Antimicrobial resistance prevention and education in schools

A brief for education policy-makers and school practitioners

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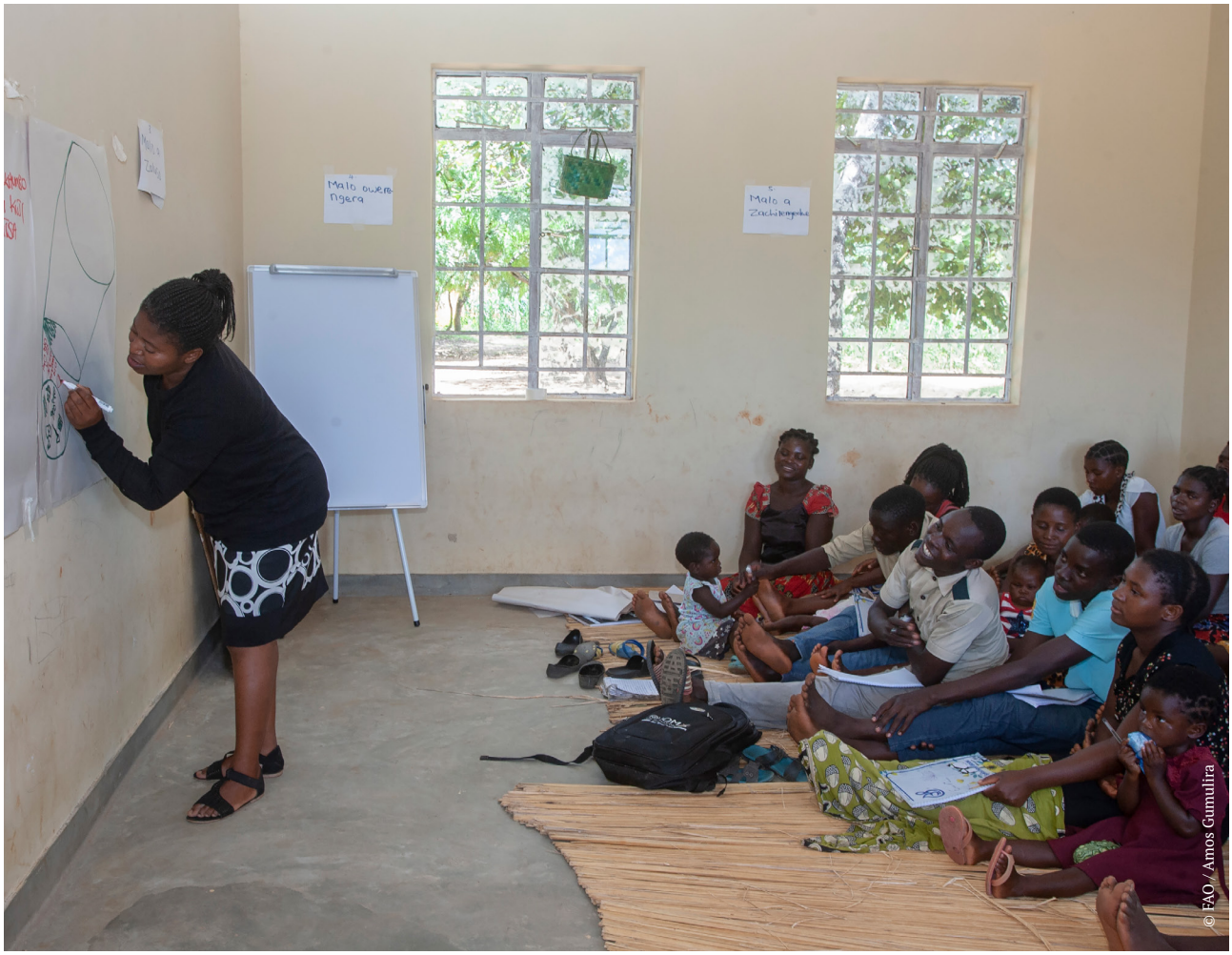
Introduction

Antimicrobial resistance (AMR) poses a threat to global health, food security and achieving the 2030 Sustainable Development Goals (SDGs). It is estimated that bacterial AMR was directly responsible for 1.27 million deaths worldwide in 2019 and contributed to 4.95 million deaths (1). Tackling AMR is critical to preserving the world's ability to treat diseases in humans, animals and plants, reduce risks to food safety and security, protect the environment and maintain progress towards achieving the SDGs.

This brief highlights the critical role of schools in the response to AMR and actions for school practitioners to consider. Implementing the strategies described below could contribute significantly to preventing and mitigating the development and spread of AMR and promoting overall health and well-being in school communities.



2022, Mchinji District, Malawi – Sellah Nkhwazi, an Agriculture Extension Development Officer at Mchinji District Agriculture Office, teaches teen mothers, adolescent girls and some boys about the importance of having personal and community short- and long-term development visions, at Mnkhomba Junior Farmer Field Life School (JFFLS).

What are the benefits of addressing AMR in schools?

