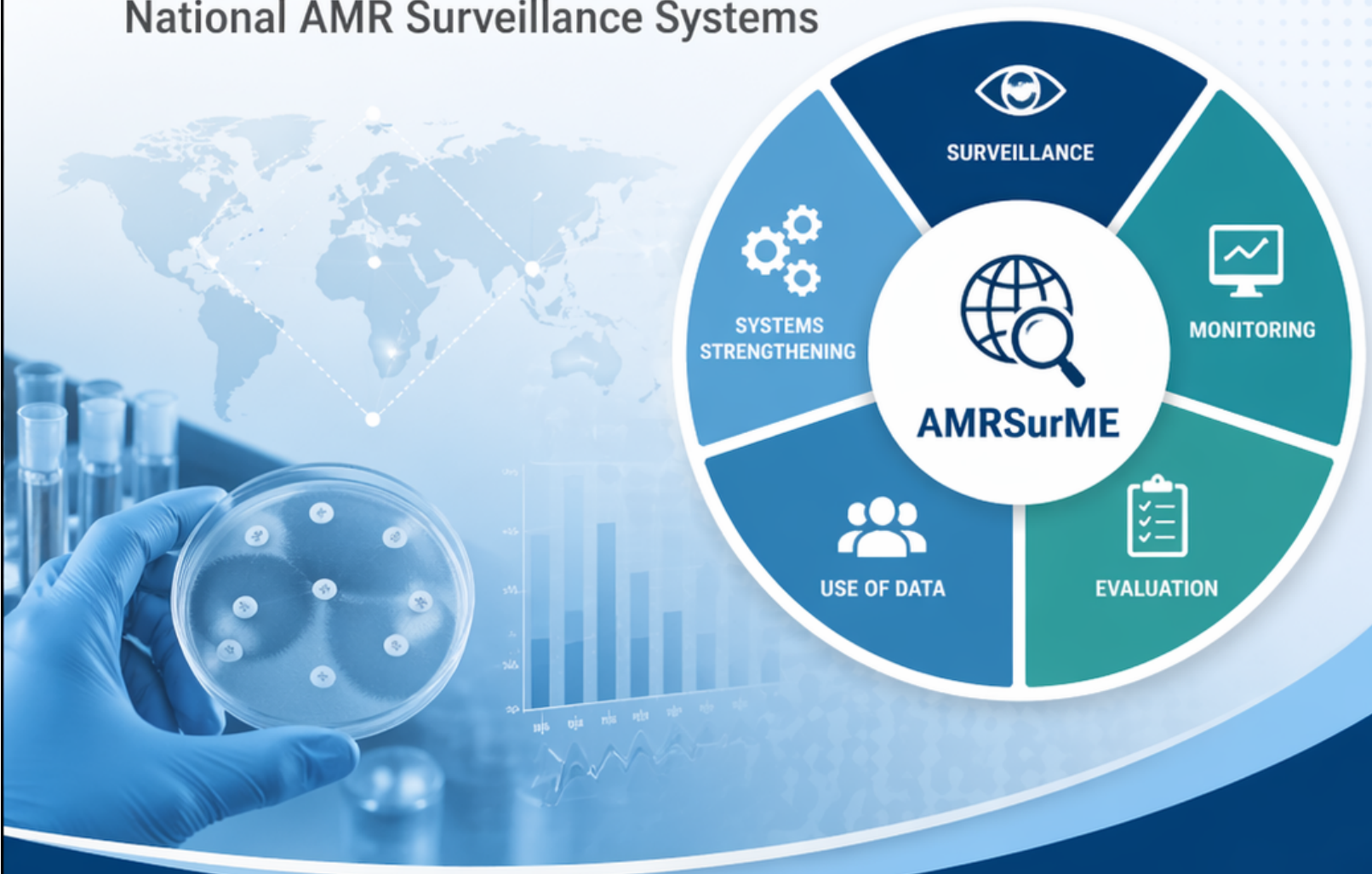
Antimicrobial Resistance Surveillance Monitoring & Evaluation (AMRSurME) Framework

A Technical Guide for National AMR Surveillance Systems



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Version 1.0

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About This Guide

This technical guide provides countries with a comprehensive, flexible framework for developing and strengthening monitoring and evaluation systems for antimicrobial resistance (AMR) surveillance. The framework is designed to be adapted to diverse country contexts, resource levels, and stages of system development.

Target Audience: National AMR program managers, surveillance coordinators, laboratory directors, M&E specialists, and policymakers responsible for strengthening AMR surveillance systems.

How This Guide Is Organized:

- Chapters 1-3 provide the conceptual foundation, methodology, and strategic framework
- Chapter 4 offers a practical menu of indicators for countries to select and adapt
- Chapter 5 provides implementation guidance, including phased approaches and resource considerations

Key Principle: This framework is intended as a guide, not a prescription. Countries should select, adapt, and customize components based on their specific contexts, priorities, and capacities.

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Acknowledgments

This AMRSurME Framework was developed through collaborative efforts of multiple stakeholders committed to strengthening antimicrobial resistance surveillance in the Asia region. The framework builds upon international best practices, WHO GLASS standards, and regional experiences in implementing AMR surveillance systems.

Technical contributions were provided by the CAPTURA Consortium, specifically from the International Vaccine Initiative (IVI) and the Heidelberg Institute of Global Health (HIGH), who led the framework design and indicator development. Development of this framework was funded by the Fleming Fund, through UK aid from the UK government.

Acronyms and Abbreviations

AMR	Antimicrobial Resistance
AMRSurME	Antimicrobial Resistance Surveillance Monitoring and Evaluation
AMS	Antimicrobial Stewardship
AST	Antimicrobial Susceptibility Testing
CAPTURA	Capturing data on Antimicrobial resistance Patterns and Trends in Use in Regions of Asia
CLSI	Clinical and Laboratory Standards Institute
EQA	External Quality Assessment
EUCAST	European Committee on Antimicrobial Susceptibility Testing
GLASS	Global Antimicrobial Resistance Surveillance System
HIGH	Heidelberg Institute of Global Health
HMIS	Health Management Information System
IPC	Infection Prevention and Control
IQC	Internal Quality Control
IVI	International Vaccine Institute
JEE	Joint External Evaluation
LIS	Laboratory Information System
LQSI	Laboratory Quality Stepwise Implementation
M&E	Monitoring and Evaluation
NAP	National Action Plan
NEQTrack	National External Quality Assessment Tracker.
NRL	National Reference Laboratory
QA	Quality Assurance
QA/PT	Quality Assurance and Proficiency Testing
QC	Quality Control
SOP	Standard Operating Procedure
WHO	World Health Organization

Executive Summary

Purpose and Context

Antimicrobial resistance (AMR) remains one of the most urgent global health threats, undermining the effectiveness of modern medicine and posing a significant burden on health systems, food security, and sustainable development. The challenge is particularly acute in Asia, where high infectious disease burdens, antimicrobial misuse, and fragmented data systems constrain coordinated responses.

The Antimicrobial Resistance Surveillance Monitoring and Evaluation (AMRSurME) Framework provides countries with a comprehensive yet adaptable approach to establishing, strengthening, and sustaining robust monitoring and evaluation (M&E) systems for AMR surveillance. It translates international standards, particularly those of the World Health Organization's Global Antimicrobial Resistance and Use Surveillance System (GLASS), into a practical, context-sensitive roadmap that emphasizes structured data collection, quality assurance, and evidence-based policymaking. This framework focuses on AMR surveillance across public health and clinical settings, while fostering collaboration with animal and environmental health sectors where appropriate.

Framework Design

The AMRSurME Framework is structured around six core pathways for strengthening AMR surveillance systems:

- **Enhancing laboratory capacity** for reliable pathogen identification and antimicrobial susceptibility testing (AST).
- **Establishing and expanding surveillance networks** to measure resistance burden and trends across priority pathogens and clinical specimens.
- **Strengthening data quality, completeness, timeliness, and analysis** to support evidence-based decision-making and inform public health interventions.
- **Implementing quality assurance and standardization** through systematic internal and external quality assurance mechanisms.
- **Fostering coordination and integration** across sectors, integrating surveillance into national health systems, and ensuring alignment with national and global AMR strategies.
- **Building workforce competencies and awareness** among healthcare, laboratory, and data professionals through targeted capacity building and information, education, and communication (IEC) strategies.

The framework balances global alignment and local flexibility: anchoring national systems to GLASS core components while allowing customization to reflect national AMR action plans, health system capacities, and governance structures.

Monitoring and Evaluation Approach

The AMRSurME Framework applies a results-based M&E model, tracking progress from inputs through activities, outputs, outcomes, and ultimately to impact. A comprehensive menu of over 40 suggested indicators is organized under six strategic domains: laboratory capacity, surveillance network performance,

data management and use, quality assurance, multisectoral coordination and integration, and capacity building and awareness.

Countries are advised to select a focused set of 15-25 core indicators, aligned with national priorities and implementation capacity. Each indicator includes clear definitions, data sources, measurement guidance, and illustrative targets for phased implementation. This modular structure allows for incremental adoption and long-term institutionalization.

Expected Results

Implementation of the AMRSurME Framework enables countries to achieve both systemic strengthening and improved utilization of surveillance data for decision-making. At the system level, the framework supports the development of expanded networks of functional surveillance sites operating under standardized testing and reporting procedures. Laboratory performance and compliance with quality assurance standards are expected to improve, leading to greater consistency and reliability of antimicrobial resistance data. In parallel, the completeness, accuracy, and timeliness of data will increase through the establishment of structured reporting and feedback mechanisms. These advances are underpinned by strengthened digital infrastructure for data management, integration, and sharing across institutions and sectors.

At the data utilization and policy level, the framework promotes the regular production and dissemination of surveillance bulletins and national antibiograms, ensuring that data are used to inform clinical and programmatic decision-making. Findings from surveillance are expected to inform the development of treatment guidelines, national AMR policies, and budgetary planning processes. The approach also strengthens coordination across human, animal, and environmental health sectors within a One Health framework, reinforcing cross-sectoral collaboration and accountability.

In the long term, implementation of the framework is expected to contribute to measurable reductions in inappropriate antimicrobial use, improved antibiotic prescribing practices based on local resistance patterns, increased awareness among health professionals and the public, and the establishment of sustainable domestic financing mechanisms for AMR surveillance.

Implementation Phases

Implementation of the AMRSurME Framework is organized as a phased, multi-year process that can be adapted to each country's pace and resources. During Phase 1 (Years 1-2), the focus is on foundation building. Countries establish governance mechanisms, designate focal institutions, initiate sentinel site networks, and invest in workforce training and the development of basic data systems.

Phase 2 (Years 3-4) emphasizes expansion and consolidation. Surveillance coverage is scaled up, laboratory and data management systems are strengthened, comprehensive quality assurance programs are implemented, and routine production of antibiograms begins.

Phase 3 (Year 5 and beyond) focuses on optimization and sustainability. By this stage, countries are expected to have achieved full network functionality, institutionalized monitoring and evaluation within national systems, integrated surveillance data with broader digital health platforms, and demonstrated measurable improvements in surveillance performance and data use.

Key Success Factors

The successful operationalization of the AMRSurME Framework depends on several interrelated enabling conditions. Sustained political commitment and policy alignment with national AMR action plans provide the foundation for implementation. Dedicated governance and monitoring units within ministries or national reference institutions ensure coordination and accountability, while long-term domestic and partner financing supports the necessary infrastructure, workforce, and digital systems. Continuous capacity development and mentoring are critical for maintaining technical proficiency among laboratory, data management, and analytical teams.

Strong digital interoperability is essential to ensure seamless data flow from sentinel laboratories to national and global platforms such as WHO GLASS. Regular review and learning cycles enable the use of data to guide resource allocation, strengthen antimicrobial stewardship, and inform updates to national policies. Integration with antimicrobial stewardship (AMS), infection prevention and control (IPC), and broader One Health initiatives further ensures that surveillance findings translate into tangible and sustained public health action.

How to Use This Generic AMRSurME Framework

The AMRSurME Framework is intentionally designed as a flexible guide rather than a prescriptive model. Countries are encouraged to align the framework with their existing national AMR action plans and surveillance strategies, selecting indicators that are most relevant, feasible, and aligned with national priorities. Targets should be realistic and based on baseline capacity assessments, enabling steady, sustainable progress. Implementation can be undertaken in phases, progressively expanding the scope and sophistication of surveillance activities as systems mature.

Institutionalizing regular review and feedback processes ensures that strategies remain responsive to changing epidemiological and operational contexts. By adopting this structured yet adaptable approach, national authorities can transform fragmented surveillance systems into coherent, high-performing networks that generate credible, actionable data to guide AMR containment and policy decisions.

Chapter 1. Introduction

Background

To further strengthen antimicrobial resistance (AMR) surveillance in the region, the CAPTURA II project is introducing the AMRSurME Framework as a technical resource for countries in Asia. The framework serves as a structured guide for assessing, optimizing, and enhancing national AMR surveillance systems through systematic monitoring and evaluation. Its focus is on strengthening surveillance of antibiotic resistance within the human health sector, while maintaining linkages to broader One Health coordination. The selection of institutions and systems for monitoring and evaluation is undertaken in consultation with national authorities and local stakeholders to ensure that the framework's application aligns with existing priorities and capacities.

Effective monitoring and evaluation are essential to ensure that AMR surveillance initiatives are not only implemented but also continuously refined based on emerging evidence. The AMRSurME Framework provides countries with a practical tool to assess progress, identify performance gaps, and target investments efficiently. By promoting structured measurement and feedback, the framework supports adaptive management of AMR strategies and helps align national and subnational actions with global AMR objectives and WHO GLASS standards.

As part of the CAPTURA Consortium, the Heidelberg Institute of Global Health (HIGH) led the development and refinement of the AMRSurME Framework in collaboration with the International Vaccine Institute. HIGH provided technical expertise in defining the framework's architecture, aligning its indicators and monitoring tools with international best practices, and ensuring that it is both methodologically rigorous and operationally feasible across diverse country contexts. This collaborative design process aimed to produce a resource that can be readily adopted or adapted by national programs seeking to strengthen their surveillance and evaluation capacities.

Data quality forms the cornerstone of the AMRSurME Framework, enabling reliable measurement of antimicrobial resistance trends over time. The framework provides structured guidance throughout the surveillance data lifecycle (including collection, compilation, analysis, and reporting), supported by standardized tools and quality assurance procedures. High-quality AMR data are critical for informing decision-making at all levels of the health system – from clinicians determining treatment regimens to program managers prioritizing interventions to policymakers allocating resources in response to emerging threats.

