MONITORING GLOBAL PROGRESS ON ANTIMICROBIAL RESISTANCE: TRIPARTITE AMR COUNTRY SELF-ASSESSMENT SURVEY (TRACSS) 2019-2020

GLOBAL ANALYSIS REPORT

Food and Agriculture Organization of the United Nations

WORLD ORGANISATION FOR ANIMAL HEALTH

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Contents

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Abbreviations

AMR	Antimicrobial resistance
AMU	Antimicrobial use
AWaRe	Access, WAtch and REserve
EML	Essential Medicines List
FAO	Food and Agriculture Organization of the United Nations
GAP-AMR	Global action plan on antimicrobial resistance
GLASS	Global Antimicrobial Resistance and Use Surveillance System
HIC	High-income country
HIV/AIDS	Human immunodeficiency virus/acquired immune deficiency syndrome
IPC	Infection prevention and control
JEE	Joint external evaluation
JMP	Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (WHO/UNICEF)
LIC	Low-income country
LMIC	Lower-middle-income country
NAP	National action plan
OIE	World Organisation for Animal Health
STI	Sexually transmitted infection
TB	Tuberculosis
TrACSS	Tripartite AMR country self-assessment survey
UMIC	Upper-middle-income country
UNICEF	United Nations Children's Fund
WASH	Water, sanitation and hygiene
WHO	World Health Organization

Definitions[1]

- **Human health:** Human health is defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.[2]
- **Animal health sector:** In its simplest form, animal health is defined as the absence of disease in animals. This sector includes systems or activities designed to optimize the physical and behavioural health and welfare of animals, including the prevention, treatment and control of diseases and conditions affecting the individual animal and herd or flock. The recording of illness, injuries, mortalities and medical treatments is an essential part of effective animal health measures where appropriate.
- **Plant health sector:** In its simplest form, plant health is defined as the absence of disease in plants. This sector includes phytosanitary systems or measures that focus on preventing, controlling and mitigating the introduction, spread and establishment of diseases or pests in plants.
- **Food production sector:** This sector includes all processes procedures and infrastructure that aim to optimize productivity and efficiency of animal and plant production systems, over and above those relevant to maintain Animal/Plant health and include aspects such as selective breeding, nutrition, housing systems, and other husbandry techniques.
- **Food safety sector:** Aspects of food production and processing which relate to safeguarding public health, whether pre or post slaughter or harvest. Food encompasses any substance, whether processed, semi-processed or raw, which is intended for human consumption.

[1] Food and Agriculture Organization of the United Nations, World Organisation for Animal Health, World Health Organization. Tripartite AMR country self-assessment survey (TrACSS): guidance note to accompany TrACSS 2019–2020 (version 4). Geneva: World Health Organization; November 2019 (https://www.who.int/antimicrobial-resistance/global-action-plan/monitoring-evaluation/AMR-country-questionnaire-guidance-note-4.0-November-2019.pdf?ua=1, accessed 2 November 2020).

[2] Official records of the World Health Organization No. 2, Summary report on proceedings minutes and final acts of the International Health Conference held in New York from 19 June to 22 July 1946. New York and Geneva: World Health Organization; 1948 (https://apps.who.int/iris/bitstream/handle/10665/85573/official_record2_eng.pdf;jsessionid=749D22CBAD3F93A6F26BDB7442F1BCEA?sequence=1, accessed 2 November 2020).

Executive summary

The annual Tripartite AMR country self-assessment survey (TrACSS) is a component of a broader approach for monitoring and evaluating the global action plan on antimicrobial resistance (GAP-AMR). This report summarizes global responses from the fourth round of the TrACSS, held from November 2019 to July 2020. Due to the COVID-19 pandemic, the response rates for the 2019–2020 TrACSS around were 11.8% lower than the previous year. A total of 136 (70.1%) countries out of 194 WHO Member States responded to the 2019–2020 TrACSS, compared to 159 out of 194 (81.9%) in 2018–2019.

Despite the lower response rate, the results indicate that countries are moving forward on key actions to help address antimicrobial resistance (AMR). Compared to previous years, the number of countries that have reached nationwide implementation on several indicators has increased, including increases in the number of countries with developed national action plans (NAPs), with functional multisectoral working groups on AMR, and with the nationwide implementation of national infection prevention and control (IPC) programmes aligned with the WHO Guidelines on Core Components for IPC.

Using data from 115 countries that had responded to the past three rounds of the questionnaire over three years, a trend analysis was conducted to evaluate whether countries had advanced to nationwide implementation over the years, represented by levels C–E for most indicators (on an A to E scale) and D–E for the indicator on raising awareness. The data show that over the past three years, these countries have advanced gradually, with increases in the percentage of countries with nationwide AMR awareness-raising campaigns, along with increases in the following areas in three main sectors: training and education on AMR, the national monitoring activities for antimicrobial consumption and use, and the national surveillance activities for resistance.

An analysis of levels of achievement on TrACSS indicators across World Bank income classification groups found that levels of achievement did significantly differ based on income group. This is in line with the prevailing assumption that higher-income countries have higher levels of achievement on TrACSS indicators (levels C–E), potentially due to greater access to resources and/or starting from a higher baseline. The analysis highlights the critical need to provide both additional technical and financial support to lower-income countries and a clear rationale to policy-makers based on a robust assessment of the economic and humanitarian impact of addressing AMR.

Based on an analysis of the TrACSS data and consideration of ongoing global efforts against AMR, countries could further enhance their efforts on addressing AMR in the following few areas:

- **Strengthening multisectoral coordination and collaboration:** The discrepancies found in the validation process between TrACSS submissions and the OIE's data on the monitoring of antimicrobial sales and use in countries, and between the TrACSS self-reported data on water, sanitation and hygiene (WASH) in health care facilities and the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) report,[3] indicate that gaps might exist in communication and coordination efforts across and between sectors. While the data show an increase in the number of countries with functional multisectoral groups responsible for AMR NAP implementation, improved processes and consistent higher-level oversight are needed to strengthen collaboration and to increase communication across and within sectors.
- **Promoting targeted AMR awareness-raising campaigns:** Globally, fewer than 50% of countries have nationwide, government funded AMR awareness campaigns targeting key stakeholders (levels D–E). Additionally, the human health and animal health sectors are the main sectors involved in awareness-raising campaigns. Better representation and involvement are needed from the food production, food processing,

[3] WASH in health care facilities: global baseline report 2019. Geneva: World Health Organization and United Nations Children's Fund (UNICEF); 2019 (https://washdata.org/sites/default/files/documents/reports/2019-04/JMP-2019-wash-in-hcf.pdf, accessed 4 November 2020).

plant health and environment sectors. Another clear need is to establish baselines on the level of awareness in countries through standardized tools to measure progress.

