All for Health, Health for All

WHO investment case deep dive: antimicrobial resistance

World Health Organization

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1. The growing threat of antimicrobial resistance

The race between resistant microbes and new drugs. Antimicrobial Resistance (AMR) refers to bacteria, viruses, fungi and parasites no longer responding to antimicrobial medicines (i.e. antibiotics, antivirals, antifungals, antiparasitics). AMR occurs worldwide, and can affect humans, animals or plants. The overuse of antimicrobials pressures pathogens to evolve (i.e., adapt genes) over time. Within AMR, resistance of bacteria to antibiotics is particularly problematic. Since the 1930s, the introduction of new antibiotics has been followed by the emergence of resistance, usually within a decade, but since the 1980s, resistance is emerging faster, usually within three years, and all antibiotics now face some level of resistance that can vary from rare to common.[1] Unfortunately, the pipeline of new antibiotics is drying out. Between 2017 and 2021, there were only 12 new antibiotics introduced to the market.[2]

AMR: A threat to public health and development. AMR means infections become difficult or impossible to treat, spread more, cause more severe illness, and lead to disability and death. As effective antimicrobials are a cornerstone of modern medicine, AMR means that common medical procedures, such as caesarean sections, organ transplants or chemotherapy, become riskier.[3] In 2019, WHO listed AMR as one of the ten top global public health and development threats.[4] The Global Burden of Diseases estimates that in 2019, 7.7 million deaths were associated with bacterial infections, of which 4.95 million were associated with AMR and 1.27 million were caused by

1. Pay L. (2008). *Antibiotic Research and Development*. Cambridge HealthTech Institute, Needham, MA, USA.
2. WHO (2022, June 22). *Lack of innovation set to undermine antibiotic performance and health gains*. <https://www.who.int/news/item/22-06-2022-22-06-2022-lack-of-innovation-set-to-undermine-antibiotic-performance-and-health-gains>
3. WHO. (2024). *Antimicrobial Resistance*. <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>
4. WHO. (2024). *Antimicrobial Resistance*. <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance> & The Lancet. (2021). *Antimicrobial resistance: a top ten global public health threat*. EClinicalMedicine Vol. 41, *101221*. <https://www.thelancet.com/action/showPdf?pii=S2589-5370%2821%2900502-2>

bacterial pathogens resistant to available antibiotics.[5] Patients affected by AMR require more intensive care and lengthier hospital stays, which increase costs.[6] A study organized by world leaders and experts from across sectors working together to accelerate political action on AMR (The Global Leaders Group, or GLG) estimates that globally, AMR could result in additional health care expenditures reaching US$ 412 billion annually, coupled with workforce participation and productivity losses of US$ 443 billion.[7]

Preventing, diagnosing and treating infections among humans, as part of a

"One Health" approach. To address AMR, we need to strengthen systems to prevent, diagnose and treat infections. Prevention includes water, sanitation, infection prevention and control (IPC) and immunization (improving coverage with the vaccines that we have and developing new vaccines). We must limit the use of antimicrobials and develop new ones. These efforts in the human health sector need to be complemented by coordinated efforts in the agri-food, environment and animal sectors as per the "One Health" approach since the ecosystems in which these microbes live are inter-connected (e.g., resistant bacteria in animals can be also transmitted to humans).

