Status of antimicrobial resistance education and awareness in the WHO African Region

2017-2021

World Health Organization
African Region

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Contents

Abbreviations

AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
AMU	Antimicrobial use
ARD	Assistant regional director
ASA	Antimicrobial stewardship and awareness
CE	Community engagement
CPA	Commonwealth Pharmacists Association
CPD	Continuing professional development
DRASA	Dr Ameyo Stella Adadevoh
EIC	Education, information and communication
FAO	United Nations Food and Agriculture Organization
GDP	Gross domestic product
HCW	Healthcare worker
WOAH	World Organization for Animal Health
IPC	Infection prevention and control
KAP	Knowledge, attitude and practices
MICAT	Ministry of Information, Culture and Tourism
LMIC	Low- and middle-income countries
NAP	National action plan
SDG	Sustainable development goals
TrACSS	Tracking AMR country self-assessment survey
WAAW	World AMR awareness week
WASH	Water, sanitation and hygiene
WHO	World Health Organization

Foreword

Antimicrobial resistance (AMR) was declared by the World Health Organization (WHO) as one of the top 10 health threats facing humanity. The effects of AMR are far-reaching as it cuts across sectors and affects food safety, nutrition security, livelihoods, environment and, consequently, attainment of several sustainable development goals (SDGs). To address this global threat, the World Health Organization developed the global action plan (GAP) on AMR, upon which Member States of the WHO African Region developed context-specific, one health AMR national action plan (NAP). A key aspect highlighted in both the GAP and country-specific NAPs is the need for improved awareness and understanding of antimicrobial resistance through effective communication, education, training and sharing of best practices on behaviour change interventions. However, AMR education and awareness interventions remain inadequate in the African Region, despite Member States having been implementing their AMR NAPs for close to five years now.

One of the documented major drivers of AMR is the misuse and overuse of antimicrobial medicines across the human, animal, and environmental sectors. A crucial step in addressing misuse and overuse of antimicrobials is identifying barriers to implementation of targeted and context-specific interventions that are pivotal for understanding the threat posed by AMR and crucial in promoting effective antimicrobial use behaviour change, which is the focus of this baseline report.

The report highlights AMR education and awareness efforts by Member States of the WHO African Region between 2017 and 2021, success stories, key deficiencies, and gaps in education and awareness efforts in the region, as well as areas that require urgent strengthening to ensure effective

and impactful outcomes.
Through this baseline report, we hope that strategic interventions will be initiated with the long-term goal of ensuring sustainable and impactful AMR education and awareness that will promote an overarching understanding of the threat posed by AMR, as well as judicious use of the diminishing arsenal of antimicrobials across all levels and sectors of society. Antimicrobials, a shared resource, form the corner stone of a strong primary care and resilient health system. We must all therefore stand committed through our public health leadership mandate to support Member States to effectively mitigate the AMR threat in the African Region, and the world at large.

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Executive summary

Antimicrobial resistance (AMR) is not only a public health security threat; it is a quintessential development issue given the reach of its negative impact and its adverse effects on the poor and the vulnerable, most especially in the African Region. It has the potential to reverse the gains made in the fight against infectious diseases and undermine our efforts in achieving universal health coverage (UHC) and related regional priorities. Globally, it is projected that by 2050, there will be an estimated 11% loss in livestock production and health consequences, and the economic costs of AMR will be 10 million annual human fatalities and 2-3.5 percent decrease (equivalent to USD 100 trillion) in global gross domestic product (GDP) respectively. Recognizing the threat of AMR and its impact on morbidity, mortality and disability, as well as the subsequent socio-economic consequences, the World Health Organization (WHO), in collaboration with the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (WOAH) have developed an AMR global action plan (GAP) and signed a tripartite agreement whose objective is to foster concerted efforts aimed at combating the threat of AMR at global level. The GAP serves as a blueprint for Member States to develop one health and context-specific AMR NAPs.

Strategic Objective 1, highlighted in the GAP, seeks to improve awareness and understanding of antimicrobial resistance through effective communication, education, and training. It calls for increased national awareness of AMR, targeting different audiences in human health, animal health and agricultural practices, establishing AMR as a core component of professional education, training, certification, and development across sectors, as well as including antimicrobial use (AMU) and resistance in school curricula so as to promote better understanding, awareness, and behaviour changes in the community. Improving AMR awareness and understanding and promoting expert-driven behavioural change through effective communication, education and training are critical to tackling the global threat of AMR, given that one of the key AMR drivers is the misuse and overuse of antimicrobial medicines.

While there is global awareness of the key AMR drivers, designing and implementing

policies to address these critical issues need to consider many different factors. Key among these factors is the 'one health approach' since the various sectors (human, animal, and environmental health) need to take responsibility for both policymaking and implementation to ensure that AMR containment efforts are impactful.

This baseline report outlines the status of AMR education and awareness in the WHO African Region, Member States' actions to date, and existing gaps between 2017 and 2021. Furthermore, the report acknowledges the challenges faced by Member States in the implementation of AMR education and awareness interventions, key among them being capacity for crafting/designing/ positioning of coherent AMR awareness messages and sustainable financing. It further makes recommendations on non-cost intensive interventions that can be implemented to address the identified gaps.

Introduction

1

Antimicrobial resistance (AMR), often referred to as the "silent pandemic", has emerged as one of the principal public health challenges of the 21st century. It is a multifaceted tragedy that threatens effective prevention and treatment of a wide range of infections caused by bacteria, parasites, viruses, and fungi across sectors due to its interdependent sector dimensions. Antimicrobial resistance also impacts sustainable food production and undermines global efforts in achieving universal health coverage (UHC)and the sustainable development goals (SDGs) [1,2,3]. The 2022 Lancet report from the global research on antimicrobial resistance (GRAM) estimated that in 2019, 4.95 million deaths were associated globally with bacterial resistance and 1.27 million deaths were directly attributable to bacterial resistance [4]. The 2015 O'Neil report estimated that in 2050, up to 10 million deaths per year will be attributed to AMR if nothing is done to address it [5]. In response to this global threat, the World Health Organization (WHO) developed a global action plan (GAP) on AMR, which was endorsed by the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (WOAH) and serves as a blueprint for country-specific AMR multisectoral national action plans (NAPs). The GAP

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highlights five strategic objectives, the first being the need to improve awareness and understanding of antimicrobial resistance through effective communication, education, and training. This is the umbrella for the other four strategic objectives highlighted in both the GAP and country-specific AMR NAPs [6,7]. The GAP mainly calls for increased national AMR awareness, targeting different audiences in human health, animal health and agricultural practices, establishing AMR as a core component of professional education, training, certification and development across sectors, as well as including antimicrobial use (AMU) and resistance in school curricula to promote better understanding and awareness [7]. Improving AMR awareness and understanding and promoting evidence-driven behavioural change through effective communication, education and training are critical to tackling global AMR threat as this will influence appropriate antimicrobial use and consumption in the community and healthcare institutions. Antimicrobial use and misuse in the animal, human, and environmental sectors and the spread of resistant pathogens and resistance determinants within and between sectors have been cited as major AMR drivers [3]. This is because AMR education and awareness interventions on prudent use of antimicrobials in the different target audiences still constitute a major gap in the AFRO Region [8,9], although AFRO Member States have been implementing their AMR national action plans for close to five years now. This is mainly because countries have for the most part focused their education and awareness activities on the commemoration of the world antimicrobial awareness week (WAAW), a week set aside annually to increase AMR awareness and encourage best practices among the general public, health workers, policy-makers and other stakeholders so as to avoid further emergence and spread of drug-resistant infections. These are usually small-scale AMR campaigns scattered around different sectors, as evidenced by the results of the 2017-2021 tracking AMR country self-assessment survey (TrACSS) (Table 4) and the AMR education and awareness baseline survey results (Table 3). However, periodic interventions and efforts are inadequate to impact in a way that would trigger sustainable behavioural change towards AMU.

To address the gap in AMR education and awareness in most of the Member States of the WHO African Region, there is need for long-term sustainable approaches to implementing the education and awareness pillar so as to guarantee effective communication of AMR risks and develop and implement tools and evidence that enable socio-anthropological context-driven interventions for effective behaviour change [6,10].

Assessing and understanding the status of AMR education and awareness in the region therefore becomes paramount as it will pave way for priority interventions to be instituted. This report provides a baseline analysis of AMR education and awareness in the region, as well as proposes recommendations and interventions that can help Member States strengthen efforts towards addressing NAP objective 1.

Setting the scene / background

The emergence of AMR is a multifaceted problem with one of its main causes being the inappropriate use of antimicrobial medicines. Antimicrobial use is influenced by knowledge, expectations/attitudes, and interactions of prescribers and patients, economic incentives, characteristics of the health system, and the regulatory environment [11]. It is therefore necessary to carry out coordinated interventions that concurrently target the behaviour of providers and patients and change important features of the environment in which they interact [11]. The AMR global action plan, upon which country-specific AMR NAPs are premised, highlights education as one of the key strategies for addressing AMR, with emphasis on establishing AMR as a core component of the education for human, animal, and plant health professionals and as part of the school education curricula [7]. However, very few countries in the region (Benin, Burkina Faso, Democratic Republic of Congo, Ethiopia, Eswatini, Guinea, Kenya, Namibia, Niger, Rwanda, South Africa, and Uganda) have incorporated AMR in the core curricula for graduating veterinarians and veterinary paraprofessionals in some educational institutions, thereby creating a gap in practice [12]. AMR education has been

focused more on the human health sector, i.e., healthcare professionals, with a few ad hoc training courses available for veterinary-related professionals, even though studies have documented that all-inclusive AMR education is important for maximum impact [6,13]. Integrating AMR-related topics in pre-service training for health workers across all the relevant professional sectors is an essential and cost-effective intervention that allows for exposure to key topics and strengthens AMR education in pre-service training for pharmacists and other professionals of health-related disciplines [11].

There are many challenges to understanding the exact burden of AMR in developing countries, particularly inadequate AMR surveillance, inadequate laboratory services and infrastructure, poor quality control of test reagents and protocols, non-effective regulation, and irrational use of medicines [11,13]. As much as reforms are needed in the above-mentioned areas, it is also important to assess how many people are aware of AMR consequences and what can be done to address it to better inform priority areas because for resource-limited situations, education and improved knowledge precede all else [11].

“Integrating AMR-related topics in pre-service training for health workers across all the relevant professional sectors is an essential and cost-effective intervention that allows for exposure to key topics and strengthens AMR education in pre-service training for pharmacists and other professionals of health-related disciplines [11].”

Results of the countries' survey conducted as part of collecting baseline information on education and awareness in the African Region (Table 3) show that activities undertaken to address objective one are confined to the world antimicrobial awareness week (WAAW) and these are focused on awareness walks and distribution of AMR awareness materials, radio and television programmes, debates for education institutions, as well as AMR orientation programmes for media personnel, prescribers, and farmers.

The 2017 WAAW saw several countries joining the global community in the commemorations. For instance, several activities were pioneered into the Liberian communities such as public awareness using simplified English on mass media, including the Liberia Broadcasting System, United Nation Missions in Liberia Radio, and the Ministry of Information, Culture and Tourism's (MICAT) weekly press conference [14].

Over the years, WAAW commemoration has steadily improved with more countries in the region taking part and facilitating activities aimed more at public sensitization and community engagement (Table 3).

Some member countries such as Benin, Botswana, Namibia, and Zambia have also endeavoured to go beyond the WAAW in their awareness efforts and have had regular television and radio AMR phone-in programmes and AMR media awards to encourage reporting on AMR and appreciate media houses and individual reporters who have been championing AMR awareness.

The adoption of the AMR agenda by professional associations is also a notable marker of progress in education and awareness efforts in the region. A case in point is the partnership between the Commonwealth Pharmacists Association (CPA), the University of Reading, and the Rwanda Community Pharmacists Union in 2018 leading to the production of essential educational resources and tools, under the “Beat bad microbes in Rwanda campaign” that helped community pharmacists in raising the much-needed awareness and education in the community [15].

However, despite efforts by African Region Member States to improve AMR awareness and education, more still needs to be done as shown by several studies conducted in some countries in the region. An assessment of the knowledge and beliefs of practicing health professionals across 13 hospitals in the Amhara region in Ethiopia indicated an AMR knowledge gap among practising health professionals, [16]. Mufwambi et al (2021) also documented the same low AMR knowledge among practising personnel in the Zambian setting [17]. Furthermore, a similar assessment was conducted for in-training personnel such as medical students, pharmacy students' and paramedical students; the results showed poor AMR knowledge, suggesting that incorporation of an AMR syllabus for university students and in-training professionals could be an excellent approach to improving awareness and curbing AMR [18,19]. Similar studies carried out in Ghana, Tanzania, and Uganda also documented similar results, confirming the fact that widespread AMR knowledge is at an embryonic stage in low middle-income countries (LMICs) [20,21,22].