- **Increasing the monitoring and enforcement of legislation involving antimicrobials:** The presence of legislation does not always indicate monitoring or enforcement. Policies regarding the prescription, dispensing, sale and disposal of antimicrobials need to be strengthened, monitored and enforced appropriately.
- **Strengthening access to essential antimicrobials and diagnostics:** Encouraging countries to adopt the AWaRe (Access, Watch, and REserve) antibiotic classification tool in their national Essential Medicines List (EML) will help them better support antibiotic monitoring and the optimal use of antibiotics. Ensuring access to diagnostic tools will help contribute to the surveillance of resistance and the optimal use of antimicrobials.
- **Strengthening data monitoring and reporting:** Strengthening data collection for AMR surveillance and antimicrobial consumption/ use and ensuring better data reporting and sharing across sectors are needed to secure a detailed picture of AMR and antimicrobial consumption/use in countries, based on the One Health approach. Additionally, better data need to be collected and shared with the multisectoral group working on AMR national action plan implementation so national policies and strategies can be revised and aligned with the country situation in a more effective way.

Since the TrACSS is a self-assessment survey, the assumption is that some of the responses were reported in a more positive light. Where possible, the responses were validated against external data, but not all TrACSS indicators have external data that can be used for validation. The gradual advancement in some of the indicators over the past three years also suggests that the data should not be dismissed due to purported self-reporting bias. The TrACSS should be just one of the available data sources for countries to consult when analysing their progress on the implementation of NAPs on AMR. Additional sources of data across sectors should also be collected and used when reviewing national action plans on AMR.

1. Introduction

BACKGROUND ON THE ANNUAL TRIPARTITE AMR COUNTRY SELF-ASSESSMENT SURVEY

Antimicrobial resistance (AMR) is one of the top global threats currently facing the world, endangering the achievement of the Sustainable Development Goals linked to health, poverty, food security and the environment, among others. In response, the global action plan on antimicrobial resistance (GAP-AMR)[4] was adopted in 2015 by all countries through decisions in the World Health Assembly,[5] the FAO Governing Conference,[6] and the OIE World Assembly.[7] It was further endorsed by heads of state during the United Nations General Assembly in October 2016.[8]

The Tripartite AMR country self-assessment survey (TrACSS) specifically addresses monitoring the implementation of AMR national action plans (NAPs), which should be aligned with GAP-AMR objectives. This report analyses the global results of the fourth round of TrACSS, which was administered from November 2019 to July 2020 (the original submission deadline of February 2020 was extended to July 2020 due to the COVID-19 pandemic).

The TrACSS multisectoral survey questionnaire closely reflects the GAP-AMR.[9] It starts by investigating the presence of multisectoral working groups on AMR within the country, followed by the country's progress in developing a NAP on AMR, as well as the presence of national regulations on antimicrobials. The subsequent questions address four of the five strategic objectives of the GAP-AMR that require country-level action: 1) raising awareness and understanding of AMR; 2) strengthening the knowledge and evidence base through surveillance and research; 3) reducing the incidence of infections; and 4) optimizing the use of antimicrobial medicines in human and animal health.

Questions in the survey ask for a rating of national capacity and progress on a five-point scale from A to E, which roughly corresponds to: no capacity, limited, developed, demonstrated and sustained capacity. **For most survey questions, the countries reporting levels C–E (or developed, demonstrated and sustained capacity, respectively) are considered to have nationwide implementation for that indicator**. For indicators on raising awareness of AMR and infection prevention and control (IPC) programmes, levels D–E are recognized as having nationwide implementation.

Complete country responses can be found on the Global Database for TrACSS at amrcountryprogress.org

It is important to note that country membership and the grouping of countries into regional blocs can differ between the FAO, OIE and WHO and do not directly correspond to one another. Mentions of regions in this report correspond to WHO regional groupings.

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4 Global action plan on antimicrobial resistance. Geneva: World Health Organization; 2015 (https://www.who.int/antimicrobial-resistance/publications/global-action-plan/en, accessed 2 November 2020). The global action plan was developed by WHO with the support of the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE).

5 Resolution WHA68.7. Global actin plan on antimicrobial resistance. In: Sixty-eighth World Health Assembly, Geneva, 26 May 2015 (http://origin.searo.who.int/entity/antimicrobial_resistance/wha68_r7-en.pdf, accessed 2 November 2020).

6 Resolution 4/2015. Antimicrobial resistance. In: Report of the Conference of FAO, Thirty-ninth session, Rome, 6-13 June 2015 (http://www.fao.org/3/a-mo153e.pdf, accessed 2 November 2020).

7 Resolution 26. Combating antimicrobial resistance and promoting the prudent use of antimicrobial agents in animals. In: World Assembly of Delegates of the OIE, Paris, 26 May 2015 in view of an entry into force on 30 May 2015 (http://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/A_RESO_AMR_2015.pdf, accessed 2 November 2020).

8 Seventy-first session of the United Nations General Assembly. Resolution adopted by the General Assembly on 5 October 2016, A/RES/71/3. Political declaration of the high-level meeting of the General Assembly on antimicrobial resistance, 19 October 2016 (https://undocs.org/en/A/RES/71/3, accessed 4 November 2020).

9 Global monitoring of country progress on addressing antimicrobial resistance: Self-assessment questionnaire 2019–2020. Geneva: World Health Organization; 2019 (https://www.who.int/antimicrobial-resistance/global-action-plan/monitoring-evaluation/AMR-country-self-assessment-2019/en, accessed 2 November 2020).

When possible, a trend analysis was performed comparing this year's responses to the two previous TrACSS rounds to identify trends on the percentage of countries that have reached nationwide implementation for each indicator. The trend analysis looked at 115 countries that consistently submitted the annual TrACSS in the past three years and evaluated the evolution of their responses to assess what percentage of countries had advanced to nationwide implementation. Because some of the indicator questions have changed over the years, only comparable years were analysed, so the first TrACSS round (2016–2017) was not used for comparison. Even within the past three years, some indicators regarding nationwide implementation are only compared for the past two years because of changes to indicator questions.

For the analysis on income classification and achievement, countries were categorized into income groups based on the latest World Bank income group classification.

Upon validation, the TrACSS data broadly correspond to data provided during joint external evaluation (JEE) missions in the 17 countries that both hosted a JEE mission and submitted data to the TrACSS. The capacities that JEEs assess include multisector coordination and NAP development, AMR surveillance, IPC and antimicrobial stewardship.

