Using implementation science to bridge the gaps between political commitment and action in antimicrobial resistance governance under the one health approach in the WHO Southeast Asia and Western Pacific regions

Xiaoran Yu,[a] Huan Wang,[a] Jian Wang,[a] Xin Yuan,[a] Xiaoding Zhou,[a] Qiushui He,[b] Igor Mokrousov,[c,d] Lin Sun,[e,**,f] Yanhui Dong,[a,*,f] and Zhiyong Zou[a,***,f]

[a]Institute of Child and Adolescent Health, School of Public Health, Peking University, National Health Commission Key Laboratory of Reproductive Health, Beijing, China
[b]Finnish Reference Laboratory for Pertussis and Diphtheria, Institute of Biomedicine, InFLAMES Research Flagship Center, University of Turku, Turku, Finland
[c]Laboratory of Molecular Epidemiology and Evolutionary Genetics, St. Petersburg Pasteur Institute, St. Petersburg, Russia
[d]Henan International Joint Laboratory of Children's Infectious Diseases, Children's Hospital Affiliated to Zhengzhou University, Henan Children's Hospital Zhengzhou Children's Hospital, Zhengzhou, China
[e]Laboratory of Respiratory Diseases, Beijing Pediatric Research Institute, Beijing Children's Hospital, Capital Medical University, Key Laboratory of Major Diseases in Children, Ministry of Education, National Clinical Research Center for Respiratory Diseases, National Center for Children's Health, Beijing, China

The Lancet Regional Health - Western Pacific 2026;66: 101783

Published Online xxx
https://doi.org/10.1016/j.lanwpc.2025.101783

Summary

The WHO Southeast Asia and Western Pacific regions, home to more than half of the world's population, bear a disproportionate burden of antimicrobial resistance (AMR), including some of the most severe resistance patterns. The convergence of rapidly growing economies and persistent health system challenges in these regions creates a critical platform for understanding the dynamics of AMR and developing scalable governance approaches relevant to other low- and middle-income countries. This Viewpoint reviews current progress in AMR governance globally and study regions, with a focus on country-specific National Action Plans, and highlights the discrepancies between policy intentions and actual implementation. Implementation science, developed to address research-to-practice gaps, provides a systematic framework for identifying and overcoming barriers to implementation, thereby translating political commitments into actionable interventions. Given the cross-sectoral complexity of AMR, we propose novel strategic priorities to enhance AMR governance by embedding implementation science within the One Health approach. This involves a four-step process: selecting and adapting evidence-based practices, assessing multilevel barriers and enablers, selecting, using and adapting implementation strategies, and evaluating and sustaining their impact. Together, this framework provides a blueprint for localising and operationalising overarching policy concepts into concrete, context-specific actions, with potential lessons for other regions globally.

Keywords: Antimicrobial resistance; One health; Implementation science; Southeast Asia; Western Pacific

Introduction

The rise of antimicrobial resistance (AMR) poses a significant challenge to public health, with more than 39 million people expected to die from antibiotic-resistant infection over the next 25 years.[1] Beyond its substantial burden on global health, AMR threatens progress towards multiple Sustainable Development Goals (SDGs).[2] Recognising this urgency, governments and international organisations have implemented numerous strategies to mitigate the spread of resistant

*Corresponding author. Institute of Child and Adolescent Health, School of Public Health, Peking University, National Health Commission Key Laboratory of Reproductive Health, 38 Xueyuan Road, Haidian District, Beijing, 100191, China.
**Corresponding author. Laboratory of Respiratory Diseases, Beijing Pediatric Research Institute, Beijing Children's Hospital, Capital Medical University, National Center for Children's Health, Beijing, China. No. 56 Nanlishi Road, Xicheng District, Beijing, 100045, China.
***Corresponding author. Institute of Child and Adolescent Health, School of Public Health, Peking University, National Health Commission Key Laboratory of Reproductive Health, 38 Xueyuan Road, Haidian District, Beijing, 100191, China.
E-mail addresses: dongyanhui@bjmu.edu.cn (Y. Dong), sunlinbch@163.com (L. Sun), harveyzou2002@bjmu.edu.cn (Z. Zou).
[f]Contributed equally.

pathogens, focusing on robust antibiotic stewardship, enhanced surveillance, and improved infection prevention and control (IPC) measures. Global governance efforts to combat AMR have achieved modest yet uneven progress over the past decade. A pivotal milestone emerged in 2015 with the World Health Organisation (WHO) Global Action Plan (GAP),[3] which mandated all member states to adopt multi-sectoral One Health strategies through National Action Plans (NAPs) by 2017. While 178 countries had developed NAPs by 2023, implementation remains alarmingly fragmented: only 27% demonstrate operational effectiveness, and a mere 11% have secured dedicated national budgets for these plans.[4] This stark disparity between policy adoption and execution underscores systemic governance deficits, particularly in accountability mechanisms and cross-sectoral resource allocation. In response, the 2024 United Nations (UN) General Assembly High-Level Meeting set an ambitious target to reduce human AMR-related mortality by 10% by 2030 through enhanced multi-sectoral coordination.[5] However, emerging analyses reveal fundamental barriers to this target, including inconsistent political prioritisation, unclear leadership responsibilities, and the absence of binding accountability frameworks to sustain multi-decadal commitments.[6] These challenges are compounded by a critical disconnect between governance frameworks and measurable health outcomes.

The Southeast Asia and Western Pacific regions have increasingly recognised AMR as a critical public health priority, implementing a spectrum of policies and initiatives; however, the continued escalation of AMR highlights an urgent need for intensified, coordinated, and sustained actions. Despite commendable progress in developing NAPs, implementation trajectories across countries remain highly variable, reflecting deep-rooted governance and capacity gaps.[7] Moreover, true One Health collaboration remains elusive,[8] as multi-sectoral engagement across human, animal, and environmental health sectors often lacks operational cohesion in low- and middle-income countries (LMICs) with rapid population growth and urbanisation.[9] These systemic inequalities are further compounded by socio-economic inequalities and limited health infrastructure, leaving vulnerable populations disproportionately exposed to the threat of resistant pathogens.[10] Recognising these issues, the two WHO regions have recently launched the "Accelerate Action to Fight Antimicrobial Resistance" initiative, which underscores the urgency of addressing AMR not only as a local problem, but as a regional and global health threat.[11] Although recent scholarship has proposed a tripartite governance model encompassing policy design, implementation tools, and monitoring and evaluation systems,[12] its application remains largely theoretical.[7,13] These persistent challenges and research limitations underscore the urgent need for an evidence-based framework to systematically address AMR governance.

This Viewpoint aligns with the research priorities outlined in the WHO agenda for AMR by 2030,[14] which focus on strengthening prevention, improving diagnosis, optimising treatment and stewardship, and advancing evidence-based policies and surveillance. We aimed to identify critical structural vulnerabilities in AMR management by examining global and regional policies and actions across the WHO Southeast Asia and Western Pacific regions. Additionally, we conducted a detailed review of the progress of NAPs at the country level to highlight the key challenges in current AMR governance. Based on these findings, we proposed an implementation science–informed governance framework within the One Health approach to support the translation of evidence-based interventions into practice and mitigate the burden of AMR.

Overview of AMR governance progress

Global AMR governance: significant progress but uneven action

Over the past decade, efforts to contain AMR have advanced modestly, driven by escalating financial investments, multilateral policies, and coordinated actions. This progress is exemplified by a notable reduction in global AMR-attributable deaths since 2016 (Appendix p 9), alongside a substantial increase in Development Assistance for Health (DAH) allocated to AMR from $9·91 million in 2015 to $34·5 million in 2024 (Appendix p 10). Fig. 1a presents a comprehensive overview of significant policies and actions concerning global AMR over the past decade based on Anderson and colleagues'[12] governance framework. The GAP laid the strategic groundwork for coordinated global responses, which were subsequently endorsed at the inaugural UN High-Level Meeting on AMR in 2016, with commitments spanning human health, animal health, and environmental management.[15] Furthermore, the Second UN High-Level Meeting in 2024 established a more explicit results-oriented agenda, intending to transition global AMR governance from broad commitments to specific and accountable actions.[16] Additionally, significant advancements have been made in implementation and monitoring, as evidenced by the establishment of the Global Monitoring System for Antimicrobial Resistance and Use (GLASS) in 2016 and the Tripartite AMR Country Self-Assessment Survey (TrACSS) in 2017, as well as the update of the WHO Prioritised Pathogens List to include fungal pathogens in 2024.[17] These initiatives demonstrate that global AMR governance is transitioning from policy vision to concrete action, underscoring the increasing prominence of AMR on the global health governance agenda.