A population-based survey conducted in Ghana revealed low knowledge of the patient spectrum, especially those of lower education status [23]. In addition, studies on knowledge, attitude, and practices (KAP) conducted in Tanzania documented alarmingly low KAP scores due to the education level of the participants who were from rural districts [21]. This is an indication that Member States need urgent

actions, particularly policy formulation and planning of community-based mitigation measures, given that the majority of people in the African Region constitute the rural population. Similar studies conducted in Cameroon, Mozambique, Namibia, and South Africa indicated suboptimal public knowledge and behaviour of antimicrobials and their use. The results were a clear indicator that more research needs to be conducted on how people perceive AMR since evaluating their knowledge and monitoring their attitudes and practices is crucial for preparing appropriate AMR action plans [22,24,25,26,27].

Antimicrobial resistance and stewardship are currently not mandatory focus areas in many undergraduate syllabi as well as in-service training programmes; consequently, healthcare professionals have a poor knowledge of antimicrobials and misuse them [12]. A study conducted among Gambian health practitioners demonstrated that they were not adequately aware of the costs involved in the management and treatment of patients with multidrug resistant infections that tend to be more expensive to treat since they sometimes require 'last resort' antibiotics [28]. Furthermore, a cross-sectional survey conducted in Mali documented that the average knowledge of every 10 students was 4.12, indicating that AMR inclusion in undergraduate syllabi is crucial [24]. This was supported by the results of a cohort study conducted in South Africa where AMR and AMS aspects were included in the curricula of undergraduate pharmacy students to promote awareness and prevent further prescription malpractice [27].

The results of a study in Tanzania underscored the importance of an all-inclusive approach to addressing AMR since there are different groups that drive the development and spread of AMR and as such, they all need to be considered and informed accordingly for any response to be effective [29].

For countries, such as Kenya, with high livestock populations and high agriculture-dependent economies, farmers need to be educated on prudent use of antimicrobials in the agricultural and livestock sectors. According to a cross-sectional KAP survey on antimicrobial users and providers in an area of high-density livestock-human population in Western Kenya, there is low AMU and AMR awareness among the farmers, with possible significant public health implications [30]. High AMU (and subsequently AMR) rates will eventually lead to significantly reduced antimicrobial efficacy in both veterinary and human medicine [30]. This further underscores the need for a one health approach to AMR education and awareness.

Methodology

2

The report under consideration was informed by data from three different sources, namely: TrACSS survey, structured survey, and systematic literature review.

2.1 Systematic literature review

A systematic search was done in Google Scholar, PubMed, and African Journals Online Library according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. Published articles on AMR awareness and understanding documented from original studies conducted in the 47 WHO African Region countries were considered. The search was done using relevant key words pooled together using the Boolean term "OR". The keywords were combined to form a final search strategy using the Boolean term "AND" as shown in Table 1. There was no restriction on the year of publication.

(a) Selection criteria

The criteria for inclusion of the articles in the qualitative synthesis were as follows: the articles must be original and published in English, they should document findings related to AMR awareness, understanding, education, communication, and training in countries within the WHO African Region, and they must be available in full text.

(b) Selection procedure

The initial 729 727 records from the databases were screened according to the relevance of the title. Out of the 165 remaining articles, 44 duplicates (articles from more than one database) were removed. The retained articles (121) were

further screened for inclusion by reading through the abstract and noting the presence of one or more of the keywords. The final screening was based on the inclusion criteria stated above and the articles that did not meet all the criteria were excluded from the final synthesis. The remaining 85 articles were then included in the final review. Fig 1 below shows the stepwise selection of the 85 articles for qualitative synthesis.

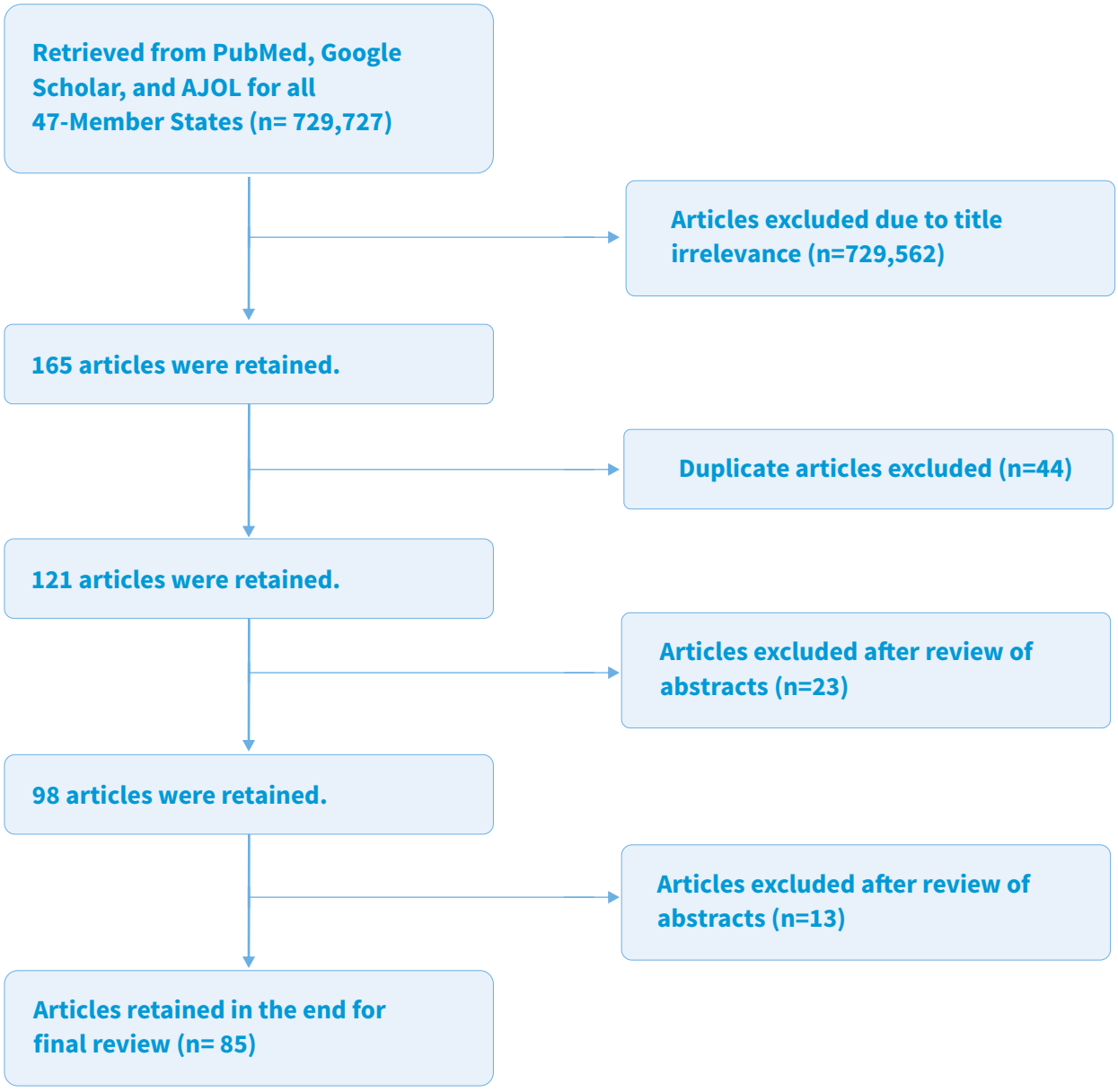
(c) Data extraction/qualitative synthesis

Relevant information synthesized from each article included the country where the study was conducted and the year of publication, type of research tools and how they were deployed (questionnaires, self-administered or interviewer-administered, physical or online/web-based), study settings (urban, semi-urban, or rural), study participants (general public, students, healthcare workers, outpatients/hospitalized patients, veterinarians, farmers, etc.), number of study participants, as well as key findings particularly knowledge, understanding and awareness levels, training, and other relevant findings.

Table 1: Search strategy

"awareness OR understanding AND antimicrobial OR antibiotic AND resistance AND education OR communication OR training AND name of country"

Fig. 1: Diagram of the search and selection of review articles



2.2 Structured survey questionnaire

A structured survey questionnaire was emailed to focal point persons in all WHO AFRO 47 Member States to collect data on AMR education and awareness activities scheduled and undertaken between 2017 and 2021, as well as challenges that may have negatively affected the implementation of planned activities. A total of 19 countries (Annex 2) completed the questionnaire, and all the responses were included in the final review.

The survey questionnaire sought to collect the following information:

- **a** Date of event
- **b** Type of event
- **c** Organizing institution
- **d** Status of implementation
- **e** Number of participants/reach
- **f** Success of implementation
- **g** Challenges that may have affected implementation
- **h** Indicator(s) used to measure/ monitor

The above information was requested for each of the five (5) years.

2.3 Review of the 2020-2021 tracking antimicrobial resistance country self-assessment survey

Additional information was collected through a desk review of the results of the 2020-2021 TrACSS report. Data for all the countries that took part in the self-assessment were captured in the report (Table 2).

Results/findings 3

3.1 Findings from the systematic literature review

Table 2 is a presentation of all the 85 articles that met the selection criteria and were used for the final synthesis on AMR education and awareness within the WHO African Region. The 85 articles reported on 92 (80 single country studies and five multi-country studies) original studies from 19 Member States.

Table 2: Summary of findings from the qualitative synthesis of articles from studies across countries in WHO African Region

SN.	Country	Study period	Research tool[a]	Setting[b] Population[c]	Number (subjects)	Survey key findings	Reference
1.	Benin	2019	Self-administered questionnaire	Urban HCW (Prescribers-nurses, midwives, physicians, etc.)	330	- Most of the participants (70-84%) surveyed had a good knowledge of antibiotic resistance but only 30-36% knew that AMR leads to treatment failure. 70-79% identified misuse as a root cause of AMR. Other causes were less readily identified, including poor antibiogram.	Dougnon et al., 2020
2.	Benin	Aug – Dec 2018	Self-administered questionnaire	Urban Dispensers: different categories of pharmacy staff	159	- 63.4% correctly defined AMR. - Causes of AMR identified as failure to comply with treatment duration (96.2%) and self-medication (94.9%). Other identified causes included SF (63.1%), poor hygiene (16.6%)). - 71.7% had no idea of the current extent of resistance.	Allabi et al., 2023
3.	Cameroon	Jun- Nov 2019	Self-administered questionnaire	RuralPoultry farmers	358	- Low mean score of AMR knowledge with significant variation across regions (higher in some regions than others) - Risk perception, including transmission from animals to humans, environment, public health threat very poor - Did not elicit information about possible AMR causes - Level of education positively influenced AMR knowledge	Moffo et al., 2020

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
[b] (urban, rural),
[c] human healthcare workers (doctors/nurses/pharmacists), patients, animal healthcare workers (farmers/vets), general public, pre-service students: medicine/pharmacy/nursing/veterinary, primary/high school, others

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
4.	Cameroon	Jan – Aug 2019	Self-administered questionnaire	Urban Antimicrobial prescribers (100), dispensers (113), and users (385)	598	- 92% of prescribers and 62.8% of dispensers could define AMR - Multidrug resistance defined correctly by 72% and 34.5% of prescribers and dispensers respectively - 90% and 78.8% of dispensers knew that AMR is a public health problem - 64% of prescribers knew that AMR is a multisectoral issue AMR is an O-H issue by 90% of prescribers, 3.54% of dispensers misuse drives resistance (89% of prescribers, 20.35% of dispensers), no information by users	Djuikoue et al., 2022
5.	Cameroon	May – Feb 2019	Self-administered questionnaire (email)	Urban Physicians practising in tertiary care	98	- 93% knew that AMR is a significant problem in the country. But 40% believed that AMR is a problem in their hospital wards. - 54% of doctors disagreed that poor hand hygiene is a cause for spread of antibiotic-resistant bacteria	Ngongang et al., 2021
6.	Côte d'Ivoire	Aug-Oct 2020	- Survey including two countries in West Africa - Self-administered (google forms-kobo)/ interviewer-administered questionnaire	Urban Health professionals (physicians-79, pharmacists-70, and veterinarians-72)	221	- 64% had good/very good knowledge of AMR - Veterinarians had significantly higher knowledge of AMR than doctors and pharmacists (69% vs 42% vs 40%) - 53% no formal AMR training	Bedekelabou et al., 2022