2019–2020 TrACSS survey participation

In the latest 2019–2020 TrACSS round, 136 (70.1%) out of 194 WHO Member States[10] responded to the survey, an 11.8% decrease in the response rate from the 2018–2019 TrACSS, in which 159 WHO Member States (81.9%) participated. The 2017–2018 TrACSS had a response rate of 154 (79.3%) WHO Member States. The lower rate of response for the latest round was most likely due to governments' engagement in the COVID-19 response in their country.

Coverage of countries in some WHO regions decreased from the previous TrACSS round, including in the WHO African Region, WHO Region of the Americas and WHO Western Pacific Region, while the response rate of the countries in the remaining regions increased or already had full participation, including in the WHO Eastern Mediterranean Region, WHO European Region and WHO South-East Asia Region.[11] Table 1 compares the response rates of the last three rounds of the TrACSS.

Despite the lower response rate this year due to the COVID-19 pandemic, the number of countries with "nationwide implementation" for several indicators has increased. Furthermore, trend analysis of the 115 countries that consistently completed the TrACSS over the past three years also revealed an increase in the percentage of countries reporting "nationwide implementation" for all indicators.

[10] FAO, OIE and WHO country membership can differ. Based on precedent and for consistency, WHO Member States are used in the rest of this report.

[11] FAO, OIE and WHO have grouped countries into different regional blocs so FAO, OIE and WHO regions do not directly correspond to each other. For FAO regions, see FAO worldwide offices at http://www.fao.org/about/who-we-are/worldwide-offices/en; for OIE regions, see OIE Regional Commissions at https://www.oie.int/about-us/wo/oie-regional-commissions; for WHO regions, see WHO regional offices at https://www.who.int/about/who-we-are/regional-offices (all accessed on 2 November 2020).

Table 1. Characteristics of countries participating in the past three rounds of the TrACSS, including the most recent round

Participation	2017–2018		2018–2019		2019–2020	
WHO Member State TrACSS participation (%), n=194	154 (79.3%)		159 (81.9%)		136 (70.1%)	
WHO region (total no. of Member States per region)	Survey respondents, n (%) n=154	Countries per WHO region (%)	Survey respondents, n (%) n=159	Countries per WHO region (%)	Survey respondents, n (%) n=136	Countries per WHO region (%)
African Region (47)	29 (18.8)	29/47 (61.7)	31 (19.5)	31/47 (65.9)	19 (14.0)	19/47 (40.4)
Region of the Americas (35)	28 (18.2)	28/35 (80)	29 (18.2)	29/35 (82.9)	19 (14.0)	19/35 (54.3)
Eastern Mediterranean Region (21)	17 (11)	17/21 (81)	18 (11.3)	18/21 (85.7)	20 (14.7)	20/21 (95.2)
European Region (53)	50 (32.5)	50/53 (94.3)	50 (31.4)	50/53 (94.3)	51 (37.5)	51/53 (96.2)
South-East Asia Region (11)	11 (7.1)	11/11 (100)	11 (6.9)	11/11 (100)	11 (8.1)	11/11 (100)
Western Pacific Region (27)	19 (12.3)	19/27 (70.3)	20 (12.6)	20/27 (74.1)	16 (11.8)	16/27 (59.3)

World Bank income group[a]	2017–2018 Number of countries[b]	2018–2019 Number of countries	2019–2020 Number of countries
High-income country (HIC)	50	52	49
Upper-middle-income country (UMIC)	44	48	36
Lower-middle-income country (LMIC)	40	34	35
Low-income country (LIC)	19	25	16

[a] The income groups for all three years are based on World Bank income classifications.

[b] No income group was listed for the Cook Islands.

Source: Tripartite AMR country self-assessment survey data (2017–2018, 2018–2019 and 2019–2020).

2. Development of national action plans

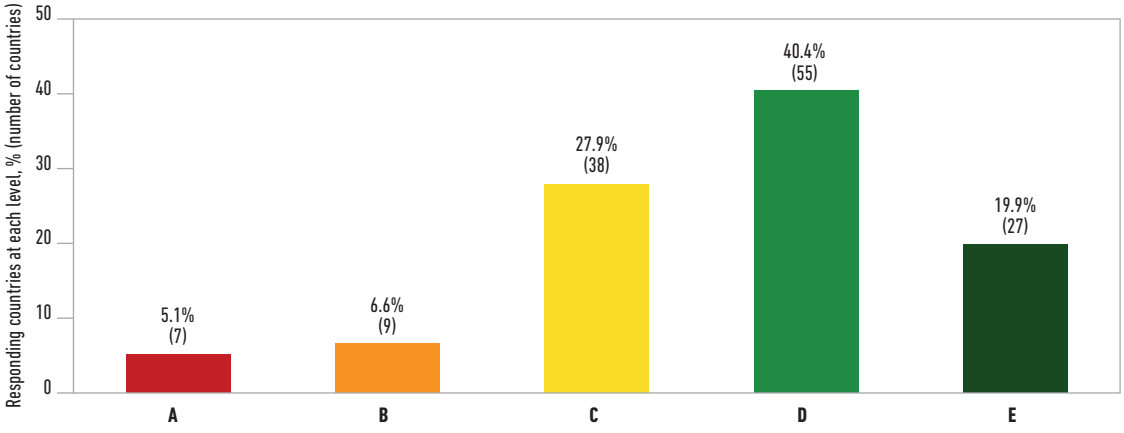
The number of countries with developed national action plans (NAP) has increased from previous years and, while most countries have developed NAPs, many have not identified funding sources for them. A total of 88.2% of responding countries reported a developed NAP on AMR, whereas 19.9% of countries reported funding their NAPs in 2019–2020.

Based on the latest World Bank population data, 90.0% of the global population is covered by countries that have developed NAPs on AMR.

Progress on countries developing NAPs has increased over the past few years; 2019–2020 TrACSS responses indicate a greater percentage of countries reporting having reached level C (a national AMR action plan has been developed), level D (an AMR NAP that reflects a GAP-AMR approved by the government, with an operational plan and monitoring arrangements) and level E (an approved NAP with identified funding sources) compared to the two previous years (Fig. 1).

In a trend analysis of 115 countries that participated in TrACSS each of the past three years (Fig. 2), there is around a 20% increase in the percentage of countries with developed AMR NAPs (levels C–E) over the past three years. This indicates that countries are shifting to developing, funding and implementing NAPs at more advanced levels over the years.

