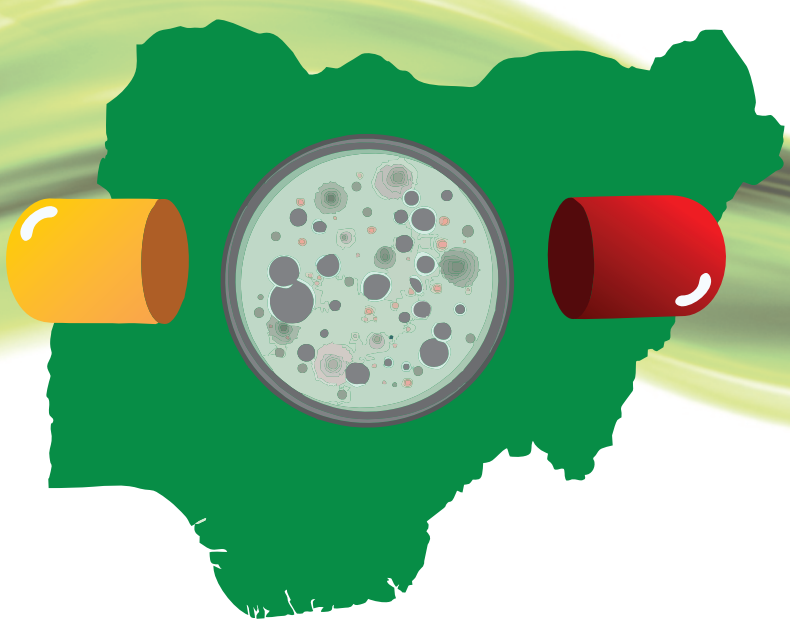
THE FEDERAL REPUBLIC OF NIGERIA

ANTIMICROBIAL RESISTANCE & ANTIMICROBIAL USE





ONE HEALTH GOVERNANCE MANUAL

September 2021

NIGERIA CENTRE FOR DISEASE CONTROL AND PREVENTION

FEDERAL MINISTRY OF HEALTH

FMARD FEDERAL MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT

FEDERAL MINISTRY OF ENVIRONMENT

PARTNERS


UKaid
from the British people


The
Fleming Fund


DAI
Shaping a more livable world.


World Health
Organization

CONTENTS

ABBREVIATIONS

AMR	Antimicrobial Resistance
AMRCC	Antimicrobial Resistance Coordinating Committee
AMU	Antimicrobial Use
FAO	Food and Agriculture Organization of the United Nations
FMARD	Federal Ministry of Agriculture and Rural Development
FMEnv	Federal Ministry of Environment
FMoH	Federal Ministry of Health
IPC	Infection Prevention and Control
JEE	Joint External Evaluation
MDAs	Ministries, Department and Agencies
M&E	Monitoring and Evaluation
NAMR-TWG	National AMR Technical Working Group
NAP	National Action Plan
NCDC	Nigeria Centre for Disease Control
NHSAP	National Health Security Action Plan
NOHCU	National One Health Coordinating Unit
NOHSC	National One Health Steering Committee
NOHSP	National One Health Strategic Plan
NOHTC	National One Health Technical Committee
OIE	World Organisation for Animal Health
PVS	OIE Performance of Veterinary Services
TWG	Technical Working Group
WHA	World Health Assembly
WHO	World Health Organisation

FOREWORD

A hugely important public health issue globally, antimicrobial resistance (AMR) has become an increasing priority in Nigeria in recent years. Following the World Health Assembly's adoption of the Global Action Plan on Antimicrobial Resistance in May 2015, it urged member states to develop their own multisectoral national action plans (NAP) to combat AMR. Keen to address the critical gaps in tackling AMR identified by the WHO's 2017 Joint External Evaluation (JEE), Nigeria developed its National Action Plan for AMR 2017-2022. Nigeria also enrolled in the Global Antimicrobial Surveillance System (GLASS), which supports global surveillance research to strengthen the evidence base on AMR.

A One Health approach – involving several different sectors related to human, animal, and environmental health – is crucial to reducing antimicrobial resistance. However, ensuring strong coordination and effective collaboration between the various sectors provides additional challenges. To overcome these, Nigeria's AMR NAP outlines a governance structure to provide oversight to the implementation of AMR-related activities. This governance manual will strengthen Nigeria's capacity to prevent the economic, health and environmental damages that result from increasing antimicrobial resistance.

This manual outlines the Antimicrobial Resistance/Antimicrobial Use (AMR/AMU) governance structure, the roles and responsibilities of each party, and operating processes and standards. We would like to thank all the stakeholders and partners who contributed to the development of this important manual. We look forward to continuing close cooperation and coordination, to ensure strong governance of AMR-related activities leading to better health for all.

.....

DR. MOHAMMED MAHMOOD ABUBAKAR

Honourable Minister of Agriculture and Rural Development

.....

MOHAMMED H. ABDULLAHI

Honourable Minister of Environment

.....

DR. OSAGIE EHANIRE

Honourable Minister of Health

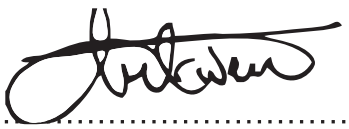
ACKNOWLEDGEMENTS

The Government of the Federal Republic of Nigeria is grateful to all those who contributed to the successful development of this Governance Manual for National Antimicrobial Resistance and Antimicrobial Use (AMR /AMU) in Nigeria.

We wish to express particular gratitude to those who participated in the AMR/AMU consultative and validation meetings, especially the Federal Ministries of Health, Agriculture, Environment and Finance.

We further extend our appreciation to the universities, research institutes, and international organisations who provided valuable support and collaboration. These include DFID, WHO, the World Bank, the US Centres for Disease Control and Prevention (CDC), the FAO, and USAID, among others.

We also thank Fleming Fund immensely for both technical assistance and financial support towards the development of this manual.



.....

DR CHIKWE IHEKWEAZU
Director General,
Nigeria Centre for Disease Control (NCDC)

BACKGROUND

Antimicrobial resistance (AMR) is a global public health threat that will result in severe social and economic consequences if unaddressed(1-4). A systematic review in 2017 revealed that 40% of African countries lacked recently updated AMR data and raised concerns over the quality of available data(5) Others have found inadequate AMR monitoring in most countries and that AMR levels to commonly used antibiotics are prevalent. In addition, they found that the availability and routine use of standard laboratory microbiological identification and susceptibility testing methods are inadequate(6–9). Consequently, AMR threatens to worsen the health situation for countries in Africa, which already bear the heaviest disease burdens, and undermines efforts towards universal health coverage and poverty reduction.

In Nigeria, AMR is a major public health threat to humans, animals and the environment. A recent situation analysis of antimicrobial use (AMU) and resistance in Nigeria documented high levels of AMR among microbes causing urinary, gastrointestinal and respiratory tract infections, as well as blood and skin infections(10). Furthermore, antimicrobial-resistant pathogens and antimicrobial-resistance genes have been isolated from different environments (air, water and soil) that serve as reservoirs for human and animal infections(11,12). These developments result from the irrational and indiscriminate use of antimicrobials, including over dosage, incomplete treatment regimens, non-observance of withdrawal periods, lack of expert supervision of antibiotic usage and the availability and easy accessibility to counterfeit antimicrobials. Other contributing factors include environmental pollution, poor sanitation and infrastructure and the indiscriminate disposal of waste from abattoirs, hospitals and effluents from industry into the environment(13). As a result, previously treatable human and animal infections are increasingly becoming difficult to treat with common (first-line) antimicrobials resulting in prolonged hospitalisation and increased cost of treatment, morbidity and mortality.

According to the World Health Organisation (WHO) Joint External Evaluation (JEE) conducted in Nigeria in June 2017, the country's capacity to address AMR/AMU issues stood at level 2 (the JEE indicators are ranked from level 1 to 5, where 1 is the lowest and 5 is highest) (14,15) in the following indicators: AMR detection, surveillance of infections caused by antibiotic-resistant pathogens, healthcare-associated infections, prevention and control programmes, and antimicrobial stewardship activities(14)(15). Similarly, in the World Organization for Animal Health (OIE) Performance of Veterinary Services (PVS) Evaluation

Follow Up report of 2019, Nigeria scored '2' for AMR and AMU, with levels of advancement ranging from 1 – 5 (16,17).

To address the above-mentioned gaps, Nigeria joined the global response to combat the growing threat of AMR and adopted the Global Action Plan on Antimicrobial Resistance at the 68th World Health Assembly. It also heeded the World Health Assembly's (WHA) 2015 call to develop multisectoral National Action Plans (NAP) that align with the global AMR Action Plan within two years(18,19). In 2016, the Federal Government of Nigeria established the National AMR coordinating body at the Nigeria Centre for Disease Control (NCDC). This was followed by the establishment of a National AMR/AMU Technical Working Group (NAMR-TWG) comprising stakeholders from the human, animal and environmental health sectors and, subsequently, Nigeria's enrolment into the Global Antimicrobial Resistance Surveillance System (GLASS) in 2017. Nigeria has also been reporting on antimicrobial agents intended for use in animals to the OIE global database using 'Reporting Option 1'. Also, the Federal Republic of Nigeria developed a National One Health Strategic Plan (NOHSP), a National Health Security Action Plan (NHSAP) and an AMR National Action Plan (2017-2022)(20–22).

These initial efforts described above demonstrate the strong commitment of the government of the Federal Republic of Nigeria to addressing AMR/AMU. They also point to the need to strengthen the existing governance structure and make it robust enough to holistically address AMR-related activities in Nigeria and do so in a systematic and comprehensive way. This manual outline and describes the components, roles and responsibilities of the AMR/AMU governance bodies and will guide the One Health coordination and operationalisation of AMR/AMU governance activities in Nigeria.

1. METHODOLOGY

A systematic approach with well-defined steps was used to develop this manual. The process began with the identification (mapping) of key AMR/AMU stakeholders under the stewardship of NCDC and AMRCC. This was followed by a stakeholder's consultation workshop, which was conducted by the Nigeria Centre for Disease Control (NCDC) and DAI in Abuja in September 2019. The consultations approved by consensus the development of Federal Republic of Nigeria AMR/AMU governance structure by combining the then established structures comprising the Antimicrobial Resistance Coordinating Committee at NCDC and the Antimicrobial Resistance Technical Working Group with the One Health Governance structure.

A second workshop was convened by NCDC under the coordination of AMRCC in October 2019, engaging the key stakeholders to develop a draft AMR/AMU Governance structure. Using a participatory approach of ensuring that the Nigerian stakeholders take leadership in deciding the structure, functionality and the driving vision, the workshop developed the vision, mission and reviewed a draft Governance structure outlined by a consultant based on the outputs of the stakeholders consultative meeting. After the workshop, Online consultations followed whereby the draft governance structure was reviewed again based on comments by stakeholders. Subsequently, a validation workshop was conducted and it was at this stage that the AMR Governance structure was approved and the workshop proposed the development of the Federal Republic of Nigeria AMR/AMU One Health (OH) Governance manual. In November 2019, a draft AMR/AMU OH Governance manual was developed by an international consultant and shared online with stakeholders for comments and additions. This was followed by a stakeholders' workshop to validate the revised AMR/AMU OH governance manual. The stakeholders consultative workshop held in November 2019 approved the AMR/AMU Governance manual which was subsequently signed by the relevant authorities under the coordination of the AMR/AMU Secretariat at the NCDC.

Table 1: Process of developing the Federal Republic of Nigeria (FRN) AMR/AMU Governance manual

Steps in the development of FRN AMR/AMU Governance manual		Outputs
1	Nigeria AMR/AMU stakeholders' mapping	FRN AMR/AMU stakeholders map
2	Stakeholders' consultation workshop September 2019. Consensus Building on need for AMR/AMU Governance structure (Purpose, vision, mission and values).	1. Consensus to merge AMR/AMU Governance with existing One Health structure 2. Consensus on the purpose; vision; mission; and values of Nigeria OH AMR/AMU Governance
3	Online stakeholders' consultation and review of draft AMR/AMU Governance structure	Draft AMR/AMU structure ready for validation
4	AMR/AMU Governance structure validation workshop (October 2019)	1. Validated AMR/AMU OH Governance structure 2. Consensus to develop AMR/AMU OH Governance manual
5	Draft AMR/AMU OH Governance manual shared with stakeholders for review	Reviewed draft AMR/AMU OH Governance Manual
6	Stakeholders workshop to validate AMR/AMU OH Governance manual (November 2019)	Validated AMR/AMU OH Governance manual
7	Official endorsement and signing of AMR/AMU OH Governance manual	Endorsed and signed AMR/AMU Governance manual

2. PURPOSE OF AMR GOVERNANCE MANUAL

To strengthen One Health governance for AMR/AMU surveillance and management in the Federal Republic of Nigeria.

2.1 Vision of the AMR Governance Manual

To institutionalise effective AMR/AMU governance that will lead to the early detection of resistant pathogens and promote the judicious use of antimicrobials, which, in turn, will lead to the prevention and reduction of AMR in Nigeria.

2.2 Mission of the AMR Governance Manual

To strengthen multisectoral coordination and operations of the Nigeria AMR/AMU governing bodies.

2.3 Values

Nigeria's AMR/AMU governance is based on the following values:

1. A One Health approach
2. Accountability
3. Transparency
4. Integrity
5. Diligence
6. Innovation

2.4 Objectives of the AMR Governance Manual

The specific objectives of the AMR governance manual include the following:

1. To provide well-defined terms of reference and modus operandi for the National One Health Steering Committee (NOHSC), Antimicrobial Resistance Coordinating Committee (AMRCC) and National AMR Technical Working Group (NAMR-TWG).
2. To strengthen the communication system for AMR/AMU.