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
7.	Ethiopia	Jun 2013	Self-administered questionnaire	Urban Physicians-175, nurses-210	385	- 72.2% were knowledgeable about AMR - Majority agreed that AMR is a global and national problem - They identified poor adherence to antibiotics (86%) and overuse (80.5%) as leading causes of AMR - Other causes are: lack of local antibiogram (12.3%), self-prescription (53.5%), and poor awareness (9.2%)	Abera et al., 2014
8.	Ethiopia	Jan – Mar 2018	Self-administered questionnaire (email)	Urban prescribers in veterinary drug retail outlets	108	- 64.8% reported AMR responsible for difficulty to treat infectious diseases. - 60.2% knew AMR is a global public health and economic threat. - Drivers or causes of AMR identified mainly as use of wrong antimicrobial (80.6%) or poor quality antimicrobial (79.6%). 70.4% self-prescribe, 9 (8.3%) did not know causes of AMR, only 24 (22.2%) have had training on AMR.	Zeru et al., 2019
9.	Ethiopia	Aug –oct 2019	Self-administered questionnaire	Urban Medical Interns in tertiary health facilities	270	- 93.3% knew AMR as a national problem; in addition, 95.5% also perceived it as an institutional problem - Respondents had good knowledge of ARM drivers (90-95%) - 94.8% would like more ARM education	Mersha 2018

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
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...continued

SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
10.	Ethiopia	Nov – Feb 2020	Self-administered/ interviewer-administered questionnaire	Rural Farmers (farm owners/ workers)	91	- 90.1% had heard about AMR, 50% did not know about ARM impact, 45% did not know about the mode of transmission - Respondents identified ARM causes as: 76.9% of farmers agreed that AMR is caused by poor awareness - Other causes of AMR noted by farmers include lack of rapid and effective diagnosis (67%), substandard antibiotic use (64.8%), and use of antimicrobial for animal growth (60.8%)	Geta and Kibret 2021
11.	Ethiopia	Mar – May 2019	Self-administered/ interviewer-administered questionnaire	Urban Community dwellers	374	- 59.4% of respondents had heard the term “AMR”. Sources of information are HCW-144 (64.8%), mass media-81 (36.5%), friends-67 (30.2%) - 51.9% believed that AMR can be reduced by rational use of antibiotics - 47.6% understood that AMR risk factors include inappropriate use of antimicrobials in terms of overuse, underuse, failure to complete the full course of therapy	Mengesha et al., 2020
12.	Ethiopia	Jun – Jul 2021	Self-administered questionnaire	Urban Community dwellers, excluding HCW, severely ill; etc.	407	- 39.8% were aware of AMR - 70.8% knew that sharing of antibiotics can cause AMR	Simegn and Moges 2022

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
[b] (urban, rural),
[c] human healthcare workers (doctors/nurses/pharmacists), patients, animal healthcare workers (farmers/vets), general public, pre-service students: medicine/pharmacy/nursing/veterinary, primary/high school, others

...continued

SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
13.	Ethiopia	Jun – Aug 2020	Self-administered questionnaire	Urban Healthcare professionals (nurse, pharmacists, medicine, laboratory)	412	- 84.7% had good AMR knowledge - Only 17.2% had training on AMR - Work experience, working hours per week, work stress, knowledge of over-the-counter drugs, use of antibiotics, and self-medication practice were associated with knowledge of AMR	Simegn et al., 2022
14.	Ethiopia	Jun- Jul 2019	Self-administered questionnaire	Urban Health sciences students	232	- 86% knew that irrational use of antibiotics can lead to AMR	Fetensa et al., 2020
15.	Ethiopia	Mar 2017	Self-administered questionnaire	Urban HCWs (physicians, nurses, pharmacists)	132	- 74.3% of physicians, 47.7% of nurses, and 90.9% of pharmacists had recent information on AMR - Regarding training, 74.3% of physicians, 84.4% of nurses, and 72.7% of pharmacists responded that they had no ARM training - Overall, more than 90% of the practitioners considered inappropriate use of antimicrobials, poor infection control in hospitals, substandard quality of antibiotics, and patients' poor adherence as factors that promote AMR	Gebrehiwot and Tadiwos, 2022

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
16.	Ethiopia	Nov – Dec 2020	Self-administered questionnaire	Urban (Hospitalized patients) Patients in a public hospital	233	- 69.8% had heard the term "AMR" 53% agreed that AMR is a global problem - Poor knowledge of the impact of AMR, 88% did not know the impact of AMR - Only 40% of respondents knew that inappropriate use of antibiotics can cause AMR	Geta and Kibret, 2022
17.	Ethiopia	Jun- Jul 2019	Interviewer-administered questionnaire	Urban Livestock producers/ farmers (cattle, sheep, goat, and poultry)	571	- 34% of the livestock producers were not aware of AMU in animal production. - 41% of participants knew that imprudent use of antimicrobials in animal production can lead to AMR. - 78% agreed that public awareness can reduce AMR	Gebeyehu et al., 2021
18.	Ethiopia	Mar 2017	Self-administered questionnaire	Urban University students	670	- Only 14.8% had adequate knowledge of AMR - Rural residence was significantly associated with drug resistance as compared to urban residence	Zelellw and Bizuayehu 2016

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
19.	Ethiopia	Dec – Mar 2016	Self-administered questionnaire	Urban Final year paramedical students	323	- 55% had poor knowledge of AMR - 96% perceived AMR as a catastrophic and preventable public problem - There was statistically significant knowledge differences across departments - Knowledge of strategies to control AMR was generally poor, at 19-51% correctness in the four test questions	Seid and Hussen, 2018
20.	Ethiopia	Oct – Nov 2015	Self-administered questionnaire	Urban Paramedical staff	218	- Overall, 62.8% of paramedical staff had good knowledge of the factors that cause AMR, particularly poor adherence (96.5%), self-medication practice (96.5%), and empiric antibiotics use (94.5%) - There was significant variation in knowledge of AMR among participants, with highest among pharmacists (83.9%) and lowest among midwives (38.1%)	Tafa et al., 2017
21.	Ethiopia		Self-administered questionnaire	Rural/non-urban Dwellers in a rural area (staff in community drug-retail outlets)	276	- 76% demonstrated good knowledge of AMR 58% dispense antibiotics without prescription - Noted contributors to AMR were inappropriate use of antibiotics (81.2%), dispensing without prescription (77.5%), incomplete antibiotic course (82.6%), clients' self-medication with antibiotics (74.6%)	Belachew et al., 2022

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22.	Ethiopia	Apr – Jul 2021	Interview administered questionnaire	Urban residents	400	- Only 35% had good knowledge of AMR, 17% had low knowledge	Dejene et al., 2022
23.	Gabon	Feb – Jun 2020	Self-administered questionnaire	Urban Physicians and nurses	47	- 64% noted AMR as a national problem while only 30% AMR noted it as a problem in their local hospitals - Noted causes of antimicrobial resistance were excessive use of antibiotics without laboratory guide (79%) and non-prescription use of antibiotics (79%) - Knowledge of AMR was significantly higher among physicians than nurses	Adegbite et al., 2022
24.	Gambia	2016	Self-administered questionnaire	Urban Healthcare workers (nurses-63.3%, pharmacists-6%, physicians-5.8%, etc.)	225	- 88.24% saw AMR as a national problem - 90.37% indicated that AMR was caused by abuse of antibiotics	Sanneh et al., 2020

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
25.	Ghana	Jan – Mar 2014	Self-administered questionnaire/ in-depth interviews	Urban Prescribers (nurses-88.50%; physician assistants-69.19% etc). Healthcare workers	379	- 81.8% agreed that antibiotics currently in use may not be effective in the future (i.e. AMR), with more doctors in agreement than CHOs (96.1% vs 69.0%) - No single formal source of information on AMR	Asante et al., 2017
26.	Ghana	May-Sep 2023	Multi-country survey Self-administered questionnaires	Human healthcare professionals	106	- Respondents had mean antibiotic resistance awareness score of 61.2% - Antibiotic resistance awareness scores were significantly different across professions with mean scores of pharmacists (68.7%) and dentists (71.4%) higher than that of doctors (59.7%)	Jinenez et al., 2023
27.	Ghana	Aug 2015	Self-administered questionnaire	Urban Physicians in a tertiary health facility	159	- 30.1% of respondents perceived AMR as an important global problem, 18.5% as a national problem, and 8.9% as a problem in their hospital, while only 5.5% perceived it as a problem in their department	Labi et al., 2018

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
28.	Ghana	Aug – Nov 2019	Self-administered questionnaire	Urban Community dwellers	632	- 75.9% knowledge of bacterial capacity to become resistant to antibiotic. - 34.8% knew that AMR is transmissible from person to person and 34.8% from animals to humans	Effah et al., 2020
29.	Ghana		Self-administered questionnaires	Urban Meat consumers in a metropolis	384	- 55% heard of AMR from teachers/school - 64% knew that AMR occurs in germs - 49% knew that AMR infections are difficult to treat	Ananchinaba et al., 2022
30.	Ghana	Jun-Oct 2021	Self-administered, web-based questionnaire	Urban Healthcare students (medicine, pharmacy, and nursing)	160	- Healthcare students in higher levels (5th year) had better knowledge of AMR than those in lower years of study - pharm/medic also better than nursing/allied	Sefah et al., 2022
31.	Ghana	Jul - Sep 2021	Self-administered questionnaire	Urban Out-patient health seekers in tertiary hospitals	800	- Less than 40% of respondents knew about AMR. - 59% knew that AMR could prolong hospital stay, 74% knew that it could affect mortality	Otieku et al., 2023

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32.	Kenya	Apr – Oct 2019	Self-administered questionnaire	Urban Prescribers (clinical officers, medical officers, pharmacists)	240	- AMR is known to be a problem worldwide (96.3%) and in the country (92.1%), but 71.6%,p=0.013 agreed AMR is a problem in their HCF; near absence of antibiogram with diverse sources of knowledge on AMR but outside training institutions. - 80% agreed that AMR is caused by overuse of antibiotics driven by patients' demands (67.5%) and over-the-counter sales (94.6%)	Kamita et al., 2022
33.	Kenya	Sep – Nov 2015	Self-administered questionnaires	Urban Physicians only	107	- 97.2% knew AMR to be a worldwide problem, while 93.4% knew it to be a local problem - 75.9% noted AMR as a problem in daily practice	Genga et al., 2017
34.	Kenya	Oct – Nov 2018	Survey in three East African countries Self-administered questionnaire	Urban Final year healthcare {medical and pharmacy} students in three universities	75	- 65% had good knowledge of AMR - 97.6% had knowledge that inappropriate use of antibiotics can lead to resistance	Lubwama et al., 2021
35.	Liberia	Jul- Aug 2022	Self-administered questionnaire	Urban Healthcare professionals {physicians, pharmacists and nurses}	126	- 86% of physicians, 81% of pharmacists, and 61.7% of nurses disagreed that AMR is an issue in the country - 37.9%, 43.8% and 32.1% (physicians, pharmacists, and nurses) agreed that bacteria resistant to antibiotics could be spread from person to person.	Paye and McClain 2022

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
36.	Malawi	Jul-Nov 2022	Self-administered questionnaire	Urban Veterinary drug dispensers	68	- 76.5% were aware of AMR and its occurrence in livestock and humans - 67.7% knew that careless use of drugs contributed to AMR in livestock	Kainga et al., 2023
37.	Malawi	February 2016	Self-administered questionnaires	Urban Final year medical students	74	- 83.7% believed that AMR is not a problem at the hospital level, while 86.1% believed that it is a national problem - 79.2% knew that better use of antibiotics can reduce AMR	Kamoto et al., 2020
38.	Nigeria	Aug-Sep 2022	Self-administered questionnaire	Urban Patients (out-patients)	400	- 17% (68) had good knowledge of AMR, 49.3% (197) had poor knowledge. - There was significant association between respondents' age, marital status, level of education, and level of AMR knowledge.	Idoko et al., 2023
39.	Nigeria	Apr 2018	Self-administered questionnaire	Urban Medical students	184	- 64.7% (119) had good knowledge of AMR - AMR knowledge was associated with respondent's gender (P=0.035)	Okedo-Alex et al., 2019