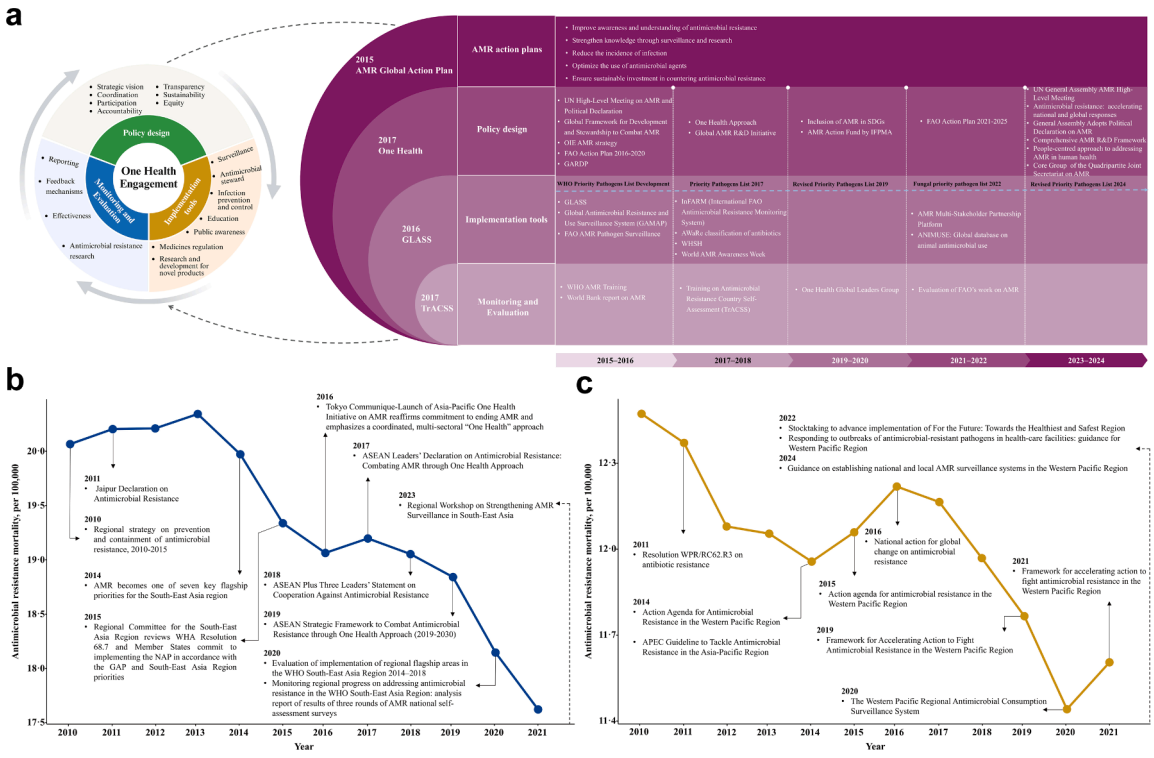

Fig. 1: **The Southeast Asia and Western Pacific regions' significant policies and actions on antimicrobial resistance**. (a) Globally significant policies and actions on antimicrobial resistance over the last decade. (b) Significant policies and actions on antimicrobial resistance in the WHO Southeast Asia region. (c) Significant policies and actions on antimicrobial resistance in the WHO Western Pacific region. The mortality data (age-standardised mortality rate, per 100,000 population) attributable to AMR (based on an alternative scenario in which all drug-resistant infections were replaced by drug-susceptible infections) were derived from the 2021 Global Research on Antimicrobial Resistance Project. Please visit https://vizhub.healthdata.org/microbe/.

However, despite these advancements, the implementation gap undermines the effectiveness of these efforts. Although evidence indicates that AMR causes more deaths worldwide than either HIV/AIDS or malaria,[18] Development Assistance for Health allocated to AMR remains disproportionately low, with HIV/AIDS and malaria receiving $8·15 billion and $2·95 billion, respectively, in 2024.[19] This disparity highlights the inequitable distribution of resources and the urgent need for integrated and sustainable investment strategies to tackle this pressing challenge. The 154th WHO Executive Board highlighted that AMR actions in the human health sector remain fragmented and largely confined to hospital settings.[20] The second edition of GAP on AMR similarly highlights persistent gaps in sustainable financing, accountability and integration of AMR within broader agendas, such as the SDGs, universal health coverage, and primary health care remain inadequate.[21] Recent analyses suggest that this omission risks ignoring important synergies and trade-offs and may reduce the intended impact of proposed interventions.[22] Furthermore, global efforts remain uneven, with the heaviest burdens and poorest coordination concentrated in low-resource settings. Since 2016, progress on global governance initiatives has been limited, with only one of the four core initiatives—the establishment of the Interagency Coordination Group—having been successfully implemented.[23] Findings from the TrACSS reveal that existing mechanisms rely predominantly on voluntary national actions, characterised by insufficient enforceable accountability and limited integration across human, animal, and environmental health sectors. Such fragmented governance structures highlight the lack of implementation capacity.

Regional AMR governance: targeted initiatives do not hide differences

The WHO Southeast Asia and Western Pacific regions have made some progress in AMR governance, yet significant regional disparities persist. These two WHO regions encompass approximately half of LMICs, although AMR-attributable mortality has declined in recent years, these regions still accounted for an estimated 0·59 million deaths in 2021 (Fig. 1b–c). In addition to participating in GLASS, the Western Pacific region established the Regional Antibiotic Consumption

Surveillance System in 2020 to systematically surveil antibiotic utilisation patterns among member states and facilitate targeted reduction of overuse.[24] By contrast, the Southeast Asia region lacks a comparable comprehensive regulatory platform, which has constrained its capacity to systematically control and monitor antibiotic consumption at the regional level. A promising step forward emerged in 2024 with the joint launch of the "Accelerating the AMR Action in the Asia-Pacific Region Initiative."[11] This collaborative endeavour seeks to bolster AMR response across the Asia–Pacific by enhancing regional cooperation, advancing policy implementation, and providing strategic direction for future governance. Nonetheless, substantial disparities within and between countries and territories remain a critical concern. These inequities manifest across various dimensions, including resource allocation, surveillance capabilities, health-care infrastructure, and public awareness, resulting in marked variations in national capacities to effectively combat AMR. For instance, even within the same region, the antimicrobial stewardship (AMS) in certain countries significantly outpaces that of others (Appendix p11). These disparities highlight that, despite well-designed regional policies, the lack of adapted implementation strategies hampers the achievement of comprehensive outcomes.

National AMR governance: implementation determines effectiveness

At the national level, AMR governance demonstrates that the strength of implementation is crucial to reducing the burden of AMR. Analysis based on Jay Patel and colleagues'[7] AMR governance scores indicates that the age-standardised mortality rate (ASMR) attributable to AMR[1] and overall governance scores showed an inverse relationship ($r = -0{\cdot}53$, $P = 0{\cdot}005$), with the strongest negative correlation observed for implementation score ($r = -0{\cdot}55$, $P = 0{\cdot}003$; Fig. 2a). Comparison of median AMR-attributable ASMR across groups demonstrated that countries meeting threshold in all three areas exhibited the lowest ASMR, followed by those meeting the threshold in both the policy design and implementation tools areas (Panel 1). These findings underscore that robust governance structures, particularly effective implementation, are critically associated with lower national AMR mortality burdens. Notably, however, only six countries achieved thresholds across all three areas, indicating that most NAPs are inadequate to effectively counter the escalating threat of AMR (Appendix pp 12–13).

Specifically, among 42 countries or territories in the two WHO regions, 37 had developed the NAP by 2024 (excluding American Samoa, Tokelau, Guam, Niue, and Northern Mariana Islands), yet only five (Japan, Malaysia, Republic of Korea, Singapore, and Thailand) had secured dedicated funding for their full implementation (Fig. 3). Notably, although Vanuatu, Kiribati, and Palau have self-reported the development of NAP, publicly accessible documentation remains unavailable. This opacity contradicts principles of health governance transparency and may hinder accountability mechanisms essential for curbing AMR commitments.[25] Furthermore, more than 40% of countries in two WHO regions have not revised or updated their original NAP following the expiration of the specified period (Appendix pp 14–15). To better understand these disparities, we conducted a comparative analysis across three countries representing diverse stages of NAP advancement: Japan, Nepal, and Maldives (Table 1). Our assessment highlighted systematic deficiencies in NAP execution, particularly in resource-constrained settings. First, regarding policy design, Japan has established concrete, measurable targets (e.g., reducing the prevalence of methicillin-resistant *Staphylococcus aureus* to below 20% by the NAP deadline), whereas Nepal and the Maldives have articulated only broad, aspirational goals without evidence-based metrics or actionable strategies. The scarcity of reliable, context-specific AMR data in these countries could impede the formulation of localised, evidence-based recommendations for AMS and rational prescribing practices. Second, despite all NAPs asserting alignment with the GAP, operationalising a genuine One Health approach remained unfeasible. Persistent gaps in engagement with environmental and agricultural sectors are evident, compounded by limited regulatory involvement and awareness surrounding AMR governance. Third, implementation tools for AMR containment remain a significant challenge, where the absence of robust national surveillance systems for AMR and antibiotic consumption further exacerbates the issue (Appendix p 16). In comparison with Japan, which has advanced to cross-sectoral genomic surveillance of resistant strains, AMR surveillance networks in Nepal typically collect phenotypic and genotypic data from healthcare facilities with inadequate quality of laboratory services. Finally, challenges in ensuring the sustainability and prioritisation of NAP are also evident. These LMICs lack explicit mechanisms for evaluating implementation priorities or mobilising sustained domestic financing, thereby jeopardising long-term programme viability and the potential for adaptive revisions and updates.

Furthermore, the implementation of NAP is further complicated by unique One Health challenges in the WHO Southeast Asia and Western Pacific regions. First, as a global hub for aquaculture and intensive livestock farming, the antibiotic misuse in food animals drives the emergence and accumulation of antibiotic-resistant bacteria and resistance genes, which are then transmitted to humans via food chains and ecosystems.[26,27] Second, unregulated pharmacies, informal clinics, and the international medical tourism[28] industry pose substantial challenges to the monitoring of