Fig. 1 Responses on NAP development, 2019–2020

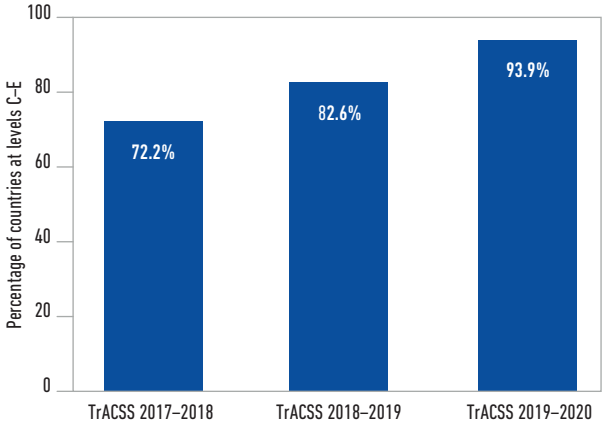


No response= 0 (n=136)

	A	No national AMR action plan.
	B	National AMR action plan under development.
	C	National AMR action plan developed.
	D	National AMR action plan approved by government that reflects Global Action Plan objectives, with a budgeted operational plan and monitoring arrangements.
	E	National AMR action plan has funding sources identified, is being implemented, and has relevant sectors involved with a defined monitoring and evaluation process in place.

Source: Tripartite AMR country self-assessment survey data.

Fig. 2 Trend: Increase in the percentage of countries with developed AMR NAPs, 2017–2018, 2018–2019 and 2019–2020



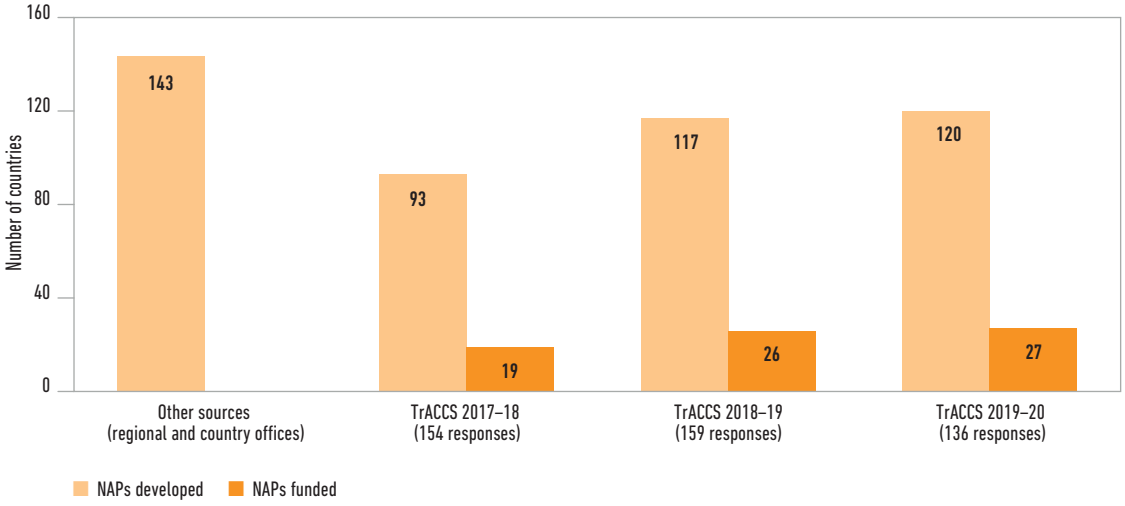
n = 115

However, while most countries have at least developed a NAP (levels C–E), many countries have not identified funding for them (level E). In the latest 2019–2020 TrACSS, 88.2% (n=120) of responding countries developed a NAP on AMR (levels C–E), but only 19.9% (n=27) of countries had identified funding for their NAPs (level E). Of the 27 countries reporting reaching level E (the highest level), 15 are high-income, 5 are low-middle-income, 6 are upper-middle- income, and 1 is a low-income country.

Both the number of countries with developed NAPs and the number of countries with funded NAPs have increased in the past two years (Fig. 3), but the challenge ahead lies in ensuring sustainable financing for NAPs to enable countries to move from the development to the implementation of plans to help address AMR.

Data for the "Other sources" column in Fig. 3 is based on country data on NAP development submitted to WHO by regions and Member States. The data are collected on a rolling basis and are current as of 4 November 2020. The discrepancy between this number and the TrACSS data on the number of developed NAPs is due to the fact that not all countries that submit data directly to WHO participated in the TrACSS.

Fig. 3 Number of countries that developed AMR NAPs versus those with funded NAPs, 2017–2018, 2018–2019 and 2019–2020



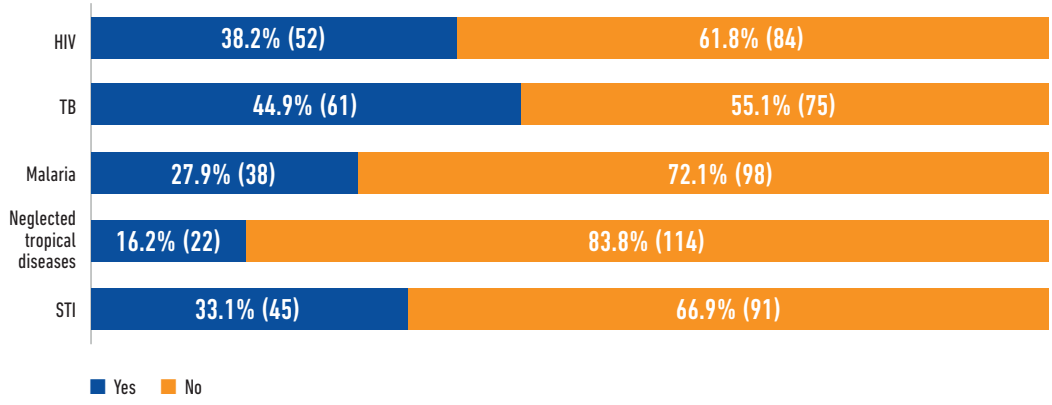
Source: Tripartite AMR country self-assessment survey data.

Strengthening collaboration between AMR and health topics such as HIV, tuberculosis (TB), malaria, neglected tropical diseases and sexually transmitted infections (STIs) will help prevent and manage AMR.[12] Rising resistance can undermine the ability to treat these diseases and make treatment more costly and difficult.[13] Linking AMR with NAPs, strategies or targets for other health topics will help address resistance, enhance collaboration in various technical areas such as surveillance, lab strengthening and diagnostics, and increase the sustainability of country actions against AMR.

Half (50%, n=68) of the responding countries had linked their AMR NAP to existing action plans for at least one of the following diseases: HIV, TB, malaria, neglected tropical diseases or STIs. TB (44.9%, n=61) was the disease most often linked in AMR NAPs, followed by HIV (38.2%, n=52). The breakdown for other diseases appears in Fig. 4.