3. GOVERNANCE MODEL AND ORGANOGRAM

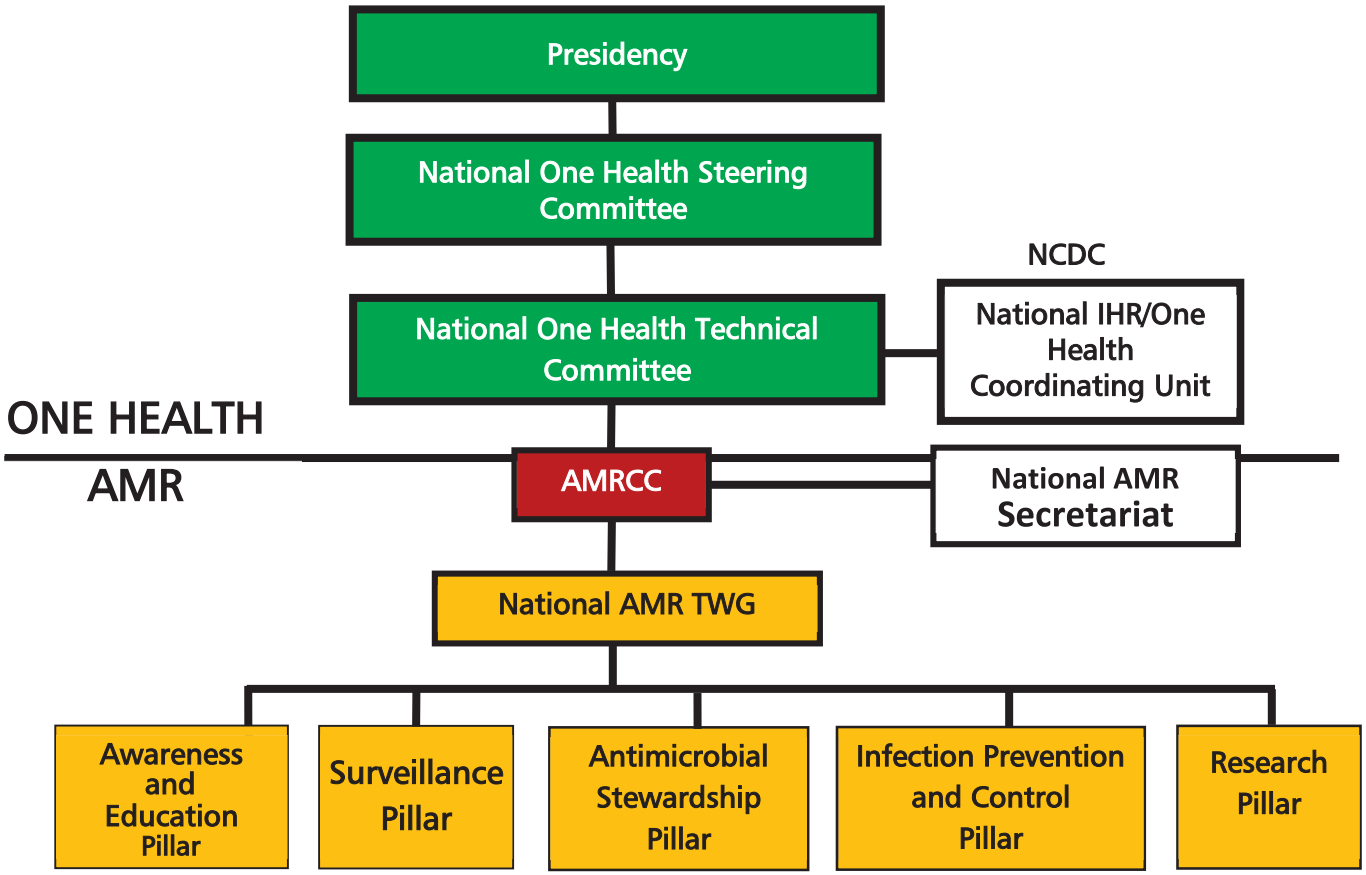
The One Health governance model for AMR/AMU surveillance in Nigeria includes the following governing bodies:

I. **The National One Health Steering Committee**: comprises the Ministers of Health, Agriculture, Environment, Finance and Information. The NOHSC is the national AMR/AMU policy and decision-making body that oversees the National One Health Technical Committee (NOHTC) and the AMRCC.

II. **The Antimicrobial Resistance Coordinating Committee**: comprises focal points from the Federal Ministry of Health (FMoH), the Federal Ministry of Agriculture and Rural Development (FMARD), the Federal Ministry of Environment (FMEnv) and the chairs of the NAMR-TWG. The AMRCC coordinates AMR/AMU activities planned by the technical working groups across the sectors.

III. **The National AMR Technical Working Group**: comprises representatives of ministries, departments and agencies (MDAs), academia, civil societies, regulatory bodies, and research institutions. These form awareness, surveillance, stewardship and infection prevention and control (IPC) sub-technical working groups. Figure 1 shows this governance structure.

Figure 1. Nigerian One Health Governance Structure (including AMR)



3.1 Roles, Responsibilities and Membership Of Each AMR/AMU Governance Body

3.1.1 National One Health Steering Committee

The National One Health Steering Committee is the supreme governing body for One Health, including AMR/AMU activities, in Nigeria.

Membership of the NOHSC

Membership of the NOHSC shall comprise:

1. The Ministers of the following ministries:
    1. Federal Ministry of Health (Chair)
    2. Federal Ministry of Agriculture and Rural Development (Co-Chair)
    3. Federal Ministry of Environment (Co-Chair)
    4. Federal Ministry of Finance and
    5. Federal Ministry of Information and Culture
2. The Director General (DG) of the NCDC (secretary).

Roles and Responsibilities of the NOHSC

The NOHSC shall:

1. Oversee the strengthening of inter-ministerial AMR/AMU coordination and collaboration.
2. Provide leadership at the highest level of government for an early resolution of One Health public health crises and AMR/AMU in the country.
3. Provide overall oversight and supervision of One Health activities, including those related to AMR/AMU.
4. Initiate and/or approve national policies and plans and oversee their implementation to strengthen multisectoral coordination and collaboration for the prevention, detection and response to health threats including AMR.
5. Review and approve proposed plans and activities by the NOHTC and the AMRCC.
6. Provide high-level support for the planning and implementation of One Health and AMR/AMU activities.
7. Advocate and track budget allocation and release by the government for One Health and AMR/AMU.
8. Report regularly to the President and the Federal Executive Council on the implementation of the NOHSP and NAP for AMR.
9. Collaborate with external agencies (e.g., WHO, OIE, FAO) to contain AMR at the national and supranational levels.

3.1.2 National One Health Technical Committee

The National One Health Technical Committee shall coordinate all national One Health activities.

Membership of the NOHTC

The membership of the NOHTC shall comprise the Directors and/or representatives of the following:

1. The Director General of the Nigeria Centre for Disease Control (Chair)
2. Chief Veterinary Officer of Nigeria (Co-Chair)
3. Nigeria Centre of Disease Control and other stakeholders
4. Federal Ministry of Health
5. Federal Ministry of Agriculture and Rural Development: Epidemiology, Veterinary Public Health, Animal Health and Clinical Service divisions of the Veterinary and Pest Control department
6. Federal Ministry of Environment
7. Federal Ministry of Finance
8. National Veterinary Research Institute
9. National Emergency Management Agency
10. Office of the National Security Adviser
11. National Environmental Standards and Regulations Enforcement Agency
12. Partners: World Health Organisation-Nigeria, Food and Agriculture Organization-Nigeria, United States Centre for Disease Control and Prevention-Nigeria, the African Field Epidemiology Network (AFENET) Nigeria and any other partner as the need arises.
13. Academia

Roles and responsibilities of the NOHTC

The NOHTC shall:

1. Support advocacy efforts to ensure adequate funds and other resources for One Health activities including AMR/AMU
2. Collaborate with the communication committee to effectively disseminate information on the status of disease outbreaks and their management
3. Ensure the successful implementation of the integrated One Health AMR/AMU governance plan by monitoring its implementation and reviewing the plan as necessary
4. Liaise with development partners to coordinate national and international efforts to contain infectious disease outbreaks

5. Support multisectoral collaboration in the management of public health emergencies
6. Provide oversight and technical support to ensure a One Health approach is applied to emergency preparedness and response efforts
7. Report back regularly to NOHSC on the implementation of One Health and AMR/AMU activities
8. Ensure inter-ministerial cooperation and coordination on AMR/AMU-related issues
9. Ensure that a memorandum of understanding is signed for the operational framework of National One Health Coordinating Unit (NOHCU) among the implementing MDAs

3.1.3 National One Health Coordinating Unit

The National One Health Coordinating Unit shall be the administrative office for the NOHSC and NOHTC.

Membership of the NOHCU

The membership of the NOHCU shall comprise:

1. The One Health Coordinator from NCDC
2. Desk officers from human health, animal health, environmental health and other disciplines related to One Health.

Roles and responsibilities of the NOHCU

The NOHCU shall:

1. Provide secretariat support to the NOHSC and NOHTC
2. Support the development of an interoperable, multisectoral system capable of preventing, detecting and responding promptly to infectious disease outbreaks.
3. Enhance collaborations between the animal, human and environment sectors to control of endemic zoonoses and respond to outbreaks
4. Prepare annual work plans
5. Coordinate regular stakeholders meeting to share information
6. Develop quarterly and annual progress reports on One Health activities
7. Serve as the liaison between the NCDC, which is the International Health Regulations (IHR)/ AMR/AMU National Focal Point, and relevant MDAs
8. Facilitate the use of the One Health approach in outbreak responses and AMR/AMU activities
9. Review and prepare technical information and documentation
10. Ensure the replication and implementation of the same One Health and AMR/AMU structures at state and local government levels

3.1.4 Antimicrobial Resistance Coordinating Committee

The Antimicrobial Resistance Coordinating Committee shall be the national AMR/AMU coordinating organ.

Membership of the AMRCC

The membership of the AMRCC shall comprise:

1. The Director General of NCDC/representative (Chair)
2. The Chief Veterinary Officer of Nigeria/representative (Co-Chair)
3. AMR focal points in Nigeria Centre of Disease Control, Federal Ministry of Agriculture and Rural Development, Federal Ministry of Environment and Federal Ministry of Health and other key MDAs
4. NAMR-TWG Chair and Co-Chair
5. Representatives of development partners in the tripartite sectors: World Health Organisation-Nigeria, Food and Agriculture Organization-Nigeria, OIE and other key partners

Roles and Responsibilities of the AMRCC

The AMRCC shall:

1. Identify stakeholders and facilitate the formation of an inclusive AMRCC .
2. Make the case for investing in AMR/AMU control and response, including antibiotic alternatives via the development of a resource mobilization plan
3. Provide guidance including strategic planning and implementation frameworks for AMR detection, prevention and response.
4. Build sustained partnerships and work to ensure the containment of AMR/AMU through existing and new national initiatives.
5. Make policy recommendations to NOHSC through NOHTC regarding AMR/AMU response in Nigeria.
6. Facilitate the review of the National AMR/AMU Action Plan.

3.1.5 National Antimicrobial Resistance Technical Working Group

The National AMR Technical Working Group shall oversee the development and implementation of the AMR action plans of each TWG.

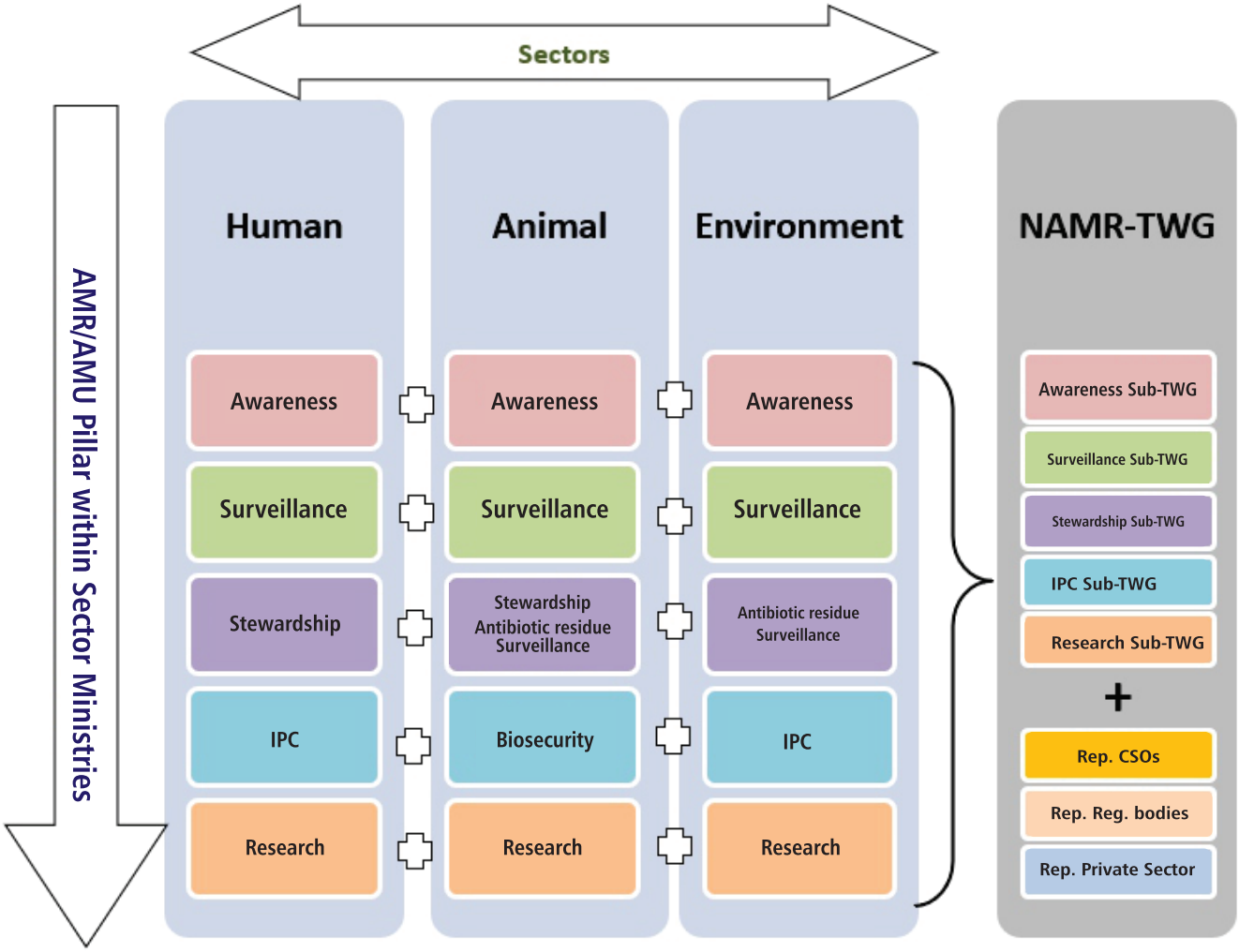
Membership of the NAMR-TWG

Membership of the NAMR-TWG shall comprise the following:

1. Fifteen leaders of the various pillars from the three sectors: animal, human and environment. The pillars are:
    a) Awareness
    b) Surveillance
    c) Antibiotic Stewardship
    d) Infection Prevention and Control (IPC)/Biosecurity
    e) Research
2. Representatives from civil societies – Each of the three key civil societies representing the three sectors shall appoint one representative
3. Representatives from health professional regulatory bodies – Each sector's professional regulatory body shall appoint one representative to the NAMR-TWG.
4. Representatives from the private sector – There shall be one or more representative(s) from the private sector collaborating with the NAMR-TWG. other stakeholders e.g Fellows trained through the Fleming Fund Fellowships

The composition of NAMR-TWG is illustrated in Figure 2.

