and global efforts to address antimicrobial resistance through coordinated action.

Key Takeaways

Global Lessons for Nigeria

- Countries with strong National Action Plans demonstrate measurably lower antimicrobial consumption
- Sweden reduced penicillin resistance from 10% to 1% through comprehensive policy interventions
- Germany achieved 57% reduction in veterinary antimicrobial use over seven years
- Implementation requires political will and adequate funding, not just well-designed plans

Artificial Intelligence Applications

- AI can predict resistance trends, extract insights from unstructured data, and automate laboratory processes
- Environmental wastewater surveillance provides early warning before clinical resistance emergence
- Open-source AI tools reduce cost barriers, making advanced surveillance accessible
- Phased implementation starting with pilot states offers pragmatic pathway to national coverage

Nigeria's Current Realities

- Nigeria ranks 19th globally with over 64,000 direct AMR deaths annually
- Actual burden likely substantially underestimated due to surveillance limitations
- Only a small number of laboratories serve 200+ million people, forcing empirical treatment
- Over-the-counter antibiotic availability and weak regulatory enforcement accelerate resistance

Strategic Priorities

- National Action Plan 2.0 (2024-2028) provides framework but requires dedicated funding
- Investment in laboratory infrastructure is fundamental to all other interventions

- Sub-national action through state-level programmes can accelerate progress
- International collaboration and equitable financing are essential for global AMR security

Urgent Call to Action

- Without action today, effective treatments for common infections may not exist tomorrow
- Global health security depends on collective action, not isolated national efforts
- Integration of clinical, environmental, and genomic surveillance is essential
- Sustainable domestic financing must replace project-based external funding