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40.	Nigeria	Aug-Sep 2014	Self-administered questionnaire	Urban Patent medicine vendors	197	- 87.3% were aware of AMR - Had good knowledge of causes (94.9%) and prevention (98%) of AMR. - Perceived AMR as a public threat (89.4-95.4%) - 59.9% dispensed antibiotics without prescription - 49.2% practised self-medication	Awosan et al., 2019
41.	Nigeria	Nov 2019-Feb 2020	Self-administered questionnaires	Urban Healthcare students (pharmacy, dentistry, medicine, nursing, and medical laboratory science)	576	- 77.9% students had good knowledge of AMR - More than 60% knew the common drivers of AMR	Bello et al., 2021
42.	Nigeria	Sep-Oct 2015	Multi-country survey Face-to-face interviewer-administered questionnaire	Multi-country awareness survey in 12 countries involving the public	664	- Only 38% had heard of antibiotic resistance, among them 81% knew what it implied - Only 57% knew that AMR is a global problem - 64% knew that antibiotic resistant infections are increasing	WHO, 2015[d]
43.	Nigeria		Interviewer-administered questionnaire	Semi-urban Farmers (cattle, fish, and poultry) and veterinary drug shop owners	150	- 50% knew the term "AMR" - 62% believed that AMR is other countries' problem - Majority did not know that AMR could be spread from human to human (58%) - Poor knowledge of causes of AMR, particularly indiscriminate use for animals (53.3%) and suboptimal dosing of antimicrobials for animals (in 53.3%)	Oyebanji and Oyebisi, 2018

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
44.	Nigeria	May-Sep 2023	Multi-country survey Self-administered questionnaire	Human healthcare professionals	112	- Respondents had mean antibiotic resistance awareness score of 59.7% - Antibiotic resistance awareness scores were significantly different across professions with mean scores of pharmacists (62.4%) and doctors (59.3%) higher than that of dentists (54.%)	Jinenez et al., 2023[b]
45.	Nigeria	Mar-Apr 2018	Self-administered questionnaires	Urban Breast feeding mothers in public hospitals	321	- 43.7% had not heard of the term "AMR" - 74.6% did not know what AMR entails - 51.3% had knowledge of how AMR spread, 24% did not.	Salihu Dadari, 2020
46.	Nigeria	Aug-Sep 2018	Self-administered questionnaire	Urban Veterinary students in 10 universities across six geopolitical zones	426	- 60% demonstrated poor knowledge of AMR - 33.2% had poor knowledge of contributory factors to AMR - Proportion with good knowledge of AMR increased with the year of study - Students (50.0%) between 22 and 26 years were four times more likely to have good overall knowledge of AMR ($p < 0.001$) than other age categories	Odetokun et al., 2019
47.	Nigeria	Aug 2016-Apr 2017	Interviewer-administered questionnaire	Semi-urban Poultry farmers	152	- 63% knew that inappropriate use causes emergence of resistance and bacteria; 25% did not - 65.8% believed that AMR in broiler chickens is not a public health concern - 67.1% believed that increased frequency of antimicrobial use cannot cause AMR in the future	Oloso et al., 2022

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48.	Nigeria	Feb-Mar 2021	Self-administered online questionnaire	Medical laboratory scientists across HCFs	117	- 65.2% had good knowledge of AMR, 34.8% had poor knowledge - 76% reported that AMR is a problem in their establishment - Only 30% of establishments provided formal training in resistance testing, while 66% did not have such training	Huang and Eze, 2023
49.	Nigeria	Apr – Jun 2019	Self-administered questionnaires	Urban Physicians in six tertiary healthcare facilities in four geopolitical regions in the country.	323	- 82.7% had good AMR Knowledge - AMR was recognized as a global and local problem by 95.4% and 81.1% of respondents respectively	Babalola et al., 2020
50.	Nigeria	Jun – Aug 2017	Self-administered questionnaire	Urban Veterinary students in five out of 10 registered universities offering veterinary medicine in Nigeria	95	- 72% knew that AMR is a global problem - 9% believed that AMR is not a major problem in the country - 55% knew that AMR is promoted by overuse of antibiotics and 8% knew that poor infection control practices contribute to AMR.	Anyanwu et al., 2018
51.	Nigeria	Jul – Aug 2017	Self-administered/ interviewer administered questionnaire	Urban Undergraduate students and community members	1230	- Undergraduate students displayed less knowledge of the fact that self-medication could lead to AMR than other community members (32.6% vs 42.2%)	Ajibola et al., 2018

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52.	Nigeria	Jul – Sep 2021	Self-administered questionnaire	Urban Final year undergraduate pharmacy students	164	- 94.5% aware of antimicrobial resistance - Knowledge about contributors to AMR among respondents include poor adherence (86.6%), overuse of antimicrobials in humans (82.3%), substandard quality of antimicrobials (75%), and poor handwashing practices (39%).	Abdu- Aguye et al., 2022
53.	Nigeria	2014	Self-administered questionnaires	Urban Physicians	105	- 57.1% lacked up-to-date information on AMR. - 81.9% had no training on AMR	Ahmad et al., 2015
54.	Nigeria	Jul-Nov 2019	Self-administered online questionnaire/ self-administered questionnaire	Urban Final year medical students in two countries (Nigeria and South Africa)	172	- 11% agreed that AMR is a problem in their hospitals - 93.0% knew inappropriate antibiotic use causes resistance - 84.3% knew that use of broad-spectrum antibiotics could cause AMR, while only less than 2/3 knew that lack of hand disinfectant promotes AMR	Augie et al., 2021e
55.	Nigeria	Jun – Nov 2019	Self-administered questionnaire	Urban Healthcare workers in six geopolitical zones in Nigeria	358	- Physicians had better knowledge of AMR than other HCWs - HCWs in tertiary HCFs had better knowledge than those in primary and secondary HCFs - Overall, 49.2% had good AMR Knowledge, 47.2 had fair knowledge, and 3.6% had poor knowledge.	Chukwu et al., 2020

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56.	Nigeria	Aug – Nov 2019	Self-administered questionnaire	Urban Healthcare Students	866	- 58.4% had good knowledge of AMR - Students in years 3-6 had greater knowledge of AMR compared to those in years 1 and 2	Akande-Sholabi and Ajamu 2021
57.	Nigeria	Jun- Nov 2019	self-administered/ interviewer-administered questionnaire	Urban/ rural Community dwellers in six geopolitical zones	482	- 56.5% familiar with the term "AMR" - Only 8.3% had good knowledge of AMR - Significant variation in knowledge of AMR across the regions in the country.	Chukwu et al., 2020
58.	Nigeria	Jan - Mar 2022	Self-administered questionnaire	Urban Healthcare workers	600	- Respondents' knowledge of AMR was 58.8%	Nwafia et al., 2022
59.	Rwanda	Mar 2017	Self-administered questionnaire	Urban Healthcare students {medical, dental, and pharmacy students}	229	- Students in Levels 3-6 had better knowledge of AMR than those in lower levels	Nisabwe et al., 2020

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60.	Senegal	Jul – Oct 2019	Self-administered questionnaire	Urban Undergraduate pharmacy students	278	- 85.6% had good knowledge of AMR	Bassoum et al., 2023
61.	Senegal	Nov – Dec 2017	Interview-administered questionnaire	Urban People attending bus station (HCWs were excluded)	400	- Only 8.8% and 41.8% knew that handwashing and vaccination prevent AMR - 7% had a good knowledge of AMR - 83.8% knew that high antibiotic consumption can lead to bacterial resistance.	Bassoum et al., 2023
62.	South Africa	Nov 2017-Jan 2018	A national cross-sectional survey Self-administered online questionnaire	Doctors, pharmacists, and nurses in public and private employment	2523	- Majority of HCPs (93.37%) perceived AMR to be a serious problem globally; however, much lower number of HCPs (73.77%) agreed that AMR was a serious problem in their hospital or practice - Antimicrobial resistance was considered a major problem globally and nationally by majority of HCPs. - Contributory factors to AMR noted were overuse of antimicrobials (by 91.6% of HCPs) and non-adherence to prescriptions (by 73.3% of HCPs) - Majority of HCPs recognised that measures to combat AMR include educational campaigns (91.2%), use of therapeutic guidelines (84.7%), and improved infection control (66.3%). - Only 40.1% of HCPs were trained in AMR and 81.6% requested more education and training.	Billiram et al., 2021

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63.	South Africa	Sep-Oct 2015	Multi-country survey Face-to-face interviewer-administered questionnaire	Multi-country awareness survey in 12 countries Involving the public	1002	- 77% had heard of antibiotic resistance and 83% knew what it implies - Only 55% knew that AMR is a global problem - 72% knew that antibiotic resistant infections are increasing.	WHO, 2015 [d]
64.	South Africa	April 2016-May 2017	Cross-sectional study Self-administered questionnaire	Patients in public and private primary health care facilities	782	- 62% of patients knew that AMR occurs when germs become resistant as people take too many antibiotics - 58% of patients knew that AMR is costly to remedy - worldwide; this fact was more commonly known by patients, with high knowledge of AMR in private (72%) and public (80%) HCFs.	Farley et al., 2019
65.	South Africa	2015	Cross-sectional study Self-administered questionnaire	Final year medical students in three medical schools	289	- 87% agreed that resistance is a major problem in the country and 61% agreed that AMR is a problem in the hospitals where they had worked. - More than 95% of students knew that inappropriate use of antibiotics causes antibiotic resistance. - Most (90%) students reported that they would appreciate more education in antibiotic resistance	Wasserman et al., 2017
66.	South Africa	Jul-Nov 2019	Self-administered online questionnaire/ Self-administered questionnaire	Urban Final year medical students in two countries (Nigeria and South Africa)	104	- 48% agreed that AMR is a problem in their hospital - 99% knew that inappropriate antibiotic use causes resistance - 91.4% knew that use of broad-spectrum antibiotics could cause AMR, while only less than 2/3 knew that lack of hand disinfectant promotes AMR.	Augie et al., 2021 [e]

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67.	South Africa	Oct 2015-Dec 2016	Cross-sectional study Self-administered questionnaire	Primary healthcare prescribers	264	- 95.8% (230/240) believed that ABR is a serious problem in the country. - Most of the prescribers generally had good knowledge of AMR and its drivers, and those with high knowledge were more likely to believe that resistance can be reduced by using narrow-spectrum antibiotics. - The majority (226/235, 96.2%) requested data on local resistance patterns, and 90.4% (208/230) requested education resource aids for discussions on AMR with patients.	Farley et al., 2018
68.	South Africa	2014	Self-administered questionnaire	University undergraduate veterinary students	71	- All respondents knew that AMR is an increasing threat to humans and animals. - Inappropriate antimicrobial use among veterinary practitioners was noted as AMR driver by 84% of students, and among farmers by 98% of students. - 55% of students believed that AMR can be reduced with a ban on the use of antimicrobials as prophylactics and growth promoters in food animal.	Smith et al., 2019
69.	Tanzania	May-Sep 2023	Multi-country survey Self-administered questionnaire	Human healthcare professionals	124	- Respondents had mean antibiotic resistance awareness score of 56.6% - Antibiotic resistance awareness scores were significantly different across professions with mean scores for pharmacists (61.9%) and doctors (60.4%) higher than those for dentists (54.1%) and nurses (54.7%)	Jinenez et al., 2023 [b]

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70.	Tanzania	Sep-Nov 2019	Qualitative study using phenomenographic approach. Face-to-face interview with audio recording.	Prescribing healthcare workers in five health centres and seven dispensaries	20	- Many HCWs knew that limited access to antibiotics can cause antibiotic resistance - Most healthcare workers were aware of the problem of antibiotic resistance, but few experienced it as a problem in daily practice. - Most healthcare workers perceived antibiotic resistance as a problem for individuals who misused antibiotics, while a few saw it as a public health issue.	Emgard et al., 2021
71.	Tanzania	Nov-Dec 2021	Mixed-method approach (quantitative and qualitative survey)	Pastoralists/ livestock farmers	250	- Only 32% were aware of AMR	Mangesho et al., 2021
72.	Tanzania		Interviewer-administered questionnaire	One person per household in four regions (12 districts) of the country	1200	- Knowledge of existence of AMR was poor across infection syndromes (22.6-38.6%) - Knowledge of AMR drivers was also poor among respondents (41.8-45.8%) - Respondents who completed primary education were three times more likely to have more knowledge than those with no or incomplete primary education.	Simba et al., 2016
73.	Tanzania	May – Jun 2019	Survey in three East African countries Self - administered questionnaire	Urban Final year healthcare {medical and pharmacy} students in three universities	178	- Only 44% had good knowledge of AMR - 97.7% knew that inappropriate use of antibiotics can lead to resistance.	Lubwama et al., 2021