Fig. 4 Countries with AMR NAPs linked to other human health topics

Half of the responding countries (n=68, 50%) had linked their AMR NAPs to existing action plans for at least one of the following health topics, % (number of countries).



Source: Tripartite AMR country self-assessment survey data.

[12] Tuberculosis, HIV, malaria and neglected tropical diseases: strengthening collaboration to prevent and manage antimicrobial resistance. Geneva: World Health Organization; 2019 (https://apps.who.int/iris/bitstream/handle/10665/311689/9789241515450-eng.pdf, accessed 1 November 2020).

[13] Organisation for Economic Co-operation and Development. Stemming the superbug tide: just a few dollars more. Paris: OECD Publishing; 2018 (https://doi.org/10.1787/9789264307599-en, accessed 3 November 2020).

3. Multisectoral AMR Working Group

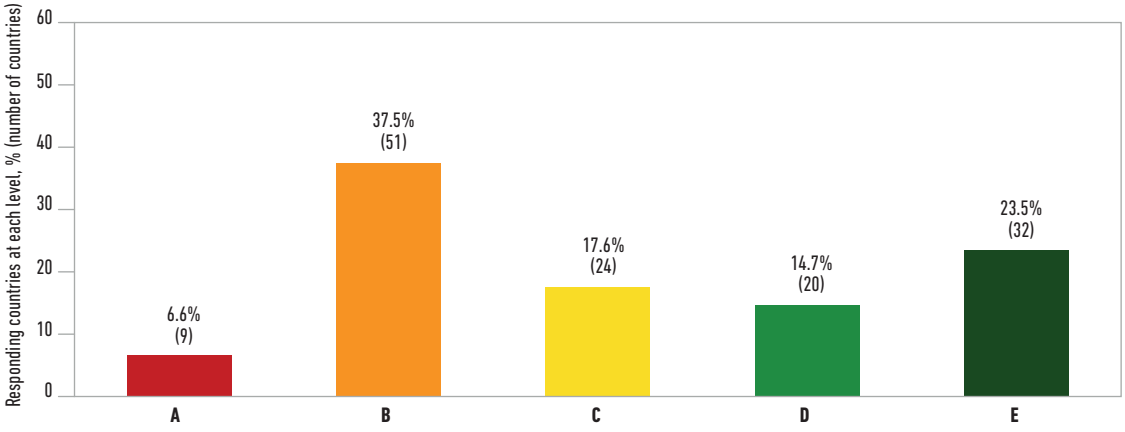
The number of countries with functional multisectoral working groups on AMR has increased from previous years, with 76 countries reporting a functional multisectoral working group.

Over 90% of responding countries had human and animal health sector representatives in their multisectoral working groups.

In the latest TrACSS round, 55.9% (n=76) of countries reported having a functional multisectoral working group on AMR (levels C–E), which is a working group with clear terms of reference, regular meetings, funding for the working group and defined activities and reporting/accountability arrangements (Fig. 5).

In a trend analysis of 115 countries which responded to TrACSS over the past three years (Fig.6), there was a 19.2% increase in over the past three years in the percentage of countries with functional AMR multisectoral working groups. This indicates that more countries are progressing towards multisectoral governance that coordinates and integrates approaches from all sectors to implement the NAP on AMR.

Fig. 5 Responses on AMR multisectoral working groups, 2019–2020



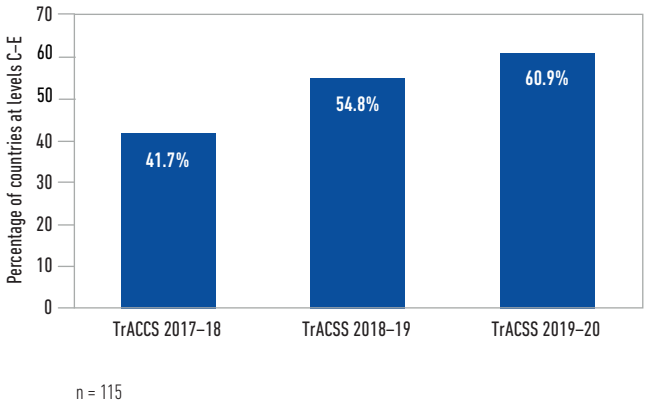
No response = 0 (n=136)

■	A	No formal multi-sectoral governance or coordination mechanism on AMR exists.
■	B	Multi-sectoral working group(s) or coordination committee on AMR established with Government leadership.
■	C	Multi-sectoral working group(s) is (are) functional, with clear terms of reference, regular meetings, and funding for working group(s) with activities and reporting/accountability arrangements defined.
■	D	Joint working on issues including agreement on common objectives.
■	E	Integrated approaches used to implement the AMR NAP with relevant data and lessons from all sectors used to adapt implementation.

Source: Tripartite AMR country self-assessment survey data

A previous statistical analysis report indicated that having a functional multisectoral working group is the best predictor for achieving higher levels in other TrACSS indicators,[14] so it is important for countries to work towards level C and above in order to address AMR from a One Health perspective.

Fig. 6 Trends: Increase in percentage of countries with functional multisectoral AMR working groups, 2017–2018, 2018–2019 and 2019–2020



n = 115

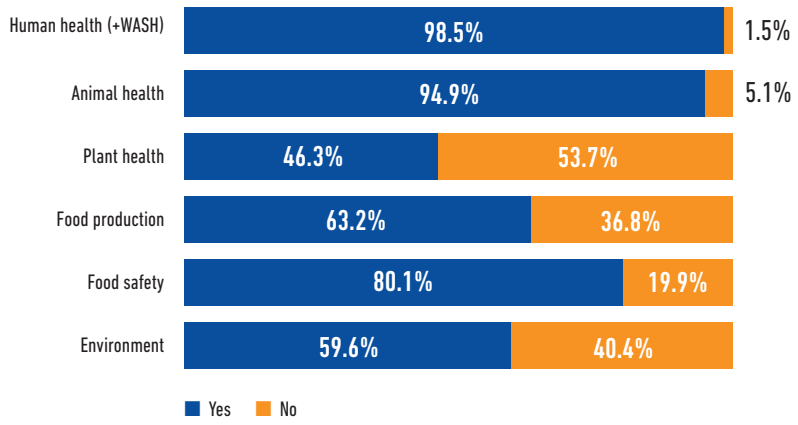
SECTOR INVOLVEMENT

The development and implementation of NAPs typically involve representatives from the human health (n=133; 98.5%), animal health (n=129; 94.9%) and food safety sectors (n=109; 80.1%). Representatives from other sectors, such as food production, environment and plant health, are less frequently included, as seen in Fig. 7.