Figure 2. Composition of the National Technical Working Group



Roles and Responsibilities of the NAMR-TWG

The NAMR-TWG shall:

1. Develop and submit their progress reports and recommendations to the AMRCC.
2. Convene NAMR-TWG meetings to plan interventions and research to prevent, detect and respond to AMR and to guide the proper use of antimicrobials.
3. Develop AMR/AM use and stewardship guidelines across sectors and technical guidance for the adoption of international standard guidelines.
4. Support collaborative research across the three sectors for AMR surveillance, antimicrobial stewardship, advanced diagnostics, therapeutics and antibiotic alternatives such as vaccine production.
5. Implement multisectoral AMR/AMU activities across all pillars to ensure effective prevention and response efforts, by strengthening and using existing national systems, sharing resources and recommending new structures as needed.
6. Facilitate the review of the National AMR/AMU Action Plan.

NAMR-TWG Terms of Reference and Selection Criteria

A. Antimicrobial Resistance Awareness and Education Pillar

The Antimicrobial Resistance Awareness and Education pillar within the National One Health AMR Technical working Group in line with the AMR NAP, is the principal forum for improving awareness and understanding of antimicrobial resistance through effective communication, education and training in health, animal, food safety and environment sectors. The group shall:

1. Develop and implement national communication plans including advocacy activities, social mobilization and social and behaviour change communication activities to improve antimicrobial resistance awareness and education at the national and sub-national levels particularly at the grassroot level to achieve wide coverage of awareness;
2. Identify issues and barriers to communication, including management of communication research activities and proffer solutions in collaboration with ministries, agencies, and departments;
3. Facilitate formation of national and sub-national TWGs and other structures to support achievement of AMR awareness objectives;
4. Work with line ministries, departments, and agencies, other public and private sector stakeholders to develop and implement training and other capacity-building activities that will strengthen communication related to AMR education;
5. Conceptualize, design and develop IEC materials on AMR with appropriate and relevant messages tailored for key stakeholders using various formats

as appropriate such as text, graphics, imageries, infographics, video, printed materials;

6. Specify appropriate communication channels, dissemination methods and media such as video, print, web/online media, traditional media, and social media, among others, to effectively communicate key AMR messages to specific stakeholders;
7. Provide quarterly reports of progress and challenges to the National AMR-TWG during the quarterly meetings.

This pillar shall have members with the following diverse skills:

1. Risk communication
2. Social mobilisation
3. Behavioural change communications
4. Media communication (public relations)

B. Antimicrobial Resistance Surveillance Pillar

The Antimicrobial Resistance Surveillance pillar within the National One Health AMR Technical working Group in line with the AMR NAP, is the principal forum for setting up a national AMR surveillance system using a 'One Health 'approach and strengthening institutional capacities (e.g. of laboratories) for early AMR detection. The group shall:

1. Provide oversight of the implementation of the surveillance systems e.g. by advising on selection of surveillance sites, reviewing SOPs, advising on surveillance laboratory standards, data generation and reporting;
2. Review AMR results and interpretations provided by sector-specific surveillance sites and makes policy recommendations regarding further surveillance, research and actions related to AMR surveillance;
3. Monitor the implementation of national and sectoral policies, strategies, plans and activities, with special attention to scaling up AMR surveillance interventions and addressing gaps in patient care;
4. Advocate for standardized laboratory capacities to produce high-quality microbiological data to support surveillance activities across all sectors including isolate and sample transport network for the One Health AMR surveillance;
5. Collaborate with international centres to monitor emerging resistance patterns and conduct research in the field of microbiology, serving as a resource and coordination point for laboratory expertise;
6. Mobilize increased funding support by leveraging resources from sector allocations, development partners, international funding agencies, NGOs, and other stakeholders.

This pillar shall have members from the three sectors (human, animal and environment) with the following diverse skills:

1. Laboratory surveillance
2. Epidemiological surveillance
3. Risk surveillance

C. Antimicrobial Stewardship Pillar

The Antimicrobial Stewardship pillar within the National One Health AMR Technical working Group in line with the AMR NAP, is the principal forum for optimizing antimicrobial utilization including: regulation, access, and responsible use in the country. The group shall:

1. Promote safe, responsible, and appropriate antimicrobial use in humans, animals, and food production as a key element of preventing emergence of antimicrobial resistance;
2. Advocate to key stakeholders to ensure improved access to quality antimicrobials through leadership and financing, and support the implementation of strategies to address identified challenges within the health, agriculture, environment, and other sectors;
3. Support national and sub national health systems to develop necessary operational structure, technology, and capacity for antimicrobial stewardship, adapt best practices and provide guidance on how to leverage on existing resources both nationally and internationally, while encouraging ownership of the AMS agenda;
4. Generate evidence and identify drivers of antimicrobial misuse and overuse, publicise the information so that other stakeholders can benefit from the insights and provide guidance towards ensuring a repository of transferable policies and good practices;
5. Report to the National AMR Coordinating Committee through the National One Health Technical Working Group.

This pillar shall have members with the following diverse skills:

1. Antimicrobial stewardship programme implementation and legislation in humans
2. Antimicrobial stewardship programme implementation and legislation in animals (livestock and fish) and, foods of animal origin
3. Antibiotic residue in the environment

D. Infection Prevention and Control Pillar

To prevent the spread of resistant infections, it is important to implement **Infection Prevention** programmes across human and animal communities and health care settings through personal and environmental sanitation and hygiene, as well as through biosecurity measures throughout the entire value chain from farm to plate. The IPC pillar within the National One Health AMR Technical working Group in line with the AMR NAP, is the principal forum for strengthening the infection prevention and control programme in human health, animal health and the environment at community and all governmental levels. The group shall:

1. Support the development, adoption and periodic review of IPC/biosecurity and WASH policies, regulations, and guidelines;
2. Support establishment and/or strengthen existing IPC, biosecurity, and WASH programs;

3. Build capacity, mobilise resources/finance and optimize standard of infrastructure to improve interventions at healthcare facilities, farms and the environment;
4. Support conduct of research on IPC biosecurity and WASH related interventions, activities, and programs;
5. Strengthen inter-sectoral collaboration, track and obtain information on AMR and IPC in some national programmes in Human, Animal and Environment sectors (e.g., TB, HIV, STI etc.);
6. Conduct advocacy to relevant stakeholders on the implementation of IPC, Biosecurity and WASH programs;
7. Advocate for the availability and optimal use of vaccines to prevent Infectious diseases in human and animal health;
8. Report to the National AMR Coordinating Committee through the National AMR Technical Working Group.

This pillar shall have members with the following diverse skills:

1. Quality assurance
2. Handling of hazardous materials
3. Biosecurity
4. Infection prevention and control

E. Antimicrobial Resistance Economic Case Investment Pillar

The Antimicrobial Resistance Economic Case Investment pillar within the National One Health AMR Technical working Group in line with the AMR NAP, is the principal forum for driving investment in the conduct of AMR research, promoting the use of innovative investment channels for research and investing in the development of antibiotic alternatives and advanced diagnostic techniques for impact on human and animal health. The group shall:

1. Advocate on behalf of AMR-TWG with appropriate government, line ministries and partners to increase awareness, understanding and prioritization of AMR agenda, to substantiate investment for specific AMR interventions and ensure that AMR concerns are kept high on the political agenda;
2. Facilitate sharing of information on AMR, both within and between sectors, including data on surveillance, antimicrobial stewardship/consumption, best practices, lessons learned, and research findings, to keep stakeholders abreast of new research findings and their implications;
3. Identify knowledge gaps and research priorities to inform the design of more effective AMR interventions;
4. Facilitate the strengthening of monitoring on AMR to ensure that monitoring and evaluation indicators are integrated into national and sectoral monitoring, evaluation, and reporting frameworks and systems

This pillar shall have members from the academia or research institute with the following diverse skills:

1. AMR research in humans, animals and/or environment
2. Development of antimicrobial alternatives

3.1.6 National AMR/AMU Secretariat

There shall be an AMR/AMU Secretariat that shall address all administrative work of the AMRCC and NAMR-TWG.

Membership of the AMR/AMU secretariat

The AMR/AMU Secretariat shall comprise focal persons from the key One Health ministries:

1. Nigeria Centre for Disease Control and Prevention
2. Federal Ministry of Health
3. Federal Ministry of Agriculture and Rural Development

Roles and responsibilities of the AMR/AMU secretariat

The AMR/AMU Secretariat shall perform the following administrative duties:

1. Ensure regular data collection, information sharing and effective communication and coordination (i.e., establish and manage a national data repository for AMR/AMU).
2. Facilitate/oversee the implementation and monitoring and evaluation (M&E) of the National AMR/AMU Action plan in collaboration with the NAMR-TWG.t
3. Oversee the implementation of the resource mobilisation plan.
4. Facilitate the review of the National AMR/AMU Action Plan.

3.2 Partners

Partners may be local and international organisations that are involved in AMR/AMU activities in Nigeria. They shall provide technical and financial assistance, including policy guidelines recommendations and capacity building, among other support.

4. MEETINGS

1. There shall be regular meetings of each organ of the governance structure.
2. Each regular meeting shall have an agenda that is developed and shared with participants at least two weeks before the scheduled date.
3. The agenda of the meeting shall contain the following essential information: the purpose of the meeting, the minutes of last meetings, matters arising from the minutes of the previous meeting, a review of activities and reports within the quarter and any other business related to AMR/AMU.
4. There shall be a quorum present for every meeting.

4.1 Schedule of Meetings

Each organ of the governance structure shall have an established schedule of meetings.

4.1.1 National One Health Steering Committee

1. There shall be an annual schedule of meetings of the NOHSC.
2. The NOHSC shall hold regular, face-to-face meetings twice a year.
3. Additional extraordinary meetings may be held, as necessary if convened by the Chair.
4. A reminder shall be sent at least one month before the scheduled meeting date.
5. The committee shall determine the quorum for its meeting.

4.1.2 National One Health Technical Committee

1. There shall be an annual schedule of meetings of the NOHTC.
2. The NOHTC shall hold regular face-to-face meetings quarterly.
3. Additional extraordinary meetings may be held, as necessary if convened by the Chair.
4. A meeting notice shall be provided at least one month before the scheduled meeting date.
5. A reminder for the meeting shall be sent at least two weeks before the meeting date.
6. The committee shall determine the quorum for its meeting.

4.1.3 Antimicrobial Resistance Coordinating Committee

1. There shall be an annual schedule of meetings of the AMRCC.
2. The AMRCC shall hold regular, face-to-face meetings quarterly.
3. Additional extraordinary meetings may be held, as necessary if convened by the Chair.
4. A meeting notice shall be provided at least one month before the scheduled date.

5. A reminder for the meeting shall be sent at least two weeks before the meeting date.
6. The committee shall determine the quorum for its meeting.

4.1.4 National Antimicrobial Resistance Technical Working Group

1. There shall be quarterly, face-to-face meetings coordinated by the AMRCC.
2. A monthly virtual/electronic meeting may also be held, as needed.
3. Additional extraordinary meetings may be held, as necessary if convened by the Chair.
4. A meeting notice shall be provided at least one month before the scheduled meeting date.
5. A reminder for the meeting shall be sent at least two weeks before the meeting date.
6. Each representative shall report back on the outcome of the meeting to its respective pillars/ ministry/organisation/society.
7. The committee shall determine the quorum for its meeting.

Pillar meetings

1. There shall be monthly face-to-face/virtual/electronic meetings.
2. Additional extraordinary meetings may be held, as necessary if convened by the Chair.
3. A meeting notice shall be provided at least two weeks before the scheduled meeting date.
4. A reminder for the meeting shall be sent at least one week before the meeting date.
5. The Pillars shall determine the quorum for their meetings.

5. Strengthening AMR Surveillance and Antimicrobial Stewardship

Increasing antimicrobial resistance (AMR) and the decreased effectiveness of antimicrobial agents used in human and animal health have led to a global focus on AMR in zoonotic bacteria. This focus, in turn, has led the World Organization for Animal Health (Office International des Epizooties, OIE) and the World Health Organization (WHO) to recommend ways to manage the risks associated with AMR.

The government of Nigeria adopted a one health approach in the National Action Plan for AMR to attain optimal health outcomes comprising the human health, animal health, and environment. A harmonized approach to testing for resistance to a set of antibiotics in a common set of bacteria in the targeted populations is core to the one health AMR surveillance system.