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74.	Tanzania	Jul 2010-Jan 2011	Interviewer-administered questionnaire	Small-scale livestock keepers	160	- 30% of respondents were not aware of antibiotic resistance	Katakweba et al., 2012
75.	Tanzania		Qualitative semi-structured interview	Veterinary paraprofessionals in five community districts	40	- Most reported that they had not attended refresher courses or seminars on AMR, which limited their understanding of AMU and AMR issues. - Reported that their clients (livestock keepers)	Frumence et al., 2021
76.	Tanzania	Jan- Feb 2020	Community-based cross-sectional study Interviewer-administered questionnaire	Community participants in three districts	828	- Low to moderate level knowledge of AMR. - Levels of knowledge were significantly influenced by higher participant's age and level of education.	Sindato et al., 2020
77.	Togo	Aug-Sep 2019 Oct- Nov 2020	Cross-sectional study. Interviewer-administered questionnaire	Commercial poultry and pig farmers	218	- 39% of poultry farmers and 57% of pig farmers were unaware of antibiotic resistance. - No adequate ABR knowledge among 19% poultry farmers and 64% pig farmers.	Bedeke labou et al.,2022

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
[b] (urban, rural),
[c] human healthcare workers (doctors/nurses/pharmacists), patients, animal healthcare workers (farmers/vets), general public, pre-service students: medicine/pharmacy/nursing/veterinary, primary/high school, others

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SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
78.	Togo	Jan-Jul 2021	Survey, including two countries in West Africa Self-administered/ interviewer-administered questionnaire	Urban Health professionals (physicians, pharmacists, and veterinarians)	221	- 84% had good/very good knowledge of AMR - No difference in proportions of respondents with good knowledge of AMR across the professions.	Bedekelabou et al., 2022[a]
79.	Uganda	Apr-May 2021	Cross-sectional study Self-administered questionnaire	HCWs (physicians, nurses, and pharmacists) in a national cancer institute	61	- All respondents had heard of the term "AMR" but level of AMR knowledge was significantly lower among nurses than pharmacists or physicians - 85% of respondents agreed that AMR is a problem for patients in the HCF - Most respondents (81-85%) respectively identified various AMR-causing practices bordering on inappropriate and excessive antibiotic uses, while only 50% knew that poor hand hygiene is an important cause of infection by AMR bug	Gulleen et al., 2022
80.	Uganda	Oct 2021	Descriptive cross-sectional, multicentre, online survey with semi-structured questionnaire	Clinical health sciences undergraduate students across nine universities	681	- Most participants (87.5%) had sufficient knowledge of AMR - AMR knowledge significantly higher among students in higher level and those with previous	Kayinke et al., 2022
81.	Uganda	Oct – Nov 2018	Survey in three East African countries Self - administered questionnaire	Urban Final year healthcare {medical and pharmacy} students in three universities	75	- 67% had good knowledge of AMR - 96% knew that inappropriate use of antibiotics can lead to resistance	Lubwama et al., 2021

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
[b] (urban, rural),
[c] human healthcare workers (doctors/nurses/pharmacists), patients, animal healthcare workers (farmers/vets), general public, pre-service students: medicine/pharmacy/nursing/veterinary, primary/high school, others

...continued

SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
82.	Uganda	Jun-Sep 2021	Cross-sectional study Interviewer-administered questionnaire	Members of farming households (crop and animal)	652	- Majority of participants were able to correctly describe antibiotics and were aware of AMR; however, there was some misunderstanding of several AMR concepts - Most (77%) respondents knew that infections are becoming increasingly resistant to treatment and difficult to treat; only 9.2% understood what AMR implies - 83% knew that AMR can affect individuals or families, but about 32% believed that it is a problem in foreign countries. 63.8% wrongly thought that AMR only affects individuals who regularly take antibiotics - 60% of respondents knew that AMR can complicate surgical procedures.	Muleme et al., 2023
83.	Uganda		Cross-sectional qualitative and quantitative study Self-administered questionnaires	Prescribing and dispensing HCWs in four primary healthcare facilities in rural communities	124	- 75% of respondents reported receiving information on antibiotic resistance in medical training school (67.2%), which was the main source of information. Only 54.8% had knowledge of drug resistant bacteria. - Only 23.5% of respondents had knowledge of the drivers of antibiotic resistance, although most of them (75.4%) knew some drugs that have been rendered ineffective to treat infections	Amelia et al., 2017
84.	Zambia	Oct 2018-Jun 2019	Self-administered questionnaire	Undergraduate medical students	260	- 87.3% had good knowledge of AMR - 59.6% agreed that misuse is the leading cause of AMR. - Higher level students had significantly more knowledge of AMR than those at lower level.	Zulu et al., 2020

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
[b] (urban, rural),
[c] human healthcare workers (doctors/nurses/pharmacists), patients, animal healthcare workers (farmers/vets), general public, pre-service students: medicine/pharmacy/nursing/veterinary, primary/high school, others

...continued

SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
85.	Zambia	Sep 2020 - Apr 2021	Cross-sectional study. Interviewer-administered questionnaire	Layers poultry farmers	77	- Overall awareness of AMR was low among poultry farmers (47%) - Awareness of AMR was greater among commercial farmers, farmers who use prescription to access antibiotics, and those who did not use antibiotics on market-ready birds.	Mudenda et al., 2022
86.	Zambia	Jan- Apr 2022	Cross-sectional study. Self-administered questionnaire	Pharmacy personnel and nurses in tertiary hospital	263	- Only 54.4% of participants knew that AMR is a public health problem, while most of them (85.9%) knew that infections with antibiotic-resistant bacteria are difficult to treat. - Pharmacy personnel had more knowledge than nurses as regards the spread of resistant bacteria from person to person and how the use of antibiotics in livestock contribute to AMR.	Tembo et al, 2022
87.	Zambia	Mar 2021- Mar 2022	Self-administered questionnaire	Medical students from six medical schools (first to final year)	180	- The students (96.7%) had good to excellent overall knowledge of AMR. - Clinical students were six times more likely to have excellent knowledge of AMR than pre-clinical students.	Nowbuth et al., 2023
88.	Zambia		Cross-sectional survey. Self-administered questionnaire	Healthcare professionals in tertiary hospitals (physicians, nurses, pharmacists, and biomedical personnel)	304	- Pharmacists had the highest score for AMR knowledge while nurses had the lowest. - Minority of respondents indicated that poor access to local antibiogram data (31.5%) and poor IPC in hospitals (31.3%) promoted AMR, while the majority (56.7%) noted that poor adherence to prescribed antimicrobials was the main cause of AMR.	Mufwambi et al., 2020

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
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[c] human healthcare workers (doctors/nurses/pharmacists), patients, animal healthcare workers (farmers/vets), general public, pre-service students: medicine/pharmacy/nursing/veterinary, primary/high school, others

...continued

SN.	Country	Study period	Research tool [a]	Setting [b] Population [c]	Number (subjects)	Survey key findings	Reference
89.	Zambia	Jan- Jul 2018	Cross-sectional survey. Self-administered questionnaire	Undergraduate pharmacy students	172	- 90% had overall knowledge of AMR. while only 54.1% knew that AMR is a global problem.	Mudenda et al., 2022
90.	Zambia	Feb-Apr 2022	Cross-sectional study Self-administered questionnaire	Community pharmacists and pharmacy technologists who dispense poultry drugs.	178	- Most (96.6%) of the participants were aware of AMR. - The study found moderate knowledge of AMR (mean score of 64.7%) - Good knowledge of AMR was associated with work experience for more than one year.	Mudenda et al., 2022
91.	Zambia	Nov – Dec 2021	Cross-sectional survey. Self-administered questionnaire	Poultry farmers	106	- 29.2% were aware of AMR. The study showed that 46.2% of participants had low knowledge of AMR	Chilawa et al., 2023
92.	Zimbabwe	Oct – Dec 2020	Cross-sectional survey. Self-administered questionnaire	Low-income suburbs. Nurse-led healthcare providers in nine primary health out-patient clinics	91	- AMR was considered a global problem (82%), a national problem (89%), and HCF problem (57%). - They had good knowledge of some AMR drivers, particularly poor adherence to prescription and excessive unregulated access to antibiotics, as well as poor knowledge of other drivers, particularly substandard drug quality and poor IPC.	Olaru et al., 2023

[a] Methodology e.g. self-administered questionnaire, online survey, interview, others
[b] (urban, rural),
[c] human healthcare workers (doctors/nurses/pharmacists), patients, animal healthcare workers (farmers/vets), general public, pre-service students: medicine/pharmacy/nursing/veterinary, primary/high school, others

3.2 Findings from structured survey questionnaire

Table 3: AMR education and awareness activities implemented per Member State - survey results

SN.	Country	Survey key findings
1.	Benin	- Official launch of the "Antibiotic good use week" campaign, used media and social media for coverage of the launch and general awareness. - Engagement at universities and educational institutions. - Broadcasts on television and radio stations at different time intervals. - Information campaigns with experts from animal health, human health, and agriculture sector in different cities of the country. - AMR debates on radio and TV channels. - Personal health awareness in six reference hospitals.
2.	Botswana	- Focused mainly on community engagement; held several meetings with farmers in small village towns, - Media engagement for public education through articles, radio shows, pull up banners, and printed AMR regalia. - Awareness through mass media: newspaper-adverts, radio jingles and posters, live morning TV shows, live call-in radio shows.
3.	Burundi	- Presentation of two studies on AMR during an AMR launch workshop. - Sensitization of journalists on AMR. - Broadcasts of AMR message on various radio stations and publication of articles. - Use of social media to enhance awareness, as well as press releases and reports. - Dissemination of awareness material to the general public, particularly the national essential medicine list.
4.	Chad	- National debates on the rational use of antimicrobials for healthcare profession students. - Collection and validation of AMR data. - Training of healthcare workers and lab personnel in AMR and AMS.
5.	DRC	- AMR sensitization among health workers. - Awareness campaigns against self-medication and the misuse of antibiotics. - Workshop to exchange experiences and scientific information on antibiotics and antimicrobial resistance.
6.	Eritrea	- Distribution of posters, leaflets, and banners to all pharmacies. - Public campaigns. - Media seminars. - AMR panel discussions; AMR radio scripts.

...continued

SN.	Country	Survey key findings
7.	Ethiopia	- Annual press releases and panel discussion at the beginning of every WAAW. - Training in AMR and AMR reporting for media personnel. Site visit and training at the national public health institution. - Advocacy workshop on AMR and AMS for health workers and the importance of infection and prevention control. - Several meetings on how to cascade implementation and consultative processes on how to improve AMR awareness in Ethiopia.
8.	Ghana	- Development and printing of EIC materials. - Launch of a national television broadcast panel discussion with special attention paid to the agricultural sector. - Media interaction and dissemination of awareness material to the community i.e. enlightening local market women, running campaigns in schools, and training the media in appropriate reporting of the AMR agenda.
9.	Liberia	- Training for health workers on AMS. - Advocacy meetings involving religious groups, partners, and key stakeholders. - Public awareness using simplified Liberian English on mass media. including the Liberia Broadcasting System, United Nation Missions in Liberia Radio, and at Ministry of Information, Culture and Tourism's (MICAT) weekly press conference. - Awareness campaigns in health facilities and schools on the dangers of antibiotic misuse in the 15 counties of Liberia. - Distribution of flyers with key facts. - Awareness on the social media (Facebook).
10.	Mali	- Presentation of the AMR agenda at the onset of 2019 to map a way forward. - Use of social media as a tool through platforms like twitter, and mass rollout of awareness materials such as posters and leaflets with targeted messages for prescribers, practitioners, and the general public. - Capacity-building training and an AMR conference.
11.	Madagascar	- Sensitization of policy-makers (parliamentarians)
12.	Mozambique	- Webinars on rational antimicrobial use. - AMR seminars with universities. - Training of journalists. - AMR debates on social media.
13.	Namibia	- Held a national television-streamed panel discussion on AMR, featuring experts from animal and human health and agriculture sectors. - Distribution of informative pamphlets and posters at all health care centres, as well as a capacity-building workshop on AMR and AMS. - Training of staff at the state veterinary.

