

CHAPTER SIXTEEN

Global Antimicrobial Resistance Surveillance: Advocating for a sustainable future

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Abstract

Antimicrobial resistance (AMR) causes treatment failures, prolonged sickness, and higher mortality. The integration of a "One Health Approach" in the human, animal, and environmental health sectors through multisectoral collaboration is vital for AMR surveillance. This review highlighted the current AMR surveillance efforts. Tracking the trends of resistant infections across populations and regions is made easier by advocating sustainable educational initiatives of AMR surveillance. Some ongoing surveillance efforts include "the World AMR Awareness Week (WAAW), the Global Antimicrobial Resistance and Use Surveillance System (GLASS), the ResistanceMap, and the UK's Fleming Fund". The WHO's GLASS offers a unified framework for countries to track the progress of existing and emerging national surveillance systems.

Keywords: Global Antimicrobial, Resistance Surveillance, Sustainable, Future

Introduction

Tenmillion deaths worldwide would result from antibiotic resistance by 2050 if the current trend of inappropriate and excessive antibiotic use continues (Pulingam *et al.*, 2022). Antimicrobial resistance, a notable health concern that occurs when microbes (bacteria, viruses, fungi, and parasites) evolve mechanisms that protect them from the effects of antimicrobials (including antibiotics, antifungals, antivirals, and antiparasitics), enabling them to thrive (Ahmed *et al.*, 2024). These resistant microorganisms can spread and infect people, plants, and animals. "The overuse and abuse of antibiotics in various industries have led to the evolution of resistant bacteria, which is a primary

cause of antimicrobial resistance (AMR), a serious global health concern" (Ahmed *et al.*, 2024).

Surveillance of antimicrobial resistance is a fundamental action to inform efforts to handle the spread of AMR through the generation of evidence for local, national, and global guidance and action plans (Lim *et al.*, 2021). "AMR surveillance involves the collection, validation, interpretation, and reporting of susceptibility data" (Lim *et al.*, 2021).

The introduction of the "One Health Approach" calls for a worldwide cooperative effort involving several disciplines, including the "World Organisation of Animal Health (WOAH, formally OIE) and the Food and Agriculture Organisation of the United Nations (FAO), to guarantee that each agency operates within its area of expertise and with other agencies to minimise the possible effects of AMR" (Tang *et al.*, 2023).

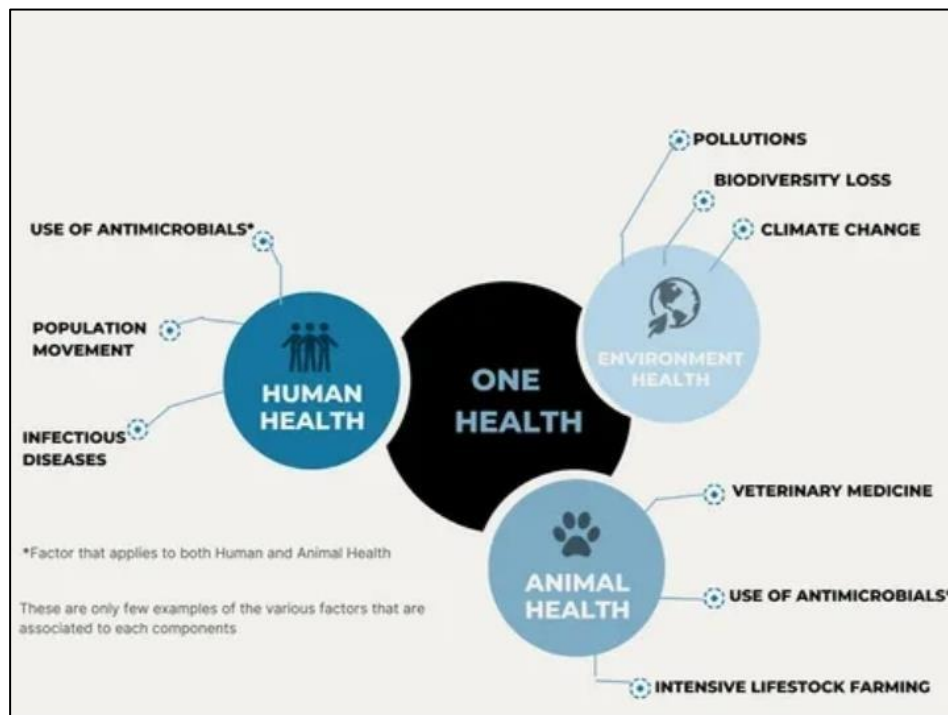


Figure 1: The concept of the One Health Approach (Tang *et al.*, 2023)