2. Comprehensive action within a global framework

The foundations of a global response to AMR have been laid. In 2016, the United Nations General Assembly (UNGA) held a first High Level Meeting (HLM) on AMR. Since then, progress has been made. AMR actions now span across all areas of WHO's global health strategy, the 14th General Programme of Work[8] (GPW14), and are embedded within UN Sustainable Development Goals (SDG).[9] To facilitate implementation, a Quadripartite Joint Secretariat for AMR (QJS) was established[10], hosted by WHO and made up of the Food and Agriculture Organization of the UN (FAO), the UN Environment Programme (UNEP), WHO and the World Organisation for Animal Health (WOAH).[11] Progress has also been made at country level. Between 2023-24, WHO's Tracking AMR Country Self-assessment Survey (TrACSS) reported that 178 countries had developed a multisectoral
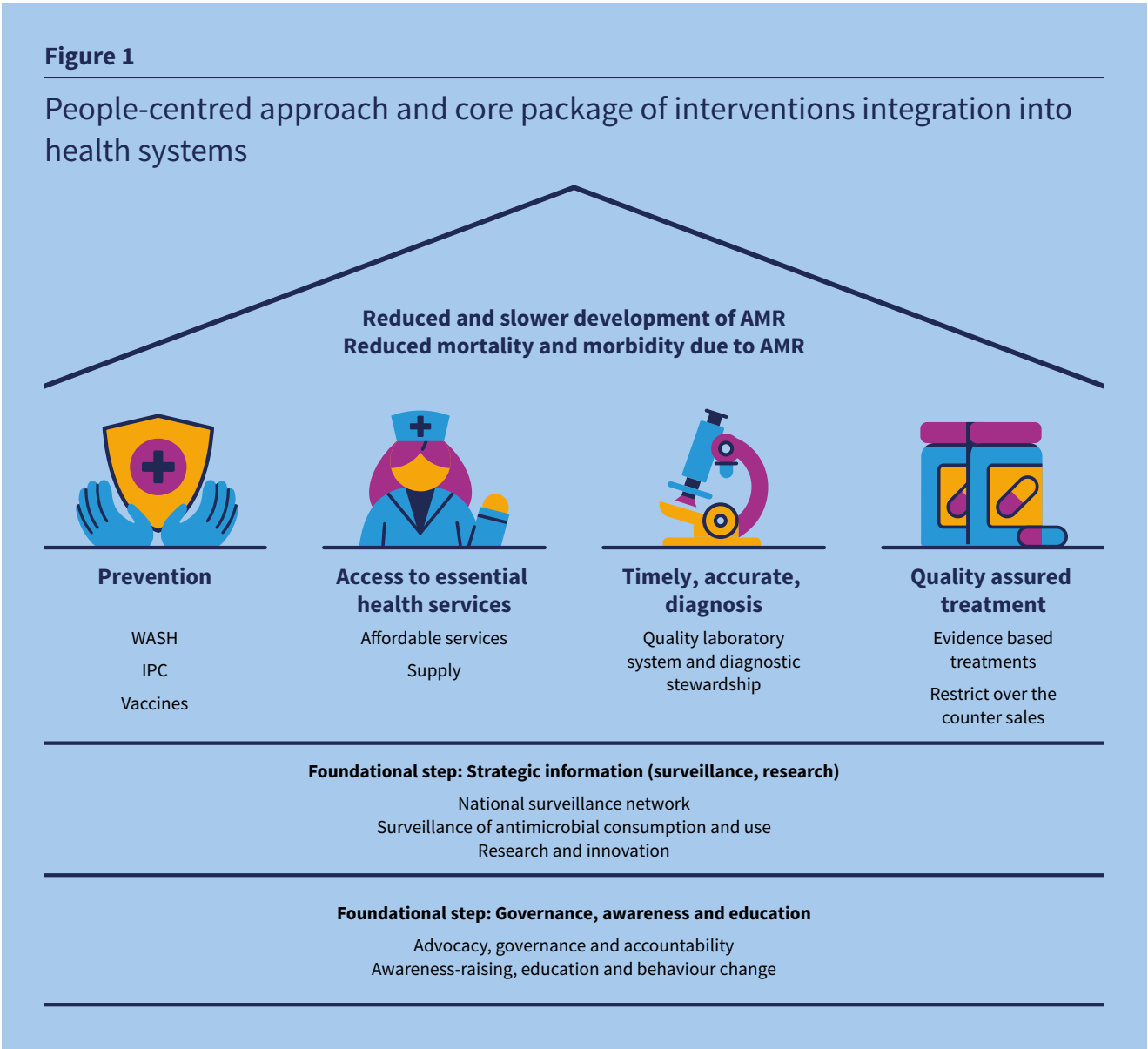
AMR national action plan (NAP). However, challenges remain. Only 28% of countries have costed and budgeted their NAPs and are monitoring implementation. Overall, while the global framework and the foundations needed for progress have been established, comprehensive action at country level needs to be accelerated.