...continued

SN.	Country	Survey key findings
14.	Sierra Leone	- AMR scientific meetings with a situational analysis of the country in relation to AMR. - Use of the media through radio discussions and poster coverage. - Introduction of the AMR agenda to educational facilities through interactive visits.
15.	South Africa	- Provincial antimicrobial stewardship symposium webinar. - AMR seminars. - Press release.
16.	Tanzania	- AMR awareness symposium. - Dissemination of AMR awareness materials. - WAAW launch.
17.	Uganda	- Annual AMR conference at the beginning of every WAAW. - Sensitization of the community, veterinary personnel, and hospital personnel. - Student competitions on AMR coupled with surveys. Setting up of online AMR community of practice. - Engagement of Ugandan media houses to disseminate the message and publishing of an AMR newsletter. -
18.	Zambia	- Targeted awareness material developed, printed, and disseminated. - Orientation for media personnel, permanent secretaries, and heads of institutions on AMR. - Sensitization of agro-vet dealers on AMR. - Assessing poultry value chain and production systems to identify high risk behaviours and practises in relation to AMR/ Measuring the impact of AMR - awareness among the poultry farmers. - Draft internal communication strategy for awareness on AMR. - Live TV and radio interviews/discussions (Occasional as and when we get free airtime). - Commemoration of 2017 - 2021 world antibiotic awareness week (WAAW) Awareness walk/campaign. - Sensitization of poultry famers on prudent use of antibiotics in poultry (2019, 2021). - AMR debates- secondary schools/ community/ university/ colleges (2019-2021). - Live phone in TV and radio programmes.
19.	Zimbabwe	- Public lectures at universities in the country on AMR. - Interaction with farmers to explain the AMR agenda. - Several AMR stakeholder meetings to plan out a way forward for AMR. - AMR debates between tertiary institutions. - Use of Zimbabwean media houses to spread awareness.

3.3 Findings from the review of the 2020-2021 TrACSS

These findings are summarized in Table 4 and Figures 2 and 3 below.

Table 4: AMR Education in human, animal, and plant health sectors – review of the 2020-2021 TrACSS results

SN.	Country	Human health	Animal health	Farmers and plant health professionals
1	Benin	- Ad hoc AMR training courses in some human health-related disciplines	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists
2	Botswana	- Ad hoc training and professional education on AMR	- Ad hoc training and professional education on AMR	- Non-existent for farmers and plant health professionals
3	Burkina Faso	- AMR is covered in pre-service training for all appropriate officers. In-service training or other CPD covering AMR is available for all types of human health workers nationwide.	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
4	Burundi	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
5	Cabo Verde	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
6	Cameroon	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
7	Central African Republic	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders
8	Côte d'Ivoire	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.

...continued

SN.	Country	Human health	Animal health	Farmers and plant health professionals
9	Chad	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals,	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
10	DRC	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
11	Eritrea	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
12	Eswatini	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	- Tailored ad hoc AMR training courses are available for all or most key stakeholders.
13	Ethiopia	- AMR is covered in pre-service training for all appropriate officers. In-service training or other CPD covering AMR is available for all types of human health workers nationwide	- Continuing professional training on antimicrobial resistance and antimicrobial use is available nationwide for veterinary-related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
14	Equatorial Guinea	- No training for human health workers on AMR.	- No training of veterinary- related professionals (veterinarians and veterinary paraprofessionals) on AMR.	- Not indicated.

...continued

SN.	Country	Human health	Animal health	Farmers and plant health professionals
15	Gabon	- No training for human health workers on AMR.	- No training of veterinary- related professionals (veterinarians and veterinary paraprofessionals) on AMR.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
16	Ghana	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
17	Guinea	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	- Tailored ad hoc AMR training courses are available for all or most key stakeholders.
18	Kenya	- AMR is covered in pre-service training for all relevant cadres. In-service training or other CPD covering AMR is available for all types of human health workers nationwide.	- Continuing professional training on antimicrobial resistance and antimicrobial use is available nationwide for veterinary-related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
19	Lesotho	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
20	Liberia	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
21	Mali	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- No training of veterinary- related professionals (veterinarians and veterinary paraprofessionals) on AMR.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.

...continued

SN.	Country	Human health	Animal health	Farmers and plant health professionals
22	Madagascar	- Ad hoc AMR training courses in some human health-related disciplines.	- No training of veterinary- related professionals (veterinarians and veterinary paraprofessionals) on AMR.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
23	Malawi	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
24	Mauritius	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
25	Mauritania	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
26	Mozambique	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	- Tailored ad hoc AMR training courses are available for at least two groups of key stakeholders.
27	Namibia	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- AMR is systematically and formally incorporated in curricula for graduating veterinarians and veterinary paraprofessionals and continuing professional training is a formal requirement.	- Tailored ad hoc AMR training courses are available for at least two groups of key stakeholders.

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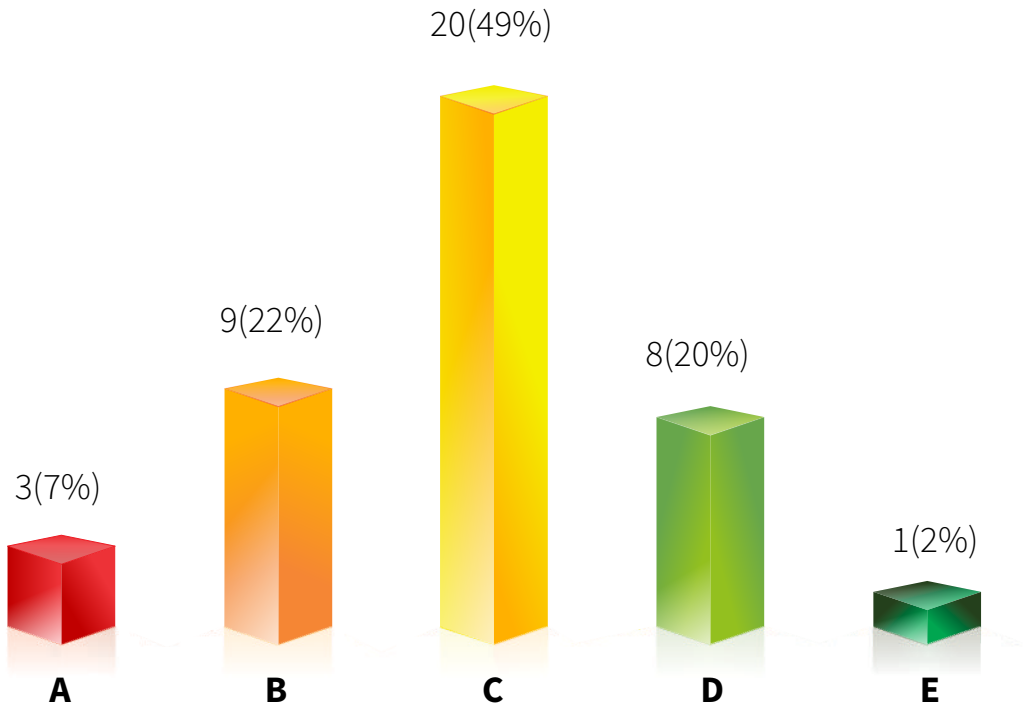
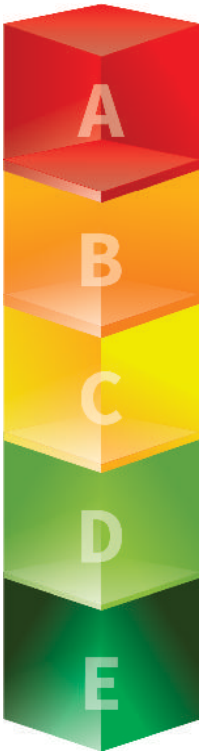
SN.	Country	Human health	Animal health	Farmers and plant health professionals
28	Niger	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
29	Nigeria	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
30	Rwanda	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- AMR is systematically and formally incorporated in curricula for graduating veterinarians and veterinary paraprofessionals and continuing professional training is a formal requirement.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
31	Senegal	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
32	Sierra Leone	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
33	South Africa	- Ad hoc AMR training courses in some human health-related disciplines.	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.

...continued

SN.	Country	Human health	Animal health	Farmers and plant health professionals
34	South Sudan	- Some ad hoc activities done in this sector.	- Ad hoc AMR training courses available for veterinary- related professionals.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
35	Sudan	- Ad hoc AMR training courses in some human health-related disciplines.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
36	Seychelles	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- No training provision on AMR for key stakeholders, e.g. agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, environmental specialists.
37	Uganda	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
38	Zambia	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
39	Zimbabwe	- AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers.	- Ad hoc AMR training courses available for veterinary- related professionals.	- Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.

Fig. 2: Status of AMR awareness raising in the WHO African Region





No significant awareness-raising activities on relevant aspects of risks of antimicrobial resistance.

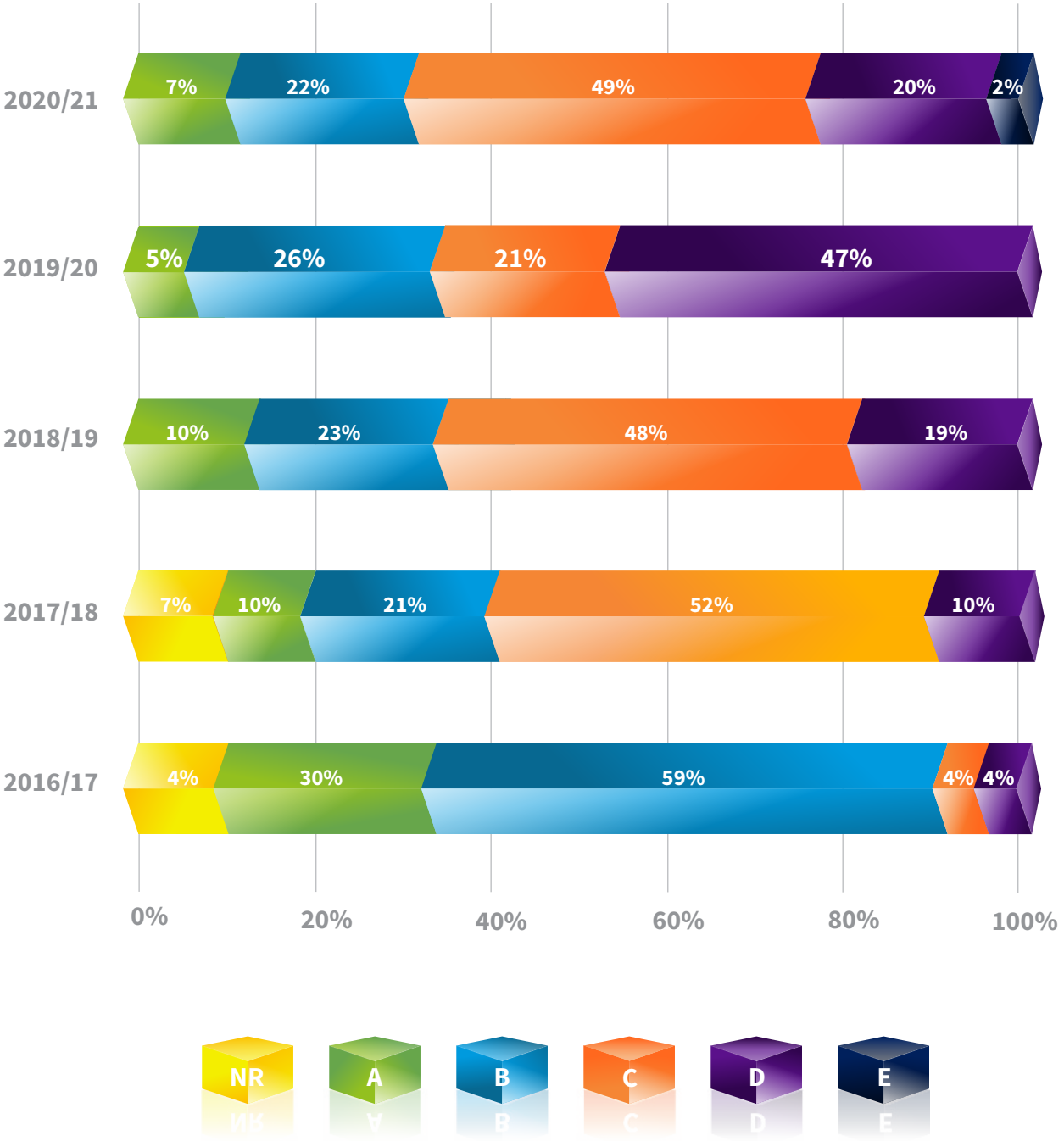
Some activities in parts of the country to raise awareness on risks of antimicrobial resistance and actions that can be taken to address it.