Current AMR Surveillance Efforts

In 2015, the World Health Organisation (WHO) introduced the Global Action Plan on Antimicrobial Resistance (GAP AMR) to combat the growing global danger of antimicrobial resistance (AMR) (Khouja *et al.*, 2022)

- Improve awareness and understanding (WHO, 2020).
- Strengthen knowledge through surveillance & research (WHO, 2020).
- Reduce the incidence of infection (WHO, 2020).
- Optimize the use of antimicrobial medicines (WHO, 2020).
- Ensure sustainable investment (WHO, 2020).

World AMR Awareness Week (WAAW)

The World AMR Awareness Week (WAAW), formerly called the World Antimicrobial Awareness Week, is celebrated from the 18th to the 24th of November every year to improve awareness and understanding of antimicrobial resistance (Sharma *et al.*, 2024). In the year 2024, the World Antimicrobial Awareness Week was themed “Educate. Advocate. Act now.”

The theme aimed to raise awareness and understanding of antimicrobial resistance (AMR) and promote best practices among "One Health" stakeholders to reduce the emergence and spread of drug-resistant infections (Sharma *et al.*, 2024).

The Global Antimicrobial Resistance and Use Surveillance System (GLASS)

The World Health Organisation (WHO) launched the Global Antimicrobial Resistance and Use Surveillance System (GLASS) after creating the Global Action Plan for managing AMR (GAP-AMR) to continuously fill in the knowledge gaps and accomplish the objectives "strengthen knowledge through surveillance and research" of the GAP-AMR program (WHO, 2021). On the 22nd of October 2015, the World Health Organisation (WHO) launched the Global Antimicrobial Resistance and Use Surveillance System (GLASS) to standardise the surveillance of antimicrobial resistance (AMR) (WHO, 2020). GLASS offers a standardised method for data collection, analysis, interpretation, and exchange among nations (WHO, 2020).

The various types of AMR-related surveillance activities led by GLASS are

grouped into a series of technical modules (WHO, 2020). These modules comprise surveillance activities built on routinely available data (for example, patient samples collected for clinical purposes or national sales of antimicrobials) and focused activities targeted at generating information for specific purposes, based on the needs of countries and regions (WHO, 2020). GLASS is also engaged in the design and implementation of surveys and studies aimed at helping countries to achieve a better quality and representativeness of their data (WHO, 2020). Furthermore, GLASS provides support, including evidence-based guidelines and technical documents, to assist countries and regions in building capacity and take appropriate and timely corrective actions (WHO, 2020).

The GLASS IT platform (<https://extranet.who.int/glass/portal/>), launched by the World Health Organization (WHO) in 2016, was designed for global data on antimicrobial resistance (AMR), Antimicrobial consumption (AMC), and Antimicrobial use (AMU), and also functions as a central platform for data sharing (WHO, 2020). Most of the IT components of GLASS's technical modules are hosted on this platform. Since its initial release, new analysis and export features have been added, improving its capabilities. Countries, territories, and regions can generate and export reports with graphical data representations and verify their accuracy using multiple metrics through data visualization (WHO, 2020). The user interface has been redesigned to offer a more straightforward, user-friendly, and intuitive experience (WHO, 2020).

ResistanceMap

In 2010, the ResistanceMap was created to help guide policies tackling antimicrobial resistance (AMR) by the Centre for Disease Dynamics, Economics & Policy (now One Health Trust) (Kapoor, 2021). It is an interactive global network that monitors changes in antibiotic use and resistance, offering vital information for public health initiatives (Kapoor, 2021). Antimicrobial resistance (AMR) and antibiotic use patterns in nations worldwide, including some "low- and middle-income countries (LMICs)", can be interactively explored with ResistanceMap (a web-based set of data visualization tools) (Kapoor, 2021).