2024: An opportunity to commit to measurable progress in countries. In 2024, we have a new vision for additional progress that could be achieved if more reliable and predictable funding is made available, including clarity on what countries need to do to address AMR. First, for the human health sector, a World Health Assembly (WHA) Resolution[12] approved WHO's strategic and operational priorities to address drug-resistant bacterial infections in the human

health sector, 2025–35,[13] calling for primary healthcare for universal health coverage and a people-centred approach that includes 13 interventions (Figure 1).[14] This means that we need to strengthen health systems to prevent, diagnose and treat infections. In September 2024, the declarations from G20 Health and Agriculture Ministers further underscored commitment of major economies to address AMR.[15] Moreover, the UNGA High Level Meeting (HLM) on AMR in September and the 4th Global High-Level Ministerial Conference on AMR in the Kingdom of Saudi Arabia in November will

be critical opportunities for Member States to commit to concrete actions and establish follow-up mechanisms to drive sustainable financing and enhance accountability. A successful response to AMR will therefore require scaling up multisectoral and interdisciplinary efforts and the engagement of all relevant sectors, including human, animal and plant health, as well as environment, research and development, finance, manufacturing, and education to generate an effective whole-of-government and whole-of-society response, in line with a One Health approach.

Figure 1

People-centred approach and core package of interventions integration into health systems

Reduced and slower development of AMR
Reduced mortality and morbidity due to AMR

Prevention
WASH
IPC
Vaccines

Access to essential health services
Affordable services
Supply

Timely, accurate, diagnosis
Quality laboratory system and diagnostic stewardship

Quality assured treatment
Evidence based treatments
Restrict over the counter sales

Foundational step: Strategic information (surveillance, research)
National surveillance network
Surveillance of antimicrobial consumption and use
Research and innovation

Foundational step: Governance, awareness and education
Advocacy, governance and accountability
Awareness-raising, education and behaviour change

5.   The Lancet. (2024). *Antimicrobial resistance: an enormous, growing, and unevenly distributed threat to global health.* <https://www.thelancet.com/infographics-do/antibiotic-resistance-series-2024>
6.   WHO. (2024). *Antimicrobial Resistance – Key Facts.* <https://www.who.int/europe/news-room/fact-sheets/item/antimicrobial-resistance>
7.   Global Leaders Group. (2024). *Towards specific commitments and action in the response to antimicrobial resistance.* <https://www.amrleaders.org/resources/m/item/glg-report>
8.   WHO. (2024). *Draft fourteenth general programme of work, 2025-2028 – A77/16.* <https://apps.who.int/gb/ebwha/pdf_files/WHA77/A77_16-en.pdf>
9.   SDG 3.d calls for strengthening early warning, risk reduction and management of national/global health risks in all countries, including for AMR. See UN. (2024). *3 : Ensure healthy lives and promote well-being for all at all ages – targets and indicators.* <https://sdgs.un.org/goals/goal3#targets_and_indicators>
10. QJS coordinates implementation of the "Strategic Framework for Collaboration on AMR through a One Health approach." Please see : QJS. (2024). Strategic Framework for Collaboration on AMR. <https://www.qjsamr.org/about-us/strategic-framework-for-collaboration>
11. QJS. (2024). *About Us.* <https://www.qjsamr.org/about-us>
12. WHO. (2024). *A77/A/CONF./1 – Antimicrobial resistance: accelerating national and global responses.* <https://apps.who.int/gb/ebwha/pdf_files/WHA77/A77_ACONF1-en.pdf>

13. WHO. (2024). *Strategic and operational priorities to address drug-resistant bacterial infections in the human health sector, 2025–35.* <https://apps.who.int/gb/ebwha/pdf_files/WHA77/A77_5-en.pdf>
14. WHO. (2023). *People-centred approach to addressing antimicrobial resistance in human health: WHO core package of interventions to support national action plans.* <https://www.who.int/publications/i/item/9789240082496>
15. G20. (2024). *Sherpa Track – Agriculture: G20 Agriculture Ministers Declaration.* <https://www.g20.org/en/tracks/sherpa-track/agriculture>

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3. WHO leading progress

WHO is well positioned to lead on AMR. AMR is a global problem that requires a collaborative global response. Progress in the fight against AMR has been mostly achieved in high-income countries through a comprehensive, systems approach in the health sector, in the context of clear multi-sectoral action. However, in many low and middle income countries (LMICs), much remains to be done. WHO, along with the Quadripartite and other relevant organizations, has a comparative advantage to coordinate accelerated response to AMR in LMICs, as the principal UN agency for human health and owing to its leadership in:

- The provision of norms and standards;
- Supporting countries to implement a core package of interventions based on a people-centred approach that is aligned with the primary health care (PHC) for universal health coverage (UHC) approach, and health emergency preparedness and response strategies;
- Guiding interventions with evidence and monitoring progress through the TrACSS and Global Antimicrobial Resistance and Use Surveillance System (GLASS) tools;

- Convening an AMR data collaborative through links with institutes including WHO Collaborating Centres that model estimates of burden; and
- Hosting the secretariat of the quadripartite organizations, while simultaneously placing work in the health sector at the heart of interventions with other sectors.