The framework's structure follows a logical progression from strategic vision to measurable impact (Figure 1). It begins with articulating core surveillance objectives, including improving laboratory capacity, expanding sentinel site networks, and integrating data systems across institutions. These objectives are translated into concrete priorities, including the strengthening of diagnostic capabilities and workforce skills to enhance the representativeness and reliability of AMR data. Implementation focuses on capacity-building, method standardization, and the establishment of quality assurance systems, which together improve data accuracy, completeness, and timeliness. The resulting outcomes include enhanced detection of resistance patterns, better-informed interventions, and a more resilient national surveillance infrastructure. Ultimately, the framework aims to support countries in reducing the public health burden of antimicrobial resistance by enabling robust, responsive, and sustainable surveillance systems.

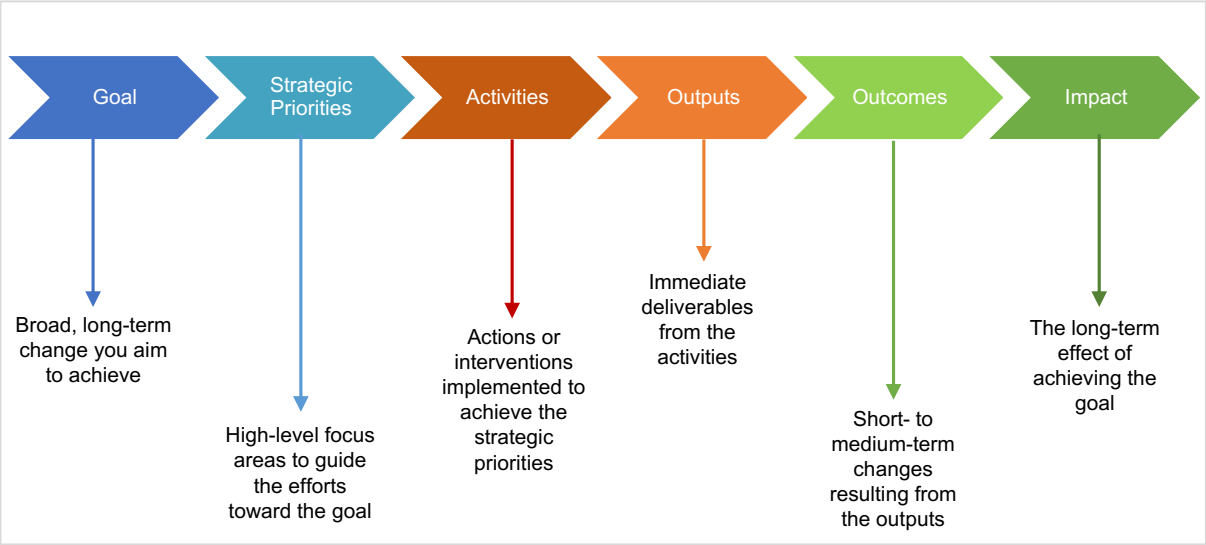

Figure 1. Framework Components

Objectives of the AMR Surveillance M&E Framework

The **Monitoring and Evaluation Framework for AMR surveillance** has the following objectives:

1. **Strengthen National AMR Surveillance:** Assess and improve the effectiveness, coverage, and functionality of national AMR surveillance systems across all levels of the healthcare system.
2. **Improve Data Quality:** Enhance the accuracy, completeness, and timeliness of AMR-related data collection and reporting to support evidence-based decision-making and policy formulation.
3. **Enhance Laboratory Capacity:** Strengthen laboratory coordination and technical capacity for standardized AMR testing and quality assurance across surveillance sites.
4. **Ensure Accountability:** Promote transparency and responsibility among healthcare providers, laboratory personnel, and policymakers for their roles in AMR containment and surveillance.
5. **Facilitate Continuous Improvement:** Enable real-time monitoring, trend analysis, and feedback mechanisms to guide adaptive management and timely interventions in AMR surveillance and response.
6. **Promote a Data-Driven and Intervention-Based Approach:** Guide decision-making with robust data analytics and targeted interventions informed by surveillance findings and identified gaps.
7. **Integrate with the National Health Management Information System:** Ensure the M&E framework is fully integrated with the existing health data platforms to streamline reporting, analysis, and data use for national health planning.
8. **Align with Global Initiatives:** Ensure national AMR surveillance efforts are consistent with global standards, including WHO GLASS.

Chapter 2. Methodology: Developing the AMRSurME Framework

The AMRSurME Framework provides a systematic approach for assessing and strengthening national AMR surveillance capacity. The methodology is grounded in international standards – particularly the WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) – and offers a structured process for evaluating performance, identifying capability gaps, and building the laboratory and data infrastructure essential for effective AMR detection and reporting.

Approach and Framework Structure

The framework adopts a capacity-based assessment model to monitor progress in AMR surveillance across four maturity levels: No Capacity, Limited Capacity, Developed Capacity, and Sustainable Capacity. Each benchmark action (e.g., establishing a National Reference Laboratory, adopting WHONET, or implementing quality assurance systems) is assessed across these defined levels to track progress, identify strengths, and highlight gaps for targeted interventions.

While the stated maturity levels provide a standard reference, countries should adapt the definitions and benchmarks to reflect their specific institutional context, resources, and priorities. This flexibility allows the framework to be applied in both early-stage and advanced surveillance systems.

Data Collection and Evaluation Process

Assessment focuses on the core components of a national AMR surveillance system:

- **Governance and Policy:** Existence of national surveillance strategies, coordination mechanisms, and protocols aligned with WHO GLASS standards.
- **Laboratory Infrastructure:** Capacity of the National Reference Laboratory (NRL) and sentinel sites to perform pathogen identification and antimicrobial susceptibility testing (AST).
- **Data Management Systems:** Use of standardized tools such as WHONET for laboratory data management, the GLASS Data Reporting Tool for global reporting, and integration with NEQTrack or the QA/PT platform to monitor quality assurance performance.
- **Quality Assurance:** Implementation of internal and external quality control systems, standard operating procedures (SOPs), and biosafety protocols, supported by external quality assessment tracking through NEQTrack.
- **Reporting and Feedback Loops:** Functionality of mechanisms to analyze, visualize, and disseminate AMR data to national stakeholders and global platforms such as GLASS, ensuring evidence-based decision-making.

Assessment Phases

The framework applies a cyclical evaluation approach comprising:

- **Baseline Evaluation:** Establishing the current status of AMR surveillance capacity and identifying priority areas for improvement.
- **Follow-up Evaluations:** Conducted periodically to measure progress, validate improvements, and ensure continued alignment with national and global AMR surveillance strategies.

Key Assessment Tools

Implementation draws on established WHO and partner instruments:

- **WHO AMR Surveillance Assessment Tool:** Evaluates national AMR surveillance systems, including governance, laboratory capacity, and data management.
- **WHO-GLASS Core Components Checklist:** Reviews country readiness and progress under the GLASS framework.
- **Surveillance and Laboratory Tools:** Including the GLASS Data Reporting Tool, WHONET, and the National Laboratory Quality Assessment Tool for evaluating microbiological testing and data accuracy.
- **Policy and Coordination Tools:** Such as the JEE AMR Self-Assessment Tool, which helps identify systemic gaps and define priority actions for strengthening surveillance.
- **Visualization and Decision-Support Tools:** National AMR dashboards and analytics platforms that enable visualization of trends and support evidence-based planning.

Reporting and Utilization

Findings from surveillance assessments should be synthesized into actionable reports that:

- **Inform Policy** by guiding national AMR surveillance strategies and legislative priorities.
- **Support Resource Allocation** through evidence-based investment in laboratories, data systems, and workforce capacity.
- **Promote Continuous Improvement** by fostering learning and sharing of best practices across sectors and regions.

This structured methodology enables countries to progressively build more robust, integrated, and responsive AMR surveillance systems, thereby strengthening early detection, timely response, and effective containment of antimicrobial resistance. Subsequent chapters, including Chapter 5, guide the translation of these assessment processes into practical implementation and monitoring actions.

Chapter 3. AMRSurME Framework: Goal and Objectives

Framework Flexibility

This chapter presents the overarching goal and strategic objectives of the AMRSurME Framework. The framework is organized around six strategic objectives that address core components of the surveillance system. This structure is based on international best practices and WHO GLASS standards, but countries may adapt it to align with their national AMR action plans and organizational preferences.

The six strategic objectives presented in this chapter provide a comprehensive and systematic approach to strengthening AMR surveillance. However, countries have flexibility in how they organize and prioritize these objectives:

- **Countries with limited resources** may prioritize 2-3 objectives most critical to their current gaps
- **Countries with existing surveillance systems** may focus on objectives related to quality assurance and integration
- **Countries starting surveillance programs** may emphasize awareness, capacity building, and basic laboratory infrastructure
- **Countries may reorganize** these objectives to match their national strategic plan terminology

The key principle is to ensure comprehensive coverage of essential surveillance system components: awareness and capacity; laboratory capacity; surveillance systems; data management; quality assurance; and coordination mechanisms.

Chapter 4 provides detailed indicators, activities, outputs, and outcomes for each strategic objective, presented as a flexible menu from which countries can select the most relevant and feasible options for their context.

Goal

The overarching goal of the AMRSurME Framework is to **strengthen national AMR surveillance systems to generate reliable, high-quality data that inform evidence-based actions to contain AMR** (see Figure 2). This includes reducing the emergence and spread of resistant pathogens, improving patient outcomes, and ensuring the continued effectiveness of antimicrobial treatments through enhanced laboratory capacity, standardized data collection, and coordinated reporting mechanisms.

Strategic Objectives

1. **Strengthen Laboratory Capacity:** Enhance laboratory infrastructure, technical capacity, and quality assurance systems to perform reliable antimicrobial susceptibility testing and support AMR surveillance.
2. **Establish and Strengthen Surveillance Systems:** Establish and expand AMR surveillance networks to measure resistance burden and trends across priority pathogens and clinical specimens.

3. **Enhance Data Management and Use:** Strengthen data quality, completeness, timeliness, and analysis to support evidence-based decision-making and inform public health interventions.
4. **Ensure Quality Assurance and Standardization:** Implement robust internal and external quality assurance mechanisms to ensure accuracy, reliability, and comparability of AMR surveillance data.
5. **Strengthen Coordination and Integration:** Foster multisectoral collaboration, integrate surveillance into national health systems, and ensure alignment with national and global AMR strategies.
6. **Strengthen Awareness and Capacity:** Build capacity among healthcare workers, laboratory professionals, and program managers through targeted training. Promote awareness through practical information, education, and communication (IEC) strategies.

Goal	***To strengthen national AMR surveillance systems to generate reliable, high-quality data that informs evidence-based actions for AMR containment.***					
Strategic Objectives	**Strategic Objective 1** **Strengthen Laboratory Capacity** Enhance laboratory infrastructure, technical capacity, and quality assurance systems to perform reliable antimicrobial susceptibility testing and support AMR surveillance.	**Strategic Objective 2** **Establish and Strengthen Surveillance Systems** Establish and expand AMR surveillance networks to measure resistance burden and trends across priority pathogens and clinical specimens.	**Strategic Objective 3** **Enhance Data Management and Use** Strengthen data quality, completeness, timeliness, and analysis to support evidence-based decision-making and inform public health interventions.	**Strategic Objective 4** **Ensure Quality Assurance and Standardization** Implement robust internal and external quality assurance mechanisms to ensure accuracy, reliability, and comparability of AMR surveillance data.	**Strategic Objective 5** **Strengthen Coordination and Integration** Foster multisectoral collaboration, integrate surveillance into national health systems, and ensure alignment with national and global AMR strategies.	**Strategic Objective 6** **Strengthen Awareness and Capacity** Build capacity among healthcare workers, laboratory professionals, and program managers through targeted training & promote awareness through effective IEC strategies.

Figure 2. AMRSurME Goal and Strategic Objectives

Chapter 4. AMRSurME Framework: Indicators

Selecting and Adapting Indicators

Chapter 4 provides practical implementation tools, presenting a comprehensive menu of suggested indicators organized under six strategic objectives. Countries should not attempt to implement all indicators presented in Chapter 4. An extensive (but not exhaustive) menu is provided so that countries at different stages of development and with different priorities can select the indicators most relevant to their contexts. The recommended approach begins by reading through all six strategic objectives to understand the full scope of the framework. Countries should then identify 15 to 25 core indicators that align with their national priorities and capacity. Targets and thresholds adapted from WHO GLASS and international QA standards (CDC/ECDC). Countries should set realistic targets based on their baseline assessment and available resources. Implementation should proceed in phases, expanding the indicator set as the system matures and capacity develops.

Key Principles for Indicator Selection

Review Options	Read through all strategic objectives to understand the full range of options available.
Select Strategically	Choose 15-25 core indicators that cover key system components and align with national priorities.
Set Realistic Targets	Base targets on current capacity and available resources, not on the illustrative examples shown.
Ensure Feasibility	Define clear data sources and collection methods that work within existing systems.
Implement in Phases	Start with priority indicators and expand over time as capacity develops.
Review Regularly	Adjust indicators annually based on system maturity and changing priorities.

Strategic Objective 1: Enhance laboratory infrastructure, technical capacity, and quality assurance systems to perform reliable antimicrobial susceptibility testing and support AMR surveillance

Objective Overview

Rationale	Laboratory infrastructure and quality assurance are foundational to generating reliable AMR surveillance data. Functional microbiology laboratories with trained personnel, standardized testing methods, and quality assurance mechanisms are essential for detecting resistance patterns and informing evidence-based interventions.
Focus Areas	• Strengthening microbiology laboratory capacity at surveillance sites • Establishing and equipping National Reference Laboratories (NRLs) • Training laboratory personnel in AMR surveillance methods • Ensuring the availability and functionality of essential AST equipment • Standardizing AST methods according to international guidelines (CLSI/EUCAST) • Implementing quality assurance programs (internal and external) • Ensuring adequate biosafety capacity (BSL-2) • Deploying laboratory information systems (LIS/WHONET)
Target Audience	National reference laboratories, district/regional laboratories, healthcare facility laboratories, laboratory technicians and microbiologists, laboratory managers, quality assurance officers, health facility administrators.
Selection Guidance	Countries should prioritize indicators based on the maturity of their current laboratory systems. All systems should monitor process indicators (1.11, 1.12) and the impact indicator (1.13) from the start to provide early warning and support outcome measurement. Early-stage systems should focus on core output and outcome indicators (1.1, 1.2, 1.5, 1.8, 1.10) related to basic infrastructure, standardization, and participation in quality assurance. As systems mature, advanced indicators (1.3, 1.4, 1.6, 1.7, 1.9) provide deeper insights into workforce capacity, equipment status, biosafety, and performance. All indicators are suggestions only and should be adapted to the national context and priorities.