- Healthy students with less likelihood of infections through simple actionable behaviour change.
- Promoting healthy, sustainable school environments and reducing the spread of resistance among humans, animals and environments.
- Educating future generations in systems-thinking for responsible antimicrobial use and disposal for long, healthy lives and a healthy planet.
- A path to financial security, stable employment and social success.
- Sparking curiosity and interest in scientific research, including investigation and innovation in the fields of science and health.
- Raising awareness about the importance of stewardship on use of antimicrobials and the interdependence of humans, animals and the environment.
- Mobilizing students to be agents of change within their families and in society to increase reach and impact.
- Contributing to global health security and environmental protection.

Antimicrobials – including antibiotics, antivirals, antifungals and antiparasitics – are medicines used to prevent and treat infectious diseases in humans, animals and plants. Antimicrobial medicines are the cornerstone of modern medicine, improving the health of humans and animals and extending years of life (2).

AMR occurs when bacteria, viruses, fungi and parasites no longer respond to antimicrobials. As a result of drug resistance, antibiotics and other antimicrobial medicines become ineffective, and infections become difficult or impossible to treat, increasing the risk of disease spread, severe illness, disability and death. Resistance can develop and spread in and among animals, humans, plants and the environment. While AMR is a natural process, it is accelerated by preventable human behaviour, mainly:

- misuse and overuse of antimicrobials;
- poor infection prevention and control; and
- pollution and poor sanitation, including poor management of solid waste, water and wastewater (3).

What is the impact of AMR?

- AMR affects countries in all regions and at all income levels; however, low- and middle-income countries bear the brunt of AMR, and children are particularly vulnerable (4). AMR's drivers and consequences are exacerbated by poverty and inequality, poor access to health services, lack of sanitation and poor hygiene (3).
- AMR also reduces productivity in farming, threatens food security and negatively impacts the health and well-being of animals (5).
- AMR has significant costs for both health systems and national economies overall. For example, it creates requirements for more expensive medicines and intensive care, affects the productivity of patients or their care givers due to prolonged hospital stays and harms agricultural productivity (3).

"As a patient, I didn't know what AMR was when I fought to survive it. I had an antibiotic-resistant infection that left me with a facial disfigurement. I wish AMR had been common knowledge back then, so that I could have played a more active role. We're not all scientists, but grasping the fundamental principles of AMR in our daily lives from an early age could significantly impact how we approach infection prevention, including responsible use of antibiotics and other antimicrobial medicines, vaccinations and hand hygiene. Education, even at a basic level, could save lives."

- Vanessa Carter, Chair, WHO Taskforce of AMR survivors

Why invest in AMR education?

Misuse and overuse of antimicrobials are linked to human health, agri-food production and animal health, including that of companion animals (3). Addressing AMR through education prepares students for understanding infections and the importance of prevention, including of infection and pollution, appropriate and rational antimicrobial use and disposal and improved hygiene practices (6).

- Investing in AMR education for children and adolescents will influence their decisions now and in the future, to preserve the efficacy of antimicrobials not only for themselves but for their families and communities while protecting the planet.
- Children and adolescents have a direct impact on their families and communities and can be champions in disseminating messages widely through, for example, social media.
- Educating pupils in schools about AMR can contribute to breaking the cycle of antimicrobial misuse and overuse, thus building a healthy future and empowering children and adolescents to reverse the trend.

139 of 177

countries surveyed (78%) in 2023 reported that primary and secondary schoolchildren do not receive education on AMR.

Quadripartite Global Database for Tracking AMR Country Self-assessment Surveys (TrACSS) (7). 2023

How can schools address the drivers of AMR?

The following actions can be adopted by schools to help reduce the use of antimicrobials and minimize the emergence and spread of AMR:

- **Promotion of hygiene, sanitation and efficient waste management:** Ensure access to clean water, hand hygiene, menstrual hygiene and proper sanitation in schools to prevent infections and reduce antimicrobial waste (8). Good hygiene is essential to prevent the spread of all infections, including those that are resistant to antimicrobials (9).
- **Education on health and the environment:** Integrate AMR education into school curricula, facilitating, for example, understanding of the microbial world around us and practical infection prevention; emphasizing the importance of using antimicrobials when and as prescribed by a qualified health professional; and responsible pet ownership by learning about antimicrobial use and disease prevention in animals. Cover other topics, such as sexual and reproductive health to prevent sexually transmitted infections, which also affect the use of antimicrobials. Moreover, understanding the interconnectedness and interdependence of the health of humans, animals, plants and the wider environment will show them the co-benefits of protecting the environment by reducing pollution (10).
- **Vaccination promotion:** Encourage vaccination of students according to nationally recommended schedules to reduce infections and thereby the need for antimicrobials (11).
- **Food safety:** In regions where schools provide meals to students, adopt best practices in food preparation and avoid procuring products made with routine use of antimicrobials (12).
- **Empowerment through interactive education:** Educate students about health and disease and responsible antimicrobial use and disposal. Engage students through gardening and farming to learn about the environmental microbiome, stewardship of resources and sustainable living (10). Strengthen the capacities of schoolteachers to deliver high-quality education on health and the environment with interactive approaches (6).
- **Encourage students to talk about health, animals, plants and the environment:** Open discussions, student clubs, experience-sharing sessions or competitions give students platforms to express their opinions and ideas about health, infections and hygiene, including appropriate use and disposal of medicines, pollution prevention, biosecurity and biosafety measures and AMR (6). Such discussions should be facilitated by trained school professionals to ensure that the information is accurate and based on evidence. Emphasis should be on the importance of seeking medical advice from health-care providers for proper diagnosis and treatment of illnesses (2).
- **Encourage commemoration of related health and environment days,** such as World Hand Hygiene Day, World Toilet Day, World AIDS Day, World Environment Day and World Water Day, and incorporate AMR education, including during World AMR Awareness Week.
- **Promote research and use of art, including drama, poetry and song,** as effective, engaging awareness-raising strategies for students and student communities (10).