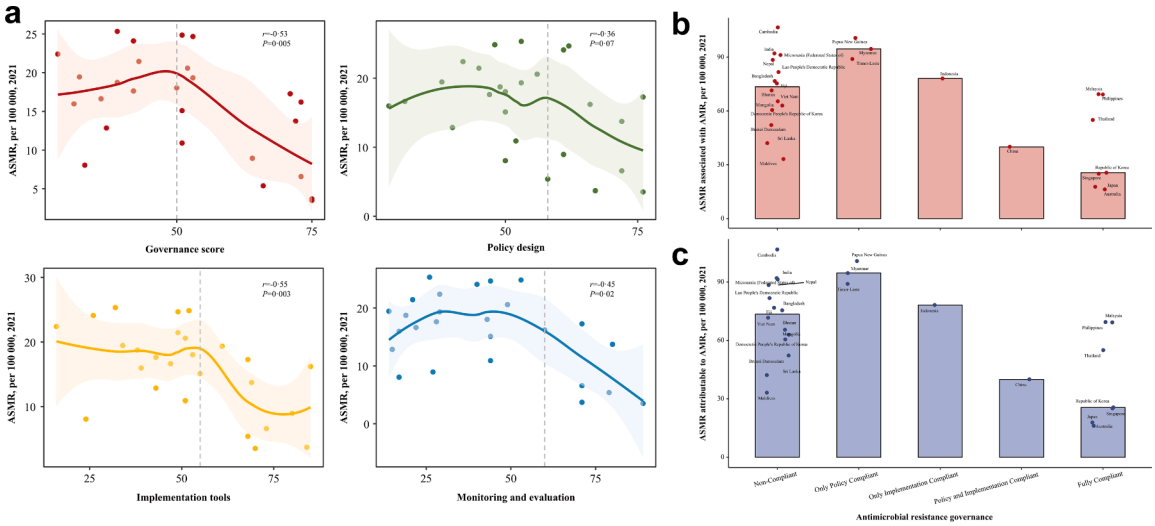

Fig. 2: **Antimicrobial resistance governance scores and age-standardised antimicrobial resistance mortality in the WHO Southeast Asia and Western Pacific regions**. (a) Association between antimicrobial resistance governance scores and age-standardised mortality rate attributable to antimicrobial resistance. National disparities in age-standardised mortality associated with (b) and attributable to (c) antimicrobial resistance stratified by scores on three governance areas. The heights of the columns represent the median ASMR of each group. ASMR = Age-standardised mortality rate. The governance scores were derived by Jay Patel and colleagues[7] and the AMR mortality data from the 2021 Global Research on Antimicrobial Resistance Project.[1] Pearson correlation and locally weighted regression models were applied to evaluate the relationship between governance capacity and ASMR of AMR. Based on locally weighted regression (LOESS) derived inflection points, where governance score improvements correlated with the steepest declines in ASMR, we established minimum thresholds to determine whether countries met benchmarks in policy design, implementation tools, and monitoring and evaluation. According to LOESS regression results, we defined minimum governance score thresholds for compliance in each area: policy design >55, implementation tools >55, monitoring and evaluation >58. Countries were then divided into five groups: none of the three areas met the threshold (Non-Compliant), only policy design met the threshold (Only Policy Compliant), only implementation tools met the threshold (Only Implementation Compliant), policy design and implementation tools met the threshold (Policy + Implementation Compliant), and all three areas met the threshold (Fully Compliant). Statistical significance was defined as a $P \leq 0{\cdot}05$. The AMR mortality data were retrieved from https://vizhub.healthdata.org/microbe/.

Panel 1: The 18 domains in AMR governance framework

- **Brief**

  The AMR governance framework developed by Anderson and colleagues[12] provides a structured approach to guide the formulation and evaluation of NAPs addressing AMR, including three principal governance areas and 18 specific domains. These 18 domains collectively span the full lifecycle of AMR NAPs, from their design and execution to their assessment, ensuring a systematic and integrated response to this global health challenge.

- **Core features**

  The framework is distinguished by its dynamic cyclical design, which facilitates continuous refinement and adaptation. This iterative process ensures that insights gained from monitoring and evaluation inform subsequent policy and implementation phases, enhancing responsiveness and effectiveness. Central to its structure is the One Health approach, which integrates human, animal, and environmental health perspectives. This holistic strategy fosters cross-sectoral collaboration, essential for addressing the complex, multi-sectoral nature of AMR.

- **Governance domains**
  - **Policy design:** Includes strategic vision, coordination, participation, accountability, transparency, sustainability, and equity. These are establish a robust foundation for AMR policies, promoting inclusivity and alignment with broader health systems.
  - **Implementation tools:** Comprises surveillance, antimicrobial stewardship, infection prevention and control, education, public awareness, medicines regulation, and research and development for novel products. These domains provide the practical mechanisms to operationalise AMR strategies effectively.
  - **Monitoring and evaluation:** Encompasses reporting, feedback mechanisms, effectiveness, and AMR research. This area ensures progress is tracked and interventions are evaluated to refine governance over time.

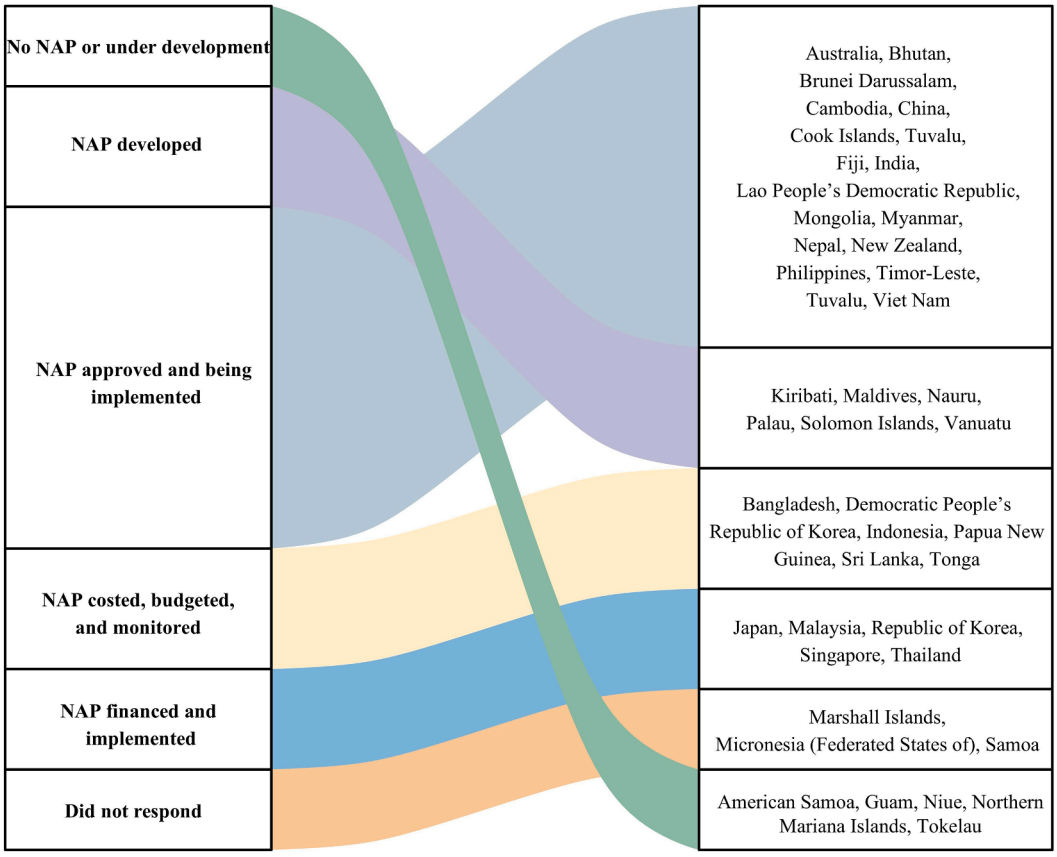

***Fig. 3*: Country progress in developing national action plans on antimicrobial resistance in the WHO Southeast Asia and Western Pacific regions, 2024**. NAP = National Action Plan; AMR = Antimicrobial Resistance. The data on NAPs' progress was sourced from the Global Database for Tracking Antimicrobial Resistance Country Self-Assessment Survey. No NAP or plan under development countries: Cook Islands and Tuvalu.

antibiotic access and use and to One Health AMR surveillance.[29] Third, the concurrent use of traditional medicine practices (such as Traditional Chinese Medicine, Ayurveda, and Jamu) alongside antibiotics poses a unique challenge, as potential pharmacokinetic interactions remain poorly characterised and seldom monitored in clinical or community settings.[30,31] Finally, the numerous island nations and archipelagic states face immense logistical and environmental constraints in establishing laboratory networks and transporting specimens for AMR testing.[32] The geographic isolation of many islands, compounded by limited infrastructure and resources, undermines the feasibility of centralised surveillance and coordinated response mechanisms, thereby delaying the timely detection, reporting, and containment of AMR outbreaks.[33] These regionally distinctive challenges further amplify the policy-implementation gap, underscoring that the greatest obstacle in AMR governance lies in translating policy commitments into effective action.

The need for implementation science in AMR governance

Global, regional, and national reviews indicate that, despite the increasing sophistication of AMR governance frameworks and policy development, a persistent gap between policy and implementation limits their full potential. For instance, a situational analysis of the Maldives' first NAP reveals that only a small fraction of its political commitments have been realised, primarily due to weak institutional capacity and the absence of multi-sectoral integration.[34] These failures emphasise the inadequacy of conventional top-down policy directives in contexts shaped by ecological, cultural, and resource-constrained settings. Consequently, this raises a critical question: why have existing policies failed to achieve their full potential? The governance of AMR is inherently complex, grappling with multifaceted challenges such as the need for multi-sectoral collaboration, varying national contexts, and the demand for evidence-based, contextually adapted strategies. In this context,