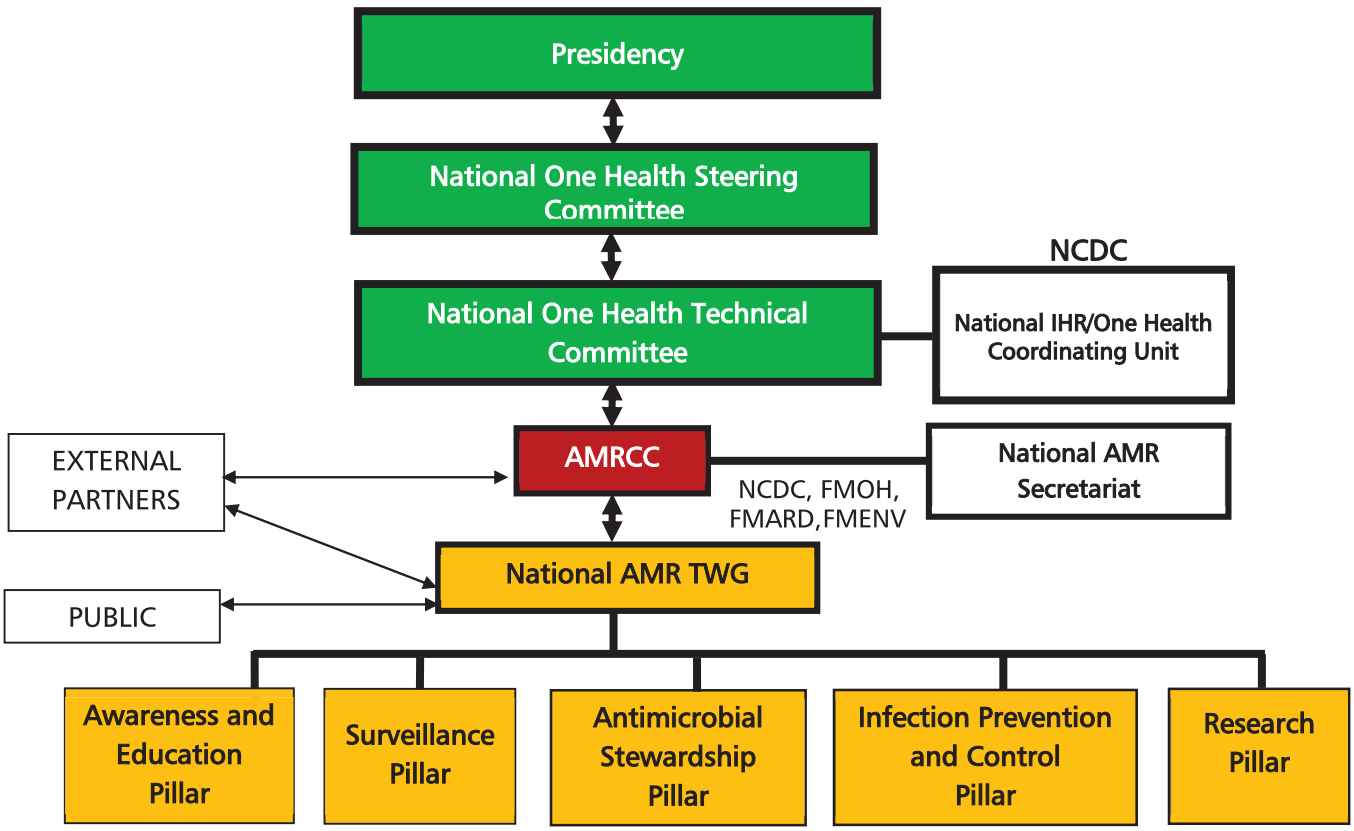
WHO, FAO and OIE frequently provides list of critically important antimicrobials and encourages the harmonization and coordination of national and international AMR surveillance and monitoring programs to ensure the responsible use of antimicrobial agents in animals. Some bacteria are now the focus of tripartite AMR surveillance and monitoring programs in several countries including ***Salmonella***, ***E. coli,*** and commensal bacteria ***Enterococcus*** **species** ***(E. faecium)*** from food-producing animals. Information on these bacteria can be more easily shared if one standardized method for antimicrobial susceptibility testing (AST) is used by all laboratories. As such, in 2017, the Nigerian government identified 4 National Reference Laboratories: National Reference Laboratory-NCDC, University College Hospital (Human Health), National Veterinary Research Institute (Animal) and National Environmental laboratory, Kano (environment). These NRLs work closely with a network of laboratories and each other in the trapartitite sectors to detect, characterise and report priority antimicrobial resistant pathogens within the AMR surveillance system. Data generation and the transmission of data to the OIE and GLASS will inform decisions for in-country and global interventions.

The terms of reference for NRL as well as the sentinel laboratories conducting AMR surveillance in Nigeria and, the memoranda of understanding which guides the relationship between all parties i.e. NCDC and Federal Ministry of Agriculture and Rural Development, the National Reference Laboratories and sentinel AMR surveillance sites are outlined in Annexes xxx.

6. Communication

There shall be formal internal and external communication channels for exchanging information, as described in Figure 3.

Figure 3. Internal and external communication channels for the AMR/AMU Governing bodies



6.1 Internal Communication

Official communications between the governing bodies shall be through:

1. Face-to-face meetings such as seminars, workshops, etc.
2. Mails both soft and hard copies
3. Telephone calls and SMS

6.2 External Communication

Official communication with external bodies/organisations shall be through:

1. Mails (soft and hard)
2. Conferences/meetings (national and international)
3. Media (radio, television and press release)
4. Publications
5. Situation reports

7. AMR/AMU GOVERNANCE AT THE SUB-NATIONAL LEVEL

At the sub-national level (i.e. state and local governments), there are currently no mechanisms to coordinate AMR/AMU activities. Nor is there an established reporting system for antimicrobial use/resistance in the human and animal sectors, a regulatory system for antibiotic use in humans and animals, nor a regulatory system to protect the environment from antimicrobial waste.

The national One Health AMR/AMU governance shall guide the development of such sub-national AMR/AMU governance. This AMR/AMU governance structure will serve as a template for developing AMR/AMU governance structure at the sub-national level. The development of sub-national level AMR/AMU governance structures that are linked to the national One Health AMR governance structure is recommended.

Figure 4. Recommended State AMRTWG organogram

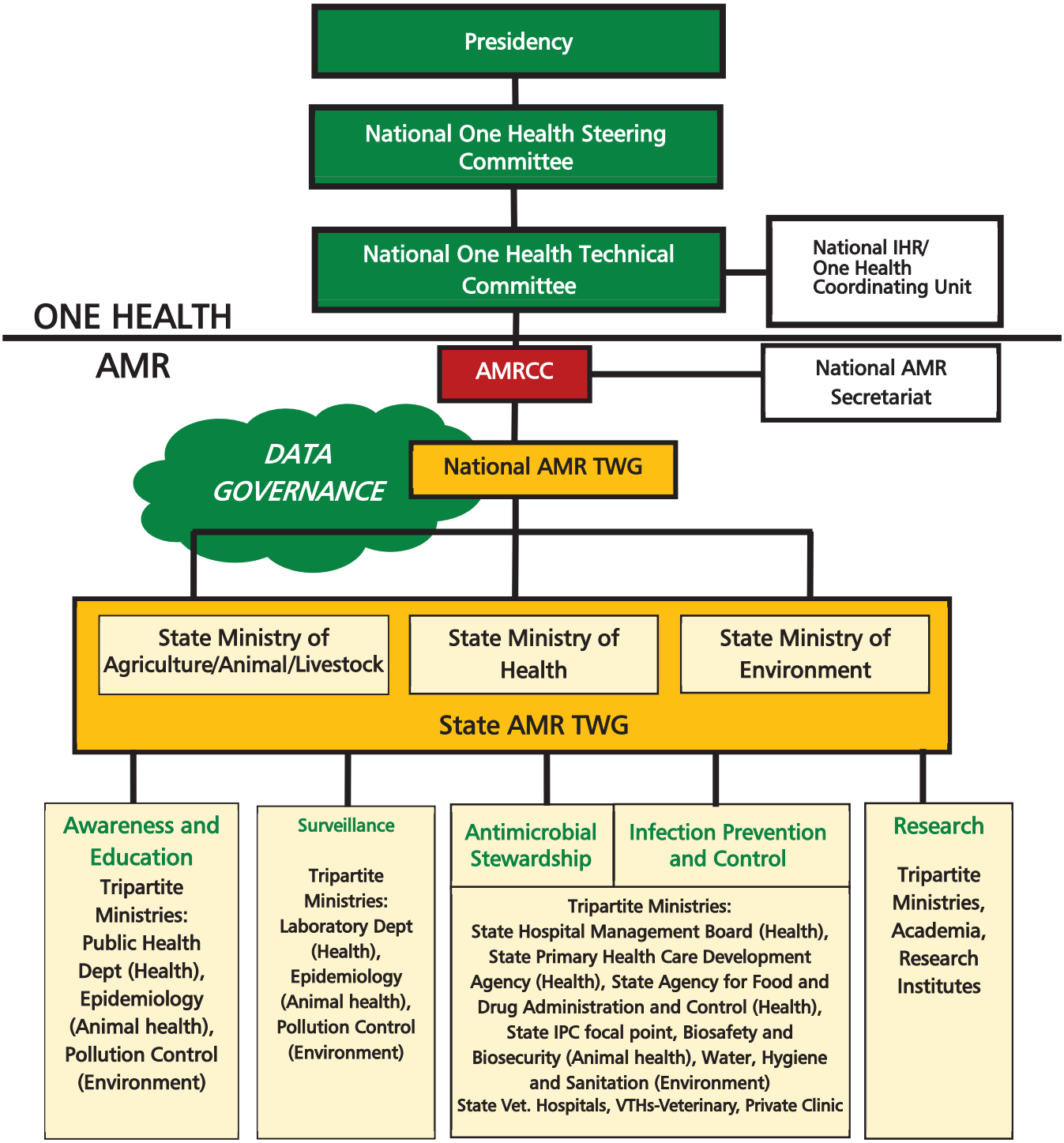


Table 2: Recommended representative organizations for State AMR TWG

AMR RESPONSE PILLAR	ORGANISATION
Awareness and Education	• State Ministry of Health • State Primary Health Care Development Agency/Board • State Ministry of Agriculture and Rural Development/Animal Health • State Ministry of Environment: Pollution Control • State Ministry of Information • State Orientation Agencies • State Ministry of Education • Academia
Surveillance	• State Ministry of Health, Hospital Management Board: Laboratory Services • Representative from Tertiary Hospital Microbiology Laboratory • State Ministry of Agriculture and Rural Development/Animal Health: Epidemiology • Representative from Veterinary Teaching Hospital Laboratory • State Ministry of Environment: Pollution Control/Microbiology • Academia • NESREA representative
Antimicrobial stewardship	• State Ministry of Health: AMS focal point • State HMB: Medical services, Pharmaceutical services, Nursing Services, Laboratory Services • Representative from Tertiary Hospital • State Ministry of Agriculture and Rural Development/Animal Health: Farms, Market, Vet Clinics • State Agency for Food and Drugs Administration and Control
Infection, Prevention and Control	• State Ministry of Health: IPC focal point • State Primary Health Care Development Agency/Board • State Ministry of Agriculture and Rural Development/Animal Health: Biosecurity

Economic Case for AMR response/ State AMR secretariat	• State Ministry of Health: Department of Public Health • State Primary Health Care Development Agency/Board • State Ministry of Agriculture and Rural: Veterinary services • State Ministry of Environment: Pollution Control • Key partners: WHO, FAO, OIE • State Agency for Food and Drugs Administration and Control • Representatives of Honourable Commissioners for Health, Agriculture and Environment

8. Monitoring/Evaluation

Effective monitoring and evaluation are needed to measure progress made by NOHSC, NOHTC, AMRCC, NAMR-TWG and sub-TWGs towards the delivery of the Nigerian NAP on AMR/AMU objectives. Furthermore, M&E helps identify key achievements and solutions to persisting gaps. The indicators for AMR/AMU sustainability outlined in Section 11 of this manual should also be monitored.

8.1 Monitoring

Each governance body shall:

1. Initiate and develop self-monitoring tools for all activities
2. Design a work plan based on the NAP
3. Develop a capacity strengthening plan
4. Identify indicators to be measured including:
    a. Frequency of meetings/workshops/seminars
    b. Written regular reports/meeting minutes/updates
    c. Achieved milestones and outputs
    d. Developed/revised plans
5. Continuously monitor progress and outputs.

The NOHSC shall receive and review AMR/AMU governance monitoring plans and reports provided by the AMRCC through the NOHTC.

The AMRCC shall coordinate the development and implementation of monitoring plans by the NAMR-TWG and Sub-TWGs.

8.2 Evaluation

There shall be both internal and external evaluations of the One Health AMR/AMU governance. The internal evaluation shall be yearly, and the external evaluation shall be every three to five years.

8.2.1 Internal Evaluation

The internal evaluation of the NOHTC, AMRCC, NAMR-TWG and sub-TWGs shall be performed by the NOHSC.

8.2.2 External Evaluation

The external performance evaluation of all governance bodies shall be performed by external expert evaluators in alignment with the national JEE.

9. Funding

To achieve and sustain the NAP objectives for AMR/AMU in Nigeria, there is need for adequate finance and finance allocation. The following potential funding sources have been identified:

1. **Government:** This funding can be obtained through the following:
   a) The Annual Appropriation Act and
   b) Coordinated bilateral and multilateral funding donors
2. **Private**: Banks, telecommunication, oil companies, individual philanthropists and other charitable organisations
3. **Partners:** All relevant partners including international development agencies, pharmaceutical companies, laboratories, professional bodies, civil societies, faith-based organisations, community-based organisations, foundations and the Nigerian military.

To mobilise fund and support from these sources, the following strategies should be adopted:

1. **Conducting regular advocacy visits to the following individuals and entities:**
   a. Ministers of key ministries involved in AMR/AMU activities
   b. Relevant legislators in the national assembly
   c. Honourable Minister of Finance, Budget, and National Planning
   d. Honourable Minister of Information and Culture
   e. Governors' forum
   f. Civil societies
   g. Donors
   h. AMR champions
2. **Strengthening public-private partnerships through:**
   a. Awareness and effective communication
   b. Regular engagement and collaboration
   c. Capacity building (training and the provision of guidelines)
   d. Research and development
   e. Data sharing
   f. Tax rebate and custom/exercise concession

10. AMR/AMU Sustainability Indicators

The indicators for AMR/AMU sustainability (described in Table 3) fall into four categories: (1) infrastructure, (2) capacity, (3) funding and (4) advocacy.