Indicator Summary

Indicator #	Indicator Name	Type	Priority Level
1.1	Proportion of AMR Surveillance Sites with Functional Microbiology Laboratories	Outcome	Core
1.2	Number of National Reference Laboratories (NRLs) for AMR	Output	Core
1.3	Cumulative Number of Laboratory Personnel Trained in AMR Surveillance	Output	Advanced
1.4	Proportion of Laboratories with Essential Laboratory Equipment for AST	Output	Advanced
1.5	Proportion of Laboratories Using Standardized AST Methods	Outcome	Core
1.6	Laboratory Workforce Capacity Index	Outcome	Advanced
1.7	Proportion of Laboratories with Adequate Biosafety Capacity	Outcome	Advanced
1.8	Participation in External Quality Assurance (EQA) Programs	Output	Core
1.9	Laboratory Performance in EQA Programs	Outcome	Advanced
1.10	Laboratory Information System (LIS) Implementation Rate	Output	Core
1.11	Timeliness of Laboratory Data Submission	Process	Core
1.12	Laboratory Data Completeness Rate	Process	Core
1.13	Median Turnaround Time for AST Results	Impact	Core

Indicator Detail

1.1	Proportion of AMR Surveillance Sites with Functional Microbiology Laboratories		
Definition	Percentage of designated AMR surveillance sites that have operational microbiology laboratories capable of performing culture and AST according to national or international standards.		
Measurement	(Number of surveillance sites with functional microbiology labs ÷ Total number of designated surveillance sites) × 100		
Illustrative Baseline	Country-specific baseline		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	40-60% of sites	70-85% of sites	≥90% of sites
Data Source	National laboratory assessment reports, surveillance site registries, laboratory accreditation databases		
Frequency	Annual		
Notes	Adapt the definition of functional based on national minimum standards. Countries may define specific equipment requirements, staffing levels, and testing volumes.		

1.2	Number of National Reference Laboratories (NRLs) for AMR		
Definition	Count of officially designated NRLs with capacity for confirmatory testing, reference culture management, and technical guidance for AMR surveillance.		
Measurement	Total count of designated NRLs with documented capacity		
Illustrative Baseline	0-2 NRLs		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Establish 1-2 NRLs	2-3 functional NRLs	3-5 NRLs with full capacity
Data Source	Ministry of Health official designations, NRL capacity assessments		
Frequency	Annual		
Notes	Number depends on the country's size and healthcare structure. Small countries may need only 1 NRL. Focus on functionality over quantity.		

1.3	Cumulative Number of Laboratory Personnel Trained in AMR Surveillance		
Definition	Total count of microbiologists, technicians, and technologists who have completed standardized training in AMR surveillance methods, quality assurance, and data reporting.		
Measurement	Cumulative count of personnel completing accredited AMR surveillance training		
Illustrative Baseline	0-50 personnel		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	100-200 trained	300-500 trained	≥500 with refresher training
Data Source	Training attendance records, certification databases		
Frequency	Annual cumulative count		
Notes	Scale targets based on country size. Training should cover specimen collection, culture methods, AST techniques, quality control, WHONET, and reporting.		

1.4	**Availability of Essential Laboratory Equipment for AST**		
Definition	Percentage of surveillance laboratories with all essential equipment functional and calibrated for antimicrobial susceptibility testing.		
Measurement	(Number of labs with all essential AST equipment functional ÷ Total surveillance labs) × 100		
Illustrative Baseline	Country-specific		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	60-75% equipped	85-95% equipped	≥95% fully equipped
Data Source	Laboratory inventory systems, equipment maintenance logs		
Frequency	Quarterly		
Notes	Define an essential equipment list based on national protocols (incubators, autoclaves, biosafety cabinets, microscopes, AST systems). Include calibration status.		

1.5	**Proportion of Laboratories Using Standardized AST Methods**		
Definition	Percentage of surveillance laboratories using nationally or internationally recognized AST methods (CLSI, EUCAST) for priority pathogens.		
Measurement	(Number of labs using standardized AST methods ÷ Total surveillance labs) × 100		
Illustrative Baseline	30-50%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	70-80% standardization	85-95% standardization	≥95% full standardization
Data Source	Laboratory SOPs, method validation reports, supervisory visit reports		
Frequency	Semi-annual		
Notes	Specify which AST methods are standard in your country (disk diffusion, broth microdilution, automated systems). Standardization is critical for data comparability.		

1.6	**Laboratory Workforce Capacity Index**		
Definition	Proportion of surveillance laboratories meeting staffing norms with trained microbiologists and technicians.		
Measurement	Composite: (1) Staff-to-workload ratio meets norms, (2) Staff completed AMR training, (3) Adequate retention		
Illustrative Baseline	Country baseline		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	50-65% meet criteria	75-85% meet criteria	≥90% meet criteria
Data Source	HR records, training databases, workload assessments		
Frequency	Annual		
Notes	Define staffing norms based on facility level and testing volume. Include both quantitative (staff numbers) and qualitative (training) measures.		

1.7	**Proportion of Laboratories with Adequate Biosafety Capacity**		
Definition	Percentage of AMR surveillance laboratories meeting minimum biosafety requirements (typically BSL-2) for handling clinical specimens and bacterial cultures.		
Measurement	(Number of labs meeting biosafety standards ÷ Total labs) × 100		
Illustrative Baseline	Country baseline		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	50-70% compliance	80-90% compliance	≥95% compliance
Data Source	Laboratory biosafety assessments, inspection reports		
Frequency	Annual		
Notes	Define minimum biosafety requirements in line with national guidelines and WHO standards (facility design, safety equipment, SOPs, waste management, and training).		

1.8	**Participation in External Quality Assessment (EQA) Programs**		
Definition	Percentage of AMR surveillance laboratories enrolled in and regularly participating in recognized EQA or proficiency testing programs.		
Measurement	(Number of labs participating in EQA ÷ Total surveillance labs) × 100		
Illustrative Baseline	10-30%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	50-70% participation	80-90% participation	≥95% with satisfactory performance
Data Source	EQA program enrollment records, proficiency testing reports		
Frequency	Annual		
Notes	Specify which EQA programs are recognized. Participation should be active. Countries may need to establish national EQA programs if international programs are not accessible.		

1.9	**Laboratory Performance in EQA Programs**		
Definition	Percentage of laboratories achieving satisfactory scores (typically ≥80% correct results) in EQA programs for AMR testing.		
Measurement	(Number of labs with satisfactory EQA scores ÷ Number of labs in EQA) × 100		
Illustrative Baseline	40-60% satisfactory		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	70-80% satisfactory	85-95% satisfactory	≥90% satisfactory
Data Source	EQA program reports, proficiency testing score summaries		
Frequency	Annual		
Notes	Define satisfactory based on EQA standards. Low performance should trigger technical support and retraining. Track trends over time.		

1.10	Laboratory Information System (LIS) Implementation Rate		
Definition	Percentage of surveillance laboratories with functional laboratory information systems or electronic data management systems for AMR data.		
Measurement	(Number of labs with functional LIS ÷ Total surveillance labs) × 100		
Illustrative Baseline	5-20%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	40-60% implementation	75-90% implementation	≥90% with interoperable LIS
Data Source	LIS deployment records, system functionality assessments		
Frequency	Annual		
Notes	LIS may range from basic WHONET to comprehensive commercial platforms. Define minimum functionality requirements. Prioritize interoperability with national systems.		

1.11	Timeliness of Laboratory Data Submission		
Definition	Percentage of surveillance laboratories submitting AMR data within the nationally defined reporting timeframe (e.g., within 7 days of the month end for monthly reports).		
Measurement	(Number of labs submitting on time ÷ Total number of reporting labs) × 100		
Illustrative Baseline	40-60% on-time		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	70-80% on-time	85-95% on-time	≥95% on-time
Data Source	Data submission logs, WHONET upload timestamps, surveillance system tracking reports, monthly submission monitoring dashboards		
Frequency	Monthly		
Notes	Define nationally appropriate reporting timeframe based on reporting cycle (weekly, monthly, quarterly). This is an early warning indicator: declining timeliness suggests system problems (staffing issues, technical difficulties, data quality concerns) before they affect data completeness or quality. Monitor monthly to identify laboratories needing technical support. Generate automated alerts for labs >7 days overdue.		

1.12	Laboratory Data Completeness Rate		
Definition	Percentage of submitted AMR surveillance records with all required data fields completed, including patient demographics, specimen type, pathogen identification, antimicrobial susceptibility testing results, and clinical context as defined by national surveillance standards or WHO GLASS requirements.		
Measurement	(Number of complete records meeting all required field criteria ÷ Total records submitted) × 100. Define the minimum required fields list based on GLASS core data elements or the national surveillance protocol.		
Illustrative Baseline	50-70% complete records		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	75-85% complete	90-95% complete	≥95% complete
Data Source	WHONET data quality reports, surveillance database validation logs, quarterly data quality audits, automated completeness checks in laboratory information systems		
Frequency	Quarterly		
Notes	Poor data completeness directly compromises the ability to analyze resistance patterns, generate accurate antibiograms, and inform prescribing decisions. Generate laboratory-specific completeness reports showing which fields are most frequently missing. Prioritize targeted training and technical support for laboratories with <70% completeness. Common missing fields include patient age, specimen source, and clinical context. Consider implementing data quality feedback loops where labs receive quarterly scorecards.		

1.13	Median Turnaround Time for Antimicrobial Susceptibility Testing Results		
Definition	Median time (in hours) from specimen collection to final antimicrobial susceptibility testing (AST) results reported to clinicians. Measures the speed at which surveillance laboratories provide actionable resistance data for patient management.		
Measurement	Calculate median hours from the timestamp of specimen collection to the timestamp of final AST report release. Track separately for bloodstream infections (priority) and other specimen types.		
Illustrative Baseline	72-96 hours (typical baseline without optimized systems)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	<72 hours for bloodstream infections	<48 hours for bloodstream infections	<24 hours for bloodstream infections; <48 hours for other priority specimens
Data Source	Laboratory information systems (LIS), WHONET timestamps, manual specimen tracking logs, hospital information systems		
Frequency	Quarterly		
Notes	This is the most widely used international AMR surveillance impact indicator (CDC, WHO GLASS, ECDC standard). Faster turnaround results in earlier appropriate treatment, which leads to better patient outcomes. Monitor by facility and pathogen type. Delays >48 hours for bloodstream infections should trigger an investigation.		

Strategic Objective 2: Establish and expand AMR surveillance networks to measure resistance burden and trends across priority pathogens and clinical specimens

Objective Overview

Rationale	Expanding surveillance networks to cover diverse geographic areas, populations, and healthcare settings is essential for generating representative AMR data. A robust network that captures resistance trends across priority pathogens and clinical specimens enables early detection of emerging threats, informs targeted interventions, and ensures no region is left blind to resistance patterns.
Focus Areas	• Expanding the number and geographic distribution of functional surveillance sites • Increasing population coverage through strategic site selection • Scaling up specimen collection and testing volumes • Diversifying priority pathogens and clinical specimens under surveillance • Building capacity for data management and quality assurance at sites • Establishing network coordination mechanisms • Ensuring specimen transport and quality compliance • Standardizing surveillance protocols across the network
Target Audience	National AMR surveillance program managers, regional/district health offices, surveillance site coordinators, hospital infection control teams, laboratory networks, public health epidemiologists, specimen transport services, data managers.
Selection Guidance	All surveillance networks should monitor process indicators (2.11, 2.12) and the impact indicator (2.13) from the start to ensure quality and demonstrate value. Early-stage networks should focus on core indicators (2.1, 2.2, 2.5, 2.8) related to establishing functional sites, geographic coverage, and basic data quality. As networks mature, advanced indicators (2.3, 2.6, 2.7, 2.9, 2.10) provide insights into population reach, coordination mechanisms, and data integration. Prioritize geographic expansion over density in early stages. All indicators are suggestions only and should be adapted to the national context and priorities.

Indicator Summary

Indicator #	Indicator Name	Type	Priority Level
2.1	Number of Functional AMR Surveillance Sites	Output	Core
2.2	Geographic Coverage of Surveillance Network	Outcome	Core
2.3	Surveillance Network Population Coverage	Outcome	Advanced
2.4	Number of Clinical Specimens Under Surveillance	Output	Core
2.5	Number of Priority Pathogens Under Routine Surveillance	Output	Core
2.6	Proportion of Surveillance Sites with Trained Data Managers	Output	Advanced
2.7	Network Coordination Meetings Held	Output	Advanced
2.8	Surveillance Data Quality Score	Outcome	Core
2.9	Inter-facility Data Comparability Rate	Outcome	Advanced
2.10	Regional Surveillance Network Integration Rate	Outcome	Advanced
2.11	Surveillance Site Reporting Compliance Rate	Process	Core
2.12	Specimen Transport and Quality Compliance Rate	Process	Core
2.13	Detection Rate of Priority Resistant Pathogens	Impact	Core

Indicator Detail

2.1	Number of Functional AMR Surveillance Sites		
Definition	Count of healthcare facilities actively participating in the national AMR surveillance network and consistently submitting quality data.		
Measurement	Count of sites meeting functionality criteria: designated, have microbiology capacity, submit data regularly, meet quality standards		
Illustrative Baseline	5-15 sites		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	20-40 sites operational	50-80 sites operational	≥100 sites with geographic coverage
Data Source	Surveillance site registry, data submission logs, site performance assessments		
Frequency	Quarterly		
Notes	Define functional based on national standards. Ensure the geographic distribution reflects urban/rural areas and different healthcare levels.		

2.2	Geographic Coverage of Surveillance Network		
Definition	Proportion of administrative regions (provinces, states, districts) with at least one functional AMR surveillance site.		
Measurement	(Number of regions with ≥1 surveillance site ÷ Total administrative regions) × 100		
Illustrative Baseline	10-30%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	50-70% coverage	80-90% coverage	≥90% geographic coverage
Data Source	Surveillance site registry with geographic mapping		
Frequency	Annual		
Notes	Define an appropriate administrative level for your country. Prioritize regions based on population density and AMR risk. Ensure urban and rural coverage.		