Domains	Country with NAP financed and implemented (Japan)[a]	Country with NAP being implemented (Nepal)[b]	Country with NAP developed (Maldives)[c]	Key insights/challeges
Policy design				
Strategic vision	• Global alignment: Adopts WHO Global Action Plan framework while customising targets. • Adopts One Health approach, integrating human, animal, agriculture, and environment. • Targeted objectives: Set specific, measurable, achievable, relevant, and time-bound (SMART) targets for 2023–2027 for the human and animal sectors.	• Goal: Reduce mortality, morbidity, and economic impact of AMR through stakeholder coordination. • Set 5 strategic priorities to be implemented in collaboration with all the One Health sectors over five years to tackle the public health challenge of AMR. • Objectives: Reduce AMR burden via multi-sectoral coordination.	• Alignment with global frameworks: Directly based on WHO's GAP AMR objectives; adds two new focus areas: governance strengthening and regulatory enhancement. • One Health integration: Explicitly adopts the One Health approach across human health, animal health (terrestrial/aquatic), agriculture, food safety, and environmental sectors. • Long-term goals: Aims to establish sustainable governance, digital surveillance, and integrated AMR containment by 2029, but no SMART targets on AMR are set.	• Precision and practicability in goal setting: The conversion from strategic vision to specific, measurable targets represents the first critical challenge, the absence of concrete objectives may lead to subsequent monitoring and evaluation efforts losing focus.
Coordination	• Intersectoral coordination: Coordination across human health, animal health, and environmental sectors is a key focus, ensuring a One Health approach. • One Health integration: Mandated collaboration between MHLW (human health), MAFF (animal/agriculture), and MOE (environment) via the AMR One Health Annual Report (NOAR). • Institutional anchors: AMR Clinical Reference Centre (AMRCRC) for healthcare coordination; Animal Pharmaceuticals Inspection Office for veterinary oversight.	• Governance structure: - National Steering Committee (NSC-AMR) chaired by the Ministry of Health and Population Secretary (federal oversight). - National Technical Working Committee (NTWC-AMR) for technical execution. - Provincial/Local Committees for subnational implementation. • Sectoral integration: Mandates One Health approach across human health, animal health, food, and environment sectors.	• National governance structure: National Multi-Sectoral Steering Committee (NMSC), National AMR Coordination Committee (NACC), National AMR Coordination Unit (NACU). • Technical Sub-committees (TSCs): Five thematic TSCs (awareness, surveillance, IPC & hygiene, antimicrobial use optimisation, research) reporting to NACC.	• Effectiveness of coordination mechanisms: National coordination units or multi-sectoral steering committees frequently suffer from inadequate.
Participation	• Stakeholder engagement: Involves ministries, regulatory authorities, research institutions, healthcare professionals, civil society (e.g., patient organisations, Non-Governmental Organisations [NGOs]), agricultural organisations, food and pharmaceutical industries, wholesale and retail distributors, and international partners.	• Stakeholder engagement: Involves health, agriculture, environment, academia, and international partners in committee structures.	• Stakeholder engagement: Involves ministries (health, fisheries, agriculture, environment, education), regulators, private hospitals, NGOs, academia, and international partners.	• Depth and breadth of stakeholder engagement: How to ensure meaningful participation rather than token representation by key marginalised sectors directly impacts the coverage and implementation capacity of the NAP.
Accountability	• Ministries & Committees: The MHLW, along with intersectoral committees, is accountable to the government for coordinating and implementing the NAP. • Responsible person: Designated individuals are assigned in each sector to oversee the implementation of specific objectives. • Agreements & Consequences: Clear agreements are in place regarding accountability for meeting objectives, with established measures for addressing any shortfalls in achieving goals.	• Role clarity: NSC-AMR oversees implementation; NTWC-AMR executes activities; Thematic Committees handle priority-specific tasks. • Accountability mechanism: Monitoring and evaluation tracks progress and ensures goals are met.	• Role clarity: NMSC provides political oversight; NACC monitors implementation; NACU executes activities and reports progress. • Performance tracking: TSCs develop annual plans; NACU uses M&E framework with activity-specific indicators. • Compliance requirements: NMSC endorsement required for key policies (e.g., AMR Containment Policy, budget plans).	Establish a clear performance tracking system and link outcomes to resource allocation and policy adjustments.

(Table 1 continues on next page)

implementation science provides a critical framework to bridge the gap between evidence and practice, fostering the adoption and integration of health interventions into real-world settings.[35] Existing studies have demonstrated that implementation science can optimise the development and use of evidence-based

Domains	Country with NAP financed and implemented (Japan)[a]	Country with NAP being implemented (Nepal)[b]	Country with NAP developed (Maldives)[c]	Key insights/challeges
(Continued from previous page)				
Transparency	• Public data platforms: Publicly reports surveillance data via J-SIPHE, NOAR, and AMRCRC website. • Publishes risk assessment results of AMR pathogens by the Food Safety Commission. • International reporting: GLASS data submission. • Disclosure protocols: Publication of all surveillance methodologies.	• Reporting mechanism: Annual progress reports from all sectors/committees to NSC via NTWC in prescribed formats. • Data sharing: AMR surveillance data shared globally via GLASS; national AMR reports published annually.	• Public communication: Plans for TV/radio programs, social media campaigns, and AMR Awareness Week activities. • Data sharing: Digital platform for integrated AMR data collection and public antibiogram dissemination by major hospitals.	• Hierarchy of data disclosure and accessibility: Consideration must be given to transitioning from internal reporting to public accessibility, transforming data into comprehensible public information to foster societal oversight and behavioural change.
Sustainability	• Institutionalisation: 5-year planning cycles with budget guarantees. • Financial drivers: Bundled payments incentivising ASP/IPC, AMED (Agency for Medical Research and Development research funding). • Future budget planning: An assessment of future budget requirements for different activities is conducted to ensure adequate funding for long-term implementation. • Ongoing technical support: Continuous support from technical advisory groups and subject matter experts is provided during the implementation, monitoring, and evaluation phases of the NAP.	• Resource mobilisation: NRs. 4586 million budget (federal/provincial/local governments & development partners). • Budgets are allocated for five years, but future reassessments are not detailed. • Ongoing support: Continuous support from a technical advisory group and subject matter experts.	• Institutionalisation: Establishes NACU with dedicated staff (Program Manager, Assistant, admin) for long-term coordination. • Funding strategy: Budget plan development with identified funding sources; integration with existing programs (e.g., immunisation). • Technical support: Ongoing support from technical advisory groups and subject matter experts is planned for the implementation, monitoring, and evaluation phases.	• Funding security: How to break free from reliance on external funding and genuinely integrate AMR activities and their budgets into national routine health and development systems, thereby ensuring the continuity of action.
Equity	• Vulnerable groups: Pediatric ASPs reducing unnecessary antibiotics in children, rural clinic training. • Regional balance: "Regional Infection Control Networks" standardising IPC resources nationwide. • One Health equity: Harmonised AMR monitoring for livestock farms/fisheries.	• Access focus: Revises National Essential Medicine List (NEML) using WHO AWaRe classification; ensures uninterrupted access to quality antibiotics. • Inclusive implementation: Targets farmers, vulnerable groups, and remote areas via community IPC campaigns; provincial/local AMR action plans ensure decentralised coverage.	• Universal access: Emphasises equitable access to antimicrobials and universal healthcare. • Support measures: Includes subsidies and policy support for low-income groups, integrating with national infectious disease elimination programmes.	How to design and implement concrete measures to ensure that vulnerable groups not only have access to antibiotics, but also receive appropriate medical care and alternative treatment options.
Implementation tools				
Surveillance	• Integrated systems: JANIS (healthcare), JVARM (animals), and J-SIPHE (interoperable data platform) with genomic integration via JARBB/J-VEG. • Genomic expansion: JARBB pathogen bank + J-VEG database for tracking resistance gene transmission. • Emerging threats: Carbapenem-resistant *Enterobacteriaceae*/Vancomycin-resistant *Enterococci* mandatory reporting; pilot wastewater AMR monitoring.	• Integrated system: Expands AMR surveillance to 26 human sites (10 priority pathogens) and 7 veterinary labs (4 priority bacteria). • Environmental monitoring: Tracks antibiotic residues in food, feed, water, and effluents. • Data harmonisation: Standardised AMR/AMC data collection and online database for STP updates.	• One Health integrated system: Establishes a cross-sectoral AMR surveillance system (hospitals, food and food products, environment, AMC, health care associated infections), strengthening laboratory reporting (e.g., staff training, equipment upgrades). • Digitalisation and early warning: Plans to digitalise reporting by Q2 2025 and develop an early warning system for resistance trends.	• One Health surveilance: Surveillance systems lack comprehensive integration across human, animal, and environmental sectors, while AMR-specific surveillance remains fragmented, underfunded, and decoupled from real-time response systems.

(Table 1 continues on next page)

interventions (EBIs), policies, guidelines, and programmes to tackle complex public health crises.[36,37] Grounded in the principles of implementation science, AMR governance can be reoriented to prioritise the real-world delivery and uptake of evidence-based practices (EBPs) across the human-animal-environment interface that defines the One Health paradigm. Rather than relying on vertical, externally driven initiatives, implementation science emphasises theory-informed, community-anchored strategies that respond to local health system capacities, socio-political dynamics, and behavioural determinants of