A single, organization-wide workplan for more efficiency and effectiveness. WHO will lead implementation through a consolidated, cross-cutting, three-level approach that would improve efficiencies and is particulary suited to AMR, which touches on many domains and requires a health systems approach. Several divisions of Headquarters, Regional Offices and Country Offices will therefore combine their comparative advantages through a results-based management approach to have positive and sustainable impacts to address AMR.

4. What we can achieve in the next four years

Strategic and operational priorities in WHO. In line with GPW14 and the 2024 WHA Resolution on AMR, WHO will deliver along the strategic and operational priorities to control and reverse the urgent public health and socioeconomic crisis due to drug-resistant infections in humans as follows:

Strategic Priorities
Prevention:

A full package of interventions, including:
- WASH;
- Infection Prevention and Control (IPC); and
- Immunization.

Universal access:

Affordable, quality diagnosis, appropriate treatment of infections and appropriate use of medicines built into essential packages of care.

Strategic information:

- A comprehensive system established to estimate prevalence, health and economic burden of AMR and measure progress throughout the result chain, including structure, input, processes, output, outcome and impact;
- AMR research agenda;
- Research and development;
- Normative tools for many stakeholders in the public and private sectors, including the bacterial priority pathogens list (BPPL), medically important antimicrobials (MIA) list, AWaRe (Access, Watch, Reserve) antibiotic book and the antibiotic pipeline reports, will also guide AMR response

Effective governance and financing:

- An approach to costing, budgeting and financing the AMR response
- Awareness-raising, education and behaviour change of health workers and communities. The WHO-established Survivor Task Force and other networks will lead in raising awareness and uptake of appropriate measures to prevent and respond to AMR.
- WHO's leading role among quadripartite organizations and beyond will enable effective and efficient multisectoral coordination to address AMR using a One Health approach.

Operational Priorities

- **A people-centred public health approach** (Figure 1) based on a core package of essential AMR interventions to enable country-level actions with emphasis on an integrated programmatic approach, aligned with strategies for PHC, UHC and health emergency preparedness and response at all levels of the health system.
- Additional country and global actions on governance and financing.
- Enabling actions to support Member States.

As a result, WHO alongside partners and member states aim to reach by 2030 the targets proposed in the political declaration of the UNGA HLM on AMR:

- Global deaths associated with bacterial AMR reduced by 10%;
- All countries have a multisectoral AMR NAP;
- 60% of countries dedicate AMR financing in national budgets;
- All countries report annual surveillance data to GLASS; and

- 70% of antibiotic use is from the access AWaRe category.

Multisectoral action. WHO will also leverage through the Quadripartite Organizations to increase the political commitment and action from other sectors to address AMR, including with respect to continuing to define antibiotics of critical importance to human health, working across sectors (alongside other partners) to eliminate unnecessary use, and address the antibiotic pipeline and access crisis.

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5. Actions we can take

Over the next four years, decisive steps towards tackling AMR must be taken. If WHO and AMR are properly resourced tangible actions can be taken. These include improving AMR systems, taking a comprehensive approach to prevention, improving access to antibiotics and diagnostics, and strengthening AMR advocacy.

i. A collaborative strategic information system for AMR

WHO will develop a comprehensive strategic information system to estimate AMR burden and monitor progress along the full result chain. This will include the convening of a global data collaborative on AMR that will regroup actors working on different sources of data (e.g., surveillance of antimicrobial use and surveillance of AMR and modelled estimates of prevalence, morbidity and mortality). This strategic information system for the health sector will connect with the animal health and environmental sector through the QJS partnership that draws on the core mandate of the Quadripartite organizations to support global response to AMR across the One Health spectrum.[16] Surveillance for AMR in human health will be implemented in close collaboration with surveillance in other sectors, integrated or collaborative [17] Surveillance data and estimates on antimicrobial use and AMR reported through GLASS will be interpreted in the contexts structural and policy uptake indicators reported by countries in TrACSS. The continuous assessment of priority pathogens and availability status of antimicrobial agents will provide evidence required.