2.3	Surveillance Network Population Coverage		
Definition	Estimated proportion of the national population served by healthcare facilities participating in AMR surveillance.		
Measurement	(Catchment population of surveillance sites ÷ Total national population) × 100		
Illustrative Baseline	5-15%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	25-40% coverage	50-70% coverage	≥70% population coverage
Data Source	Census data, facility catchment estimates, surveillance site service statistics		
Frequency	Annual		
Notes	Use catchment area population estimates. More important than the number of sites is ensuring representative data.		

2.4	Number of Clinical Specimens Under Surveillance		
Definition	Annual count of clinical specimens from which bacterial isolates are collected and tested for AST as part of national surveillance.		
Measurement	Total count of specimens tested during the reporting period		
Illustrative Baseline	1,000-5,000 specimens		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	10,000-25,000 specimens	40,000-75,000 specimens	≥100,000 specimens annually
Data Source	Laboratory information systems, specimen registers, WHONET data		
Frequency	Annual		
Notes	Scale targets based on country size and laboratory capacity. Track by specimen type (blood, urine, respiratory, wound) to ensure diversity.		

2.5	Coverage of Priority Pathogens in Surveillance		
Definition	Proportion of WHO priority pathogens (GLASS list) or nationally defined priority pathogens included in regular surveillance.		
Measurement	(Number of priority pathogens under active surveillance ÷ Total priority pathogens) × 100		
Illustrative Baseline	3-5 pathogens (30-40%)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	6-8 pathogens (50-60%)	10-12 pathogens (70-80%)	≥12 pathogens (≥80%)
Data Source	Surveillance protocols, laboratory testing reports, national pathogen lists		
Frequency	Annual		
Notes	Start with the most common pathogens. Expand as capacity grows. Align with GLASS but adapt to local epidemiology.		

2.6	Specimen Type Diversity in Surveillance		
Definition	Number of different clinical specimen types from which bacterial isolates are routinely collected, tested, and reported.		
Measurement	Count of specimen types with ≥100 isolates tested annually		
Illustrative Baseline	2-3 specimen types		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	4-5 specimen types	6-8 specimen types	≥8 specimen types
Data Source	Laboratory records, WHONET data analysis		
Frequency	Annual		
Notes	Common types: blood, urine, respiratory, wound, CSF, genital, stool. Diversity ensures a comprehensive picture of AMR across infection types.		

2.7	**Healthcare-Associated Infection (HAI) Surveillance Sites**		
Definition	Number of surveillance sites conducting systematic HAI surveillance with AMR data collection for key HAI pathogens.		
Measurement	Count of sites with active HAI surveillance programs integrated with AMR monitoring		
Illustrative Baseline	0-5 sites		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	10-20 sites	30-50 sites	≥60 sites with comprehensive HAI-AMR
Data Source	HAI surveillance reports, IPC program data, hospital epidemiology records		
Frequency	Annual		
Notes	HAI surveillance requires additional capacity, including infection control practitioners. Focus initially on the ICU and surgical wards in tertiary facilities.		

2.8	**Community-Acquired Infection Surveillance Sites**		
Definition	Number of sites collecting data on community-acquired infections with AMR data, particularly from primary care and outpatient settings.		
Measurement	Count of primary/secondary care sites contributing community-acquired infection data		
Illustrative Baseline	0-5 sites		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	10-25 sites	40-70 sites	≥100 sites with community AMR data
Data Source	Primary care databases, outpatient laboratory records		
Frequency	Annual		
Notes	Community surveillance is often neglected but critical for understanding the actual AMR burden. Focus on common community infections (UTIs, respiratory infections, skin infections).		

2.9	**Private Sector Engagement in Surveillance**		
Definition	Proportion of major private laboratories and hospitals participating in the national AMR surveillance network.		
Measurement	(Number of major private facilities participating ÷ Total major private facilities) × 100		
Illustrative Baseline	0-10%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	20-40% participation	50-70% participation	≥70% private sector integration
Data Source	Private sector facility registries, data sharing agreements		
Frequency	Annual		
Notes	The private sector often accounts for a significant share of healthcare delivery but is underrepresented in surveillance. Requires incentives, data-sharing agreements, and the addressing of confidentiality concerns.		

2.10	GLASS Enrollment and Annual Data Submission		
Definition	Country enrollment in the WHO Global AMR Surveillance System (GLASS) and status of annual data submission to the GLASS platform.		
Measurement	Binary: (1) Enrolled in GLASS, (2) Annual data submission status		
Illustrative Baseline	Not enrolled		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Enrolled, preparing	Enrolled with first submission	Regular annual GLASS reporting
Data Source	WHO GLASS enrollment documentation, data submission confirmations		
Frequency	Annual		
Notes	GLASS enrollment is a national-level commitment. The first data submission may take 2-3 years due to system development. Focus on quality over quantity.		

2.11	Surveillance Site Reporting Compliance Rate		
Definition	Percentage of enrolled surveillance sites that submit complete monthly/quarterly reports according to the national surveillance protocol reporting schedule.		
Measurement	(Number of sites submitting complete reports on time ÷ Total number of enrolled surveillance sites) × 100. A complete report includes: (1) specimen count, (2) pathogen isolate data, (3) AST results for priority organisms, (4) quality control data		
Illustrative Baseline	50-65% compliance		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	70-80% compliance	85-90% compliance	≥95% compliance
Data Source	Surveillance site registry, data submission tracking system, WHONET upload logs, monthly compliance monitoring reports		
Frequency	Monthly		
Notes	This measures network functionality, not just size. Declining compliance indicates sites are enrolled but not actively participating, suggesting a need for technical support, supervisory visits, or infrastructure strengthening. Generate site-specific compliance scorecards. Sites with <60% compliance for 2+ consecutive months should trigger immediate follow-up. Distinguish between "no data to report" (acceptable) and "failed to report" (compliance issue).		

2.12	Specimen Transport and Quality Compliance Rate		
Definition	Percentage of clinical specimens arriving at testing laboratories meeting quality standards for microbiological testing (appropriate transport conditions, proper labeling, viable organisms, within acceptable time from collection).		
Measurement	(Number of specimens accepted for testing ÷ Total specimens received) × 100. Track rejection reasons: inadequate labeling, inappropriate transport media, excessive transport time, specimen contamination, insufficient volume		
Illustrative Baseline	70-80% acceptance rate		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	85-90% acceptance	92-95% acceptance	≥95% acceptance
Data Source	Laboratory specimen receipt logs, specimen rejection records, transport monitoring systems, laboratory quality management databases		
Frequency	Quarterly		
Notes	Poor specimen quality leads to unreliable results, which in turn wastes resources. High rejection rates indicate problems with collection training, transport logistics, or cold chain. Generate site-specific rejection reports showing primary failure modes. Facilities with >20% rejection rate need immediate intervention. This is critical for network expansion: adding more sites that send poor specimens doesn't improve surveillance. Consider this a prerequisite for site certification.		

2.13	**Detection Rate of Priority Resistant Pathogens**		
Definition	Number of priority resistant pathogen-antibiotic combinations detected per 10,000 specimens tested through the surveillance network. Measures the network's ability to identify clinically and epidemiologically significant resistance patterns. Prioritize combinations defined in the national AMR action plan (e.g., MRSA, MDR-TB).		
Measurement	(Total number of priority resistant pathogen detections ÷ Total specimens tested) × 10,000. Track separately by: (1) pathogen type, (2) resistance mechanism, (3) geographic region, (4) facility level		
Illustrative Baseline	≥50% geographic regions reporting at least one priority resistant pathogen		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	≥50% geographic regions reporting at least one priority resistant pathogen	≥75% geographic regions reporting at least one priority-resistant pathogen	Stable or increasing detection rate (indicates improved surveillance sensitivity, not necessarily increased resistance) with shortened time to detection
Data Source	National AMR surveillance database, WHONET, laboratory information systems, outbreak investigation reports, regional surveillance summaries		
Frequency	Quarterly (with annual comprehensive analysis)		
Notes	This is the most widely used impact metric for surveillance network expansion (used by ECDC, CDC, WHO GLASS). An increasing detection rate in early years is positive: it means the network is getting better at finding resistance, not that resistance is worsening. Compare detection rates across geographic areas to identify surveillance gaps vs. true hotspots. A region with zero detections likely has surveillance gaps, not no resistance. This indicator demonstrates that the network is fulfilling its core mission: detecting resistance threats to support public health action. Use detections to trigger: (1) infection control measures, (2) prescribing guidance updates, (3) targeted interventions.		

Strategic Objective 3: Strengthen data quality, completeness, timeliness, and analysis to support evidence-based decision-making and inform public health interventions

Objective Overview

Rationale	High-quality AMR surveillance data is the foundation for evidence-based decision-making and effective public health interventions (WHO GLASS Core Components, 2021). Without complete, accurate, timely, and analyzable data, surveillance investments cannot inform prescribing practices, infection control measures, or policy decisions. Strengthening data quality systems, implementing robust validation processes, and building analytical capacity ensure that surveillance generates actionable intelligence rather than just collecting information.
Focus Areas	• Establishing and monitoring data completeness standards for all critical fields • Implementing systematic data validation and accuracy checks • Ensuring timely data submission and processing • Standardizing data management tools (WHONET, LIS, databases) • Building analytical capacity for data interpretation and visualization • Creating feedback loops between data producers and users • Developing and disseminating facility and national antibiograms • Integrating AMR data with national health information systems • Conducting regular data quality audits with corrective action
Target Audience	Data managers at surveillance sites, National surveillance program data analysts, laboratory information system administrators, WHONET users and trainers, public health epidemiologists, hospital infection control officers, quality assurance officers, clinical microbiologists, health information officers.
Selection Guidance	All surveillance programs should monitor process indicators (3.11, 3.12) and the impact indicator (3.13) from the start to ensure quality processes function and data reaches decision-makers. Early-stage programs should focus on core indicators (3.1, 3.2, 3.3, 3.4, 3.8) related to establishing basic data quality standards, implementing WHONET, and measuring fundamental completeness/accuracy/timeliness. As systems mature, advanced indicators (3.5, 3.6, 3.7, 3.9, 3.10) provide insights into analytical capacity, data integration, visualization capabilities, and sophisticated quality assurance. Data quality must be addressed before expanding surveillance networks: poor-quality data from many sites is worse than good-quality data from a few sites. All indicators are suggestions only and should be adapted to the national context and priorities.

Indicator Summary

Indicator #	Indicator Name	Type	Priority Level
3.1	Data Completeness Rate	Outcome	Core
3.2	Data Accuracy Rate	Outcome	Core
3.3	Data Timeliness	Outcome	Core
3.4	WHONET Implementation and Use	Output	Core
3.5	Availability of Facility-Level Antibiograms	Output	Core
3.6	AMR Data Analyst Workforce Capacity	Output	Advanced
3.7	Data Feedback Reports Generated and Disseminated	Output	Advanced
3.8	Surveillance Data Integration into National HMIS	Outcome	Core
3.9	Data Visualization and Dashboard Utilization Rate	Outcome	Advanced
3.10	Proportion of Surveillance Data Used in Policy/Clinical Decisions	Outcome	Advanced
3.11	Data Quality Audit Completion Rate	Process	Core
3.12	Data Correction and Validation Response Time	Process	Core
3.13	Antibiogram Production and Dissemination Rate	Process	Core

Indicator Detail

3.1	Data Completeness Rate		
Definition	Percentage of submitted AMR surveillance records that contain all required data elements without missing values in critical fields.		
Measurement	(Number of complete records ÷ Total records submitted) × 100		
Illustrative Baseline	50-65%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	70-80% completeness	85-92% completeness	≥95% completeness
Data Source	Data validation reports, database quality checks		
Frequency	Quarterly		
Notes	Define critical data elements (demographics, specimen type, pathogen ID, antibiotic panels, susceptibility results). Implement automated completeness checks.		

3.2	Data Accuracy Rate		
Definition	Proportion of AMR surveillance data records that pass validation checks for logical consistency, appropriate value ranges, and concordance with quality control.		
Measurement	(Number of records passing all validation checks ÷ Total records assessed) × 100		
Illustrative Baseline	60-70%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	75-85% accuracy	90-95% accuracy	≥95% accuracy
Data Source	Data validation software reports, data quality assessments		
Frequency	Quarterly		
Notes	Accuracy checks: valid organism-antibiotic combinations, appropriate MIC/zone ranges, consistency with intermediate categories. Use automated validation tools.		

3.3	Data Timeliness		
Definition	Percentage of surveillance sites submitting data within the defined timeframe after the reporting period ends.		
Measurement	(Number of sites submitting on time ÷ Total surveillance sites) × 100		
Illustrative Baseline	40-50%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	65-75% timely	80-90% timely	≥90% within deadline
Data Source	Data submission tracking systems, timestamp logs		
Frequency	Quarterly		
Notes	Define acceptable timeframe based on reporting frequency (e.g., monthly data within 2 weeks, quarterly data within 4 weeks). Timely data enables responsive action.		

3.4	WHONET Implementation and Use		
Definition	Percentage of surveillance laboratories using WHONET software for AMR data management and analysis.		
Measurement	(Number of labs actively using WHONET ÷ Total surveillance labs) × 100		
Illustrative Baseline	10-25%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	50-70% implementation	80-90% implementation	≥95% standardized use
Data Source	WHONET installation records, data export logs		
Frequency	Annual		

Notes	WHONET is WHO's free software for AMR data management. Essential for standardization and GLASS reporting. Requires training and ongoing technical support.

3.5	**Integration with National Health Information Systems**		
Definition	Number of surveillance sites with electronic data exchange between laboratory systems and national HMIS.		
Measurement	Count of sites with functional data interoperability and regular exchange		
Illustrative Baseline	0-5 sites		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	10-25 sites	40-70 sites	≥80 sites with seamless integration
Data Source	NHIS integration assessments, data exchange logs		
Frequency	Annual		
Notes	Integration reduces duplicate entries, improves quality, and enables real-time monitoring. Requires technical standards (HL7, FHIR), unique identifiers, and IT infrastructure.		

3.6	**Frequency of National AMR Data Analysis**		
Definition	Number of times per year that comprehensive national-level AMR data analysis is conducted and disseminated.		
Measurement	Count of analysis cycles producing national reports or bulletins		
Illustrative Baseline	0-1 per year		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	2-3 analyses (semi-annual/quarterly)	4 analyses (quarterly)	≥4 comprehensive analyses
Data Source	Published AMR reports, analysis schedules		
Frequency	Annual		
Notes	Regular analysis is critical for identifying trends, outbreaks, and emerging resistance. Should include trend analysis, antibiograms, and facility- and regional-level comparisons. Quarterly optimal.		