Table 3: AMR/AMU Sustainability Indicators

Category	Indices to be Monitored
Infrastructure	Existence of AMR/AMU Governance Structure
	Existence of AMR/AMU Governance Manual
	Existence of National AMR/AMU Action Plan
	The proportion of AMR/AMU Action Plan Activities in Operation
Capacity	The proportion of identified gaps in JEE that have been addressed (improvement in JEE ranking)
	The proportion of identified gaps in OIE that have been addressed (improvement in OIE PVS ranking)
	Level of laboratory capacity to generate standard data for AMR surveillance
	Level of AMR/AMU stewardship in both human and animal sector
	Number/Proportion of research activities on AMR/AMU
	Level of inter-sectoral and interdisciplinary (One Health) coordination and collaboration for AMR/AMU activities (e.g., the number of coordination meetings; the number of multisectoral activities implemented; the number of multisectoral AMR/AMU plans developed and implemented, etc.)
Funding	Budget allocation for AMR/AMU by the government
	The proportion of total allocated funds for AMR/AMU that comes from the government (sector ministries)
	The proportion of total allocated funds for AMR/AMU that comes from development partners
	The proportion of total allocated funds for AMR/AMU that comes from the private sector
	The proportion of total allocated funds for AMR/AMU that comes from partners' projects
	The proportion of government budgeted money released and used
Advocacy	Number of advocacy activities/campaigns
	Level of awareness at the community level and policy level for AMR
	Number of AMR/AMU champions among stakeholders
	The proportion of sub-national engagements for AMR/AMU

Annexes

Annex 1. Recommended AMR Pillar Members at State Level

PILLAR	ORGANISATION	DESIGNATION	NUMBER
Awareness	SMOH SPHCDA/B SMARD SMEnv SMinInformation NOA/ MinEducation Academia Professional associations	State Health Promotion/Education Officers	10 persons
Surveillance	SMOH (DLabServ) Tertiary Hospital Micro Lab State tertiary Hospital micro lab SMARD Lab serv./VTH SMEnv Lab serv. Academia NESREA	Directorate level or Chiefs cadre	10 persons
AMS	HMB Tertiary health facilities SMARD- Farms, Market, Vet Clinics NAFDAC -State	DMS DPH DNS DLab service Other corresponding designations at SMARD and SMEnv	10 persons
IPC	SMOH SPHCDA/B SMARD/Biosecurity	State IPC Focal, Biosecurity/Biosafety lead for SMARD and SMEnv	10 persons

Economic Case for AMR response/ State AMR secretariat	SMOH SPHCDA/B SMARD Vet services SMEnv- Pollution Partners NAFDAC	DPH, SEpid, SDSNO Rep of HCH/HCA/HCE SCVO, and relevant directorate cadre in Environment	10 persons

State TWG Membership: 3 persons/pillar – Awareness, Surveillance, AMS, &IPC (Human, Animal and Environment), plus all members of AMR secretariat

Annex 2. Terms of Reference and Memorandum of Understanding for Antimicrobial Resistance Surveillance and Antimicrobial Stewardship in Human Health

RECITALS

WHEREAS, Surveillance of antimicrobial resistance (AMR) tracks changes in microbial populations, permits the early detection of resistant strains of public health importance, and supports the prompt notification and investigation of outbreaks. AMR surveillance is crucial for detecting the emergence of new resistance patterns and for monitoring the impact of interventions towards minimizing the spread and burden of AMR. An efficient surveillance system for AMR is also part of Integrated Disease Surveillance and Response (IDSR) implementation and health systems strengthening to reduce mortality and morbidity due to infectious diseases.

WHEREAS, Effective and efficient national AMR surveillance system is important in planning and implementing the National Action Plan on AMR in Nigeria. AMR surveillance and Antimicrobial stewardship data should be interpreted in the context of local clinical practice. This is particularly relevant in the Nigeria's context which uses syndromic management strategies to clinically diagnose and treat patients empirically

CONSIDERING, Data on these bacteria can be more easily shared if one standardized method for antimicrobial susceptibility testing (AST) is used by all laboratories. As such, In October 2017, NCDC engaged 10 laboratories to participate in the National Antimicrobial Resistance Surveillance System in Nigeria. University College Hospital Ibadan (UCH) and National Reference Laboratory Gaduwa were identified as the two National Reference Laboratories for human health sector.

THEREFORE, Activities of the NRLs will be coordinated by the Nigeria Center for Disease Control. It is expected that as the country's national reference laboratory, the NRLs will work closely with a network of laboratories in the human health sector to provide support for the isolation, testing, and identification of antimicrobial resistant pathogens. Data generation and the transmission of data to GLASS will inform decisions for in country and global interventions.

THUS, this MOU which was prepared with the support of the Fleming Fund Country Grant to Nigeria, summarizes the terms of reference for the NRLs as well as the sentinel laboratories conducting human health AMR surveillance in Nigeria. Once signed by the relevant parties, the MOU within this document will guide the relationship between NCDC and the NRLs and between NCDC and the sentinel laboratories.

Terms of Reference: National Reference Laboratories (Human Health) for Antimicrobial Resistance

The Special Programmes 1 division is under the directorate of Prevention, Programmes and Knowledge Management at the Nigeria Centre for Disease Control. The directorate develops health promotion and disease prevention plans which address priority endemic infectious diseases and non-communicable diseases. The Directorate conducts research to inform evidence-based policies and practice and make evidence-based practice the foundation of all programs. The Team also works with other government agencies and partners to promote partnerships and collaborations, especially towards strengthening the One Health approach. In April 2017,the Directorate coordinated the development of a National Antimicrobial Resistance Situational Analysis and Action Plan, as well as the enrolment of laboratories into the Global Antimicrobial Resistance Surveillance System (GLASS).

The National Reference Laboratory – NCDC is part of the Public Health Laboratory at the Nigeria Center for Disease Control. NRL Gaduwa is the apex Public Health Reference Laboratory of the country and has the mandate to coordinate the diagnosis of diseases of public health importance. Over the last three years, the laboratory has developed the capacity for molecular diagnosis of Lassa fever, monkeypox, yellow fever, measles, rubella, meningitis, cholera and highly pathogenic infections such as Ebola. In addition to its diagnostic capacity, the NRL also provides genetic sequencing and other advanced services for research and surveys. In 2018, the NRL served as the central laboratory for the National AIDS Indicator and Impact Survey (NAIIS) and is well positioned to provide similar support to other disease surveys.

The University College Hospital, Ibadan was officially opened to the public on 20th November 1957. The mission of UCH Ibadan as a tertiary health institution is to render excellent, prompt, affordable and accessible health care in an environment that promotes hope and dignity, irrespective of status, and to also develop high quality health personnel in an atmosphere that stimulates excellent and relevant research. UCH currently has medical microbiology and parasitology that offers training and services in Surveillance and Control of Hospital Infections and Sexually Transmitted Infections in addition to the residency training programme.

The laboratory is currently undertaking the following work: processing of various clinical samples from various wards, clinics and outside hospitals, training of Resident Doctors (both rotating and specialist in Medical Microbiology); training of Intern Medical Laboratory Scientist from various Universities, through rotational posting in various sections of the Microbiology laboratory; surveillance of Hospital infections by the Infection Control Unit of the department to reduce nosocomial infections and daily Medical Microbiology consult services for in-patients and weekly ward rounds. In terms of infrastructure, the medical microbiology and parasitology department at the UCH is equipped with

automated blood culture machines, minus 80-degree freezer, autoclave and incubator in the laboratory to perform AMR surveillance function.

The description of the terms of reference (TOR) for the coordination of activities between the NCDC, UCH and the sentinel laboratories on the surveillance of AMR is detailed below.

The Special Programmes 1 at the NCDC Terms of Reference:

1. Carry out all AMR surveillance activities of the national reference laboratory for the human health sector as contained in the AMR National Action Plan (NAP), Guidelines for AMR/AMU Surveillance in the human health sector in Nigeria.
2. Constitute, where non-existent, an institutional based AMS committee with membership drawn from relevant technical experts including clinical microbiology, pharmacology, medical laboratory scientists, and public health, among other areas.
3. Provide capacity building support including trainings and technical assistance on antimicrobial stewardship and antimicrobial resistance.
4. Roll out and implement a National Information Management System for communications within the National AMR surveillance system.
5. Serve as a coordination point for AMR surveillance and antimicrobial stewardship, and share information with relevant stakeholders.

The NRL-NCDC Terms of Reference:

1. Oversee the coordination of an AMR isolate and sample transport network for the sentinel laboratories, based on the AMR surveillance guidelines.
2. The NRL-NCDC will review and investigate any incomplete, atypical, or unusual results from sentinel sites before sharing reports with the AMR-IPC unit, PPKM and the DG, NCDC.
3. The NRL-NCDC will provide feedback to sentinel sites on reporting and EQA performance quarterly.

The NRL-NCDC and UCH-Ibadan Terms of Reference:

1. Receive isolates from the AMR sentinel laboratories and where necessary, sample specimens as may be determined by the National Reference Laboratory (NRL).
    a. Carry out culture, isolation, identification, and confirmation of the target bacteria and conduct AST and any other relevant tests on the isolates.
    b. Provide reference service for core organism/antimicrobial combinations for borderline isolates or isolates with unexpected or unusual resistance profiles.
    c. Provide technical oversight of active surveillance including SOPs and reference materials in human health, to sentinel sites including training on procedures relevant to AMR surveillance with provided funding.

d. Collaborate with international centres to monitor emerging resistance patterns.
e. Establish and maintain a bacterial isolate biorepository following standard operating procedures (SOPs).
f. Prepare for relevant ISO standard accreditations serving as the national human bacteriology EQA provider in the country, and the sentinel sites for relevant ISO standard accreditation
g. Participate in internationally recognized proficiency testing and other external quality assessment (EQA) programmes.
h. Coordinate proficiency testing, EQA programmes and work with other recognized institutions to provide proficiency testing across sentinel site laboratories.
i. Confirm the identification and susceptibility pattern of isolates sent to the NRL from sentinel sites for EQA.
j. Provide appropriate mediative actions to sentinel sites based on the outcomes of periodic proficiency testing rounds.

2. Coordinate and conduct periodic on-site supervision of the sentinel laboratories based on the AMR surveillance guidelines and report the outcomes to the facilities, the NAMR Technical Working Group (NAMR-TWG), NAMR Coordinating Centre (NAMRCC), NCDC, and other key stakeholders for intervention, as appropriate.
   a. Conduct periodic training and reviews of AMR laboratory activities in conjunction with AMR-IPC unit and the sentinel laboratories. Resources for such trainings will be provided by the NCDC or other funding that would be sought for by the AMRCC.
   b. Negotiate procurement and tendering processes to improve access to reagents and consumables for sentinel site laboratories, in collaboration with the AMR secretariat.
   c. Continue to collaborate and conduct research in the field of microbiology, serving as a resource and coordination point for laboratory expertise.
   d. Provide periodic reports including analysis and interpretation, to provide information to the AMR secretariat and other key stakeholders on the AMR burden in the human health sector in Nigeria to inform policy and decision-making, in accordance with the AMR National Action Plan and guidelines for AMR/AMU Surveillance in the human health sector in Nigeria.
   e. The Fleming Fund , World Health Organisation and other key partners would cater to the installation, training and initial maintenance of equipment supplied for AMR surveillance covering a period as within the contract.

Reporting lines and Schedules

The NCDC will report to the Honourable Minister of Health through the Director General, Nigeria Center for Disease Control as outlined in the One-Health Strategic Plan. The NCDC will perform the following actions:

1. Collate data from surveillance sites as detailed in the AMR surveillance and Antimicrobial stewardship (AMS) plans.
2. Coordinate access to EQA nationally and internationally, within the national AMR surveillance network
3. Provide training, laboratory infrastructure and technical support to the national AMR surveillance network.
4. Provide other relevant support as necessary to the network.

Terms of Reference: Sentinel Laboratories within the National Antimicrobial Resistance Surveillance Network in Nigeria

The government of Nigeria adopted a one health approach in the National Action Plan for AMR to attain optimal health outcomes comprising the human health, animal health, and environment. A harmonized approach to testing for resistance to a set of antibiotics in a common set of bacteria in the targeted populations is core to the one health AMR surveillance system.

As the first step to strengthen the AMR surveillance system for human health in Nigeria, the system will focus on strengthening detection, characterization and reporting of priority bacterial organisms for AMR surveillance in humans.

The Nigeria Center for Disease Control identified a network of laboratories to roll out the AMR surveillance programme in Nigeria: two National Reference Laboratories for AMR and nine sentinel sites. Appropriate terms of reference for the operations of both the NRL and sentinel sites are essential for implementing a functional AMR surveillance system.

Membership

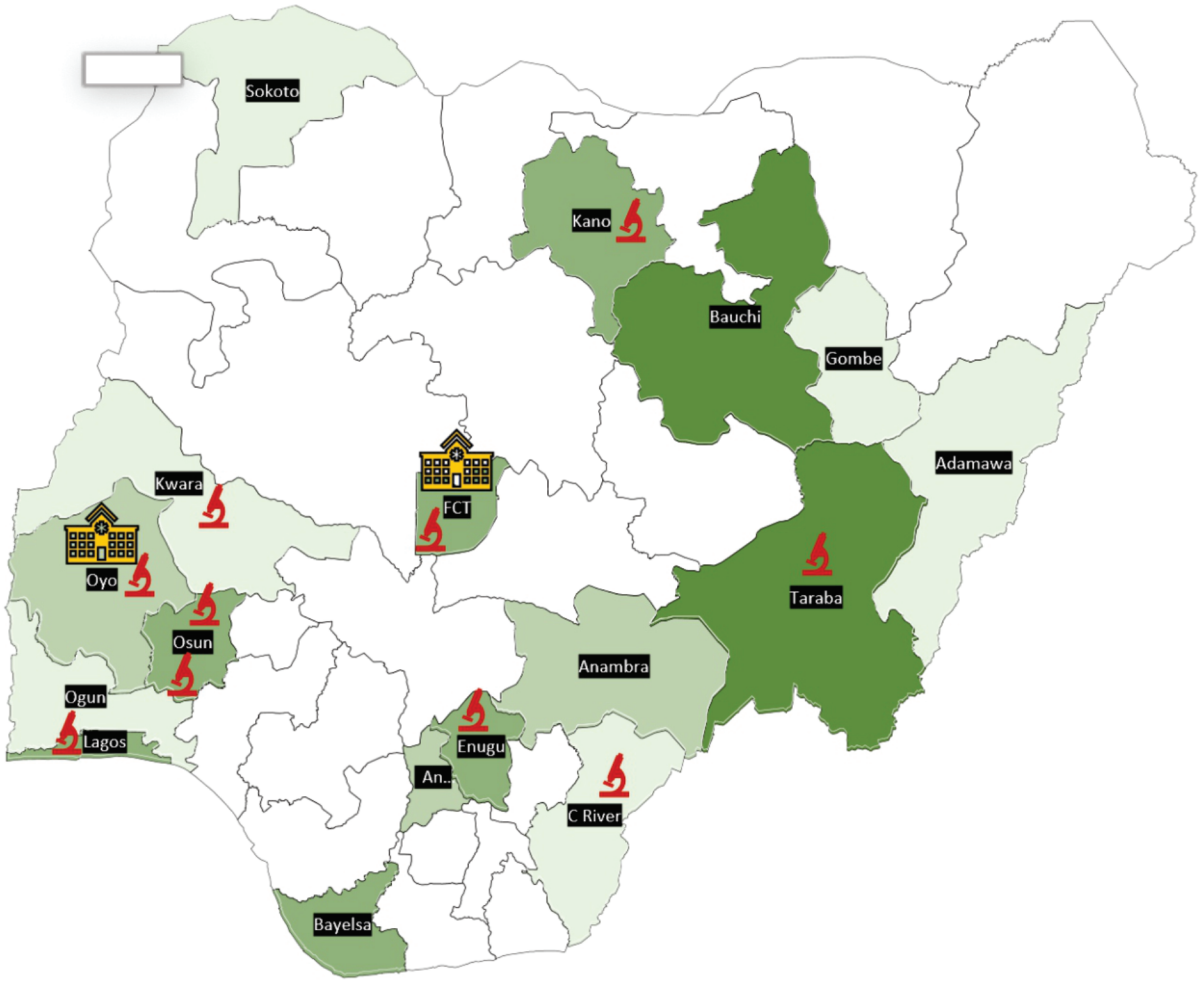
The Nigeria Center for Disease Control in collaboration with the NAMRTWG and NAMRCC identified and assessed nine sentinel laboratories for rolling out AMR surveillance in the country. These laboratories are:

1. Lagos University Teaching Hospital (LUTH)
2. Aminu Kano University Teaching Hospital (AKTH)
3. National Hospital Abuja (NHA)
4. Obafemi Awolowo University Teaching Hospital Complex (OAUTHC)
5. University Teaching Hospital Ilorin (UITH)
6. University of Calabar Teaching Hospital
7. University Teaching Hospital Enugu (UNTH)
8. Federal Medical Centre (FMC) Jalingo
9. Ladoke Akintola University Teaching Hospital, Osogbo
10. Babcock University Teaching Hospital

Methods of receiving samples, isolation, identification, antibiotic susceptibility testing of bacterial isolates, storage and transportation of isolates to NRL for EQA shall be conducted in accordance with the Active AMR Surveillance Strategy in Nigeria. External Quality Assurance shall be conducted following set guidelines.