Domains	Country with NAP financed and implemented (Japan)[a]	Country with NAP being implemented (Nepal)[b]	Country with NAP developed (Maldives)[c]	Key insights/challeges
(Continued from previous page)				
Antimicrobial stewardship	• Human sector: Mandatory hospital ASP teams with reimbursement incentives; strict outpatient guidelines for fluoroquinolones/cephalosporins. • Animal sector: Veterinary prescribing standards, ban on growth-promoter antibiotics (5 feed additives cancelled), "Prudent Use Guidelines" for pets.	• Human sector: Implements AMS programs in hospitals; establishes Drug & Therapeutic Committees; uses WHO toolkit. • Animal sector: Bans antibiotics as growth promoters; develops veterinary NEML and treatment guidelines; regulates antibiotic use in aquaculture. • Community: Audits antibiotic use in pharmacies/clinics; trains dispensers/farmers.	• Human sector: Hospital ASP are mandatory, with reimbursement incentives to encourage participation. Strict outpatient guidelines for the use of fluoroquinolones and cephalosporins. National guidelines exist for antimicrobial use and the interpretation of rapid diagnostic tools. • Animal sector: Veterinary prescribing standards in place to ensure prudent antimicrobial use. A ban on growth-promoter antibiotics and cancellation of 5 feed additives. Prudent Use Guidelines are established for pets.	Scant implementation of AMS programmes in primary and secondary healthcare settings enables pervasive challenges, including inappropriate prescribing, over-the-counter antibiotic access, and unenforced guidelines.
Infection prevention and control	• Healthcare: Standardised protocols for hand hygiene/device-associated infections, HAI reduction linked to diagnosis procedure combination payments. • Agriculture: Hazard Analysis and Critical Control Point enforcement in food processing, livestock vaccination programs. • Community: "Regional IPC Networks" integrating nursing homes.	• Healthcare facilities: Mandates IPC committees; national IPC guidelines; Healthcare-Associated Infections (HCAI) surveillance in hospitals. • Animal/Food sectors: Develops Good Husbandry/Veterinary Practices; promotes animal vaccination. • Community: "My Health, My Responsibility" campaigns; handwashing/sanitation programs in schools.	• Guidelines: Endorse national IPC/HAI guidelines for human health and animal health. • Facility-level measures: - IPC committees in 80% of tertiary hospitals. - Dedicated infection control nurses (1/250 beds) in 80% of hospitals. • Monitoring: Annual IPC assessments using WHO tools.	• Cross-departmental application: IPC measures are feasible in well-resourced healthcare institutions, but the challenge lies in scaling them up for implementation in resource-constrained primary healthcare facilities, livestock farms, and communities.
Education	• Professionals: AMR modules in medical/veterinary licensing exams; Infection Control Team certification programs. • Public: School curricula on antibiotic misuse, AMRCRC e-learning platforms. • Innovative training: "Infection Control Consortium" for cross-sector trainer development.	• Curriculum integration: AMR topics added to medical, veterinary, pharmacy, and school curricula (secondary level). • Training: Pre-/in-service modules for professionals; Continuing Professional Development on AMR; IPC training for healthcare/animal workers.	• Curriculum integration: Incorporates AMR into professional training for healthcare workers and veterinarians; undergraduate/postgraduate health programs. • Professional training: Continuing Medical Education on AMR/IPC for health workers; KAP studies to tailor content. • Capacity gaps: Needs assessment for training in microbiology, infectious diseases, veterinary AMR.	• From knowledge to behavioural change Designing effective, sustained professional development and public awareness campaigns capable of tangibly altering deeply ingrained behavioural patterns among prescribers and general public.
Public awareness	• Campaigns: annual "AMR Action Month", social media. • Targeted outreach: Parent guides on childhood antibiotics, farmer workshops on animal AMR. • Metrics: Biennial public knowledge surveys.	• Nationwide campaigns: Annual World AMR Awareness Week; IEC materials for farmers/communities. • Targeted programs: Schoolteachers, drug retailers, policymakers; behavioural change communication for hygiene/antibiotic use.	• Targeted campaigns: Conducts awareness activities during World Antibiotic Awareness Week (e.g., leaflets, community talks). • Tailored messaging: Designs messages for consumers and professionals, using social media to promote proper antibiotic use. • Evaluation: Annual KAP surveys to measure campaign impact.	• Measuring the effectiveness of campaigns: Rigorous KAP surveys are required to evaluate their actual effectiveness, enabling iterative refinement of messaging strategies to ensure information penetrates diverse audiences and drives behavioural change.
Medicines regulation	• Human antibiotics: Post-marketing surveillance of resistance. • Veterinary antimicrobials: Risk-based restrictions—e.g., colistin limited to non-food animals. • Feed additives: "Importance Ranking" system banning critically important antimicrobials.	• Prescription enforcement: Prohibits OTC antibiotic sales; audits prescriptions; bans colistin in animal feed. • Quality control: Post-marketing surveillance by the Department of Drug Administration; tests antibiotic residues in food. • Policy alignment: Adopts WHO AWaRe classification; regulates reserve antibiotics via hospital pharmacies only.	• Quality control: Mandatory GMP audits for imported antimicrobials; pharmacovigilance and post-market surveillance. • Access: ensure 80% availability of Essential Antimicrobial List (EAL) drugs; restrict OTC sales. • Non-therapeutic ban: Regulatory provisions against antimicrobials in animal feed/growth promoters.	How to strengthen supply chain oversight and enforcement to tackle the market for illegal and non-compliant medicines, particularly in remote areas.

(Table 1 continues on next page)

Domains	Country with NAP financed and implemented (Japan)[a]	Country with NAP being implemented (Nepal)[b]	Country with NAP developed (Maldives)[c]	Key insights/challeges
(Continued from previous page)				
Research and development for novel products	• Drug development: AMED funding for novel antibiotics/vaccines (e.g., "Innovative Drug Development for Emerging Infections"). • Alternatives: Phage therapy research, immunostimulants for aquaculture. • Market incentives: Exploring "de-linkage" models separating revenue from sales volume.	• Operational research: IPC effectiveness, behavioural change, antibiotic alternatives. • Traditional medicine: Studies herbal products for antibiotic residues; explores Ayurvedic alternatives. • Innovation fund: Promotes research via NHRC/NARC and international collaboration.	• Research agenda: Prioritise human/animal/environmental AMR studies. • Innovation focus: Needs assessments for novel diagnostics/vaccines; collaboration with the Maldives Technical Advisory Group on Immunisation for vaccination strategies. • Funding: No dedicated budget; reliance on donor support and integration with existing programs.	The absence of a dedicated sustainable budget and business model to incentivise the research and development of novel antibiotics and alternatives.
Monitoring and evaluation				
Reporting	• Mandatory notifications: Report cases through National Epidemiological Surveillance of Infectious Diseases. • Structured outputs: Annual NOAR reports integrating human/animal data, facility-level J-SIPHE dashboards. • Global alignment: WHO GLASS-compatible data formats.	• Annual reports: Sectors/provinces submit progress to NSC via NTWC in standardised formats. • Surveillance reports: National AMR/AMC data published yearly; shared with GLASS.	• Structures: NACU compiles national reports; submits to NMSC, GLASS, and international partners. • Frequency: NMSC (biannual), NACC (quarterly), Antimicrobial Use/HAI surveillance (annual/quarterly). • Public access: Antibiograms published monthly by major hospitals; social media updates.	• Balancing reporting burdens and data utilisation: All three nations have established reporting mechanisms, yet the critical challenge lies in ensuring data can be fed back for real-time alerts and policy adjustments.
Feedback mechanism	• Real-time clinical alerts: J-SIPHE benchmarks for hospitals. • Policy adaptation Loops: - AMR One Health Committee: Biannual NOAR review → strategy revisions; - GLASS compliance unit: WHO feedback → JANIS methodology updates.	• Review cycles: NSC meets annually; NTWC meets quarterly; Thematic Committees meet quarterly. • Data utilisation: AMR surveillance data informs STP updates; residue monitoring guides food safety policies.	• Prescriber audit: AMS teams conduct retrospective audits with feedback to clinicians. • Data utilisation: Surveillance data informs guideline revisions (e.g., antibiotic stewardship based on antibiograms). • Stakeholder reviews: NACC reviews TSC progress; NMSC endorses budget/policy adjustments.	Establish mechanisms to ensure data can be rapidly analysed, interpreted, and translated into concrete actions for updating clinical guidelines, adjusting policies, and implementing targeted interventions.
Effectiveness	• Target tracking: AMC in human and antimicrobial sales in animals. • Economic impact analysis: - Excess costs/length-of-stay for cases; - Productivity loss modelling for outbreak containment. • Intervention return on investment: ASP team cost vs. antibiotic expenditure reduction	• National steering committee-AMR oversees evaluation. • KPIs: Number of AMR surveillance sites, IPC-trained staff, revised policies, awareness campaigns, and budget allocations. • Impact tracking: Reduced mortality/morbidity; optimised antibiotic use; decreased HCAI rates.	• Custom tool to track activity outcomes (e.g., lab standardisation, IPC coverage). • KPIs: 30+ indicators across 8 focus areas (e.g., % facilities with AMS teams, drug availability, trained staff numbers). • End-term evaluation: External expert-led assessment in 2029 to measure impact.	Develop and monitor outcome indicators that genuinely reflect the reduction in the AMR burden within the One Health sector, and conduct cost-benefit analyses to optimise resource allocation.
AMR research	• Research priorities: Understanding the drivers and effects of AMR, as well as evaluating potential policies and interventions. • Dedicated budget: A dedicated national budget for AMR research is in place to support ongoing studies on AMR mechanisms, resistance spread, and the impact of interventions. • Research collaboration: Encouraging collaboration between research institutions, government bodies, and international partners to advance AMR-related research and develop innovative solutions.	• Prioritisation: Expert consultations identify research topics (e.g., IPC, alternatives to antibiotics). • Knowledge generation: Studies on AMR drivers in humans/animals; cost-benefit analysis of interventions. • Budget: No specific budget line is explicitly dedicated solely to AMR research, as costs are aggregated across all activities	• Local evidence generation: KAP studies, cultural driver analyses, and cost-effectiveness research prioritised. • Gap identification: TrACSS 2022 data used to target weak areas (e.g., aquatic animal health, environmental AMR). • Output tracking: Annual targets for publications (human/animal/environmental studies) and collaborative projects. • Budget: No dedicated national budget specifically allocated. Efforts are ongoing to integrate research funding into the overall NAP activities.	The financial sustainability of NAP remains uncertain, with heavy reliance on development partners and limited domestic investment, threatening the continuity and impact of AMR containment strategies.

According to the national responses from the Global Database for TrACSS in 2024, we selected three countries to represent varying levels of progress in AMR governance. Japan, a high-income country with advanced health infrastructure, represents a leading level of AMR governance, with its NAP being both financed and implemented. Nepal, a lower-middle-income country, demonstrates intermediate progress, with its NAP currently under implementation. The Maldives, a small island state with limited health system capacity, with NAP that has been developed but not yet implemented or financed. All three countries have recently updated their NAPs, and together they provide a representative cross-section of country profiles commonly found across the Southeast Asia and Western Pacific regions.
AMC = Antimicrobial Consumption; AMR = Antimicrobial Resistance; ASP = Antimicrobial Stewardship Program; AWaRe = Access, Watch and Reserve; ESBL = Extended-spectrum beta-Lactamase; GLASS = Global Monitoring System for Antimicrobial Resistance and Use; HAI = Healthcare-associated Infection; JANIS = Japan Nosocomial Infections Surveillance; J-SIPHE = Japan Surveillance for Infection Prevention and Healthcare Epidemiology; JVARM = Japanese Veterinary Antimicrobial Resistance Monitoring System; KAP = Knowledge, Attitude, and Practice; MAFF = Ministry of Agriculture, Forestry and Fisheries; MHLW = Ministry of Health, Labour and Welfare; MOE = Ministry of the Environment; POT = PCR-based Open Reading Frame Typing; STP = Standard Treatment Protocol. [a]Japan: Second national action plan on antimicrobial resistance 2023–2027. [b]Nepal: Second national action plan on antimicrobial resistance. [c]Maldives: National Action Plan on Antimicrobial Resistance 2024–2029.