3.7	**Production of National Antibiograms**		
Definition	Annual production and dissemination of national cumulative antibiograms for priority organisms and antimicrobials.		
Measurement	Binary plus quality: completeness, representativeness, CLSI M39 compliance[1]		
Illustrative Baseline	No antibiogram		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	First antibiogram produced	Annual with regional breakdown	Comprehensive annual and facility antibiograms
Data Source	Published antibiograms, CLSI M39 compliance assessment		
Frequency	Annual		
Notes	National antibiograms guide empiric therapy and monitor trends. Follow CLSI M39 guidelines: ≥30 isolates per organism-antibiotic, exclude duplicates, specify inclusion criteria.		

[1] CLSI M39-Ed5: Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data (2022).

3.8	Data Visualization and Dashboard Implementation		
Definition	Availability and functionality of AMR surveillance dashboards enabling real-time or near-real-time data visualization for decision-makers.		
Measurement	Number of functional dashboard platforms with defined user access		
Illustrative Baseline	No dashboard		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Basic dashboard for national level	Enhanced dashboard with drill-down	Comprehensive multi-level dashboards
Data Source	Dashboard platform documentation, user access logs		
Frequency	Annual		
Notes	Dashboards improve data accessibility. Should include: resistance trends, geographic distribution, pathogen-antibiotic combinations, and facility comparisons. Ensure data security.		

3.9	Dissemination of AMR Surveillance Findings		
Definition	Number of formal dissemination activities per year, sharing AMR findings with stakeholders (reports, bulletins, presentations, publications).		
Measurement	Count of dissemination products and activities		
Illustrative Baseline	0-2 per year		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	4-8 per year	12-20 per year	≥24 activities
Data Source	Publication records, presentation logs, distribution lists		
Frequency	Annual		
Notes	Effective dissemination is critical for data use. Target multiple audiences: clinicians, policymakers, public health officials, and researchers. Use multiple channels. Include interpretation.		

3.10	Use of AMR Data in Clinical Guidelines		
Definition	Number of evidence-based clinical guidelines or STGs that explicitly incorporate national AMR surveillance data in their recommendations.		
Measurement	Count of updated guidelines using AMR data		
Illustrative Baseline	0-1 guideline		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	2-4 guidelines updated	5-8 guidelines	≥10 guidelines with AMR data
Data Source	Clinical guideline documents, development committee records		
Frequency	Annual		
Notes	Demonstrates direct impact on clinical practice. Guidelines should cite specific local AMR data. Priority areas: sepsis, pneumonia, UTI, and surgical prophylaxis.		

3.11	Data Quality Audit Completion Rate		
Definition	Percentage of surveillance sites that complete scheduled quarterly data quality audits using standardized audit tools and submit audit reports with corrective action plans within the defined timeframe.		
Measurement	(Number of sites completing quarterly DQ audit + submitting report ÷ Total surveillance sites expected to audit) × 100. A complete audit includes: (1) systematic review of a random sample of records (minimum 50 records), (2) assessment against national data quality standards, (3) documented findings, (4) corrective action plan with timelines		
Illustrative Baseline	30-45% completion rate		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	60-75% completion	80-90% completion	≥95% completion
Data Source	Data quality audit logs, site audit reports, supervisory visit records, quality assurance tracking systems		
Frequency	Quarterly		
Notes	This measures whether quality assurance processes are actually being implemented, not just whether they exist on paper. Sites that consistently complete audits achieve significantly better data quality outcomes (typically 15-25% higher completeness and accuracy scores). Low completion rates indicate: (1) insufficient staff time allocated to QA, (2) lack of understanding of audit procedures, (3) absence of accountability mechanisms. Generate league tables showing site audit compliance. Sites missing two or more consecutive audits should receive immediate technical support. This is a leading indicator: declining audit completion predicts declining data quality 1-2 quarters later.		

3.12	Data Correction and Validation Response Time		
Definition	Median time (in days) from identification of data quality issues (validation errors, missing data, logical inconsistencies) to documented correction or resolution by the surveillance site.		
Measurement	Calculate median days from automated validation flag/manual quality check to corrected record resubmission or documented resolution. Track separately by error type: (1) missing critical fields, (2) logical inconsistencies (e.g., susceptible to drug not tested), (3) out-of-range values, (4) duplicate records		
Illustrative Baseline	15-30 days median response time		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	<14 days	<7 days	<3 days
Data Source	Data validation logs, WHONET quality check reports, laboratory information systems, data cleaning tracking databases, email/communication logs between the central unit and sites		
Frequency	Monthly		
Notes	Fast correction response = responsive system with good communication loops. Slow response indicates: (1) unclear accountability, (2) insufficient feedback mechanisms, (3) sites overwhelmed with validation queries, and (4) a lack of automated systems. This directly impacts data utility-records with errors cannot be used for analysis or reporting. Categorize errors as “critical” (affects patient ID, pathogen ID, key resistance) vs “minor” (formatting, non-essential fields). Critical errors should have a <48-hour resolution target. Generate automated alerts when errors remain unresolved >7 days. Sites with consistently slow response need workflow assessment and possible LIS improvements. International best practice: real-time validation with immediate feedback loops.		

<table>
<tr><td>3.13</td><td colspan="3">Antibiogram Production and Dissemination Rate</td></tr>
<tr><td>Definition</td><td colspan="3">Percentage of surveillance facilities producing facility-level or regional antibiograms at recommended intervals (at minimum annually) based on surveillance data, AND documented evidence of dissemination to prescribers through: (1) clinical guideline updates, (2) prescriber education sessions, (3) EMR/clinical decision support integration, or (4) posted treatment algorithms.</td></tr>
<tr><td>Measurement</td><td colspan="3">(Number of facilities producing AND disseminating antibiograms ÷ Total surveillance facilities with sufficient data volume) × 100. Sufficient data volume: ≥30 isolates per organism-antibiotic combination; Dissemination: documented evidence in at least one of the four channels listed above</td></tr>
<tr><td>Illustrative Baseline</td><td colspan="3">20-35% of facilities</td></tr>
<tr><td rowspan="2">Illustrative Targets</td><td>Years 1-2</td><td>Years 3-4</td><td>Years 5+</td></tr>
<tr><td>50-65% of facilities produce and disseminate antibiograms</td><td>75-85% of facilities with evidence of clinical use</td><td>≥90% of facilities + documented impact on prescribing patterns (through prescription audits)</td></tr>
<tr><td>Data Source</td><td colspan="3">Facility antibiogram publication records, clinical guideline documentation, CME/training logs, EMR system logs, prescriber surveys, prescription audits, hospital pharmacy records</td></tr>
<tr><td>Frequency</td><td colspan="3">Semi-annual</td></tr>
<tr><td>Notes</td><td colspan="3">This is the critical “data-to-action” pathway indicator used internationally (per CDC, ECDC, and IDSA standards). Surveillance is only valuable if the data reaches and influences clinicians. This indicator measures three critical elements: (1) sufficient data quality to generate antibiograms, (2) analytical capacity to produce them, and (3) dissemination mechanisms to reach prescribers. Progressive measurement: Start by measuring production only (Years 1-2), then add dissemination documentation (Years 3-4), and finally measure prescribing concordance (Years 5+). Facilities without antibiograms cannot claim evidence-based prescribing. Common barriers: (1) insufficient specimen volume, (2) lack of analytical skills, (3) no dissemination channels, (4) antibiograms produced but not updated.</td></tr>
</table>

Strategic Objective 4: Implement robust internal and external quality assurance mechanisms to ensure accuracy, reliability, and comparability of AMR surveillance data

Objective Overview

Rationale	Quality assurance is the cornerstone of reliable AMR surveillance. Without robust internal and external quality control mechanisms, surveillance data cannot be trusted for clinical decision-making, policy formulation, or international reporting. Systematic quality assurance ensures that resistance patterns reflect true epidemiology rather than laboratory variation, that data from different facilities can be compared and aggregated, and that surveillance investments produce actionable intelligence.
Focus Areas	• Establishing and monitoring internal quality control (IQC) practices for AST • Ensuring availability and proper use of ATCC/equivalent QC reference strains • Enrolling laboratories in external quality assessment (EQA) programs • Implementing systematic proficiency testing participation • Developing corrective action systems for quality failures • Standardizing AST methodologies and interpretation criteria • Building QA training and mentorship capacity • Conducting regular supervisory visits and audits • Measuring and improving inter-laboratory agreement • Integrating QA into laboratory accreditation pathways
Target Audience	Laboratory quality officers, clinical microbiologists, laboratory managers, national reference laboratory QA coordinators, EQA program providers, laboratory accreditation bodies, supervisory visit teams, training institutions, laboratory technicians performing AST.
Selection Guidance	All surveillance laboratories must implement process indicators (4.11, 4.12) and work toward the impact indicator (4.13) from the start: quality assurance is not optional for surveillance. Early-stage programs should focus on core indicators (4.1, 4.2, 4.3, 4.5, 4.8) related to establishing basic IQC practices, ensuring QC materials, participating in EQA, and standardizing methods. As systems mature, advanced indicators (4.4, 4.6, 4.7, 4.9, 4.10) provide insights into accreditation progress, audit frequency, documentation systems, and inter-facility collaboration. Recommended to not expand surveillance networks without ensuring participating laboratories meet minimum QA standards: quality must precede quantity. All indicators are suggestions only and should be adapted to the national context and priorities.

Indicator Summary

Indicator #	Indicator Name	Type	Priority Level
4.1	Implementation of Internal Quality Control (IQC)	Output	Core
4.2	Quality Control Strain Availability	Output	Core
4.3	Performance in EQA Programs	Outcome	Core
4.4	Laboratory Accreditation/Certification Status	Outcome	Advanced
4.5	QA Training and Competency Assessment Coverage	Output	Core
4.6	Frequency and Quality of Supervisory Visits/Audits	Output	Advanced
4.7	AST Method Standardization Compliance	Outcome	Advanced
4.8	QA Documentation and SOPs Availability	Output	Core
4.9	Inter-laboratory Collaboration and Learning Networks	Outcome	Advanced
4.10	QA Resource Allocation and Sustainability	Outcome	Advanced
4.11	Proficiency Testing Participation and Completion Rate	Process	Core
4.12	Corrective Action Implementation and Documentation Rate	Process	Core
4.13	Inter-laboratory Agreement Rate for AST Results	Impact	Core

Indicator Detail

4.1	Implementation of Internal Quality Control (IQC)		
Definition	Percentage of surveillance laboratories routinely performing internal quality control for AST using appropriate reference strains.		
Measurement	(Number of labs with documented regular IQC ÷ Total surveillance labs) × 100		
Illustrative Baseline	30-50%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	65-80% implementation	85-95% implementation	≥95% consistent IQC
Data Source	IQC logs, quality control strain inventory		
Frequency	Quarterly		
Notes	IQC should include daily/weekly testing of ATCC reference strains, documentation of results within acceptable ranges, and corrective actions when out of range.		

4.2	Quality Control Strain Availability		
Definition	Percentage of surveillance laboratories that have adequate stocks of all required ATCC or equivalent reference strains for quality control.		
Measurement	(Number of labs with complete QC strain sets ÷ Total surveillance labs) × 100		
Illustrative Baseline	20-40%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	55-75% have required strains	80-90% have strains	≥95% consistent availability
Data Source	Laboratory strain inventory, procurement records		
Frequency	Semi-annual		
Notes	Required strains typically: E. coli ATCC 25922, S. aureus ATCC 25923, P. aeruginosa ATCC 27853, E. faecalis ATCC 29212. Establish central repositories.		

4.3	Performance in EQA Programs		
Definition	Cross-reference to Indicator 1.9: included in Strategic Objective 1 for laboratory capacity, but also a core quality indicator for Strategic Objective 4.		
Measurement	See Indicator 1.9 for definition and measurement		
Illustrative Baseline	See 1.9		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	See 1.9	See 1.9	See 1.9
Data Source	See Indicator 1.9		
Frequency	Annual		
Notes	EQA performance is a primary quality outcome indicator already covered in Objective 1. Emphasize the importance of this indicator for the quality assurance framework outlined here in Objective 4.		

4.4	Standard Operating Procedure (SOP) Availability and Currency		
Definition	Percentage of surveillance laboratories with complete, up-to-date SOPs covering all critical AMR testing processes.		
Measurement	(Number of labs with complete, current SOPs ÷ Total surveillance labs) × 100		
Illustrative Baseline	40-60%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	70-85% compliance	90-95% compliance	≥95% comprehensive SOPs
Data Source	SOP documentation review, laboratory audits		
Frequency	Annual		
Notes	Critical SOPs: specimen collection/transport, culture methods, AST methods, QC procedures, equipment maintenance, data management, biosafety. Review annually.		

4.5	Staff Competency Assessment		
Definition	Percentage of laboratory personnel involved in AMR testing who undergo annual competency assessment and retraining as needed.		
Measurement	(Number of staff with current competency assessments ÷ Total AMR testing staff) × 100		
Illustrative Baseline	20-40%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	60-75% assessed	85-95% assessed	≥95% annual verification
Data Source	Training and competency records, performance evaluations		
Frequency	Annual		
Notes	The assessment should include theoretical knowledge, practical skills, proficiency with equipment, understanding of quality procedures, and a link to targeted retraining.		

4.6	Equipment Calibration and Maintenance		
Definition	Percentage of critical laboratory equipment receiving scheduled calibration and preventive maintenance according to manufacturer specifications.		
Measurement	(Equipment items with current calibration/maintenance ÷ Total critical equipment) × 100		
Illustrative Baseline	50-65%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	75-85% compliance	90-95% compliance	≥95% maintained
Data Source	Equipment maintenance logs, calibration certificates		
Frequency	Quarterly		
Notes	Critical equipment: incubators, autoclaves, biosafety cabinets, microscopes, automated AST systems, refrigerators. Establish tracking systems.		

4.7	Non-Conformance and Corrective Action System		
Definition	Percentage of surveillance laboratories with documented systems for identifying, recording, and addressing non-conformances and implementing corrective actions.		
Measurement	(Number of labs with functional CAPA systems ÷ Total surveillance labs) × 100		
Illustrative Baseline	10-30%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	50-70% have systems	80-90% have systems	≥95% effective CAPA
Data Source	CAPA documentation, audit findings, corrective action logs		
Frequency	Annual		
Notes	CAPA systems are essential for quality management. Should include: non-conformance identification, root cause analysis, corrective action, effectiveness verification, and preventive measures.		