Four-monthly review meetings shall be held between the AMR secretariat, NRLs, and the sentinel laboratories in the AMR surveillance network. Performance evaluation and strategic recommendations that could inform service improvement and policy to be forwarded to the NCDC.

Distribution of laboratories within the National AMR Surveillance Network in Nigeria



States with at least one AMR sentinel site

At least one microbiology laboratory optimized in the State (tertiary or secondary)

denotes National Reference Laboratory for AMR surveillance

Terms of Reference

1. Constitute antimicrobial stewardship committee in each health facility comprising experts from bacteriology, parasitology, clinical microbiology, pharmacology, and other relevant professionals. The Chairperson of the committee shall be nominated from amongst members of the committee. The committee shall report to the Head of the Teaching Hospital/ Institutions of the respective sentinel sites.
2. Receive specimens from collection sites and carry out isolation, identification, and Antimicrobial Susceptibility Testing on the target bacterial isolates according to specific SOPs and establish the susceptibility and resistance pattern of the isolates.
3. Analyse the AMR data and interpret results and report data on AMR incidence/pattern to the NCDC and the NRL monthly.
4. Submit resistant bio-specimens (samples and isolates) and results to the NRL for human health sector for EQA.
5. Establish a bacterial isolate cold storage for future reference.
6. Roll out and implement the established National Laboratory Information Management System (LIMS) for communication between the laboratories, the NRL, AMR secretariat, NAMR-TWG and NAMRCC.
7. Reporting of AMR data shall be done following the National AMR Surveillance Guidelines for Human Health Laboratories in Nigeria.

Memorandum of Understanding (MOU): Between the National Reference and Sentinel Laboratories in the National Antimicrobial Surveillance Network

Article 1: Objectives of cooperation

The objective of this memorandum of understanding is to establish links between the national and laboratories selected to act as sentinel sites for the surveillance of antimicrobial resistance and antimicrobial stewardship for human health in Nigeria. Co-operation between these laboratories will support the development and maintenance of a national surveillance system for antimicrobial resistance.

Article 2: Areas of cooperation

The NCDC and NRLs will provide:

1. Provision of a reference service for core organism/antimicrobial combinations for borderline isolates or isolates with unexpected or unusual resistance profiles, including quality assurance.
2. Support procurement and tendering process to improve access to reagents and consumables for diagnostics at the microbiology laboratories at AMR/U sentinel sites, in collaboration with the National Antimicrobial Resistance Coordination Committee (NAMRCC).
3. Oversee AMR sample transport network and maintain a biorepository for bacterial isolates.
4. Promote good practice through to ensure standardization and quality control through proficiency testing, audits training and mentorship.
5. Facilitate the development of internal quality assurance at sentinel site laboratories.
6. Review EQA performance of participating laboratories and provide feedback on results to laboratories.
7. Provide the technical guidance on all AMS/AMR trainings for health care workers in all sentinel sites.
8. Coordinate the set-up of antimicrobial stewardship programmes at the hospital/AMR/U surveillance sentinel sites.
9. Provide sentinel sites with opportunities to benefit from national and or international trainings, networking and learning opportunities in antimicrobial stewardship/AMR.
10. Serve as a platform for experience sharing, resource and coordination point for laboratory expertise and share information and advice with sentinel sites on antimicrobial stewardship.
11. Collaborate with international centres to monitor emerging resistance patterns.

The sentinel site will

1. Establish a site coordinating committee for AMR with oversight of AMR surveillance implementation at the site and reporting against key indicators.
2. Carry out culture, isolation, identification and antimicrobial susceptibility testing of specimens and isolates of national importance in accordance with federal guidelines.
3. Submit isolates, results and associated clinical data quarterly to the national reference laboratory in their region for quality assurance and epidemiological testing as requested by the appropriate National Reference Laboratory and in accordance with Federal guidelines.
4. Participate in the National External Quality Assurance Scheme for bacteriology and antimicrobial susceptibility testing.
5. Communicate AMR results (organism and susceptibilities) to clinicians in a timely manner to improve the care of individual patients.
6. Refer isolates with unusual, unexpected or indeterminate resistance patterns to the coordinating AMR laboratory for further testing.
7. Participate in on-site AMR and AMS training and attend national training as appropriate.
8. Conduct internal quality assurance procedures to ensure the quality of AMR results.
9. Work with the coordinating committee and supporting NRL-NCDC and UCH-Ibadan to develop capacity, working towards gaining laboratory accreditation in iso15189.
10. Establish antimicrobial stewardship committee with oversight of facility antimicrobial stewardship programme implementation at the site
11. Provide monthly/quarterly feedback on antimicrobial consumption to NCDC and the hospital management to improve patient care
12. Conduct regular point prevalence surveys, monitoring of antimicrobial stewardship activities in the sentinel site

Article 3: Equipment Maintenance

In addition to the Terms of Reference listed above, the sentinel sites are also expected to maintain and service the equipment provided by the NCDC or her partners, procure consumables and reagents as at when due and escalate major equipment malfunction to NCDC. The sentinel sites management are expected to have a budget line for sustainability.

Article 4: Ethics in Science

Ethics, including patients' rights, shall be observed in all cases throughout the AMR surveillance activities.Laboratory quality management systems should be put in place at the NRL and sentinel sites.

Article 5: Confidentiality of Information

All parties shall comply with all laws and regulations governing the confidentiality of the information that is the subject of this MOU.

1. The data recipient will not release data to a third party without prior approval from the NCDC.
2. The data recipient will not share, publish, or otherwise release any findings or conclusions derived from analysis of data obtained from the data provider without prior approval from NCDC.
3. Data transferred pursuant to the terms of this Agreement shall be utilized solely for the purposes set forth in the "MOU".

Article 6: Amendment

The contents of this MOU can be amended via a written communication to the DG NCDC subject to mutual agreement and amendments shall be regarded as integral component of the MOU.

Article 7: Amendment Force majeure

Neither party to this MoU shall be liable for any loss, damage, injury or delay in performance or non-performance due to an Act of God which expression shall include acts of government, labour disputes (industrial actions), lock outs, fire, lightening, flood, pandemic, riots, civil commotion, acts of war and earthquake.

However, the party exposed to or affected by such act of God shall immediately notify the other party(ies) about such event, its extent and the anticipated duration of the respective disruptions and shall do what is reasonably in its means to avoid or remove the causes of the Force Majeure in order to continue performance under this Agreement.

Article 8: Dispute Settlement

The contents of this MOU can be amended via a written communication to the DG NCDC subject to mutual agreement and amendments shall be regarded as integral component of the MOU.

Article 9: Conduct Compliance

Each party shall comply with all applicable laws and legal requirements in connection with the activities contemplated by this MOU.

Article 10: Funding

The NCDC, national reference laboratories and AMR sentinel sites tare expected to have a budget line for implementation of AMR response activities and

sustainability of the MOU. Such support shall cater for power, equipment and consumables for activities. The NCDC as well as the participating laboratories shall explore/mobilize additional resources including development partner interventions.

This memorandum of understanding binds the above-mentioned sentinel sites, NRLs and other sentinel sites joining the AMR surveillance system.

Article 11: Entry into Force, Renewal Termination

1. This MOU shall be effective as of this day Monday, the 22nd of April 2021 and shall remain in full force until the Project completion and review by stakeholders.
2. A party may renew OR terminate this MOU provided that at least three (3) months notification (to the renewal or termination date) has been given to the other party.
3. The MOU, unless terminated earlier, can be consensually reviewed to cover other areas of support related to AMR.

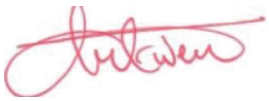
Signature Page

The undersigned being duly authorized thereto by their respective organizations have signed this MOU:

Representative of Nigeria Centre for Disease Control

Name **Dr Chikwe Ihekweazu**

Designation **Director General NCDC**

Sign 

Representative of University College Hospital, Ibadan, Oyo State

Name **Professor Jesse A.**

Sign 

Representative of University of Nigeria Teaching Hospital, Nsukka, Enugu State

Name **Dr Obinna Onodugu**

Sign 

Representative of University of Ilorin Teaching Hospital, Ilorin, Kwara State

Name **Professor Abdullahi Yusuf**

Sign 

Representative of University of Osun Teaching Hospital, Osogbo, Osun State

Name **Professor P.B. Olaitan**

Sign 

Representative of Federal Medical Centre Jaling0, Taraba State

Name **Dr Wanonyi Ishaya Kwala**

Sign 

Representative of Lagos University Teaching Hospital, Idi-Araba, Lagos State

Name **Professor Chris Bode**

Sign 

Representative of National Hospital, Abuja, Federal Capital Territory

Name **Professor Jafaru A.**

Sign 

Representative of Obafemi Awolowo University Teaching Hospital, Ile-Ife, Osun State

Name **Professor V.A. Adetiloye**

Sign 

Representative of University of Calabar Teaching Hospital, Calabar, Cross River State

Name **Professor A. Ikpeme**

Sign 

Representative of Aminu Kano University Teaching Hospital, Kano State

Name **Professor A. Abba**

Sign 

Annex 3. Terms of Reference and Memorandum of Understanding for Antimicrobial Resistance Surveillance in Animal Health

Terms Of Reference for the Animal Health National Reference Laboratory (National Veterinary Research Institute, Vom) for Antimicrobial Resistance Surveillance in Nigeria

The National Veterinary Research Institute (NVRI), Vom was established in 1924. The mandates of NVRI as a Veterinary Research Institute based on Decree 35 of 1975 are as follows:

1. To conduct research on all aspects of animal diseases and their treatment and control.
2. To develop and produce animal vaccines, sera, and biological to meet the national demand.
3. To provide surveillance and diagnosis of animal diseases.
4. To introduce exotic stock for improved eggs, meat, and milk production.
5. To provide extension services to poultry and livestock farmers.
6. To train intermediate manpower in veterinary laboratory technology and animal health and production technology.

NVRI has highly trained staff, including experienced research professionals in veterinary science and other fields of natural and applied sciences as well as several medical laboratory and animal husbandry scientists. The Institute's primary areas of focus include research for the development of new vaccines and other methods of combatting emerging diseases in livestock and poultry as well as the improvement of vaccine production.

NVRI currently has three laboratories undertaking bacteriological work:

1. The bacterial vaccines production laboratory is concerned with the production of bacterial vaccines.
2. The bacteriology research laboratory is primarily concerned with research into bacterial diseases, though it does assist with diagnostic work. Currently, research is focused on ***Mycoplasma***, ***Pasteurella***, **staphylococci,** ***E. coli, Campylobacter***, ***Salmonella,*** **and** ***Brucella***. AST is performed on *Salmonella*, ***E. coli, Campylobacter*** and staphylococcus isolates.
3. The Central Diagnostic Laboratory (CDL) functions as a diagnostic laboratory for animal disease. All routine samples for laboratory diagnostic testing are sent to this facility, though they may be transferred to other departments for specialized tests or further testing.

There are also molecular facilities, including a BSL-3 laboratory focused on the surveillance of important virologic diseases of animals and humans such as avian influenza, coronavirus, monkeypox, Lassa fever virus, etc. While no laboratory performs dedicated AMR surveillance function, the CDL and bacteriology research laboratories can work together to develop this function.

The description of the terms of reference (TOR) for the coordination of activities between the NRL and the sentinel laboratories on the surveillance of AMR is detailed below.

The AMR TOR:

1. Carry out all AMR surveillance activities of the national reference laboratory for the animal health sector as contained in the AMR National Action Plan (NAP), Guidelines for AMR/AMU Surveillance in the animal health sector in Nigeria, Surveillance for antimicrobial resistance in poultry in Nigeria and expanded antimicrobial resistance surveillance strategy for ruminants, swine and aquaculture in Nigeria.
2. Constitute, where non-existent, an Institutional based AMR committee with membership drawn from relevant technical experts in veterinary medicine, veterinary microbiology, veterinary public health and preventive medicine, veterinary pharmacology, medical laboratory scientists, and public health, among other areas.
3. Receive isolates from the field and sentinel laboratories and where necessary, sample specimens as may be determined by the NRL.
4. Carry out culture, isolation, identification, and confirmation of the target bacteria and conduct AST and any other relevant tests on the isolates.
5. Conduct data entry and analysis and interpret laboratory results to provide information to the Federal Ministry of Agriculture and Rural Development (FMARD) on the AMR burden in the animal health sector in Nigeria to inform policy and decision-making.
6. Roll out and implement the established National Laboratory Information Management System (LIMS) for communications between the laboratories, the FMARD and the National Antimicrobial Resistance Coordination Committee (AMRCC).
7. Establish and maintain a bacterial isolates biorepository following standard operating procedures (SOPs).
8. Participate in internationally recognized proficiency testing and other external quality assessment (EQA) programmes with the support of implementing partners such as the Fleming Fund (FF) EQA grant for Africa (EQuAFRICA).
9. Conduct/coordinate proficiency testing and other EQA programmes for the sentinel laboratories.
10. Provide appropriate mediative actions to sentinel sites based on the outcomes of periodic proficiency testing rounds.
11. Coordinate and conduct periodic on-site supervision of the sentinel laboratories based on the AMR surveillance guidelines and report the

outcomes to the facilities, the AMRCC, FMARD, and partners such as the Fleming Fund consortium, OIE etc for intervention, as appropriate.