Table 1: **Comparison of 18 governance domains among three countries with different progress in antimicrobial resistance national action plans.**

antimicrobial use.[38] As illustrated in Fig. 4, we identify four key implementation science steps and critical considerations for effective AMR governance.

Application of implementation science to bridge policy-practice gap on AMR governance

Step 1: select and adapt evidence-based practices

The first step in operationalising implementation science within real-world AMR governance is the systematic identification and selection of EBPs with demonstrated effectiveness across varied settings. In this process, One Health concept demands active engagement of policymakers, regulatory authorities, professionals, and the public across the human, animal, and environmental sectors in the co-design process, ensuring that interventions are feasible, equitable, and sustainable across all domains of AMR governance. In many LMICs, where informal antibiotic access, unregulated veterinary use and environmental contamination frequently coexist,[29] few interventions have been developed or tested with a true One Health approach. The existing implementation research on AMR, such as hospital-based stewardship programmes or prescription

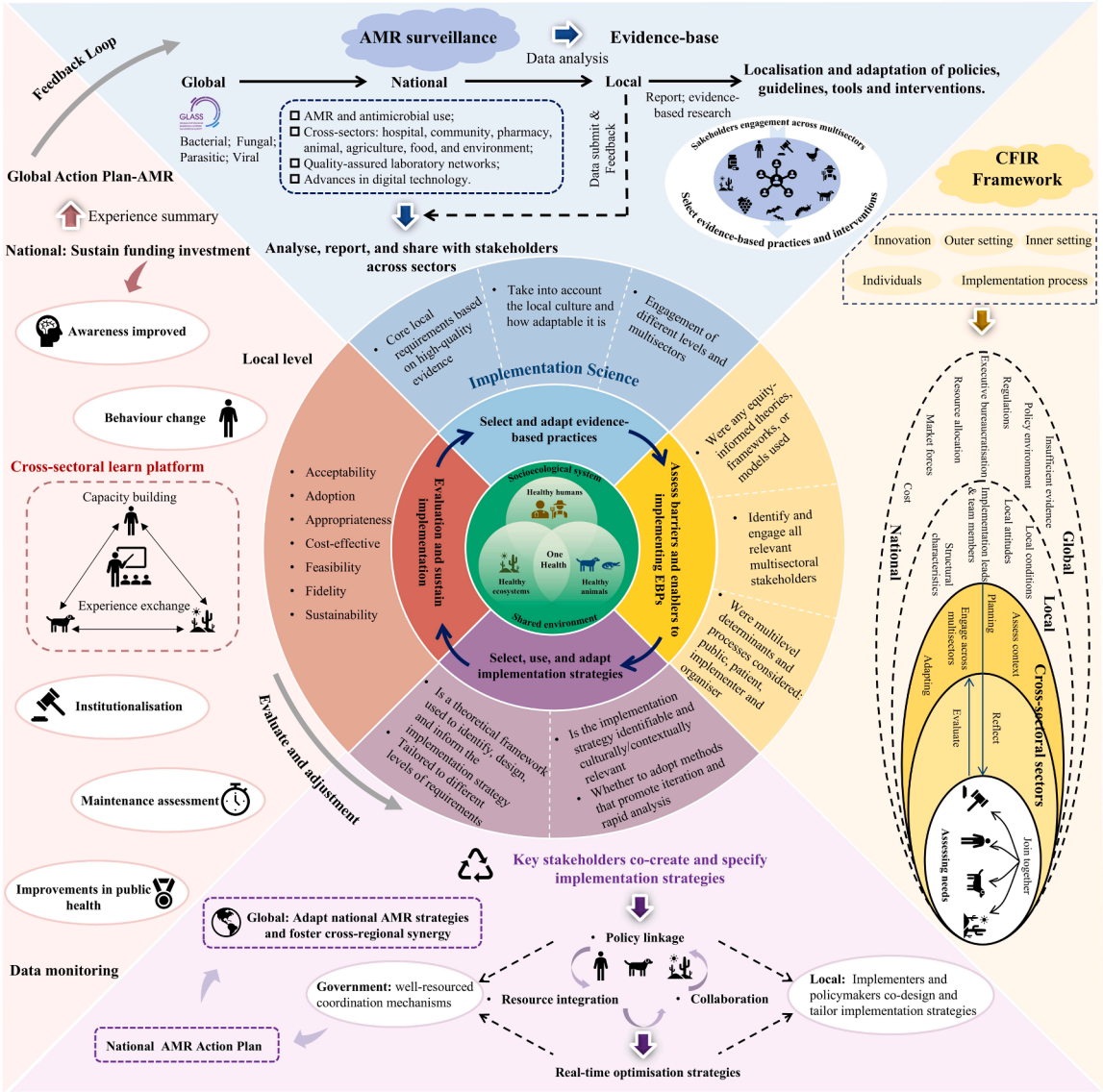

Fig. 4: **Implementation science–informed One Health antimicrobial resistance governance framework across multilevel and multisectoral systems.**

monitoring,[39] may be difficult to generalise to livestock systems or community pharmacies, particularly in countries where system capacity varies greatly. Effective EBPs require national and regional authorities to have the autonomy to formulate and adapt policies tailored to local epidemiological and specific contexts, rather than relying exclusively on externally provided solutions or standardised frameworks.[40] At the national level, this involves integrating proven interventions into strategic AMR action plans and aligning them with legal and regulatory frameworks. At regional and local levels, EBPs should be collaboratively co-developed with frontline implementers and contextually adapted to reflect local variations, redistribute decision-making power, and be iteratively refined using local epidemiological data to ensure cultural appropriateness. For instance, in antibiotic-intensive and high-resistance aquaculture-dominant economies such as Indonesia, selecting EBPs may involve adapting human health stewardship models to veterinary and farming contexts through participatory co-design with farmers, veterinary officers, and regulators. This approach enables the contextual tailoring of training content, monitoring mechanisms, and incentive structures to local ecological and economic conditions. Such down-top, multilevel participation will help to facilitate the implementation and dissemination of relevant policies in low-resource settings.[41]

Step 2: assess barriers and enablers to implementing EBPs

The next step after selecting EBPs involves identifying barriers and facilitators to the implementation process and using the findings to guide the adaptation of implementation strategies. Implementation science frameworks, such as the Consolidated Framework for Implementation Research (CFIR) and the Theoretical Domains Framework (TDF), are essential to systematically identify multilevel determinants of implementation success or failure.[42] However, current analyses applying these frameworks to AMR governance predominantly focus on isolated factors,[36,43,44] thereby overlooking One Health synergies and missing cross-sectoral barriers or facilitating factors, including coordination challenges and opportunities for interdisciplinary collaboration. These factors are crucial for a comprehensive assessment of the implementation outcomes of EBPs. To comprehensively assess implementation barriers and enablers, we suggest integrating both theory-driven frameworks and context-responsive methods. In practice, this involves mapping determinants across multiple domains, including innovation (i.e., EBPs/intervention characteristics), inner and outer settings, individual characteristics, and the implementation process.[45] Mixed-methods designs, such as structured interviews, site assessments, and participatory diagnostics, are particularly valuable in resource-constrained or multisectoral settings. For instance, the CFIR framework can be applied to assess barriers to antibiotic reduction in aquaculture across five domains: intervention characteristics (e.g., intervention source, evidence strength, and adaptability to local contexts), inner setting (e.g., farm-level infrastructure), outer setting (e.g., market incentives and national policies), individual characteristics (farmers' awareness of AMR and economic pressures), and implementation processes (multisectoral stakeholder engagement spanning environmental and food-safety authorities). This comprehensive assessment provides a robust foundation for developing of evidence-based implementation strategies.

Step 3: select, use, and adapt implementation strategies

After identifying barriers and enablers, the next step is to select and use implementation strategies, which are defined as "methods or techniques used to enhance the adoption, implementation, and sustainability of a clinical program or practice".[46] The optimal approach is to co-select and refine these strategies with key stakeholders across sectors from the outset, grounded in contextual barriers and implementation needs across settings. However, in practice, such intentional alignment is often lacking in their application. A recent systematic review on AMS interventions found that implementation strategies often focus narrowly on education or audit-feedback, with limited attention to their interaction with local governance, health service delivery models, or professional norms.[47] Additionally, most AMS interventions lacked a structured approach to strategy design or contextualisation, highlighting a common gap in global AMR efforts.[47] Implementation science has identified and tested numerous strategies to promote the adoption and integration of EBPs, with structured tools such as the Expert Recommendations for Implementing Change (ERIC) providing useful starting points, but their application requires participatory refinement.[48] In the context of One Health approach, strategies such as "tailoring strategies to context", "building stakeholder relationships", and "employing iterative evaluation" are of particular significance. For instance, to address the widespread public misconceptions on antimicrobial use, Thailand's 2020 "Responsive Dialogues" campaign exemplified how contextually adapted implementation strategies can advance AMR awareness and co-create solutions.[49] The initiative used iterative stakeholder mapping and community "conversations" to tailor AMR messages to regional cultures, engage local leaders as implementation champions, and embed feedback loops for continuous evaluation and refinement. By aligning education and communication interventions with Thailand's diverse sociocultural contexts, this project operationalised context-sensitive and co-created implementation strategies that strengthened local ownership

and sustained behaviour change. The incorporation of well-specified, theory-informed, and context-responsive implementation strategies, particularly those that engage stakeholders across the One Health spectrum, is imperative for the effective implementation of AMR intervention.