4.8	Inter-Laboratory Comparison and Concordance		
Definition	Agreement rate in AST results between surveillance laboratories and NRLs for selected isolates.		
Measurement	Percentage concordance in susceptibility categorization (S/I/R) for selected organism-antibiotic combinations		
Illustrative Baseline	60-75% concordance		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	80-90% concordance	90-95% concordance	≥95% concordance
Data Source	Inter-laboratory comparison studies, NRL verification testing		
Frequency	Annual		
Notes	Essential for assessing data comparability across sites. NRL should conduct annual comparisons using selected isolates distributed to labs. Discordance triggers review.		

4.9	Method Standardization Compliance		
Definition	Percentage of surveillance laboratories demonstrating adherence to standardized methods (CLSI/EUCAST) through supervisory assessments.		
Measurement	(Number of labs fully compliant with standard methods ÷ Total labs assessed) × 100		
Illustrative Baseline	40-60%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	70-85% compliance	90-95% compliance	≥95% standardization
Data Source	Supervisory visit reports, method verification studies		
Frequency	Annual		
Notes	Standardization ensures comparable results. Assess through on-site observation, procedure review, and verification of incubation parameters. Non-compliance requires retraining.		

4.10	Quality Management System Maturity		
Definition	Assessment of laboratory QMS development using the WHO Laboratory Quality Stepwise Implementation (LQSI) tool or equivalent.		
Measurement	Average LQSI score across surveillance laboratories (scale 0-5 for each quality system essential)		
Illustrative Baseline	Level 1-2 (Basic)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Level 2-3 (Developing)	Level 3-4 (Established)	Level 4-5 (Advanced)
Data Source	LQSI assessments, quality system audits		
Frequency	Annual		
Notes	LQSI assesses 12 quality system essentials. Provides a roadmap for quality system development. Consider a phased approach to full QMS implementation.		

4.11	Proficiency Testing Participation and Completion Rate		
Definition	Percentage of surveillance laboratories that complete and submit all required external quality assessment (EQA) proficiency testing rounds within the specified deadline for each testing cycle. A "complete submission" includes testing all challenge strains and submitting interpretive results (S/I/R) within the defined turnaround time.		
Measurement	(Number of labs completing ALL PT rounds on time ÷ Total labs enrolled in EQA program) × 100. Track separately: (1) participation rate (labs that received PT materials), (2) completion rate (labs that tested strains), (3) on-time submission rate (labs that submitted within the deadline)		
Illustrative Baseline	60-75% complete on-time participation		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	80-85% participation	90-95% participation	≥95% participation across all core laboratories
Data Source	EQA program enrollment records, PT material distribution logs, results submission tracking systems, proficiency testing provider databases (e.g., UK NEQAS, CAP, national PT programs)		
Frequency	Per PT cycle (typically 2-4 cycles annually)		
Notes	This measures whether labs engage with quality assurance, not their performance. Non-participation indicates: (1) insufficient priority given to QA, (2) lack of awareness of requirements, (3) logistical problems (PT materials not received, cold chain failure), and (4) insufficient staffing to complete testing. Labs missing two or more consecutive PT cycles should: (1) receive a supervisory visit, (2) have surveillance data flagged as "unvalidated," and (3) potentially be suspended from the network until QA participation resumes. International best practice: PT participation should be mandatory for inclusion in surveillance networks. Some countries make it a licensing requirement. Late submissions should be accepted but marked separately; on-time submission shows operational discipline.		

4.12	Corrective Action Implementation and Documentation Rate		
Definition	Percentage of laboratories with documented quality issues (failed IQC, unsatisfactory EQA scores, audit findings, equipment failures) that implement documented corrective actions within the specified timeframe and provide evidence of resolution.		
Measurement	(Number of QA issues with documented corrective action + verification ÷ Total QA issues identified) × 100. A "complete corrective action" includes: (1) root cause analysis, (2) action plan with timeline, (3) implementation documentation, (4) verification of effectiveness (e.g., repeat testing, follow-up audit)		
Illustrative Baseline	40-55% of issues resolved with documentation		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	65-75% corrective action completion	80-90% completion	≥90% with critical issues resolved within 30 days
Data Source	Quality incident reports, corrective action tracking logs, IQC failure records, EQA follow-up documentation, supervisory visit reports, and laboratory quality management system records.		
Frequency	Quarterly.		
Notes	Finding quality problems is valueless if they're not fixed; this is the most critical gap in many QA systems. Quality issues without corrective action erode confidence in surveillance data and demonstrate that QA is "box-checking" rather than proper quality management. Common failure modes: (1) issues identified but no follow-up, (2) action plans created but never implemented, (3) fixes implemented but not verified, (4) same problems recurring (indicating ineffective corrections).		

<table>
<tr><td>4.13</td><td colspan="3">Inter-laboratory Agreement Rate for AST Results</td></tr>
<tr><td>Definition</td><td colspan="3">Percentage agreement in antimicrobial susceptibility test interpretations (susceptible, intermediate, resistant) between surveillance laboratories when testing identical challenge organisms or split specimens. Measures whether different laboratories produce comparable, reproducible results: the fundamental goal of quality assurance systems.</td></tr>
<tr><td>Measurement</td><td colspan="3">(Number of concordant AST interpretations ÷ Total paired comparisons) × 100. Measurement approaches: 1. PT-based: Compare each lab's PT results to the reference lab consensus; 2. Split specimen: Selected specimens tested independently by two or more labs; 3. Panel retesting: Random samples from routine testing were retested by the reference lab. Calculate separately for: (1) priority organism-antibiotic combinations, (2) critical resistance mechanisms (e.g., MRSA), (3) methodologies (disk diffusion vs automated systems)</td></tr>
<tr><td>Illustrative Baseline</td><td colspan="3">75-85% essential agreement*
(*Essential agreement = within 1 dilution or zone diameter equivalent)</td></tr>
<tr><td rowspan="2">Illustrative Targets</td><td>Years 1-2</td><td>Years 3-4</td><td>Years 5+</td></tr>
<tr><td>≥85% essential agreement for priority pathogens</td><td>≥90% essential agreement with ≥95% categorical agreement for common organism</td><td>≥95% categorical agreement across all priority organism-antibiotic combinations with systematic investigation of discrepancies</td></tr>
<tr><td>Data Source</td><td colspan="3">Proficiency testing reports, split specimen testing records, re-testing programs, reference laboratory comparison studies, EQA provider analysis reports, inter-laboratory comparison study results.</td></tr>
<tr><td>Frequency</td><td colspan="3">Per PT cycle (2-4 times annually) with annual comprehensive analysis</td></tr>
<tr><td>Notes</td><td colspan="3">This is the gold standard QA impact metric used internationally (CDC, EUCAST, CLSI, WHO). Without inter-laboratory agreement, surveillance data cannot be pooled, compared, or trusted. A resistance rate of 30% in Hospital A vs 50% in Hospital B could reflect actual epidemiological differences or just measurement error. This indicator reveals whether quality assurance systems are working. International benchmarks: Well-functioning surveillance networks achieve ≥95% categorical agreement. Disagreement >10% indicates systematic problems requiring investigation. Common causes of disagreement: (1) Different methodologies (disk diffusion vs MIC), (2) Inadequate training, (3) Equipment calibration differences, (4) Inoculum density variations, (5) Interpretation criteria inconsistencies. Critical uses: (1) Identifies outlier laboratories needing support, (2) Validates that network expansion maintains data quality, (3) Demonstrates QA program effectiveness to funders/policymakers, (4) Builds confidence in pooled national data.</td></tr>
</table>

Strategic Objective 5: Foster multisectoral collaboration, integrate surveillance into national health systems, and ensure alignment with national and global AMR strategies

Objective Overview

Rationale	AMR is a complex, multisectoral challenge that requires coordinated action across human, animal, food safety, and environmental sectors. Effective surveillance cannot function in isolation: it must be integrated into national health systems, aligned with national AMR action plans, and coordinated across sectors through functional One Health mechanisms. Strong coordination ensures efficient resource use, prevents duplication, enables comprehensive resistance tracking, and ensures surveillance findings inform policy and practice across all sectors.
Focus Areas	• Establishing and strengthening national AMR coordination mechanisms and governance structures • Operationalizing multisectoral technical working groups with regular engagement • Integrating AMR surveillance into national AMR action plans with defined roles • Building One Health surveillance systems linking human, animal, and environmental data • Facilitating cross-sectoral data sharing through legal frameworks and technical platforms • Aligning national surveillance with WHO GLASS and international reporting requirements • Ensuring coordination meetings produce actionable outcomes • Developing joint cross-sectoral investigations and interventions • Integrating AMR surveillance into national health information systems Mobilizing and coordinating multisectoral resources for surveillance
Target Audience	National AMR coordination secretariats, One Health steering committees, Ministry of Health leadership, Ministry of Agriculture/Livestock officials, Environmental protection agencies, national planning commissions, WHO GLASS focal points, public health institutes, veterinary services, food safety authorities, academia and research institutions, development partners and donors.
Selection Guidance	All countries must monitor the process indicators (5.11, 5.12) and the impact indicator (5.13) from the outset to ensure that coordination mechanisms are functional and produce tangible results. Early-stage coordination should focus on core indicators (5.1, 5.2, 5.3, 5.4, 5.8) related to establishing basic structures, holding regular meetings, integrating into national plans, and aligning with global frameworks. As coordination matures, advanced indicators (5.5, 5.6, 5.7, 5.9, 5.10) provide insights into resource mobilization, policy influence, joint capacity building, and sustained multisectoral engagement. Coordination is not about creating new bureaucracies but about leveraging existing structures to ensure they produce collaborative action. All indicators are suggestions only and should be adapted to the national context and priorities.

Indicator Summary

Indicator #	Indicator Name	Type	Priority Level
5.1	Functionality of the National AMR Coordination Mechanism	Outcome	Core
5.2	Frequency of AMR Surveillance Technical Working Group Meetings	Output	Core
5.3	Integration with National AMR Action Plan	Outcome	Core
5.4	One Health Surveillance Integration	Outcome	Core
5.5	Multisectoral Resource Mobilization for AMR Surveillance	Output	Advanced
5.6	AMR Surveillance Data Utilization in Policy Development	Output	Advanced
5.7	Cross-Sectoral Joint Training and Capacity Building Activities	Outcome	Advanced
5.8	Alignment with WHO GLASS and International Reporting	Outcome	Core
5.9	Stakeholder Engagement and Participation Rate	Outcome	Advanced
5.10	Integration of AMR Surveillance into National HMIS	Output	Advanced
5.11	Coordination Meeting Action Item Completion Rate	Process	Core
5.12	Cross-Sectoral AMR Data Sharing and Exchange Frequency	Process	Core
5.13	Joint Cross-Sectoral AMR Investigations and Interventions	Impact	Core

Indicator Detail

5.1	Functional National AMR Coordination Mechanism		
Definition	Existence and functionality of a multi-stakeholder national coordination body for AMR surveillance and containment activities.		
Measurement	Composite: (1) Formal structure exists, (2) Meets regularly (≥2/year), (3) Includes key sectors, (4) Produces action plans, (5) Has resources		
Illustrative Baseline	No formal mechanism		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Established, limited function	Functional with regular engagement	Highly effective intersectoral action
Data Source	National AMR committee meeting minutes, terms of reference, workplans		
Frequency	Annual		
Notes	This coordination mechanism is critical for a One Health approach. Must include representatives from health, agriculture, environment, technical agencies, academia, and professional associations.		

5.2	Frequency of AMR Surveillance Technical Working Group Meetings		
Definition	Number of national or regional technical working group meetings held annually to review surveillance data, address challenges, and plan activities.		
Measurement	Count of meetings held with documented attendance and outcomes		
Illustrative Baseline	0-2 meetings		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	3-4 meetings (quarterly)	4-6 meetings	≥6 meetings with active problem-solving
Data Source	Meeting minutes, attendance records, action item tracking		
Frequency	Annual		
Notes	Regular technical meetings are essential for maintaining momentum, addressing challenges, sharing best practices, and fostering collaboration. Quarterly meetings are recommended as a minimum.		

5.3	Integration with National AMR Action Plan		
Definition	Surveillance M&E framework explicitly integrated into the national AMR action plan with defined indicators, targets, and resource allocation.		
Measurement	Binary plus quality: (1) Included in NAP, (2) Indicators defined, (3) Resources allocated, (4) Implementation monitored		
Illustrative Baseline	Not integrated or outdated NAP		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Mentioned in NAP, limited detail	Well-integrated with indicators	Fully integrated with resources
Data Source	National AMR Action Plan document, NAP implementation reports, budget records		
Frequency	Annual or at NAP revision		
Notes	NAP should include surveillance as a priority pillar with specific objectives, activities, indicators, and a budget. Surveillance cannot function effectively in isolation from a broader AMR strategy.		

5.4	One Health Surveillance Integration		
Definition	Level of integration between human health AMR surveillance and animal health/food safety surveillance systems.		
Measurement	Composite: (1) Data sharing mechanisms exist, (2) Joint analysis conducted, (3) Shared laboratory capacity, (4) Coordinated reporting, (5) Joint publications		
Illustrative Baseline	No integration (siloed)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Initial coordination established	Regular data sharing and joint analysis	Fully integrated One Health surveillance
Data Source	One Health coordination meeting records, joint reports, data sharing agreements		
Frequency	Annual		
Notes	The One Health approach is critical for comprehensive AMR surveillance. Start with foodborne pathogens and zoonotic organisms. Address institutional and regulatory barriers.		

5.5	Antimicrobial Stewardship Program Integration		
Definition	Number of surveillance sites where AMR surveillance data actively informs facility-level antimicrobial stewardship programs.		
Measurement	Count of sites with documented linkages between surveillance and AMS programs		
Illustrative Baseline	0-10 sites		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	20-40 sites	60-100 sites	≥120 sites with integrated feedback
Data Source	AMS program documentation, facility antibiograms, prescribing guideline documents		
Frequency	Annual		
Notes	Surveillance must inform AMS to drive rational use. Integration includes: distributing facility antibiograms to prescribers, regularly reviewing AMS resistance data, and adapting protocols.		