Around 92.6% of responding countries (n=126) have human health and animal health representatives involved in the development and implementation of NAPs, whereas 38 (27.9%) countries reported having all sectors involved.

Not having adequate representation from the food production, environment, and plant sectors could impact the strategies and activities included in the NAP and could leave out critical areas of work that need to be considered when taking a One Health approach against AMR.

Fig. 7 Percentage of country responses on sectors involved in developing and implementing NAP, 2019–2020



Source: Tripartite AMR country self-assessment survey data.

[14] Monitoring global progress on addressing antimicrobial resistance: analysis report of the second round of results of AMR country-self-assessment survey 2018. Geneva: World Health Organization, Food and Agriculture Organization of the United Nations, World Organisation for Animal Health; 2018 (https://www.who.int/antimicrobial-resistance/publications/Analysis-report-of-AMR-country-se/en, accessed 3 November 2020).

4. Raising awareness and education on AMR (GAP-AMR Objective 1)

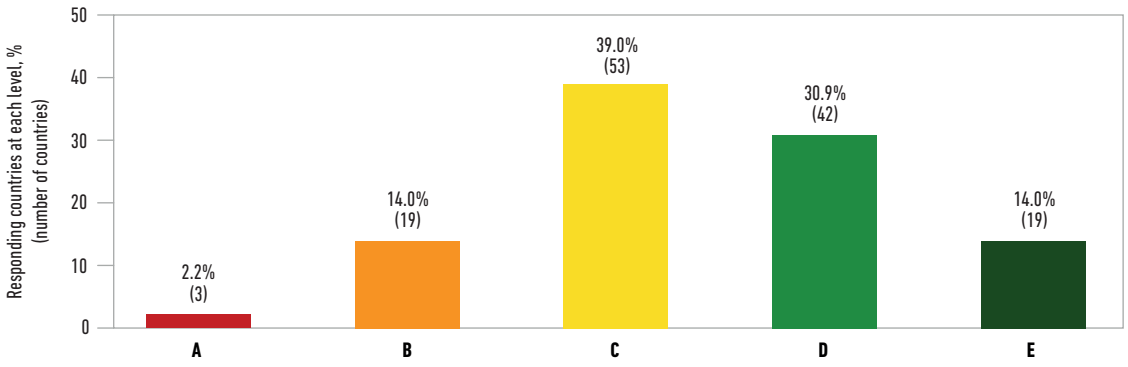
A total of 44.9% of reporting countries had nationwide awareness campaigns targeting priority stakeholder groups. The data highlight the need for additional investments in awareness-raising campaigns with targeted messaging.

AMR AWARENESS-RAISING CAMPAIGNS

For this indicator, 44.9% (n=61) of responding countries had advanced to nationwide implementation (levels D–E), represented by national, government-supported AMR awareness campaigns targeting all relevant stakeholders.[15] Of these, 42 countries had AMR awareness campaigns targeting relevant stakeholder groups (level D) and 19 had targeted, nationwide government-supported activities regularly implemented to change the behaviour of key stakeholders within sectors.

Since awareness-raising activities, such as participating in World Antibiotic/Antimicrobial Awareness Week (WAAW), are the most public-facing interventions on AMR, countries should aim to move from level C to levels D–E to ensure

Fig. 8 Responses on AMR awareness raising and understanding, 2019–2020



No response = 0 (n=136)

■	A	No significant awareness-raising activities on relevant aspects of risks of antimicrobial resistance.
■	B	Some activities in parts of the country to raise awareness about risks of antimicrobial resistance and actions that can be taken to address it.
■	C	Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders.
■	D	Nationwide, government-supported antimicrobial resistance awareness campaign targeting all or the majority of priority stakeholder groups, based on stakeholder analysis, utilizing targeted messaging accordingly within sectors.
■	E	Targeted, nationwide government-supported activities regularly implemented to change behavior of key stakeholders within sectors, with monitoring undertaken over the last 2–5 years.

Source: Tripartite AMR country self-assessment survey data.

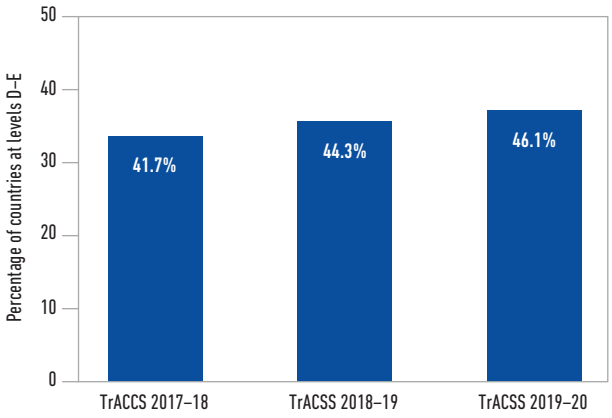
[15] Relevant stakeholders and key stakeholder groups for each country are based on the results of the country's stakeholder analysis and can include the human health, animal health, food sector, environment and plant health sectors.

they have government-supported nationwide awareness campaigns. As shown in Fig. 8, 53 countries (39%) are at level C with limited, small-scale AMR awareness-raising campaigns targeting some relevant stakeholders; these countries are on the threshold of moving up to nationwide implementation and national, government-supported AMR awareness campaigns because they have already identified relevant stakeholder groups to target.

Trends: AMR awareness campaigns

Trend analysis of the 115 countries that have consistently responded to the past three TrACSS rounds shows an increase in the percentage of countries that have participated in nationwide government-supported AMR awareness campaigns (levels D–E). The progress on this indicator has been very gradual over the past three years (Fig. 9). The first step towards changing behaviour on antimicrobial misuse and overuse is to raise awareness of this issue among relevant stakeholders, so it is critical for countries to invest in nationwide AMR campaigns targeting the stakeholders with focused messaging.