12. Submit periodic reports of laboratory results to the AMR Coordinating Centre for the Animal Health Sector (Federal Department of Veterinary and Pest Control Services, FMARD) in accordance with the AMR National Action Plan, Guidelines for AMR/AMU Surveillance in the animal health sector in Nigeria, Surveillance for antimicrobial resistance in poultry in Nigeria and expanded antimicrobial resistance surveillance strategy for ruminants, swine and aquaculture in Nigeria.
13. Conduct periodic training and reviews of AMR laboratory activities in conjunction with FMARD and the sentinel laboratories. Resources for such trainings will be provided for by the FMARD, FF country grant or other funding that would be sought for by the AMRCC.
14. Prepare both the NRL and sentinel sites for relevant ISO standard accreditation with the support of the implementers of FF EQA grant for Africa (EQuAFRICA).
15. Prepare for relevant ISO standard accreditations serving as the national veterinary bacteriology EQA provider in the country.
16. Provide reference service for core organism/antimicrobial combinations for borderline isolates or isolates with unexpected or unusual resistance profiles.
17. Collaborate with international centres to monitor emerging resistance patterns.
18. Negotiate procurement and tendering processes to improve access to reagents and consumables for sentinel site laboratories, in collaboration with the AMRCC.
19. Oversee the coordination of an AMR sample transport network as would be established by the AMRCC based on the AMR surveillance guidelines.
20. Provide technical oversight of active surveillance in animal health concerning sample collection, transport, and testing.
21. Provide standardized SOPs and reference materials to be developed with the FMARD in collaboration with Fleming Fund Country Grant to sentinel sites.
22. Train staff of sentinel laboratories in procedures relevant to AMR surveillance with funding provided by the FF grant and other donor agencies.

23. Work with the EQuAFRICA and other recognized institutions to provide proficiency testing across sentinel site laboratories.
24. Confirm the identification and susceptibility pattern of isolates sent to them from sentinel sites for EQA.
25. Continue to collaborate and conduct research in the field of microbiology.
26. Serve as a resource and coordination point for laboratory expertise and share information and advice with relevant stakeholders.
27. The Fleming Fund Country Grant shall cater for the installation, training and initial maintenance of equipment supplied for AMR surveillance covering a period as should be stipulated within the contract. The NRL is expected to develop a maintenance plan for the equipment and ensure its functionality, security beyond the life cycle of the Fleming Fund grant.

Reporting Lines / Reporting Schedules

The NRL will report to the Honourable Minister of Agriculture and Rural Development through the Chief Veterinary Officer of Nigeria (CVON) every quarter. The NRL will report to the Department of Veterinary and Pest Control, FMARD, on the following:

1. Data from surveillance sites as detailed in the AMR surveillance plan.
2. EQA results of the sentinel site surveillance network.
3. Loss or delayed laboratory reports.
4. Sample rejection.
5. NRL's international EQA performance.
6. Training undertaken.
7. Any other relevant issues with the laboratory surveillance network.

The NRL will review and investigate any incomplete, atypical, or unusual results from sentinel sites before sending the reports to the CVON.
The NRL will provide feedback to sentinel sites on reporting and EQA performance quarterly.

Terms Of Reference For Sentinel Laboratories For Antimicrobial Resistance Surveillance In Nigeria

Background:

The government of Nigeria adopted a one health approach in the National Action Plan for AMR to attain optimal health outcomes comprising the human health, animal health, and environment. A harmonized approach to testing for resistance

to a set of antibiotics in a common set of bacteria in the targeted populations is core to the one health AMR surveillance system.

As the first step to strengthen the AMR surveillance system for animal health in Nigeria, the system will focus on strengthening AMR surveillance in poultry, specifically broiler and layer poultry populations. Poultry was selected because of high consumption levels compared to other meat sources and the wide use of antibiotics in the sector, including some antibiotics for which the emergence of resistance in humans is of great concern.

The Federal Ministry of Agriculture and Rural Development (FMARD) in collaboration with the National Antimicrobial Resistance Coordination Committee (AMRCC) identified a network of laboratories to roll out the AMR surveillance programme in Nigeria. The laboratories comprised of the National Veterinary Research Institute (NVRI), Vom as the National Reference Laboratory (NRL) and seven sentinel sites comprising the National Fisheries laboratory, the Central Diagnostic Laboratory, NVRI Vom and five other Veterinary Teaching Hospitals. Appropriate terms of reference for the operations of both the NRL and sentinel sites are essential for implementing a functional AMR surveillance system.

Membership:

The Federal Ministry of Agriculture and Rural Development in collaboration with the National Antimicrobial Resistance Surveillance Coordination Committee (AMRCC) identified and assessed seven veterinary laboratories for rolling out AMR surveillance in the country. These laboratories are:

1. AMR National Reference Laboratory. (NRL)
2. The Veterinary Teaching Hospital, University of Ibadan
3. The Veterinary Teaching Hospital, University of Nigeria, Nsukka
4. The Veterinary Teaching Hospital, Ahmadu Bello University, Zaria
5. The Veterinary Teaching Hospital, Usmanu Dan Fodiyo University, Sokoto
6. The Veterinary Teaching Hospital, University of Ilorin, Ilorin.
7. The National Fisheries Laboratory, Lagos
8. Central Diagnostic Laboratory, National Veterinary Research Institute, Vom.

Working Method in AMR Surveillance:

Methods of receiving samples, isolation, identification, antibiotic susceptibility testing of bacterial isolates, storage and transportation of isolates to NRL for EQA will be conducted in accordance with the Active AMR Surveillance Strategy in Poultry in Nigeria. External Quality Assurance shall be conducted following the AMR EQA Guidelines for Animal Health Laboratories in Nigeria.
Quarterly review meetings shall be held between the CVON, management of the NRL / VTH / Institutions, and all laboratory focal persons in the AMR surveillance

network. Performance evaluation and strategic recommendations that could inform service improvement and policy to be forwarded to the FMARD.

TERMS OF REFERENCE

1. Constitute a technical committee in each laboratory comprising experts from veterinary medicine, veterinary microbiology, veterinary public health and preventive medicine, veterinary pharmacology, and other relevant professionals. The Chairperson of the committee shall be nominated from amongst members of the committee. The committee shall report to the Director VTH / Institutions of the respective sentinel sites.
2. Receive specimens from collection sites and carry out isolation, identification, and Antimicrobial Susceptibility Testing on the target bacterial isolates according to specific SOPs and establish the susceptibility and resistance pattern of the isolates.
3. Analyse the AMR data and interpret results and report data on AMR incidence/pattern to the FMARD and the NRL monthly.
4. Submit resistant bio-specimens (samples and isolates) and results to the NRL for animal health sector for EQA.
5. Establish a bacterial isolate cold storage for future reference.
6. Roll out and implement the established National Laboratory Information Management System (LIMS) for communications between the laboratories, the FMARD and the National Antimicrobial Resistance Coordination Committee (AMRCC).
7. Reporting of AMR data shall be done according to the Active AMR Surveillance Strategy in Poultry in Nigeria and the AMR External Quality Assurance Guidelines for Animal Health Laboratories in Nigeria.
8. The Fleming Fund Country Grant shall cater for the installation, training and initial maintenance of equipment supplied for AMR surveillance covering a period as should be stipulated within the contract. The NRL is expected to develop a maintenance plan for the equipment and ensure its functionality, security beyond the life cycle of the Fleming Fund grant.
9. The sentinel sites should always ensure that there are well trained staff within the microbiology laboratory for continuity of AMR services within the institution.

Memorandum Of Understanding Between The Sentinel Laboratories, National Reference Laboratory For Animal Health (National Veterinary Research Institute, Vom) and The Federal Ministry Of Agriculture Rural Development

Article 1: Parties involved in the MOU

This MOU is between the Federal Ministry of Agriculture and Rural Development (FMARD), the National Reference Laboratory (National Veterinary Research Institute, Vom) and the seven Sentinel laboratories involved in AMR Surveillance activities sponsored by the Fleming Fund Country grant for Nigeria (FFCG).

Article 2: Scope

a) All activities earmarked for implementation of national AMR surveillance plan by the Fleming Fund through FMARD include but are not limited to the provision of laboratory equipment and other necessary facilities and resources for AMR and antimicrobial use (AMU) at the laboratories.

b) Training and re-training for surveillance and laboratory personnel by the NRL and development partners.

c) Sample collection, bacteria isolation, identification, and AST; analysis of results, and data reporting to the FMARD and AMRCC.

d) The identification of risk factors for AMR based on the data generated.

Article 3: Non-disclosure

Any information concerning active AMR Surveillance results/data obtained from the FFCG covered by this MOU will not be disclosed or divulged without the consent and approval of FMARD.

Article 4: Intellectual Property

Any right arising from investigation, results and future applications (product development) from the AMR surveillance in accordance with this MOU will be an intellectual property belonging to the Federal Government of Nigeria and the surveillance sites under Nagoya protocol. Violation of such rights will be treated under the appropriate procedure.

Article 5: Ethics in Science

a) Laboratory ethics, including animal rights, shall be observed in all cases throughout the AMR surveillance activities.

b) Laboratory quality management systems should be put in place at the NRL and sentinel sites.

Article 6: Receiving Arrangements

The NRL and the seven sentinel laboratories shall make adequate arrangements to receive samples (faecal materials), isolates (NRL) and other consumables. They should always also be prepared to receive samples from field staff accordingly.

Article 7: Financial Arrangement

a) The management of NRL and sentinel sites to develop an internal mechanism of financial support for AMR activities as reflected in their respective capacity strengthening plans. Such support shall cater for power, equipment and consumables for activities beyond those provided for in the FFCG.

b) The FMARD to ensure budgetary allocations and appropriations for AMR surveillance to sustain the national surveillance system.

c) The FMARD as well as the participating laboratories shall explore/mobilize additional resources for the national one-health platform and development partners' interventions.

Article 8: Entry into Force; Renewal Termination

a) This MOU shall be effective as of this day **Monday, the 2nd of November, 2020** and shall remain in full force until the Project completion and review by stakeholders.

b) A party may renew OR terminate this MOU provided that at least three (3) months notification (to the renewal or termination date) has been given to the other party.

c) The MOU, unless terminated earlier, can be consensually reviewed to cover other animal species.

Article 9: Force Majeure

Neither party to this MoU shall be liable for any loss, damage, injury or delay in performance or non-performance due to an Act of God which expression shall include acts of government, labour disputes (industrial actions), lock outs, fire, lightening, flood, pandemic, riots, civil commotion, acts of war and earthquake.

However, the party exposed to or affected by such act of God shall immediately notify the other party(ies) about such event, its extent and the anticipated duration of the respective disruptions and shall do what is reasonably in its means to avoid or remove the causes of the Force Majeure in order to continue performance under this Agreement.

Article 10: Amendment

The contents of this MOU can be amended via a written communication to the office of the CVON subject to a mutual agreement, and amendments shall be regarded as an integral component of the MOU.

Article 10: Dispute Settlemen12t

The parties shall settle any difference in the interpretation and application of this MOU by applying alternative dispute resolution (ADR) mechanisms.

Article 11: Conduct Compliance

Each party shall comply with all applicable laws and legal requirements in connection with the implementation of activities contemplated by this MOU.

Signature Page

The undersigned being duly authorized thereto by their respective organizations have signed this MOU:

Representative of National Veterinary Research Institute, Vom

Name: Hajiya Maryam Muhammad.

Sign 

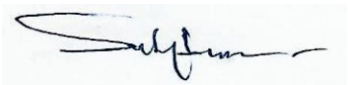
Representative of Veterinary Teaching Hospital, University of Ibadan

Name: Prof. Omolade Oladele.

Sign 

Representative of Veterinary Teaching Hospital, University of Nigeria, Nsukka

Name: Prof. S.O. Udegbunam.

Sign 

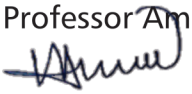
Representative of Veterinary Teaching Hospital, Ahmadu Bello University, Zaria

Name: Professor Balarabe Jahun.

Sign 

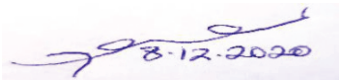
Representative of Veterinary Teaching Hospital, Usmanu Dan Fodiyo University, Sokoto

Name: Professor Aminu Alhaji Mohammed.

Sign 

Representative of Veterinary Teaching Hospital, University of Ilorin, Ilorin

Name: Dr O. B. Akanbi.