What key learning objectives and topics can be integrated into curricular or extracurricular activities in schools?

The key learning objectives and topics for AMR education are summarized in the table below, which can be adapted for different age groups and can include relevant subjects such as environment, science, biology and/or health. Interactive activities, such as experiments, discussions and project work can enhance understanding and engagement of schoolchildren on this critical topic (6).

Learning objective	Key topics
1. Understanding microorganisms	• Introduction to bacteria, viruses, fungi and parasites • Appreciating the value of a diverse microbiome and understanding that only certain microbes cause disease • Basic principles of infection, including the germ theory of disease
2. Basics of antimicrobials	• What are antimicrobials, and how do they work? • The differences between antibiotics, antivirals, antifungals and antiparasitics • Uses of antimicrobials in human, animal and plant health • Importance of prescription of antimicrobials by health-care or animal-health professionals • Importance of pollution, waste and wastewater in the environment
3. What is AMR and its impact?	• Explanation of how and why microorganisms become resistant to antimicrobials • Importance of collective action to address the issue (e.g. drawing parallels with the climate crisis) • Global and local impact of AMR (e.g. increased morbidity and mortality due to resistant infections and economic and health-care impacts)
4. Main causes of AMR	• Overuse and misuse of antimicrobials in humans, animals and plants and their discharge into the environment • How poor sanitation and hygiene can lead to AMR • Use of antimicrobials for growth promotion in animals • Spread of antimicrobial residues and resistant microbes in the environment

5. Prevention of Infections and AMR	• Safe drinking-water, food safety and pathways of infection transmission • Pollution prevention and control, waste management • Sexual and reproductive health, including sexually transmitted infections and menstrual hygiene • Importance of hygiene (hand, respiratory and oral hygiene, animal and farm hygiene, environmental hygiene) • Vaccination and its role in preventing infections in both humans and animals • Use of treated manure
6. Responsible use of antimicrobials	• When to use antimicrobials and when not to • Importance of following the advice of health-care professionals on antibiotic use • Safe disposal of antimicrobials
7. Global and local responses to AMR (secondary school only)	• Role of governments and policy in AMR prevention and control, including local initiatives (e.g. local hospitals or primary health care centres) • Introduction of the One Heath approach and multisectoral action • Overview of global and regional initiatives on AMR
8. The role of everyone in the response to AMR	• How students and families can contribute to preventing and controlling AMR • Importance of awareness-raising and advocacy, including peer–peer education, sensitization of families and the broader public
9. Future challenges and research (secondary school only)	• Research on new antimicrobials and alternatives • Research on the significance of AMR to the environment, including links to the climate crisis • Importance of scientific innovation in tackling AMR

Call to action

- Schools and school systems should adopt a holistic approach to AMR, encompassing health education, environmental education, safe drinking-water, sanitation, promotion of good hygiene practices, food safety, environmental sustainability (e.g. waste management) and community engagement.
- Policy-makers and school systems, including school practitioners, must provide the necessary resources and support for implementing AMR-related measures and programmes in schools, including use of interactive learning and formal incorporation of AMR education into school curricula.
- Civil society organizations should support learning on AMR in schools through educational tools, resources and incentives.
- Health workers, especially in primary health care, must provide guidance and empower school administrators for effective delivery of a multisectoral curriculum on AMR in schools.

2021, Barskoon, Kyrgyzstan – Two girls – students of Zhamilya's embroidering lessons.

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Annex

Approach to development

A review of literature was undertaken to identify relevant background information and potential interventions relating to antimicrobial resistance (AMR) in the context of schools, including primary and secondary schools. Priority was given to publications over the past decade. This review included UN agency documents suggested by the Quadripartite (FAO, UNEP, WHO and WOAH) and UNESCO and UNICEF. The policy brief was also designed with a simplified format, based on lessons learned from the Health Promoting Schools' topic briefs led by UNESCO, UNICEF and WHO. The draft document was developed and reviewed by all six organizations both at HQ and regional levels, as well as key expert peer reviewers with expertise particularly in AMR education. This robust review aimed to ensure that the content, language, and tone was appropriate for the audience.

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