Fig. 9 Trends: Increase in percentage of countries with nationwide AMR awareness campaigns, 2017–2018, 2018–2019 and 2019–2020

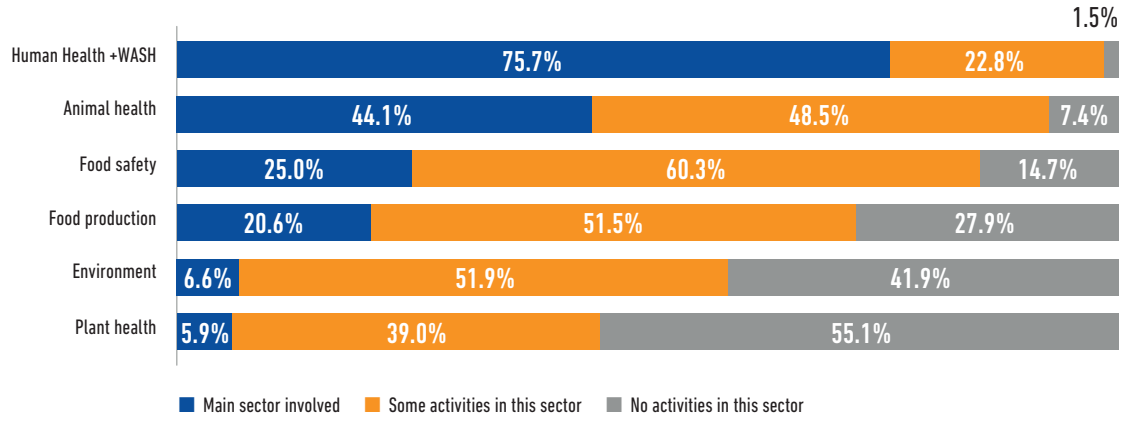


n = 115

Source: Tripartite AMR country self-assessment survey data.

Identifying and targeting priority stakeholder groups is a key component to achieve levels D–E for this indicator, which will also help include more sectors in national awareness-raising campaigns. Currently, as shown in Fig. 10, human health is the main sector involved in awareness campaigns (n=103, 75.7%), followed by the animal health sector (n=60, 44.1%). The remaining sectors, food safety, food production, environment and plant health, should be engaged further in the communications and outreach of AMR national awareness campaigns.

Fig. 10 Percentage of sector involvement in AMR awareness-raising campaigns, 2019–2020



n = 136

Source: Tripartite AMR country self-assessment survey data.

TRAINING AND PROFESSIONAL EDUCATION ON AMR

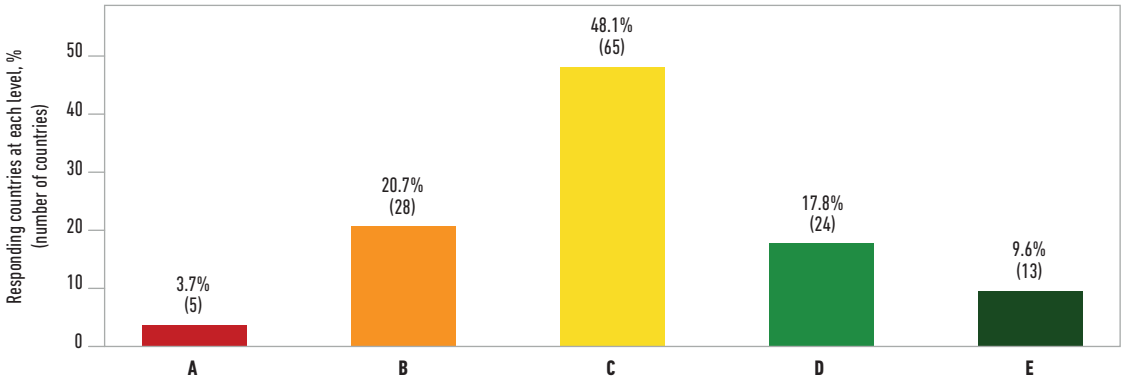
In total, 75.6% of responding countries offer at least some level of training on AMR for human health professionals, of which only 9.6% countries have systematically incorporated AMR into training curricula for these professionals. A concerted push needs to be made globally to incorporate AMR formally and systematically into the training curricula for all relevant human health cadres.

More than half (57.1%) of countries have some level of training on AMR for professionals in the veterinary sector; 24.2% of countries have training for professionals in the farming and environment sector.

The trend analysis shows the levels of training in AMR have increased across the human health, animal health and farming sectors over the past three years, with the most rapid rise in the veterinary sector.

As shown in Fig. 11, around three fourths (75.6%, n=102) of the responding countries offer at least some level of training on AMR for human health professionals (levels C–E). The most common practice among countries is to offer some pre-service and in-service training on AMR for human health workers (48.1%, n=65), but only 17.8% (n=24) have AMR covered nationwide in pre-service training for all relevant human health professionals. Globally, only 9.6% (n=13)

Fig. 11 Responses on training and education on AMR for human health workers, 2019–2020



No response = 1 (n=135)

■	A	No training for human health workers on AMR.
■	B	Ad hoc AMR training courses in some human health related disciplines.
■	C	AMR is covered in 1) some pre-service training and in 2) some in-service training or other continuing professional development (CPD) for human health workers.
■	D	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.
■	E	AMR is systematically and formally incorporated in pre-service training curricula for all relevant human health cadres. In-service training or other CPD on AMR is taken up by relevant groups for human health nationwide, in public and private sectors.

Source: Tripartite AMR country self-assessment survey data.

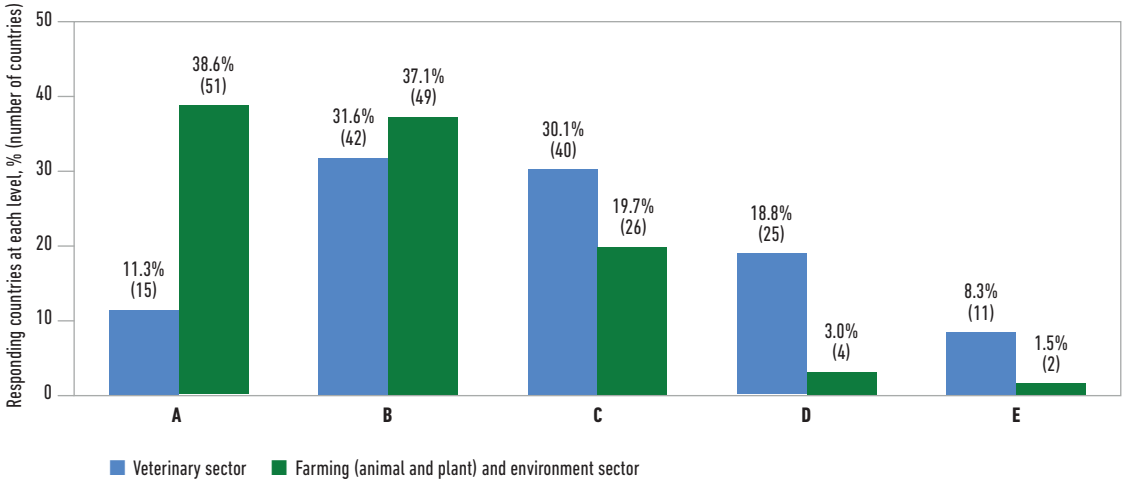
of countries have AMR systematically and formally incorporated in pre-service training curricula for all relevant human health professionals.