ii. Comprehensive approach to prevention and antibiotics stewardship

Improving the use of antimicrobials worldwide is key to controlling the further emergence and spread of AMR. WHO will provide a comprehensive package of guidance and tools for Member States to ensure appropriate antimicrobial use based on WHO's AWaRe (Access, Watch, Reserve) system. Surveillance of antimicrobial use through GLASS and other assessment in all health care settings identifies priority areas for improvement and generates data that monitors the impact of interventions. Interpreting this in the context of measurable AWaRe-based indicators and targets will measure how people access and use antimicrobials. WHO will provide modular evidence-based toolkits for clinicians and policymakers, so that implementation and evaluation of national antimicrobial policies is adapted to local resources, needs and priorities. Patient-level antimicrobial stewardship interventions and communication for behavioural impact will engage the public and health workers in a push-pull approach. The comprehensive package of guidance and tools will include regularly updated guidance (e.g. WHO AWaRe antibiotic book) and be closely integrated with other interventions (IPC, WASH, vaccines, diagnostics) aligned with WHO's strategic and operational priorities to address drug-resistant bacterial infections in the human health sector.

iii. Access to antibiotic treatments and complementary diagnostics

WHO's *strategic and operational priorities for addressing drug-resistant bacterial infections in the human health sector* list universal access to quality and affordable antibiotics as a key element to mitigate AMR's impact on public health.[18] However, access challenges persist for both new and old antibiotics. For existing antibiotics, global shortages, weak forecasting, insufficient financing, substandard and falsified products, and fragile supply chains are the key bottleneck, especially in LMICs. For newer products, access is limited by low and erratic volumes and high prices, which limits registration and supply. WHO will work closely with national governments and partners to increase access to essential antibiotics. This includes collaborating with Global Antibiotic Research and Development Partnership (GARDP) on SECURE[19] – an initiative aimed at improving access to new and existing antibiotics through interventions. This collaboration will lead to improved forecasting and market intelligence; simplification of antibiotic portfolios; streamlined regulatory functions, pooled/coordinated procurement; measures to address shortages; and product introduction planning and support. Furthermore, WHO will target research and development (R&D) for new antibacterials to areas of greatest public health need and ensure there are financial incentives for R&D, including strong access provisions for LMICs. WHO will also continue to work to expand access to new, but also existing antibiotics that face significant access barriers and ensuring that efforts to develop new antibacterial agents are matched by parallel efforts to ensure they can be equitably accessed and are appropriately used in accordance with antimicrobial stewardship principles.

16. QJS. (2024). *About Us – Who We Are.* <https://www.qjsamr.org/about-us>
17. Matheu, J. et al. (2017). *The ESBL Tricycle AMR Surveillance Project: A Simaple, One Health Approach to Global Surveillance. AMR Control*, pp. 55-58. <http://resistancecontrol.info/wp-content/uploads/2017/08/55-58-Andremont.pdf>
18. WHO. (2024). *Strategic and operational priorities to address drug-resistant bacterial infections in the human health sector, 2025–35.* <https://apps.who.int/gb/ebwha/pdf_files/WHA77/A77_5-en.pdf>
19. SECURE. (2024). *About.* <https://www.secureantibiotics.org/about>