Sign 

Representative of National Fisheries Laboratory, Lagos

Name: Mr Ime S. Umoh

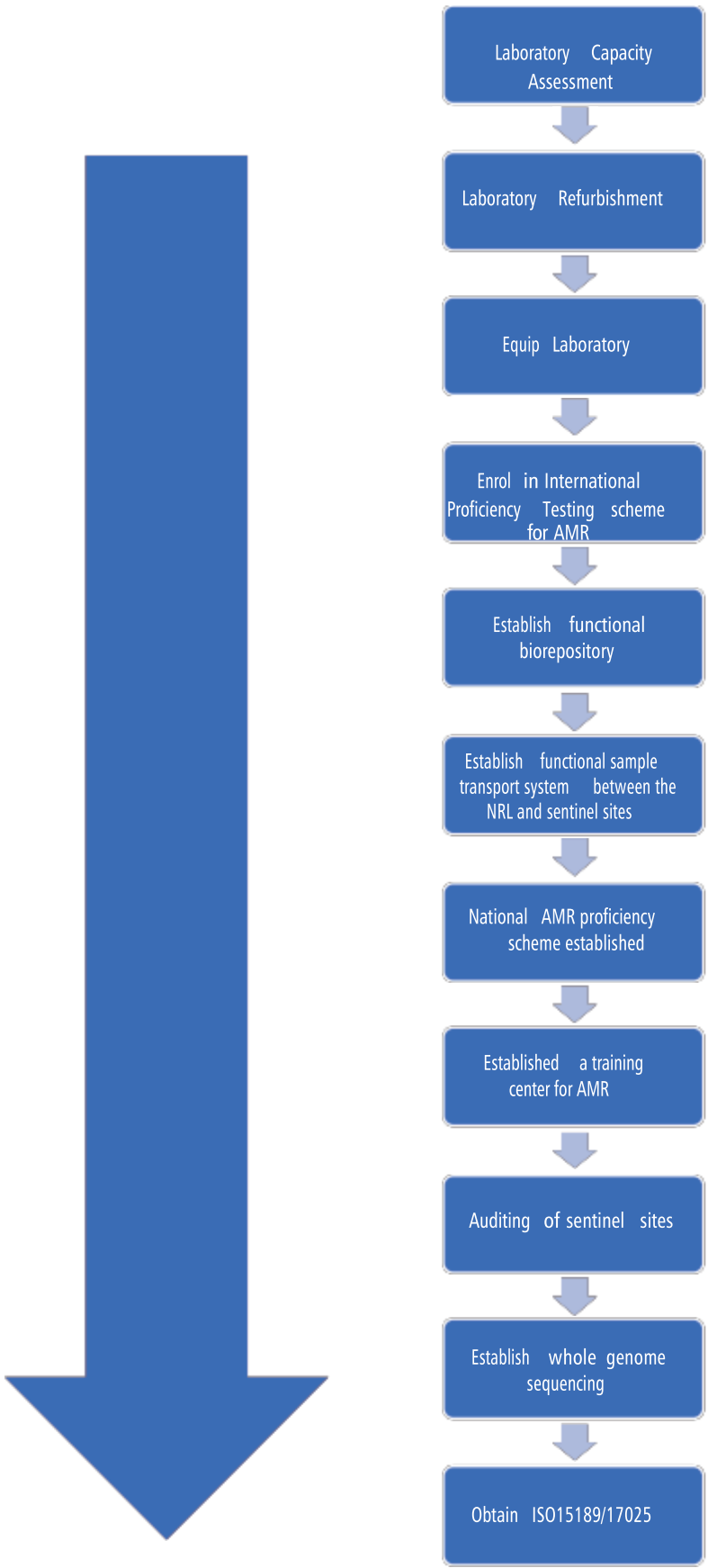
Sign 

Representative of the Federal Ministry of Agriculture and Rural Development

Name: Dr Olaniran Alabi

Sign 

Figure 1: Framework for Antimicrobial Resistance Surveillance National Reference Laboratories



REFERENCE

1. Tackling drug-resistant infections globally: final report and recommendations [Internet]. [cited 2021 Oct 27]. Available from: https://apo.org.au/node/63983

2. World Bank. Drug-Resistant Infections: A Threat to Our Economic Future [Internet]. [cited 2021 Oct 27]. Available from: https://www.worldbank.org/en/topic/health/publication/drug-resistant-infections-a-threat-to-our-economic-future

3. World Health Organization (WHO). Antimicrobial resistance: Global report on surveillance 2014 - World | ReliefWeb [Internet]. [cited 2021 Oct 27]. Available from: https://reliefweb.int/report/world/antimicrobial-resistance-global-report-surveillance-2014

4. World Health Organization. High levels of antibiotic resistance found worldwide, new data shows [Internet]. [cited 2021 Oct 27]. Available from: https://www.who.int/news/item/29-01-2018-high-levels-of-antibiotic-resistance-found-worldwide-new-data-shows

5. Tadesse BT, Ashley EA, Ongarello S, Havumaki J, Wijegoonewardena M, González IJ, et al. Antimicrobial resistance in Africa: A systematic review. BMC Infect Dis [Internet]. 2017 Sep 11 [cited 2020 Aug 4];17(1). Available from: /pmc/articles/PMC5594539/?report=abstract

6. Essack SY, Desta AT, Abotsi RE, Agoba EE. Antimicrobial resistance in the WHO African region: current status and roadmap for action. J Public Health (Bangkok) [Internet]. 2017 Mar 1 [cited 2021 Oct 27];39(1):8–13. Available from: https://academic.oup.com/jpubhealth/article/39/1/8/3065721

7. Kariuki S, Keddy KH, Antonio M, Okeke IN. Antimicrobial resistance surveillance in Africa: Successes, gaps and a roadmap for the future. Afr J Lab Med [Internet]. 2018 Dec 6 [cited 2021 Oct 28];7(2):2. Available from: https://ajlmonline.org/index.php/ajlm/article/view/924/1208

8. Tadesse BT, Ashley EA, Ongarello S, Havumaki J, Wijegoonewardena M, González IJ, et al. Antimicrobial resistance in Africa: a systematic review. BMC Infect Dis 2017 171 [Internet]. 2017 Sep 11 [cited 2021 Oct 27];17(1):1–17. Available from: https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-017-2713-1

9. Kimang'a AN. A situational analysis of antimicrobial drug resistance in

Africa: are we losing the battle? - PubMed [Internet]. [cited 2021 Oct 28]. Available from: https://pubmed.ncbi.nlm.nih.gov/22876078/

10. Nigeria Centre for Disease Control. Antimicrobial Use and Resistance in Nigeria SITUATION ANALYSIS AND RECOMMENDATIONS.

11. Bengtsson-Palme J, Kristiansson E, Larsson DGJ. Environmental factors influencing the development and spread of antibiotic resistance. FEMS Microbiol Rev [Internet]. 2018 Jan 1 [cited 2021 Oct 28];42(1):68–80. Available from: https://academic.oup.com/femsre/article/42/1/fux053/4563583

12. Bengtsson-Palme J, Larsson DGJ. Antibiotic resistance genes in the environment: prioritizing risks. Nat Rev Microbiol 2015 136 [Internet]. 2015 Apr 27 [cited 2021 Oct 28];13(6):396–396. Available from: https://www.nature.com/articles/nrmicro3399-c1

13. Organization F and A. Antimicrobial Resistance in the Environment Summary Report of an FAO Meeting of Experts FAO Antimicrobial Resistance Working Group. 2018 [cited 2021 Oct 28]; Available from: www.fao.org/antimicrobial-resistance

14. World Health Organization. Joint external evaluation of IHR core capacities of the Federal Republic of Nigeria, mission report: June 11-20, 2017.

15. Talisuna A, Yahaya AA, Rajatonirina SC, Stephen M, Oke A, Mpairwe A, et al. Joint external evaluation of the International Health Regulation (2005) capacities: Current status and lessons learnt in the WHO African region. BMJ Glob Heal. 2019 Nov 1;4(6).

16. Health WHO for A. PVS Follow-up Reports - OIE - World Organisation for Animal Health [Internet]. [cited 2021 Oct 28]. Available from: https://www.oie.int/en/what-we-offer/improving-veterinary-services/pvs-pathway/evaluation/pvs-follow-up-reports/

17. Food and Agriculture Organization. DRIVERS, DYNAMICS AND EPIDEMIOLOGY OF ANTIMICROBIAL RESISTANCE IN ANIMAL PRODUCTION. Available from: https://www.fao.org/3/i6209e/i6209e.pdf

18. World Health Organization. Follow-up to the high-level meetings of the United Nations General Assembly on health-related issues Antimicrobial resistance Report by the Director-General. 2019 [cited 2021 Oct 28]; Available from: https://amrcountryprogress.org.

19. WHO. WHO Library Cataloguing-in-Publication Data Global Action Plan on Antimicrobial Resistance. Microbe Mag [Internet]. 2015 [cited 2021 Oct 28];10(9):354–5. Available from: www.paprika-annecy.com

20. Federal Ministry of Health. National Action Plan for Health Security Federal

Republic of Nigeria (2018-2022) | Strategic Partnership for Health Security and Emergency Preparedness (SPH) Portal [Internet]. [cited 2021 Oct 28]. Available from: https://extranet.who.int/sph/national-action-plan-health-security-federal-republic-nigeria-2018-2022

21. Nigeria Centre for Disease Control. Nigeria: National Action Plan for Antimicrobial Resistance [Internet]. [cited 2021 Oct 28]. Available from: https://www.who.int/publications/m/item/nigeria-national-action-plan-for-antimicrobial-resistance

22. Nigeria Centre for Disease Control. Guideline For Antimicrobial Resistance Laboratory Surveillance for Laboratories in Nigeria. Available from: https://www.ncdc.gov.ng/themes/common/docs/protocols/120_1581793668.pdf

CONTRIBUTORS

NAME	DESIGNATION	INSTITUTION
Abdullahi Abubakar	Program Manager	Institute of Human Virology Nigeria
Abiodun Egwuenu	AMR Programme Manager	Nigeria Centre for Disease Control
Abiodun Ogunniyi	Epidemiologist	Nigeria Centre for Disease Control
Abiola Ebohen	Finance and Operations Manager	DAI- Fleming fund
Abir Dounuit	Finance	DAI- Fleming fund
Adedeji Adebayo	Consultant	Nigeria Centre for Disease Control
Adeniyi Adedoyin	Deputy Director	Federal Ministry of Agriculture and Rural Development
Ado Abubakar	Project Manager	Institute of Human Virology Nigeria
Aghogho Gbetsere	Chief Environmental Health Officer (CEHO)	Federal Ministry of Environment
Aishat Shittu	Scientific Officer	National Environmental Standards and Regulations Enforcement Agency
Ajani Timothy	Technical Officer	Nigeria Centre for Disease Control
Akor Joesphine	PTOU	National Environmental Standards and Regulations Enforcement Agency
Andrew Kitua	Facilitator	DAI- Fleming fund
Augustine Dada	Technical officer	African Field Epidemiology Network
Avong Y. Kambai	Assistant Director	Institute of Human Virology Nigeria
Bala Muhammed	Chief Environmental Health Officer	Livestock Management Services
Bernard Ebruke	Country Director	International Foundation Against Infectious Diseases
Blessing Stephen	Deputy Team Lead	DAI- Fleming fund
Bright Dowole	Chief Environmental Health Officer	Environmental Health Officers Registration Council of Nigeria
Celestina Obiekea	Laboratory Network Advisor	Nigeria Centre for Disease Control
Charles Emejuru	Assistant Director	Federal Ministry of Agriculture and Rural Development
Daniel Duvall	Programme Director	US-Centre for Disease Control
Disu Yahya	Assistant Director	Nigeria Centre for Disease Control
Donald Ofili	Acting Director	Medical Laboratory Science Council of Nigeria
Dooshima Kwange	Chief Veterinary Officer	Federal Ministry of Agriculture and Rural Development
Eme Ekeng	Medical Laboratory Scientist	Nigeria Centre for Disease/ National Reference Laboratory
Enang Oyama	NPO - Tuberculosis	World Health Organization
Esiro Anavhe	Administrator	DAI- Fleming fund
Ezenwa Nwakonobi		Livestock Management Services
Faruk Sarkinfada	Team Lead	DAI- Fleming fund
Gaius Mathew	MLS	Federal Ministry of Health
Gbagidi Faith	Senior Scientific Officer (SSO)	Federal Ministry of Environment
Gidado M. Muhammed	Director	Livestock Management Services
Grace Olanipekun	Laboratory Manager	Internation Foundation Against Infectious Diseases

CONTRIBUTORS

NAME	DESIGNATION	INSTITUTION
Ibrahim Yusuf		Bayero University Kano
Inwregbu Stella	Scientific Officer	Nigeria Centre for Disease Control
James I. Balami	North Chief Veterinary Officer	Federal Ministry of Agriculture and Rural Development
Joseph Gbenga	Chief Pharmacist	Nigeria Centre for Disease Control
Joshua Obasanya	Facilitator	Nigeria Centre for Disease Control
Josiah T. Kantiyok	Acting Registrar	Veterinary Council of Nigeria
Jumnai Gwary	Intern	Nigeria Centre for Disease Control
Junaidu Kabir	Professor	Ahmadu Bello University Zaria
Mariah Perton	Program Manager	DAI- Fleming fund
Mba Nkechi	Deputy Director	Federal Competition and Consumer Protection Commission
Moreen Kamateeka	Field Coordinator	African Field Epidemiology Network
Nasir A. Onu	IHR Officer	Nigeria Centre for Disease Control
Ndahi Mwapu	Assistant Director	Federal Ministry of Agriculture and Rural Development
Ndanusa Amina	Technical staff	Livestock Management Services
Nimatullah Braimah	Scientific officer	Federal Competition and Consumer Protection Commission
Nubwa Medogu	Consultant Microbiologist	International Foundation Against Infectious Diseases
Obadina Adewale	Lecturer	Federal University of Agriculture, Abeokota
Ogunnaiki G.A.M	Vetenary	Federal Department of Fisheries Federal Ministry of Agriculture and Rural Development
Okea Rita	Acting Head	Federal Ministry of Environment
Oladipo Aboderin	Professor/Cinical Microbiologist	Obafemi Awolwo University Teaching Hospital, Ile-Ife
Oladipo Ogunbode	Assistant Director	Nigeria Centre for Disease Control
Olowopila Kike Precious	Microbiologlist	Nigeria Centre for Disease Control
Oluwatoyin Karimu	Assistant Director	Food and Drug Service/ Federal Ministry of Health
Oyeladun Okunromade	Assistant Director	Nigeria Centre for Disease Control
Oyin Oduyebo	Consultant/lecturer	Lagos University Teaching Hospital
Peters Oladosu	Assistant Professor	National Institute for Pharmaceutical Research and Development
Pharm Janet Ugbem	Chief pharmacist	Pharmacist Council of Nigeria
Pharm Omotayo Hamzat	NPO/EDM	World Health Organization
Prince D. Emeka	Logistics Officer	DAI- Fleming fund
Reuben Arowolo	National Consultant	DAI- Fleming fund
Sam Peters	Senior Technical Officer	Institute of Human Virology Nigeria
Sola Aruna	Senior Public Health Advisor	Uk Health Security Agency

CONTRIBUTORS

NAME	DESIGNATION	INSTITUTION
Stephen Obaro	Director	International Foundation Against Infectious Diseases
Temitope Ben-Ajepe	EDM	World Health Organization
Theresa Ajose	Project Coordinator	Internation Foundation Against Infectious Diseases
Tijesu Ojumu	Communication	Nigeria Centre for Disease Control
Timzing Miri - Dashe	PM Lab Services	Institute of Human Virology Nigeria
Tunde Jegede	Senior Medical Officer	Nigeria Centre for Disease Control
Mabel Aworh-Ajumobi	Assistant Director	Federal Ministry of Agriculture and Rural Development.

EDITORS

NAME	DESIGNATION	INSTITUTION
Abiodun Egwuenu	AMR Programme Manager	Nigeria Centre for Disease Control
Andrew Kitua	Consultant	DAI- Fleming fund
Tochi Okwor	Special Programme 1 Division Cordinator/AMRCC Chair	Nigeria Centre for Disease Control

AN OFFICIAL PUBLICATION FOR THE

GOVERNMENT OF NIGERIA