5.6	Infection Prevention and Control (IPC) Program Linkages		
Definition	Proportion of surveillance sites where AMR data systematically informs IPC strategies and outbreak detection.		
Measurement	(Number of sites with IPC-surveillance linkages ÷ Total surveillance sites) × 100		
Illustrative Baseline	10-30%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	50-70% integration	80-90% integration	≥95% with IPC-surveillance feedback
Data Source	IPC program documentation, outbreak investigation reports		
Frequency	Annual		
Notes	AMR surveillance should alert IPC to resistance trends, clusters, and potential outbreaks. Requires regular data sharing, joint outbreak investigations, and collaborative HAI pattern analysis.		

5.7	Public-Private Partnership Development		
Definition	Number of formal partnerships between the public sector AMR surveillance system and the private healthcare/laboratory sectors for data sharing and capacity building.		
Measurement	Count of documented partnerships with MOUs or agreements		
Illustrative Baseline	0-2 partnerships		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	3-6 partnerships	8-12 partnerships	≥15 partnerships across regions
Data Source	Partnership agreements, MOU documentation		
Frequency	Annual		
Notes	The private sector holds significant AMR data that is often not captured. Partnerships should address confidentiality, data sharing mechanisms, capacity building, quality assurance, and incentives.		

5.8	Academic and Research Institution Engagement		
Definition	Number of formal collaborations with universities, research institutions, or international partners supporting surveillance activities.		
Measurement	Count of active collaborations with documented outputs (research, capacity building, technical support)		
Illustrative Baseline	0-3 collaborations		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	4-8 collaborations	10-15 collaborations	≥16 collaborations with outputs
Data Source	Collaboration agreements, joint publications, research grant records		
Frequency	Annual		
Notes	Academic partnerships enhance surveillance through research capacity, advanced techniques (molecular typing, sequencing), data analysis expertise, training, and international networks.		

5.9	Dedicated AMR Surveillance Budget Line		
Definition	Existence of a specific, protected budget line item in the national health budget for AMR surveillance activities.		
Measurement	Binary with adequacy assessment: (1) Budget line exists, (2) Covers core costs, (3) Inflation-adjusted growth		
Illustrative Baseline	No dedicated budget		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Small budget line established	Adequate budget for core activities	Comprehensive sustainable funding
Data Source	National budget documents, ministry of health budget allocations		
Frequency	Annual		
Notes	Dedicated funding is critical for sustainability. The budget should cover personnel, lab supplies, equipment maintenance, training, data management, quality assurance, and supervision.		

5.10	Regional and International Network Participation		
Definition	Active participation in regional AMR surveillance networks and international initiatives beyond GLASS.		
Measurement	Count of regional/international networks where the country actively participates and contributes data		
Illustrative Baseline	1 network (GLASS only)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	2-3 networks	4-5 networks	≥5 networks with leadership roles
Data Source	Network membership records, participation certificates, data contribution logs		
Frequency	Annual		
Notes	Regional networks provide benchmarking, technical support, capacity building, harmonized methods, and collaborative research. Active participation means contributing data and engaging.		

5.11	Coordination Meeting Action Item Completion Rate		
Definition	Percentage of action items assigned during national AMR coordination meetings (steering committee, technical working groups, One Health committees) that are completed within the agreed timeline and documented with evidence of completion. Measures whether coordination mechanisms produce tangible results rather than just discussions.		
Measurement	(Number of action items completed on time ÷ Total action items assigned) × 100. Track separately by: (1) Sector (human/animal/environment), (2) Action type (data sharing, joint analysis, policy development, resource mobilization), (3) Priority level (critical/routine)/ A "completed action" requires documented evidence submitted to the secretariat.		
Illustrative Baseline	35-50% completion rate (common for new coordination bodies)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	60-70% completion	75-85% completion	≥85% with critical items at ≥95% completion
Data Source	Meeting minutes with action item logs, coordination secretariat tracking systems, action item completion reports, email confirmations, document repositories		
Frequency	Quarterly (reviewed at each coordination meeting)		
Notes	This is the most critical indicator of whether coordination is functional or performative. Meetings without follow-through waste resources and erode stakeholder confidence. Common failure modes: (1) Action items assigned without clear ownership, (2) No tracking system, (3) No accountability for non-completion, (4) Unrealistic timelines, (5) Resource constraints not addressed when assigning actions. Best practices: Use structured action-tracking tools (online dashboards), assign a single point of accountability per action (not committees), set realistic timelines, and report completion rates at every meeting to foster peer accountability.		

5.12	Cross-Sectoral AMR Data Sharing and Exchange Frequency		
Definition	Frequency and timeliness of formal AMR surveillance data exchange between human health, animal health, and environmental surveillance systems. Measures whether sectors share data as specified in coordination agreements, enabling integrated One Health analysis.		
Measurement	**Two sub-metrics:** 1. **Exchange frequency:** Number of formal data exchanges per year (human: animal, human: environment, animal: environment); 2. **Exchange timeliness:** % of scheduled data exchanges completed within the agreed timeframe. A "formal exchange" includes: (1) Documented data transfer, (2) Standardized format, (3) Metadata included, (4) Exchange logged in coordination records.		
Illustrative Baseline	1-2 exchanges/year with 40-60% on-time completion		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Quarterly exchanges (4/year) with 70-80% on-time	Monthly exchanges (12/year) with 85-90% on-time	Continuous/automated data sharing with ≥95% scheduled exchanges on time
Data Source	Data sharing logs, memoranda of understanding/data sharing agreements, email correspondence records, shared database access logs, One Health platform usage statistics, and coordination secretariat documentation		
Frequency	Quarterly		
Notes	Data sharing is the foundation of One Health surveillance: without it, coordination is just meetings with no substance. Common barriers: (1) Legal/policy restrictions on data sharing, (2) Different data formats/standards between sectors, (3) Lack of data sharing agreements, (4) Mistrust between sectors, (5) Technical incompatibility of systems, (6) Unclear data ownership/confidentiality rules. Progressive implementation: Start with annual aggregated summaries (Years 1-2), move to quarterly line-list sharing (Years 3-4), implement real-time data platforms (Years 5+).		

5.13	**Joint Cross-Sectoral AMR Investigations and Interventions**		
Definition	Number of documented AMR-related investigations, outbreak responses, or interventions conducted jointly by two or more sectors (human health, animal health, environment) with evidence of: (1) shared data analysis, (2) coordinated action, (3) joint reporting, and (4) measurable outcomes. Measures whether coordination mechanisms produce tangible multisectoral action that addresses AMR threats comprehensively.		
Measurement	Count and categorize: 1. Joint investigations: Cross-sectoral investigations of resistance clusters/outbreaks; 2. Joint interventions: Coordinated AMR reduction programs (e.g., reducing agricultural antibiotic use + improving infection control in linked human populations); 3. Joint analyses: Integrated One Health assessments of resistance trends. Each must document: (two) ≥2 sectors participating, (2) Shared data used, (3) Joint analysis or action, (4) Outcomes measured. Quality criteria: Not just "met to discuss" but actual collaborative investigation/intervention with measurable results		
Illustrative Baseline	0-2 joint activities/year (most countries at baseline)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	3-5 joint activities/year (establishing mechanisms)	8-12 joint activities/year (routinization)	≥15 joint activities/year with documented impact on AMR outcomes (e.g., outbreak contained, resistance reduced in targeted populations)
Data Source	Investigation reports, intervention documentation, joint publications, coordination secretariat records, One Health case studies, ministry of health/agriculture official reports, scientific publications, media coverage of joint activities.		
Frequency	Semi-annual with annual comprehensive analysis		
Notes	This is the ultimate measure of whether One Health coordination produces results. Used internationally as the gold standard for assessing multisectoral collaboration maturity. Why it matters: Coordination infrastructure (5.1), meetings (5.2), plans (5.3), and data sharing (5.4, 5.12) are all means to this end: collaborative action that addresses AMR more effectively than single-sector approaches. Examples of joint activities: 1) Investigation of ESBL E. coli in poultry farms and linked human cases; 2) Joint analysis showing agricultural antibiotic sales correlate with community-acquired resistance patterns; 3) Integrated surveillance showing environmental contamination from pharmaceutical manufacturing affecting community resistance.		

Strategic Objective 6: Build capacity among healthcare workers, laboratory professionals, and program managers through targeted training & promote awareness through effective IEC strategies

Objective Overview

Rationale	Human capacity is the foundation of functional AMR surveillance systems. Healthcare workers, laboratory personnel, and program managers require comprehensive knowledge of AMR epidemiology, specimen collection practices, surveillance protocols, data management, and interpretation. Without adequate training and sustained capacity building, even well-resourced surveillance infrastructure cannot generate reliable, actionable data. Building awareness among healthcare workers and the public creates demand for surveillance and promotes rational antimicrobial use based on surveillance findings.
Focus Areas	• Building healthcare workers' knowledge of AMR surveillance objectives and procedures • Training laboratory personnel in standardized AST methods and quality assurance • Developing surveillance coordinator and program manager capacity • Standardizing training curricula and materials across sites • Producing and disseminating IEC materials on AMR surveillance • Raising healthcare provider awareness of local resistance patterns • Establishing training resource repositories and materials • Building training-of-trainers capacity for sustainability • Ensuring knowledge retention through refresher training • Integrating AMR surveillance into pre-service health professional education • Promoting public and patient awareness of AMR
Target Audience	Healthcare workers (physicians, nurses, infection control staff), laboratory technicians and microbiologists, surveillance coordinators and data managers, program managers and supervisors, training institutions and medical/nursing schools, national training coordinators, healthcare professional associations, pharmacy personnel, public health officers, health facility administrators, medical students and residents.
Selection Guidance	All surveillance programs must monitor Process indicators (6.11, 6.12) and the Impact indicator (6.13) from the start to ensure training quality and demonstrate measurable performance improvements. Early-stage programs should focus on Core indicators (6.1, 6.2, 6.5, 6.6) related to establishing baseline knowledge, providing initial training, developing IEC materials, and raising awareness. As programs mature, Advanced indicators (6.3, 6.4, 6.7, 6.8, 6.9, 6.10) provide insights into coordinator capacity, training standardization, resource availability, knowledge retention, pre-service integration, and public awareness. Training should be competency-based with verified outcomes, not just certificate

	distribution. Follow-up and mentorship are essential for translating training into improved practice. All indicators are suggestions only and should be adapted to the national context and priorities.

Indicator Summary

Indicator #	Indicator Name	Type	Priority Level
6.1	Healthcare Worker Knowledge of AMR Surveillance	Outcome	Core
6.2	Laboratory Personnel Training Coverage	Output	Core
6.3	Surveillance Coordinator and Manager Capacity	Output	Advanced
6.4	Training Program Standardization	Output	Core
6.5	IEC Material Production and Distribution	Output	Core
6.6	Healthcare Provider Awareness of Local Resistance Patterns	Output	Core
6.7	Training Resource Repository and Materials Availability	Output	Advanced
6.8	Training Retention and Refresher Participation Rate	Outcome	Advanced
6.9	Integration into Pre-Service Health Professional Education	Outcome	Advanced
6.10	Public and Patient Awareness of AMR and Surveillance	Outcome	Advanced
6.11	Post-Training Competency Assessment Pass Rate	Process	Core
6.12	Training Completion and Follow-up Rate	Process	Core
6.13	Trained Staff Performance Differential in Surveillance Activities	Impact	Core

Indicator Detail

6.1	Healthcare Worker Knowledge of AMR Surveillance		
Definition	Percentage of healthcare workers (physicians, nurses, clinical officers) at surveillance sites demonstrating adequate knowledge of AMR surveillance objectives, proper specimen collection, and reporting procedures.		
Measurement	Knowledge score ≥70% on standardized assessment or proportion scoring satisfactorily		
Illustrative Baseline	10-30%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	45-65% adequate knowledge	75-85% adequate knowledge	≥85% with good knowledge
Data Source	Knowledge assessment surveys, pre- and post-training evaluations		
Frequency	Annual		
Notes	Healthcare workers are critical to the quality of specimen collection and clinical data. Assessment should cover: understanding of AMR, specimen collection techniques, transport requirements, and awareness of protocols.		

6.2	Laboratory Personnel Training Coverage		
Definition	Percentage of laboratory personnel working in AMR surveillance who have completed standardized AMR surveillance training.		
Measurement	(Number of lab personnel trained in AMR methods ÷ Total lab personnel in surveillance) × 100		
Illustrative Baseline	20-40%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	60-75% trained	85-95% trained	≥95% with current training
Data Source	Training records, HR databases, certification documentation		
Frequency	Annual		
Notes	Comprehensive training coverage ensures consistent quality. Training should include: culture methods, AST techniques, quality control, biosafety, WHONET use, and data quality. Include refresher training.		

6.3	Surveillance Coordinator and Manager Capacity		
Definition	Number of trained surveillance coordinators and program managers at national, regional, and facility levels with competencies in surveillance M&E.		
Measurement	Count of individuals with documented training in surveillance coordination, M&E, and data analysis		
Illustrative Baseline	2-5 coordinators		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	10-20 coordinators	30-50 coordinators	≥60 coordinators at multiple levels
Data Source	Position descriptions, training certificates, performance records		
Frequency	Annual		
Notes	Strong program management is essential for sustainability. Coordinators need skills in surveillance system design, data management/analysis, quality assurance, stakeholder coordination, report writing, and M&E.		

6.4	Training Program Standardization		
Definition	Availability of standardized national training curricula and materials for AMR surveillance targeting different cadres (laboratory staff, clinicians, data managers).		
Measurement	Count of standardized training packages developed, pilot-tested, and available for use		
Illustrative Baseline	0-1 curriculum		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	2-3 curricula for key cadres	4-5 comprehensive curricula	≥5 curricula with regular updates
Data Source	Training curriculum documents, training materials repositories		
Frequency	Annual		
Notes	Standardized training ensures consistent competencies nationwide. Curricula should include: learning objectives, content modules, practical exercises, assessment tools, and trainer guides. Regular updates needed.		

6.5	Mentorship and On-Site Support System		
Definition	Existence and functionality of mentorship programs and on-site supportive supervision for surveillance sites, particularly newly enrolled facilities.		
Measurement	Composite: (1) Mentorship program established, (2) Regular site visits conducted, (3) On-site training provided, (4) Documented problem-solving		
Illustrative Baseline	No formal mentorship		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	Basic mentorship initiated	Functional mentorship with regular support	Comprehensive mentorship with documented impact
Data Source	Mentorship program documentation, supervisory visit reports, mentee feedback		
Frequency	Annual		
Notes	Mentorship accelerates capacity development and quality improvement. Should include: regular site visits, hands-on training, problem-solving support, and performance feedback. Develops local champions.		