Limited or small-scale antimicrobial resistance awareness campaign targeting some, but not all, relevant stakeholders.

Nationwide, government-supported antimicrobial resistance awareness campaign targeting all or most priority stakeholder groups, based on stakeholder analysis, utilizing targeted messaging accordingly within sectors.

Targeted, nationwide government-supported activities regularly implemented to change behaviour of key stakeholders within sectors, with monitoring undertaken over the past 2-5 years.

Fig. 3: WHO African Region TrACSS 5-year responses - AMR awareness raising campaigns



According to the results of the 2021 TrACSS, almost half of the countries 20 (49%) are at level C with limited or small-scale antimicrobial resistance awareness campaigns (level C) with 9 countries (22%) reported having government supported nationwide AMR awareness campaigns (D-E). The 5year trends show that countries have small scale awareness raising activities targeting some stakeholders (C-E). There is need for more investment in targeted, nationwide government supported AMR campaigns for key stakeholders (D-E).

Discussion

4

Antimicrobial use is mostly influenced by knowledge, perception, prevailing attitudes, and practices. Education and awareness play a critical role in addressing the use of antimicrobials and ultimately AMR, as it is an overarching objective that cuts across the other four objectives of both the global action plan and Member State's action plans for AMR control. Expeditious and effective implementation of the one health national plans to mitigate AMR requires an all-encompassing, robust, and society-wide approach that utilizes target-specific, efficient communication strategies aimed at the government and policy-makers, healthcare workers, veterinarians, animal farmers and food producers, community drug vendors, high school, undergraduate and graduate students, as well as the general public.

Results of the 2021 TrACSS show that almost half of the Member States (20,49%) that responded to the survey have limited or small-scale AMR awareness campaigns with only eight countries (20%) reporting having small-scale govern- ment-supported nationwide AMR awareness campaigns. The 5-year trend shows that only 2% of the Member States have targeted nationwide government-supported activities implemented regularly to change the behaviour of key

2021 TrACSS show that almost half of the Member States

(20,49%)

that responded to the survey have limited or small-scale AMR awareness campaigns

The 5-year trend shows that only

2%

of the Member States have targeted nationwide government-supported activities

Given that the public is generally unaware of AMR and its dire consequences, control efforts require aggressive orientation and community engagement among Member States

stakeholders within sectors, with monitoring undertaken over the past 2-5 years. If these interventions are to be impactful and trigger behavioural change, there must be deliberate effort by governments in individual Member States to ensure sustained support and funding for targeted awareness activities.

Although most countries (74%, 23/31) in the region hold regular public awareness campaigns against AMR and its drivers [31], our literature review noted low levels of awareness and knowledge of AMR across societal strata. One of the key AMR control factors is public awareness/engagement which, if conducted with due regard for context-specific determinants and elements of behaviour change, can provoke behavioural change among the public since AMR is a societal issue, demanding specified roles to be played by everyone [32]. Given that the public is generally unaware of AMR and its dire consequences, control efforts require aggressive orientation and community engagement among Member States with full participation of the governments' relevant sectors, civil society, non-governmental organizations, and the media for concerted and coordinated activities and enhanced understanding.

> "Our findings in this regard equally correlate with those of a systematic governance analysis which reviewed the contents of NAPs on AMR from 114 countries and showed that the rating for education was about the lowest of the 18 domains [46]"

Proper messaging of information plays a critical role in impactful communication, and therefore educator and expert engagement in messaging is key to effective communication and behavioural change. A few member countries have made efforts in partnering with media personnel to package and disseminate AMR awareness messages. However, there is need for consistency and broadened scope to include different audiences and ensure development, packaging and positioning of messages that will speak to different relevant audiences. It is also necessary to enhance capacity-building for media professionals for them to better understand the subject matter for effective messaging and communication. Previous reports suggest that such community engagement, using context-driven community approaches and tools for appropriately packaged and positioned messaging, can go a long way towards facilitating expected behavioural change in LMICs [33].

> Despite the GAP recommending inclusion of AMR as a core component in the education curricula, only about 20% of Member States have lived up to this.

Our review noted an unappreciable AMR knowledge even among human HCWs; findings in a multi-country survey across Ghana, Nigeria and Tanzania showed that respondents with good AMR awareness were not up to 60% in majority of the countries and awareness scores differed significantly among the different professionals within each country [34]. The review also noted in two separate Nigerian studies that more than 40% of human HCWs, even in urban centres, lack knowledge on AMR [35, 36]. Our review findings therefore validate what was previously noted in a scoping review which documented global knowledge gaps on AMR in human health, particularly in AMR burden and drivers, as well as awareness and education, with the African Region leading the gap chart [37]. Even in studies where AMR knowledge levels were reported to be high among the human healthcare professionals, high proportions neither knew the extent of AMR nor that AMR could lead to treatment failure [38, 39]. In addition, some HCWs neither saw AMR as a problem in their local HCFs nor appreciated its impact in their daily routine practice, a knowledge dearth also documented among physicians in tertiary HCFs [40-42], with associated serious consequences on healthcare cost and patient outcomes. Knowledge of good practices as regards antimicrobial use is noted among most HCWs; however, there is still widespread knowledge deficit on key drivers such as lack of antibiogram and poor hand hygiene and IPC measures, as documented by two studies carried out in Ethiopia and Zambia [43, 44], as well as other three studies conducted in Benin, Cameroon, and Uganda [38, 42, 45] respectively. Several studies show higher AMR knowledge levels among physicians and pharmacists compared to other HCWs, including nurses. Other studies also show that human HCWs had poor training on AMR; most respondents had no current knowledge and a few claimed that their last training dated back to their student years. Our findings in this regard equally correlate with those of a systematic governance analysis which reviewed the contents of NAPs on AMR from 114 countries and showed that the rating for education was about the lowest of the 18 domains [46], highlighting that basic and continuous education on AMR for healthcare workers need to be robustly established in most countries. Despite the GAP recommending inclusion of AMR as a

core component in the education curricula, only about 20% of Member States have lived up to this. In most cases, AMR is covered in some pre-service training and in some in-service training or other continuing professional development (CPD) for human health workers, with ad hoc AMR training courses for veterinary practitioners to little or no training provision on AMR for key stakeholders, such as agricultural extension workers, farmers, food safety officers, food and feed processors and retailers, and environmental specialists. This could account for the results of the studies conducted in some countries in the region that documented poor knowledge levels among different key stakeholders [16, 17,18,19].

There is therefore an urgent need among the Member States in the region for strong efforts to institutionalize AMR aspects in workforce education in relevant sectors as pre-service training, or in-service training which demands champions and resources. In the human health sector, for example, countries can leverage on the curricula guide by the World Health Organization (WHO) for health workers education and training to develop templates for continuous professional development [47]. In addition, AMR topics should also be incorporated into high school and university courses as curricula-based education.

Furthermore, the findings justify the use of unconventional approaches to systematize education, thereby promoting and ensuring sustainable behavioural change for addressing AMR threats. Countries within the region can leverage on several educational initiatives targeted at different groups of people to improve AMR awareness and education, for example, e-Bug Europe and MicroMundo for pre-university students, the “Do bugs need drugs” programme which is an initiative of Alberta Health Services and the British Columbia Centre for Disease Control, WHO-African Region debate initiative which took place in Senegal during the 2022 continental world AMR awareness week celebration, the debate kit launched by the Spanish national AMR plan, and the ReAct campaign which educate on AMR nature and drivers. There are other smaller initiatives, such as the “Bugs in Bangkok” board game, the WHO-supported youth awareness pilot initiative, and the Dr. Ameyo Stella Adadevoh (DRASA) Health Trust model which uses health clubs as part of extra-curricular activities to teach secondary school students about AMR in Nigeria [48, 49]. The results of this pilot initiative showed statistically significant increase in knowledge on antibiotics, their use and antibiotic resistance, as well as improved knowledge on personal health among the student ambassadors. Educating young people and getting them involved early enough and letting them to

> To improve prescribing and dispensing behaviours among healthcare practitioners, WHO has formulated a curriculum to serve as guide for health workers' education and training in AMR. It is designed to aid users in adapting their own curricula to the local setting [24,47].

be part of the solutions will cultivate innovative approaches to some of the education and awareness barriers in the African setting. Similarly, the potential usefulness of social media for AMR awareness and education has not been appreciably explored in the region; in fact, the utility of social media for addressing AMR has been a neglected approach, especially in low- and middle-income countries [50].

It is therefore instructive that countries adapt and, where possible, deploy social media platforms for education and information dissemination, particularly with young people among whom its use is rising significantly and has a high tendency to bring about change in attitudes, practices, perceptions and, ultimately, behaviour [51].

The burgeoning number of young people utilizing social media platforms presents an opportunity to increase and sustain AMR education and awareness.

Partnering with social media influencers with huge following also provides a perfect opportunity for effective youth engagement as these are seen as role models and emulated by most of their followers.

As regards the agricultural sector, farmers across the region showed abysmal level of AMR knowledge, many of them neither correlated the use of antimicrobials on their animals to AMR nor comprehended the possibility of resistant bugs being transmitted from animals to humans. This is demonstrated in a study conducted in Ethiopia involving 571 rural farmers which documented that only 41% knew that excessive use of antimicrobials in their animals can cause AMR. In the same vein, a study conducted in Cameroon involving 358 farmers, among several others, reported insufficient knowledge of AMR being transmitted from their animals to humans or the environment [52, 53]. These findings have been well substantiated in a systematic review among poultry farmers which revealed that only 43% had knowledge about AMR and only about 50% understood the impacts of AMR on poultry, human health, and the environment [54]. Poor AMR knowledge in LMICs had been earlier reported in a review of 103 multiregional study articles which revealed that farmers in Africa and Asia demonstrated grossly deficient knowledge of AMR compared to their counterparts in

> Furthermore, community engagement (CE) can facilitate AMR behaviour change, specifically in LMICs, as it adopts approaches that support communities to develop solutions that are locally meaningful and factors in economic feasibility and social acceptability [23,60].

Europe [55]. The responsibility therefore rests on Member States to be committed to providing flexible and contextualized methods to educate and inform community farmers about AMR which can be facilitated by existing platforms, such as appropriate broadcast media for wide reach. Successes recorded by some countries can be replicated and upscaled by many other countries; a typical example is the poultry farmer field schools by FAO in Ghana and Kenya which facilitated a knowledge-driven reduction in antibiotic use in birds, improvement in IPC practices, and enhancement of patronage with animal health professionals [56]. Furthermore, fortifying AMR education among veterinary and paraveterinary workers is a step in the right direction in efforts to stepdown robust knowledge to farmers. Being animal health practitioners and health extension workers, their education provides direct impact on farmers' knowledge of animal husbandry and drug resistance. Such education can be well guided at the undergraduate level, and can utilize various platforms and tools including online-based resources deployed for enhanced education on antimicrobial resistance and antimicrobial use [57]. The region will do well to leverage on previously used initiatives to strengthen veterinary training by incorporating AMR education [58]

To improve prescribing and dispensing behaviours among healthcare practitioners, WHO has formulated a curriculum to serve as guide for health workers' education and training in AMR. It is designed to aid users in adapting their own curricula to the local setting [24,47]. WOAH has also published recommendations on the competencies of graduating veterinarians to ensure quality national veterinary services that includes a section on veterinary products, which requests appropriate use of medicines by graduating veterinarians [59]. The availability of sparse data on AMR education in the WHO African Region is an indicator that very few countries have adopted this curriculum. While the existing efforts are to be commended, more needs to be done to ensure increased and sustained AMR education and awareness.

The engagement of the community as another key stakeholder is crucial in addressing antimicrobial misuse as one of the critical drivers of AMR among the general public [15]. However, most interventions to engage the community have been at a small scale and limited to the yearly WAAW commemoration through awareness walks and television and radio programmes. Given the magnitude of AMR and the fact that addressing it needs efforts from all, it is important that the public be engaged through outreach programmes and awareness campaigns which create an opportunity for people to identify with the AMR agenda and understand how it will affect everyone if not contained. Furthermore, community engagement (CE) can facilitate AMR behaviour change, specifically in LMICs, as it adopts approaches that support communities to develop solutions that are locally meaningful and factors in economic feasibility and social acceptability [23,60].