Step 4: evaluate and sustain implementation

Once feasible strategies to address identified barriers are established, the next step is to evaluate their performance and sustain their impact. Evaluating implementation success within AMR governance requires theory-informed, mixed-method approaches capable of capturing cross-sector dynamics, contextual variability, and equity impacts. Frameworks such as the RE-AIM (reach, effectiveness, adoption, implementation, and maintenance) and CFIR offer structured means to assess whether AMR-related EBPs are being delivered equitably and sustained over time. A recent example from the EQUIPS-ICU study illustrates this approach in strengthening AMS within intensive care units in LMICs.[44] Using the RE-AIM framework, the evaluation systematically assessed the reach of structured antimicrobial reviews, fidelity to review timelines and documentation standards, adoption rates over time, and sustained changes in prescribing indicators. Meanwhile, CFIR assesses determinants of success by exploring contextual factors such as inner setting (ICU workflows) and outer setting (resource constraints) through qualitative interviews with champions, ensuring equitable and adaptable implementation. However, ensuring the sustainability of EBIs within the One Health framework requires careful consideration of several factors. Strategic planning and active stakeholder engagement are essential for maintaining long-term impact. Early and continuous engagement is key to building local ownership, ensuring that interventions remain relevant and adaptable to local ecological and social contexts. Moreover, cost-effectiveness plays a crucial role by optimising resource allocation to support scalability without sacrificing impact. Finally, continuous One Health surveillance enables iterative refinements, ensuring that interventions remain equitable, effective, and aligned with evolving community needs over time.[50]

Implementation science–informed multilevel one health AMR governance: from conceptual framework to action

Building on the multilevel architecture illustrated in Fig. 4, implementation science provides the connective tissue that links global guidance, national coordination, and local adaptation into a One Health AMR governance system capable of navigating the regions' uniquely intertwined challenges. The framework underscores three core functions: strategy coordination to align interventions across sectors; contextual adaptation to tailor practices to diverse settings; and holistic evaluation to integrate cross-sectoral data to assess and refine outcomes. First, governance architecture must be grounded in a rigorously integrated, cross-sectoral evidence base that captures the dynamics of AMR across human, animal, and environmental domains, while redressing deficiencies in market regulation. Comprehensive surveillance that incorporates AMR trends, prescribing and dispensing behaviours, and antimicrobial supply-chain flows can reveal regional systemic vulnerabilities and identify core drivers, thereby enabling targeted interventions. Second, applying CFIR-guided barriers assessment and embedding multi-stakeholder engagement loops, policymakers can understand how traditional medicine practices, cultural treatment norms, and mixed therapeutic pathways shape real-world behaviours, thus informing culturally attuned, cross-sectoral implementation strategies. Third, the iterative development and refinement of implementation strategies constitute the decisive mechanism through which One Health governance is operationalised. At the local level, multisectoral stakeholders should participate as equal partners in co-creating and specifying implementation strategies that are responsive to contextual realities. At national and regional levels, sustained leadership, regulatory coherence, resource integration, and coordination of laboratory capacity should provide the foundation for effective and harmonised implementation. Finally, real-time optimisation guided by locally generated data should enable continuous adaptation of strategies across sectors in response to evolving resistance patterns and emerging risks, thereby mitigating AMR pressures and enhancing public awareness. Furthermore, cross-country exchanges of implementation strategies should be promoted to enhance regional alignment and accelerate the development of context-specific AMR governance programmes. Globally, structured integration and comparative analysis of these data streams are imperative to guide updates to the GAP, ensuring One Health governance adapts to evolving epidemiological trends and the distinct vulnerabilities of high-burden regions. This integrated, implementation science–based approach can address persistent challenges in AMR governance and foster its evolution from aspirational policy to adaptive practice.

Future perspectives

Curbing the AMR crisis in the Southeast Asia and Western Pacific regions can no longer wait for incremental reforms; an urgent imperative is to bridge the gap between policy commitments and fragmented actions. In the next decade, a transformative One Health approach that integrates implementation science, behavioural insights, and economic analysis will be essential to broaden stakeholder engagement,

Search strategy and retrieval for National Action Plan

We searched PubMed, Google Scholar, Google, WHO library, Ministry of National Health, and National AMR Official Government Website for NAPs addressing AMR, published January 1, 2010, and January 1, 2025 (Appendix pp 1–8). Searches were conducted without language restrictions using combinations of the following key terms: "antimicrobial resistance", "antibiotic resistance", "AMR", policy", "strategy", "strategic", "national", "action", "plan", and "NAP". Documents were included if they were publicly accessible (e.g., as PDF files, official website publications, or scanned official documents), represented official national-level AMR NAPs or policy frameworks, and were written either in English or in the respective country's official language. Only the most recent publicly available version of each country's NAP was included in the final analysis. Non-governmental reports, regional or local guidelines, conference abstracts, commentaries, editorials, and academic publications were excluded. Native language documents (e.g., Japanese) were translated into English using Google Neural Machine Translation software to ensure accuracy and consistency of analysis. Screening, eligibility assessment, and data extraction were independently carried out by at least two researchers, with any discrepancies resolved by discussion or consultation with a third researcher. The data on policy design, implementation, and monitoring and evaluation were extracted from the NAPs contents, guided by Anderson's framework, through independent analysis by two researchers. In total, 35 NAPs were identified and retrieved, representing 11 countries from the Southeast Asia Region and 23 countries from the Western Pacific Region. A detailed list of included countries is provided in the Appendix (pp 14–15).

strengthen cross-sectoral policy coherence, and address the structural drivers that shape antimicrobial use and resistance.[21] Here, we advocate for the establishment of an Asia–Pacific AMR Governance Taskforce, comprising government, academic, and civil society representatives, which could standardise surveillance protocols and enforce accountability through peer-reviewed progress dashboards. Furthermore, the rapid development of genomic sequencing and artificial intelligence will propel the transition towards integrated laboratory network surveillance, enabling real-time pathogen tracking and predictive modelling to inform pre-emptive interventions across One Health sectors.[51,52] However, these innovations risk exacerbating inequities in LMICs through infrastructure gaps, high costs straining limited budgets, capacity shortages, and ethical concerns over data sovereignty.[53] Therefore, sustainable financing must underpin these efforts through investment in equitable access to safe, quality and efficacious vaccines, diagnostics, and antibiotics, together with AMS, IPC, and education and training across sectors.[54] Without such transformative, equity-focused measures, the region risks losing decades of health gains to the silent pandemic of resistance.

Conclusions

As both an AMR hotspot and a living lab for governance innovation, the WHO Southeast Asia and Western Pacific regions play a pivotal role in shaping the global response to AMR. Notwithstanding the commendable progress has been achieved in establishing regional coordination frameworks and high-level political endorsement, the persistent challenge lies in translating these commitments into coordinated, effective, and sustained implementation across the multiple sectors. Bridging this gap requires adaptive governance mechanisms that harness regional synergies while enabling context-specific solutions at subnational level. Our proposed integration of implementation science into the One Health framework highlights the importance of strategic alignment across sectors, contextual adaptation to local realities, iterative evaluation through cross-sectoral learning, and sustained policy feedback. This framework facilitates a closed-loop AMR governance model within the One Health approach, providing a practical blueprint for localising, concretising, and operationalising grand concepts into actionable strategies through evidence-driven mechanisms. Our findings provide governance guidance to help local governments in other regions worldwide utilise existing resources to address the avoidable burden of AMR and other adverse health threats.

Contributors

Z.Z., Y.D., and L.S. contributed equally to the Viewpoint. Y.D. and X.R.Y. developed the study concept. X.R.Y. drafted the manuscript, provided the analysis and visualisation. Q.H. and I.M. contributed to the interpretation of the data and extensive revision of the manuscript. H.W., J.W., X.Y., and X.D. helped interpret the results. All authors critically revised the manuscript for important intellectual content, including input into the panel, figures, and tables, and approved the final manuscript. All authors were responsible for the decision to submit the manuscript for publication.

Editor note

The Lancet Group takes a neutral position with respect to territorial claims in published maps and institutional affiliations.

Declaration of interests

We declare no competing interests.

Acknowledgements

The authors thank anonymous reviewers for their generous and constructive feedback. This study was supported by the National Natural Science Foundation of China (Grant 82373593 and 82103865 to Y.D., 82073573 to Z.Z.), National Key R&D Program of China (Grant 2024YFC3308302 to Y.D.), Peking University Talent Introduction Program Project (BMU2023Y1011 to Y.D.) and National Ten Thousand Talents Program for Youth Talent Excellence (Y.D.), Beijing Natural Science Foundation (Grant L246011 to L.S., 7222244 to Y.D.) and Training Plan for High-Level Public Health Technical Talents of Beijing Municipal Health Commission (2022-02-04 to L.S.).

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lanwpc.2025.101783.

References

1 Global burden of bacterial antimicrobial resistance 1990-2021: a systematic analysis with forecasts to 2050. *Lancet*. 2024;404(10459):1199–1226.