6.6	Awareness Campaigns and Information Dissemination		
Definition	Number and reach of public awareness campaigns, healthcare provider communications, and educational materials about AMR and surveillance.		
Measurement	Count of awareness activities (campaigns, materials, events) plus estimated reach (audience size)		
Illustrative Baseline	0-5 limited activities		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	10-20 activities, moderate reach	30-50 activities, broad reach	≥60 activities with comprehensive coverage
Data Source	Campaign documentation, educational materials inventory, media coverage tracking		
Frequency	Annual		
Notes	Awareness foundation for engagement and behavior change. Target multiple audiences: public, healthcare providers, policymakers, students. Use multiple channels. Participate in World AMR Awareness Week.		

6.7	Integration into Pre-Service Education		
Definition	Number of medical schools, nursing schools, pharmacy programs, and laboratory technology training institutions that have integrated AMR surveillance concepts into curricula.		
Measurement	Count of training institutions with AMR surveillance in the core curriculum		
Illustrative Baseline	0-3 institutions		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	5-10 institutions	15-25 institutions	≥30 institutions with comprehensive integration
Data Source	Curriculum review documentation, faculty engagement records		
Frequency	Annual		
Notes	Pre-service education creates a sustainable capacity pipeline. Integrate: AMR biology/epidemiology, rational antimicrobial use, specimen collection, surveillance methods, and public health importance.		

6.8	Continuing Professional Development		
Definition	Availability of continuing education opportunities (conferences, workshops, webinars, courses) focused on AMR surveillance for health professionals.		
Measurement	Count of CPD activities offered annually with participant numbers		
Illustrative Baseline	0-5 activities		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	10-20 activities	30-50 activities	≥60 activities with broad participation
Data Source	CPD event records, participant registration, continuing education credit documentation		
Frequency	Annual		
Notes	Regular continuing education maintains and updates workforce skills. Include: national conferences, regional workshops, webinars, and online courses. Collaborate with professional associations. Offer CPD credits.		

6.9	Policymaker and Decision-Maker Engagement		
Definition	Number of briefings, policy dialogues, or high-level meetings conducted to engage policymakers with AMR surveillance data and implications.		
Measurement	Count of high-level engagement activities with participation of senior officials		
Illustrative Baseline	0-2 events		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	3-6 events annually	8-12 events annually	≥12 events with documented policy influence
Data Source	Meeting records, policy briefs, presentation materials		
Frequency	Annual		
Notes	Policymaker engagement is critical for political commitment and resource allocation. Present data in accessible formats emphasizing public health/economic impacts, policy options, and success stories.		

6.10	Data Analysis and Interpretation Skills		
Definition	Percentage of surveillance program staff demonstrating competency in AMR data analysis, interpretation, and visualization using standard tools (WHONET, statistical software).		
Measurement	(Number of staff competent in data analysis ÷ Total surveillance program staff) × 100		
Illustrative Baseline	10-25%		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	40-60% competent	70-85% competent	≥85% with strong analytical capacity
Data Source	Skills assessments, training completion records, analysis of product quality review		
Frequency	Annual		
Notes	Data analysis capacity is often a limiting factor in surveillance utility. Training should cover: WHONET advanced features, basic statistical analysis, data visualization, trend analysis, and report writing.		

6.11	Post-Training Competency Assessment Pass Rate		
Definition	Percentage of participants in AMR surveillance training programs who successfully demonstrate competency through post-training assessments (written tests, practical skills demonstrations, or case-based evaluations) meeting the nationally defined passing criteria. Measures whether training translates to verified knowledge and skills, not just attendance.		
Measurement	(Number of participants achieving passing score on competency assessment ÷ Total participants completing training) × 100. Passing criteria examples: 1) Written assessment: ≥70% correct answers; 2) Practical skills: Demonstrates all critical steps correctly; 3) Case scenarios: Appropriate interpretation and action. Track separately by: (1) Training topic (specimen collection, WHONET, data management, AST), (2) Cadre (clinicians, lab technicians, data managers), (3) Training modality (in-person, online, mentorship)		
Illustrative Baseline	65-75% pass rate (typical without quality control)		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	75-85% pass rate	85-90% pass rate	≥90% pass rate with ≥95% for Core competencies
Data Source	Training attendance registers, post-training assessment scores, practical skills evaluation checklists, competency certification records, training database management systems.		
Frequency	Per training cohort (aggregated quarterly)		
Notes	High attendance with low competency leads to wasted training resources. Pass rates reveal early training quality issues. Common problems indicated by low pass rates: (1) Trainees lack prerequisites, (2) Training content is too advanced/too basic, (3) Poor instructional quality, (4) Inadequate training duration, (5) Language barriers, (6) Assessment doesn't match training content. Best practices: Set minimum passing threshold (typically 70-80%). Offer remedial training for those who fail. Track trainer pass rates to identify instructors who need mentorship. Analyze which topics have the lowest pass rates to improve the curriculum.		

<table>
<tr><td>6.12</td><td colspan="3">Training Completion and Follow-up Rate</td></tr>
<tr><td>Definition</td><td colspan="3">Percentage of enrolled training participants who: (1) complete the full training program (attend ≥80% of sessions), (2) complete post-training competency assessment, AND (3) receive documented follow-up supervision/mentorship within 3 months of training to support practical application. Measures training program completion and support systems, not just initial enrollment.</td></tr>
<tr><td>Measurement</td><td colspan="3">Two-part measurement: Part 1. Training Completion: (Participants completing training + assessment ÷ Participants enrolled) × 100; Part 2. Post-Training Support: (Trained participants receiving documented follow-up ÷ Participants who completed training) × 100. Follow-up activities include: Supervisory visits, mentorship sessions, refresher trainings, competency verification checks, and troubleshooting support</td></tr>
<tr><td>Illustrative Baseline</td><td colspan="3">70-80% completion rate; 30-40% receive follow-up</td></tr>
<tr><td rowspan="2">Illustrative Targets</td><td>Years 1-2</td><td>Years 3-4</td><td>Years 5+</td></tr>
<tr><td>85% completion, 60% follow-up</td><td>90% completion, 80% follow-up</td><td>≥95% completion, ≥90% follow-up</td></tr>
<tr><td>Data Source</td><td colspan="3">Training enrollment records, attendance sheets, assessment completion logs, supervisory visit reports, mentorship documentation, follow-up tracking systems.</td></tr>
<tr><td>Frequency</td><td colspan="3">Quarterly</td></tr>
<tr><td>Notes</td><td colspan="3">Training without follow-up leads to rapid skills decay: studies show 40-60% of learned skills are lost within 6 months without reinforcement. This indicator captures two critical failure points:

<u>Failure Point 1. Dropout</u>: Low completion rates indicate: (1) Training poorly timed (harvest season, busy clinical periods), (2) Participants inappropriately selected, (3) Training location/accommodation issues, (4) Personal circumstances not considered. Solutions: Better participant selection, timing coordination, and provision of locums/coverage for clinical staff.

<u>Failure Point 2. No Follow-up:</u> High completion but low follow-up indicates: (1) Training planned without post-training support resources, (2) Supervisors not engaged, (3) No mentorship systems, (4) “Train and abandon” approach. Solutions: Budget follow-up visits into training programs, create peer mentorship networks, establish virtual support groups (WhatsApp, email lists), and schedule 1-month and 3-month check-ins.</td></tr>
</table>

6.13	**Trained Staff Performance Differential in Surveillance Activities**		
Definition	Measurable performance difference between trained and untrained staff in conducting AMR surveillance activities, assessed through: (1) specimen quality/rejection rates, (2) data completeness and accuracy, (3) protocol adherence, and (4) surveillance participation rates. Demonstrates that training investments translate to improved surveillance quality and engagement.		
Measurement	Compare trained vs untrained staff across multiple performance metrics: Metric 1. Specimen Quality: % reduction in specimen rejection rates at facilities with ≥80% trained staff vs <50% trained; Metric 2. Data Quality: Compare data completeness (Indicator 3.1) and accuracy (Indicator 3.2) between trained and untrained staff; Metric 3. Protocol Adherence: Supervisory assessment scores for following surveillance protocols (trained vs untrained); Metric 4. Active Participation: Surveillance reporting compliance rates at trained vs untrained sites. Target: ≥20 percentage point performance advantage for trained staff		
Illustrative Baseline	Minimal difference (5-10 points): indicates training is not yet impactful		
Illustrative Targets	**Years 1-2**	**Years 3-4**	**Years 5+**
	15-20 percentage point advantage for trained staff	20-30 percentage point advantage	≥30 percentage point advantage with sustained performance over time
Data Source	Laboratory specimen acceptance/rejection logs, data quality reports (linked to Indicators 3.1, 3.2), supervisory visit assessment tools, surveillance site reporting compliance tracking, training database (to identify trained vs untrained staff)		
Frequency	Semi-annual		
Notes	This is the definitive metric proving the return on investment of training: it shows that training investments produce measurable improvements in surveillance performance. Used by major global health programs (PEPFAR, Global Fund) to demonstrate capacity building impact.		

Chapter 5. Implementation Guidance

This chapter provides governments and implementing partners with practical steps for operationalizing the AMRSurME Framework described in previous chapters. It is intended as a high-level implementation guide that translates the conceptual and technical elements of the framework into actionable steps. The guidance targets national AMR focal points, surveillance coordinators, laboratory leads, and policymakers. It is not prescriptive but offers sequenced actions adaptable to diverse national contexts. This chapter aligns with WHO's 2023 guidance on Monitoring and Evaluation for AMR National Action Plans and the GLASS implementation manuals.

Phased Implementation Roadmap

Implementation of the AMRSurME Framework can be approached through a phased roadmap that supports gradual system strengthening and alignment with national priorities (Table 1).

Phase	Focus	Key Actions	Expected Outputs
Phase 1: Preparation and Planning	Establish governance and baseline readiness	Map existing AMR surveillance actors; define coordination and reporting structures; designate M&E focal point; align with NAP objectives.	Country implementation plan endorsed; baseline assessment completed.
Phase 2: System Strengthening and Capacity Building	Strengthen technical and institutional capacity	Train focal points; adopt standardized indicators and reporting formats; ensure laboratories participate in LQSI and EQAS; secure data management tools.	Functional national surveillance and M&E team; initial data collection pipeline established.
Phase 3: Data Collection and Routine Monitoring	Operationalize data flow and feedback loops	Integrate indicator data into national information systems; validate, analyze, and submit data to GLASS.	Regular national reports and submissions to GLASS.
Phase 4: Review, Learning, and Adaptation	Institutionalize the use of M&E results	Convene national review meetings; update surveillance priorities and resource allocations; document lessons learned.	Annual M&E review report and action plan produced.

Table 1. Phased implementation roadmap for the AMRSurME Framework

Core Implementation Function

Governance and Coordination

Effective governance is central to the successful implementation of the AMRSurME Framework. National oversight should be assigned to an AMR Surveillance M&E Steering Group that provides strategic direction, reviews progress, and ensures accountability across the health system. Integration of AMR M&E functions within existing national health information systems and One Health coordination platforms helps to reduce duplication and fosters cross-sectoral alignment, ensuring that surveillance data are used coherently across ministries and institutions.

Planning and Resource Mobilization

Implementation should be guided by coordinated planning and sustainable resource allocation. Aligning M&E planning cycles with the review timelines of the national AMR Action Plan promotes consistency and enables continuous improvement. Countries are encouraged to define core and optional indicators based on national priorities and available capacities, and to explicitly link these indicators to national budgets and, where appropriate, to external funding opportunities. This approach ensures that monitoring and evaluation activities remain both feasible and adequately resourced.

Capacity Development and Technical Support

Building technical capacity is essential to operationalize the framework effectively. Countries should strengthen the competencies of national and subnational staff in data collection, analysis, visualization, and interpretation to improve the quality and utility of AMR surveillance data. Implementation should apply international laboratory and data standards, including those of WHO, the Clinical and Laboratory Standards Institute (CLSI), and the European Committee on Antimicrobial Susceptibility Testing (EUCAST), to promote data comparability and uphold quality assurance throughout the system.

Data Management and Quality Assurance

Robust data management and quality control are critical to ensuring that M&E findings accurately reflect system performance. Countries should establish systematic data validation workflows and conduct regular internal quality audits to maintain data integrity. The use of WHO GLASS reporting templates and the Laboratory Quality Stepwise Implementation (LQSI) tool can help standardize data processes across laboratories and surveillance sites, ensuring that reported information is reliable, timely, and comparable at national and international levels.

To operationalize these processes, a standardized *AMRSurME Data Collection Tool* has been developed to accompany this framework. The tool provides an Excel-based registry of all framework indicators and includes adaptable templates for site-level data entry, data quality checks, and summary dashboards. Countries are encouraged to customize the tool to their own surveillance architecture and indicator set – selecting those indicators most relevant to national priorities and integrating the templates within existing health information and reporting systems. This approach promotes consistency in data capture and validation while supporting interoperability with national AMR databases and WHO GLASS. Properly

adapted, the tool facilitates routine monitoring, real-time performance tracking, and evidence-based decision-making for continuous improvement and resource allocation.

Reporting, Dissemination, and Use of Evidence

Transparent and routine reporting is fundamental to sustaining engagement and accountability. National authorities should develop standardized reporting templates and feedback mechanisms that enable the timely dissemination of surveillance results to stakeholders at all levels. Emphasis should be placed on promoting the use of surveillance findings across sectors to inform national policies, guide resource allocation, and strengthen programmatic decision-making. Embedding mechanisms for feedback and evidence sharing support a culture of learning and continuous improvement in AMR surveillance.

Institutional Roles and Partnerships

Clear institutional roles and responsibilities are essential for coordinated implementation. The Ministry of Health should designate an AMR M&E focal point responsible for coordinating national implementation. National public health institutes, laboratories, and data units should support data collection, validation, and reporting. WHO Country Offices and regional networks can provide technical assistance, training, and peer learning opportunities.

Key Enablers and Sustainability

Successful implementation depends on several enabling factors:

- Political commitment and legal frameworks supporting surveillance and data sharing.
- Dedicated and sustainable funding streams for surveillance and M&E activities.
- Integration with national digital health and information systems.
- Continuous capacity development and retention of trained personnel.
- Regional collaboration and partnerships for peer learning and benchmarking.

Continuous learning should be built into the AMRSurME Framework implementation process. Countries are encouraged to document lessons learned, participate in the WHO's GLASS community of practice, and use review findings to refine AMR surveillance strategies. M&E results should inform revisions to national AMR action plans and guide investments in system strengthening.

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Annex 1. AMRSurME Data Collection Tool

Please see the attached Excel document.