Efforts by Member States to improve AMR education and awareness have not been without challenges. One of the highlighted barriers to achieving optimal education and awareness, as well as effective health communication in the African Region is the inadequate capacity for packaging actionable, clear, useful, accurate and appropriate/relevant messages that sink into hearts and minds. Although drug resistance has been with us for quite some time, the concept of AMR is still relatively "new" to most people and can be difficult to explain in a way that is relatable to the target audience.

Inadequate human and financial resources is another common challenge cited by Member States. The implementation of AMR NAPs requires capital investment, both human and financial; inadequate sustainable financing and dedicated human resources, in the midst of competing priorities (where AMR competes for political attention and resources with other public health issues that are viewed as more immediate priorities), has impacted the implementation of sustainable education and awareness interventions.

Furthermore, the unavailability of adequate, accurate and useful country and regional data to inform targeted and impactful interventions has also negatively affected education and awareness efforts in most countries.

Over the past couple of years, the corona virus disease 2019 (COVID-19) pandemic overshadowed a lot of public health issues, including AMR. While the COVID-19 pandemic provides some levers to governments and institutions to address these two health emergencies in tandem, many COVID-19 response plans did not

clearly articulate AMR awareness, education, and training for healthcare workers in pre-and in-service. Recognizing the advantages of new technologies for disseminating education and awareness messages, restrictions on physical meetings led to the virtualization of most activities which negatively impacted on the implementation of physical education and awareness activities and limited participation by those without access to virtual tools. In addition, human resources were also thinly spread as the pandemic saw most staff being reassigned to support the COVID-19 response, leaving few or none to spearhead the implementation of NAP activities.

5 Conclusion

A lot has been said and documented on what needs to be done to enhance AMR education and awareness in the region, but the "implementation method" has been lacking. Concretizing what is on paper is the only way to see improved and sustained AMR education and awareness and behaviour change in antimicrobial use in the African Region. Effective education and awareness is required for evidenced-based behaviour change. Without behaviour change in the use of antimicrobials, all our efforts will remain inadequate.

It is time to move the plans from paper to action. Given the available resources and capacities, this is likely to be a gradual process that will require immense efforts and consistency by everyone, but it can be achieved [60].

6 Recommended actions

(a) government involvement and allocation of resources dedicated to increasing momentum on education and awareness activities, with the inclusion of antimicrobial resistance as a core element of the syllabus for students to ensure pre-service cost effective and sustainable AMR educational and awareness. Continuous education, training, certification and assessment of in-service practitioners in the human health, animal health, environment and agriculture sectors should also be introduced to address education and awareness among professionals;

(b) capacity building for Member States in messaging, information packaging, and effective communication (virtual options would be cost effective);

(c) targeted webinars and spoken messages in local languages: This could be very effective and help to package AMR messages in simplified ways that are relatable to the target audience and use languages that can be understood and promote better understanding;

(d) inclusion of basic non-cost intensive antimicrobial stewardship (AMS) interventions at all levels of health care: This will address not only AMR education for health workers, but also extensive use of antimicrobials in healthcare settings;

(e) use of captivating visuals and entertainment in awareness messages targeted at youths and children, as well as social media to enhance awareness. It would be necessary to identify and partner with social media influencers with large following and use their platforms for wider dissemination of key AMR messages;

(f) engagement of messaging and communication experts in AMR education and awareness activities and actively involving and building capacity of other sectors, such as the environment, district assemblies, and regulators, on AMR issues for advocacy;

(g) documenting changes in relevant behaviour among the general public, farmers, veterinarians, and health workers for decision making;

(h) capacity-building for NGOs in health to include AMR education in their community outreach programme for awareness and education; and

(i) leveraging and incorporating AMR and AMU into existing public health programmes on infectious diseases, to raise awareness.

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DRASA Pilot Project- WHO AMR education and awareness school initiative

DRASA (DR Ameyo Stella Adadevoh) Health Trust is a public health non-profit organization based in Lagos, Nigeria, that works with government at all tiers, as well as local and international partners to improve sanitation and hygiene and reduce the burden of communicable diseases. DRASA has been actively involved in improving awareness and understanding of antimicrobial resistance (AMR) among young people, especially in-school adolescents in Lagos State, through effective communication, education, training, and research.

In 2018, DRASA developed and implemented a secondary school health and hygiene programme in collaboration with World Health Organization (WHO) Nigeria, with support from the WHO AMR division and WHO Regional Office for Africa. The programme successfully trained 320

> The programme successfully trained **320 students** (AMR ambassadors) from 10 schools in Lagos State

students (AMR ambassadors) from 10 schools in Lagos State (eight public (government) secondary schools and two private secondary schools), as agents of change in slowing down development of resistance and preventing the spread of "supergerms".

The curriculum used to educate and develop these ambassadors was innovative, involving activities such as arts and crafts, music, dance, essays, competitions, poetry, and debates, leveraging the talents and energies of the students.

As a result of this programme, there was a statistically significant increase in knowledge on antibiotics, their use, and antibiotic resistance among the student ambassadors. There was also improved knowledge on personal health, with an increase in the number of ambassadors reporting that they always wash their hands using soap and an increased number of ambassadors reported seeking to be tested at a health facility after experiencing fever. Results from the 2018-2019 school health and hygiene programme provide strong evidence that there is a pressing need to promote integrated awareness, education, and behaviour change

> These students are using the lessons in DRASA's fun and engaging curriculum to help people around them stay healthy.

interventions using youth to effectively address AMR in the WHO African Region. Through these extracurricular clubs, 900 students (AMR ambassadors) are being trained to become champions of healthy behaviours in their schools, homes, and communities. These students are using the lessons in DRASA's fun and engaging curriculum to help people around them stay healthy. The curriculum covers topics on microbiology, antimicrobial resistance, personal hygiene, menstrual hygiene, hand washing, environmental sanitation, sexually transmitted diseases/infections and food safety. The student ambassadors take what we teach them at the club meetings to their communities, and progress/impact is tracked through a weekly activity log sheet, a document that specifies who they spoke to and what they taught those persons.

Given the outcomes and impact of the first phase of the school programme, DRASA has engaged 30 health and hygiene clubs in 30 schools in 2 states in Nigeria. The goal is to provide an interactive and engaging educational and behavioural change programme to reduce the incidence and spread of AMR in Nigeria and promote antimicrobial stewardship in the country.

Zambia AMR debates

Raising awareness of AMR and promoting behavioural change through public communication programmes that target different audiences in human health, animal health and agricultural practice, as well as consumers, is critical to tackling the threat of AMR. Debates have been and still are one of the effective ways to disseminate positive information to the public, and at

Empowering youths to engage and take on a more active and prominent role in AMR awareness raising can play a critical role in the societal perception of AMR.

the same time get feedback for quick action.

Debate also cuts across several disciplines outside academic subjects and enable effective communication to listeners, providing an engaging learner-centred platform, and equipping participants with knowledge and skills to better engage in dialogue and actions to curb AMR.

Since young people make up a large proportion of our population, their role/ voice in addressing the issues relevant to their future, including antimicrobial resistance, is important. Empowering youths to engage and take on a more active and prominent role in AMR awareness raising can play a critical role in the societal perception of AMR. In addition, interventions involving youths have influenced the overall attitude of parents and families, as demonstrated by the DRASA project.

Since 2019, Zambia has been conducting AMR student debates, with only seven schools from one province participating initially to 36 schools in three provinces by 2021.

The debates have witnessed an increasing number of students getting involved in AMR awareness raising and have given birth to a youth movement called “Zambia Youthful AMR Ambassadors” (YAMRAZ) that carries out AMR awareness campaigns and runs an AMR awareness social media page with over 2000 followers and reach of over 2600.

Photo story:

Because there is power in visuals

Burkina Faso

Democratic Republic of Congo

Sensitization and vaccination campaigns

Ethiopia

Participants - WAAW panel discussion

Dr Scott Newman, Emergency Center for Transboundary Animal Disease Team Leader, from FAO addressing the participants

Ghana

2021 WAAW commemoration

AMR awareness walk

Liberia

Dissemination of simplified AMR awareness materials

MoH_WHO Staff promoting public awareness and understanding of World Antibiotic Resistance during WAAW on the State Radio Liberia

Nigeria

AMR inter-school talent competition

AMR inter-school talent competition

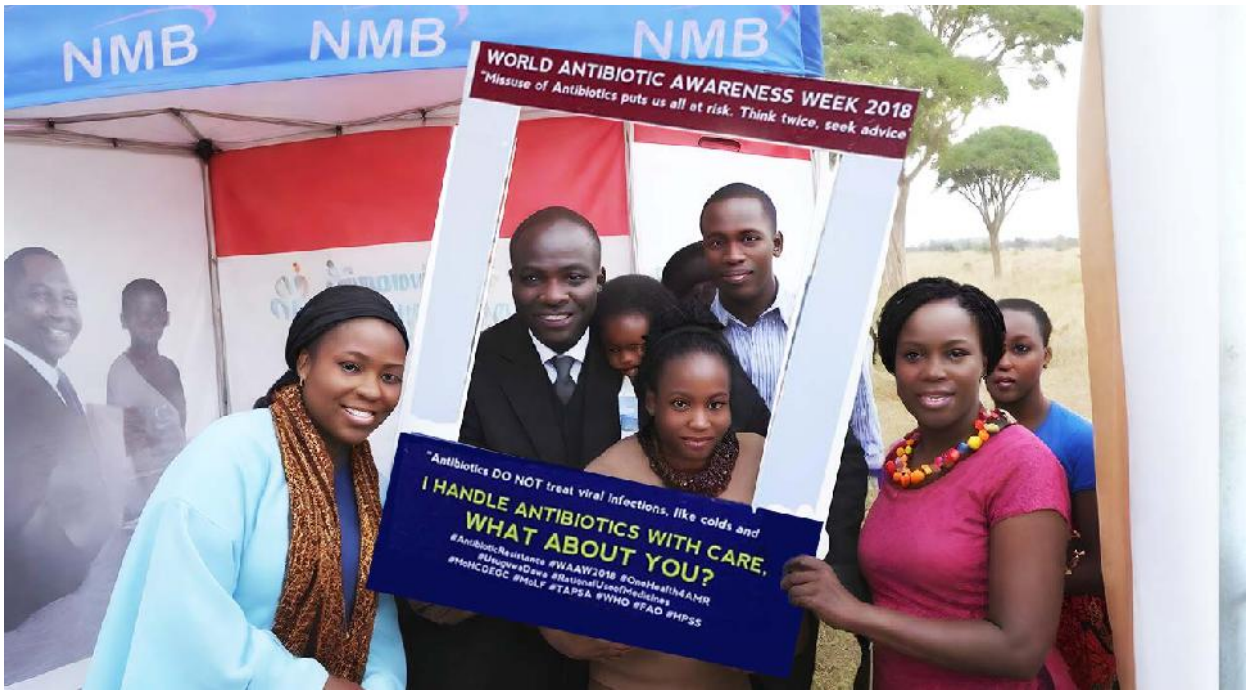
AMR awareness campaign: engaging community in local language

Sierra Leone

AMR awareness campaign (talks and dissemination of awareness materials)

AMR awareness campaign

Tanzania



2018 AMR Symposium

Zambia

AMR Media awards and targeted awareness materials for policy markers

AMR debates for universities and colleges

Zimbabwe

Call to tackle antibiotic resistance

AMR awareness campaign

Annexes

Annex 1:
List of countries that completed the baseline assessment questionnaire

Chad

Benin

Botswana

Burundi

Democratic Republic of the Congo

Eritrea

Ethiopia

Ghana

Liberia

Madagascar

Mali

Mozambique

Namibia

Sierra Leone

South Africa

Tanzania

Uganda

Zambia

Zimbabwe

2021 WORLD ANTIMICROBIAL AWARENESS WEEK (WAAW)

18-24 NOVEMBER 2021

EVENTS REPORTING FORMAT/FORMAT DE RAPPORT D'ÉVÉNEMENTS

NAME OF REGION OR COUNTRY OR ORGANIZATION (NOM

DATE OF EVENT	NAME OF EVENT	ORGANIZER(S)	TYPE (e.g. WEBINAR)	STATUS OF IMPLEMENTATION	NUMBER OF PARTICIPANTS	CHALLENGES THAT MAY HAVE AFFECTED IMPLEMENTATION	GENERAL COMMENTS (INCLUDING SUGESTIONS TO OVERCOME LISTED CHALLENGES)

The WHO Regional Office for Africa

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Africa is one of the six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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