2 Okeke IN, de Kraker MEA, Van Boeckel TP, et al. The scope of the antimicrobial resistance challenge. *Lancet*. 2024;403(10442):2426–2438.
3 WHO. Global action plan on antimicrobial resistance. https://www.who.int/publications/i/item/9789241509763; 2016. Accessed March 21, 2025.
4 WHO. Seventy-seventh World Health Assembly agenda item 11.8 antimicrobial resistance: accelerating national and global responses. https://apps.who.int/gb/ebwha/pdf_files/WHA77/A77_ACONF1-en.pdf; 2024. Accessed December 23, 2024.
5 World leaders commit to decisive action on antimicrobial resistance. https://www.who.int/news/item/26-09-2024-world-leaders-commit-to-decisive-action-on-antimicrobial-resistance; 2024. Accessed September 26, 2024.
6 Anderson M, Kluge HHP, Lo Fo Wong D, Butler R, Mossialos E. Promoting sustainable national action to tackle antimicrobial resistance: a proposal to develop an antimicrobial resistance accountability index. *Lancet Microbe*. 2024;5(11):100997.
7 Patel J, Harant A, Fernandes G, et al. Measuring the global response to antimicrobial resistance, 2020-21: a systematic governance analysis of 114 countries. *Lancet Infect Dis*. 2023;23(6):706–718.
8 Musicha P, Morse T, Cocker D, Mugisha L, Jewell CP, Feasey NA. Time to define one health approaches to tackling antimicrobial resistance. *Nat Commun*. 2024;15(1):8782.
9 Ikhimiukor OO, Odih EE, Donado-Godoy P, Okeke IN. A bottom-up view of antimicrobial resistance transmission in developing countries. *Nat Microbiol*. 2022;7(6):757–765.
10 Cocker D, Birgand G, Zhu N, et al. Healthcare as a driver, reservoir and amplifier of antimicrobial resistance: opportunities for interventions. *Nat Rev Microbiol*. 2024;22(10):636–649.
11 WHO. Accelerating action to fight AMR in the Asia-Pacific region. https://www.who.int/westernpacific/publications/m/item/accelerating-action-to-fight-amr-in-the-asia-pacific-region; 2024. Accessed January 9, 2025.
12 Anderson M, Schulze K, Cassini A, Plachouras D, Mossialos E. A governance framework for development and assessment of national action plans on antimicrobial resistance. *Lancet Infect Dis*. 2019;19(11):e371–e384.
13 Chua AQ, Verma M, Hsu LY, Legido-Quigley H. An analysis of national action plans on antimicrobial resistance in Southeast Asia using a governance framework approach. *Lancet Reg Health West Pac*. 2021;7:100084.
14 Bertagnolio S, Dobreva Z, Centner CM, et al. WHO global research priorities for antimicrobial resistance in human health. *Lancet Microbe*. 2024;5(11):100902.
15 Nations U. *Political Declaration of the High-Level Meeting of the General Assembly on Antimicrobial Resistance: Resolution/Adopted by the General Assembly*. 2016.
16 Organization WH. Seventy-seventh world health assembly – Daily update: 30 May 2024. https://www.who.int/news/item/30-05-2024-seventy-seventh-world-health-assembly—daily-update–30-may-2024; 2024. Accessed July 10, 2025.
17 Casalini G, Giacomelli A, Antinori S. The WHO fungal priority pathogens list: a crucial reappraisal to review the prioritisation. *Lancet Microbe*. 2024;5(7):717–724.
18 Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. *Lancet*. 2022;399(10325):629–655.
19 Apeagyei AE, Bisignano C, Elliott H, et al. Tracking development assistance for health, 1990-2030: historical trends, recent cuts, and outlook. *Lancet*. 2025;406(10501):337–348.
20 WHO. EB154/13 antimicrobial resistance: accelerating national and global responses. https://apps.who.int/gb/ebwha/pdf_files/EB154/B154_13-en.pdf; 2023. Accessed November 4, 2025.
21 Qjso AMR. Accelerating the global response: 2nd ed. 2026-2035. https://www.qjsamr.org/docs/librariesprovider25/mspp-page/zero-draft-updated-gap-amr.pdf; 2025. Accessed November 6, 2025.
22 Nguyen Thanh L, Wernli D, Målqvist M, Søgaard Jørgensen P. 'When global health meets global goals': assessing the alignment between antimicrobial resistance and sustainable development policies in 10 African and Asian countries. *BMJ Glob Health*. 2025;10(3).
23 WHO. No time to wait: securing a future from drug-resistant infections. https://www.who.int/publications/i/item/no-time-to-wait-securing-the-future-from-drug-resistant-infections; 2019. Accessed March 25, 2025.
24 WHO. The Western Pacific Regional Antimicrobial Consumption Surveillance System (WPRACSS). https://www.who.int/westernpacific/health-topics/antimicrobial-resistance/wpracss; 2020. Accessed March 28, 2025.
25 Harant A. Assessing transparency and accountability of national action plans on antimicrobial resistance in 15 African countries. *Antimicrob Resist Infect Control*. 2022;11(1):15.
26 Li B, Jiang L, Johnson T, et al. Global health risks lurking in livestock resistome. *Sci Adv*. 2025;11(26):eadt8073.
27 Schar D, Zhao C, Wang Y, Larsson DGJ, Gilbert M, Van Boeckel TP. Twenty-year trends in antimicrobial resistance from aquaculture and fisheries in Asia. *Nat Commun*. 2021;12(1):5384.
28 Pavli A, Maltezou HC. Infectious complications related to medical tourism. *J Travel Med*. 2021;28(1).
29 Do NTT, Vu HTL, Nguyen CTK, et al. Community-based antibiotic access and use in six low-income and middle-income countries: a mixed-method approach. *Lancet Glob Health*. 2021;9(5):e610–e619.
30 Tan S, Guo H, Chow A. Complementary and alternative medicine (CAM) use and its association with antibiotic usage practices: a nationally representative population study. *Int J Antimicrob Agents*. 2023;61(6):106796.
31 Li J, Feng S, Liu X, et al. Effects of traditional Chinese medicine and its active ingredients on drug-resistant bacteria. *Front Pharmacol*. 2022;13:837907.
32 Loftus M, Stewardson A, Naidu R, et al. Antimicrobial resistance in the Pacific Island countries and territories. *BMJ Glob Health*. 2020;5(4).
33 Loftus MJ, Everts RJ, Cheng AC, et al. Antimicrobial susceptibility of bacterial isolates from clinical specimens in four Pacific Island countries, 2017-2021. *Lancet Reg Health West Pac*. 2023;32:100677.
34 Maldives MoHRo. National action plan on antimicrobial resistance 2024-2029. https://health.gov.mv/storage/uploads/Vw9Zg5Yv/zbzwqoec.pdf; 2024. Accessed June 30, 2025.
35 Luke DA, Powell BJ, Paniagua-Avila A. Bridges and mechanisms: integrating systems science thinking into implementation research. *Annu Rev Public Health*. 2024;45(1):7–25.
36 Wu S, Tannous E, Haldane V, Ellen ME, Wei X. Barriers and facilitators of implementing interventions to improve appropriate antibiotic use in low- and middle-income countries: a systematic review based on the Consolidated Framework for Implementation Research. *Implement Sci*. 2022;17(1):30.
37 Sarkies MN, Jones LK, Gidding SS, Watts GF. Improving clinical practice guidelines with implementation science. *Nat Rev Cardiol*. 2022;19(1):3–4.
38 Ramanadhan S, Alemán R, Bradley CD, et al. Using participatory implementation science to advance health equity. *Annu Rev Public Health*. 2024;45(1):47–67.
39 Ng TM, Heng ST, Chua BH, et al. Sustaining antimicrobial stewardship in a high-antibiotic resistance setting. *JAMA Netw Open*. 2022;5(5):e2210180.
40 Ogyu A, Chan O, Littmann J, et al. National action to combat AMR: a One-Health approach to assess policy priorities in action plans. *BMJ Glob Health*. 2020;5(7).
41 Adsul P, Shelton RC, Oh A, Moise N, Iwelunmor J, Griffith DM. Challenges and opportunities for paving the road to global health equity through implementation science. *Annu Rev Public Health*. 2024;45(1):27–45.
42 Birken SA, Powell BJ, Presseau J, et al. Combined use of the Consolidated Framework for Implementation Research (CFIR) and the Theoretical Domains Framework (TDF): a systematic review. *Implement Sci*. 2017;12(1):2.
43 Peiffer-Smadja N, Descousse S, Courrèges E, et al. Implementation of a clinical decision support system for antimicrobial prescribing in Sub-Saharan Africa: multisectoral qualitative study. *J Med Internet Res*. 2024;26:e45122.
44 Wagstaff D, Amuasi J, Arfin S, et al. Evidence based QUality Improvement for Prescribing Stewardship in ICU (EQUIPS-ICU): protocol for type III hybrid implementation-effectiveness study. *Implement Sci*. 2025;20(1):12.
45 Damschroder LJ, Reardon CM, Widerquist MAO, Lowery J. The updated Consolidated Framework for Implementation Research based on user feedback. *Implement Sci*. 2022;17(1):75.
46 Powell BJ, Waltz TJ, Chinman MJ, et al. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implement Sci*. 2015;10:21.
47 Conlin M, Hamard M, Agrinier N, Birgand G. Assessment of implementation strategies adopted for antimicrobial stewardship

interventions in long-term care facilities: a systematic review. *Clin Microbiol Infect*. 2024;30(4):431–444.
48 Waltz TJ, Powell BJ, Matthieu MM, et al. Use of concept mapping to characterize relationships among implementation strategies and assess their feasibility and importance: results from the Expert Recommendations for Implementing Change (ERIC) study. *Implement Sci*. 2015;10:109.
49 Poomchaichote T, Kiatying-Angsulee N, Boonthaworn K, et al. Embedding community and public voices in co-created solutions to mitigate antimicrobial resistance (AMR) in Thailand using the 'Responsive Dialogues' public engagement framework. *Antimicrob Resist Infect Control*. 2024;13(1):71.
50 Winkler AS, Brux CM, Carabin H, et al. The Lancet One Health Commission: harnessing our interconnectedness for equitable, sustainable, and healthy socioecological systems. *Lancet*. 2025;406(10502):501–570.
51 Djordjevic SP, Jarocki VM, Seemann T, et al. Genomic surveillance for antimicrobial resistance - a one Health perspective. *Nat Rev Genet*. 2024;25(2):142–157.
52 Liu GY, Yu D, Fan MM, et al. Antimicrobial resistance crisis: could artificial intelligence be the solution? *Mil Med Res*. 2024;11(1):7.
53 Lewnard JA, Charani E, Gleason A, et al. Burden of bacterial antimicrobial resistance in low-income and middle-income countries avertible by existing interventions: an evidence review and modelling analysis. *Lancet*. 2024;403(10442):2439–2454.
54 Painter C, Limmathurotsakul D, Roberts T, et al. Sustainable antimicrobial resistance surveillance: time for a global funding mechanism. *Lancet Infect Dis*. 2025;25(2):e99–e103.