UK's Fleming Fund

The Fleming Fund, supported by the UK Department of Health through its UK Aid, overseas development assistance programme, is one of the most

important multinational efforts aimed at enhancing AMR and AMC surveillance in "low- and middle-income countries (LMICs)" (Frost *et al.*, 2021). The Fund takes a One Health approach and promotes surveillance activities at institutional, national, and regional levels through a £265 million investment (Frost *et al.*, 2021). The Fleming Fund's initiatives complement and support existing AMR strategies, including national action plans, antimicrobial stewardship programmes, the development of empirical treatment guidelines, and regional frameworks such as the African Union's AMR control framework (Frost *et al.*, 2021). Through various national and regional grants and programmes, the UK's Fleming Fund intends to establish sustainable AMR surveillance systems in over 30 countries across both Asia and Africa, while also encouraging cooperation among governments, the private sector, NGOs, academia, and the pharmaceutical and research communities (Frost *et al.*, 2021).

Challenges Faced by Antimicrobial Resistance Surveillance Systems in the World

Data gathering and aggregation are extremely difficult tasks since information systems are frequently paper-based (Frost *et al.*, 2021).

The funding of AMR control activities is "sector-specific" and mainly focused on human health. AMR control initiatives in non-human health domains are either "underfunded or undeveloped" in several LMICs (Frost *et al.*, 2021).

The challenges are severe in low-income environments due to inadequate communications and laboratory infrastructures, limited resources, a shortage of skilled and qualified personnel, and a variety of behavioural and socioeconomic factors that contribute to resistance (Iskandar *et al.*, 2021). "The quality and dependability of pathogen identification and antimicrobial susceptibility testing might be impacted by inadequate laboratory infrastructure" (Iskandar *et al.*, 2021).

The underestimated impact of AMR is due to the weak connections between the environmental, animal, and human health sectors. This could be the result of conflicting political and economic objectives (Frost *et al.*, 2021).

Due to inadequate continent-wide AMR surveillance data, gaining a complete understanding of the extent and impact of antimicrobial resistance (AMR) in

Africa remains a significant challenge. Although country data are available, they are not regularly gathered, disseminated, or acknowledged by national bodies, which restricts their ability to impact national policies (Okolie *et al.*, 2023).

Strategies for Sustainable Antimicrobial Resistance Surveillance Systems

A key factor in determining the long-term success of AMR monitoring systems is ensuring financial sustainability. Finding outside finance through trusts and other funds has been the main strategy used in the literature to get beyond financial obstacles (Do *et al.*, 2023).

Legal underpinnings (legal principles, laws, and precedents) for surveillance must be investigated to enhance surveillance systems and promote stakeholder cooperation where obstacles might exist (Do *et al.*, 2023).

Accelerated implementation of one health national action plans must be at the heart of the global response to antimicrobial resistance (WHO, 2020). The establishment of good monitoring systems necessitates strong political will, capacity building, standardisation of procedures, tight coordination between all stakeholders, and a One Health approach (Frost *et al.*, 2021).

Conclusion

Antimicrobial resistance causes treatment failures, longer sickness, and higher death, making it one of the WHO's top 10 worldwide public health challenges. It has a substantial financial impact on economies and healthcare systems. An integrated strategy is essential to address the escalating issue of antimicrobial resistance (AMR). This involves optimising antibiotic usage in healthcare environments, enhancing infection prevention and control measures, fostering innovation in antimicrobial drug discovery through dedicated research efforts, and educating both healthcare providers and the public on the critical importance of responsible antimicrobial stewardship. Working together to address this global problem can effectively slow the spread of antimicrobial resistance and maintain the effectiveness of the antimicrobial chemotherapies currently in use. Global cooperation, more funding, and ongoing political commitment are needed to combat AMR. In the battle against AMR, surveillance is essential since it allows for progress tracking and focused treatments.

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