iv. Awareness, education and advocacy on AMR

Raising awareness about AMR is a prerequisite for behaviour change among the public, healthcare workers and policymakers. The allocation of resources to AMR depends on adequate awareness of the current and future threat it presents to humanity. The World AMR Awareness Week[20] is a global campaign, led by the Quadripartite Organizations with harmonized messages, campaign guides and communication assets. WHO, along with other quadripartite organizations, is also producing awareness-raising toolkits to strengthen engagement of priority stakeholders like youth, media and policymakers. It has created mechanisms such as the WHO Taskforce of AMR Survivors[21], the Quadripartite Working Group on Youth Engagement for AMR[22] and supports the Global AMR Media Alliance[23]. WHO is also strengthening the integration of AMR in formal education in primary, secondary and tertiary institutions through the development of curriculum-based tools and advocacy resources, as well as work to improve country-level capacities to conceptualize, plan, implement and evaluate awareness, education and advocacy initiatives on AMR, so global interventions can be replicated within national contexts. Building on these successful initiatives, WHO will expand awareness-raising efforts to newer audiences such as community health workers, women's groups, teachers, professional associations and other civil society organizations. WHO will also design new awareness tools to support influential stakeholders following the second UNGA HLM on AMR and fourth Ministerial Meeting on AMR in 2024. WHO is also working to improve country-level capacities to conceptualize, plan, implement and evaluate awareness, education and advocacy initiatives on AMR, so that global interventions are replicated within national contexts.

Glossary

Access, Watch, Reserve (AWaRe) Classification	The AWaRe classification of antibiotics assigns them into three groups, *Access, Watch* and *Reserve*, according to their risk of emergence of resistance. It helps defining targets and monitoring the effects of policies to optimize antibiotic use and curb antimicrobial resistance.[24]
Antimicrobial Resistance (AMR)	Phenomenon by which bacteria, viruses, fungi and parasites change over time and no longer respond to medicines.
Bacteria Priority Pathogens List (BPPL)	A WHO list that updates and refines the prioritization of antibiotic-resistant bacterial pathogens to address the evolving challenges of antibiotic resistance. It informs research and development and public health interventions. As of 2024, the BPPL covers 24 pathogens.[25]
Global Antimicrobial Resistance and Use Surveillance System (GLASS)	GLASS provides a **standardized approach** to the collection, analysis, interpretation and sharing of data on AMR and antibiotic use and by countries.[26]
Infection prevention and control (IPC)	IPC is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infections. Without effective IPC it is impossible to achieve quality health care delivery.[27]
Medically important antimicrobials (MIA)	The WHO MIA is a risk management tool developed in collaboration with FAO, UNEP, and WOAH. It identifies antimicrobials for which use in non-human sectors can impact on AMR in humans. The list complements the WHO AWaRe framework.[28]
National Action Plan (NAP) for AMR	NAPs for AMR are developed by the health sector and others prevent and address AMR.[29]
One Health	One Health is an integrated approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.[30]
Tracking AMR Country Self-assessment Survey (TrACSS)	TrACSS is a joint FAO, WOAH, WHO and UNEP platform that monitors annual country progress in the implementation of their AMR NAP.[31]

20. WHO. (2024). World AMR Awareness Week. <https://www.who.int/campaigns/world-amr-awareness-week>
21. WHO. (2024). *Task Force on AMR Survivors – About.* <https://www.who.int/groups/task-force-of-amr-survivors>
22. QJS. (2024). *Quadripartite Working Group on Youth Engagement for AMR.* <https://www.qjsamr.org/technical-work/working-group-on-youth-engagement>
23. Global AMR Media Alliance. (2024). *Homw.* <https://www.amrmedia.org/>
24. WHO. (2024). *AWaRe classification of antibiotics for evaluation and monitoring of use, 2023.* <https://www.who.int/publications/i/item/WHO-MHP-HPS-EML-2023.04>
25. WHO. (2024). *WHO bacterial priority pathogens list, 2024.* <https://www.who.int/publications/i/item/9789240093461>
26. WHO. (2024). *Global Antimicrobial Resistance and Use Surveillance System.* <https://www.who.int/initiatives/glass>
27. WHO. (2024). *Infection prevention and control – Overview.* <https://www.who.int/health-topics/infection-prevention-and-control#tab=tab_1>
28. WHO. (2024). *WHO publishes the AHO Medically Important Antimicrobials List for Human Medicine.* <https://www.who.int/news/item/08-02-2024-who-medically-important-antimicrobial-list-2024>
29. WHO. (2016). *Global action plan on antimicrobial resistance.* <https://www.who.int/publications/i/item/9789241509763>
30. WHO. (2024). *One Health – Overview.* <https://www.who.int/health-topics/one-health#tab=tab_1>
31. WHO. (2023). *Tracking AMR Country Self-assessment Survey – TrACSS (7.0) 2023.* <https://www.who.int/publications/m/item/tracking-amr-country-self-assessment-survey-tracss-(7.0)-2023>