Considering the importance of antimicrobial stewardship principles among health care professionals, a concerted effort needs to be made globally, regionally and nationally to incorporate AMR formally and systematically into the training curricula for all human health workers.

In the veterinary sector, 57.1% (n=76) of responding countries reported offering at least some levels of training (levels C–E) in AMR as a part of veterinary professional training (Fig. 12). Around 30.1% (n=40) of countries are at level C and have AMR training in core curricula for some veterinary educational institutions, 18.8% (n=25) are at level D with nationwide training available to veterinary professionals and 8.3% (n=11) have AMR systematically and formally incorporated into the curricula for veterinary professionals and paraprofessionals.

In the farming (animal and plant) and environment sector (Fig. 12), 24.2% (n=32) of responding countries offer at least some level of training (levels C–E) in AMR for stakeholders, whereas 19.7% (n=26) of responding countries have tailored ad hoc AMR training courses available for all or the majority of key stakeholders (level C), 3.0% (n=4) have training routinely available nationwide (level D) and 2 countries have completion of training as a formal requirement for key stakeholders (level E).

Fig. 12 Responses on training and education on AMR in the veterinary and farming sectors, 2019–2020



Veterinary sector: no response = 3 (n=133)
Farming sector: no response = 4 (n=132)

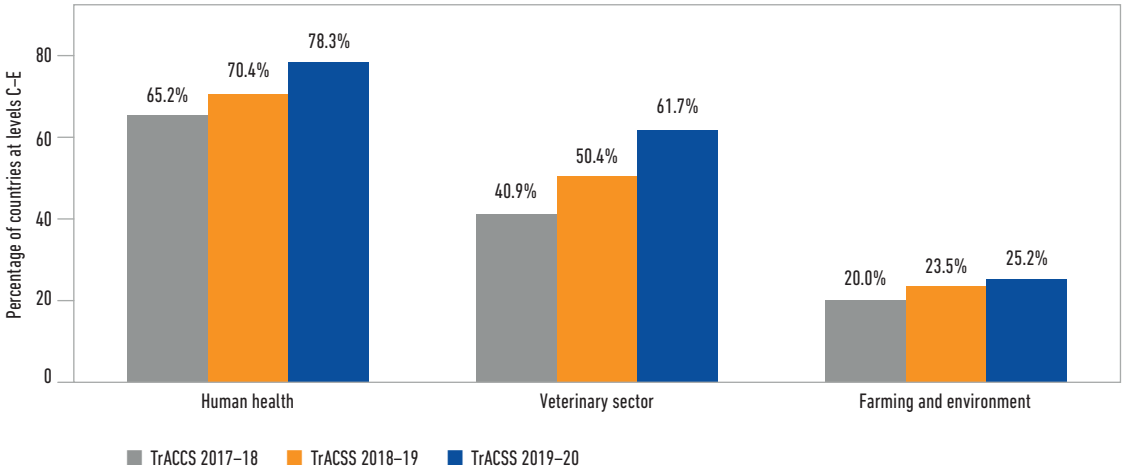
A	No training on AMR provided
B	Ad hoc AMR training courses available
C	AMR and prudent use of antimicrobial agents are covered in some trainings
D	Nationwide training available
E	Systematic training in core professional education with AMR incorporated into curricula

Source: Tripartite AMR country self-assessment survey data.

Trends: Training on AMR across sectors

The trend analysis of the 115 countries that participated in the TrACSS in the past three years shows training on AMR has increased in all sectors (Fig. 13), with the percentage of countries offering at least some training and professional education on AMR (levels C–E) increasing each year, with the most rapid rise in the veterinary sector.

Fig. 13 Trends: Increase in training and education on AMR in all sectors, 2017–2018, 2018–2019 and 2019–2020



n=115

Source: Tripartite AMR country self-assessment survey data.

5. Strengthening the knowledge and evidence base through surveillance and research (GAP-AMR Objective 2)

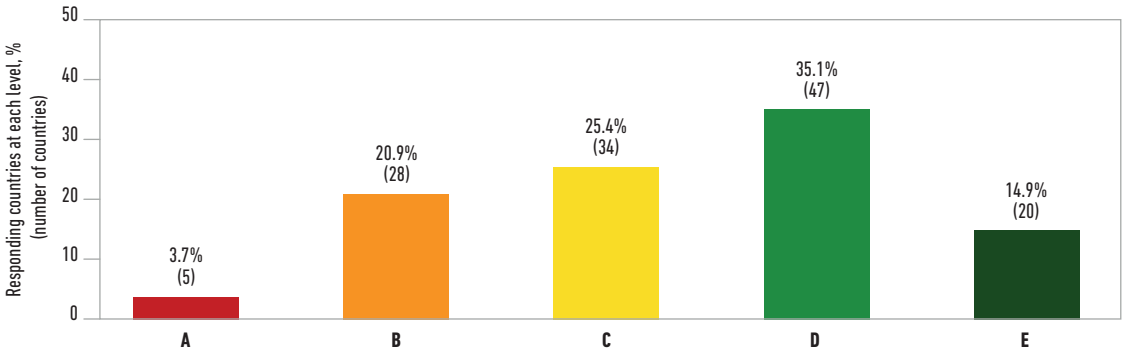
A total of 75.4% of responding countries reported having national AMR surveillance activities in human health. Ninety-two of these countries are currently enrolled in WHO's Global Antimicrobial Resistance Surveillance System (GLASS), and 66 submitted resistance data to GLASS in 2019.

Over two thirds of countries (68.9%) collect at least some AMR data on animals, and 41.7% of countries have systematic data collection on resistance in animals.

NATIONAL SURVEILLANCE FOR ANTIMICROBIAL RESISTANCE

For AMR surveillance in the human sector, 75.4% (n=101) of responding countries are at or above level C (Fig. 14). This level indicates that countries have national AMR surveillance activities in place for common bacterial pathogens following national standards, and a national reference laboratory that participates in external quality assurance.

Fig. 14 Responses on national AMR surveillance activities in human health, 2019–2020



No response = 2 (n=134)

■	A	No capacity for generating data (antibiotic susceptibility testing and accompanying clinical and epidemiological data) and reporting on antibiotic resistance.
■	B	AMR data is collated locally for common bacteria, but data collection may not use a standardized approach and lacks national coordination and/or quality management.
■	C	National AMR surveillance activities for common bacterial infections follow national standards, and a national reference laboratory that participates in external quality assurance.
■	D	There is a functioning national AMR surveillance system covering common bacterial infections in hospitalized and community patients, with external quality assurance, and a national coordinating centre producing reports on AMR.
■	E	The national AMR surveillance system integrates surveillance of AMR across sectors, and generates regular reports covering at least one common indicator.

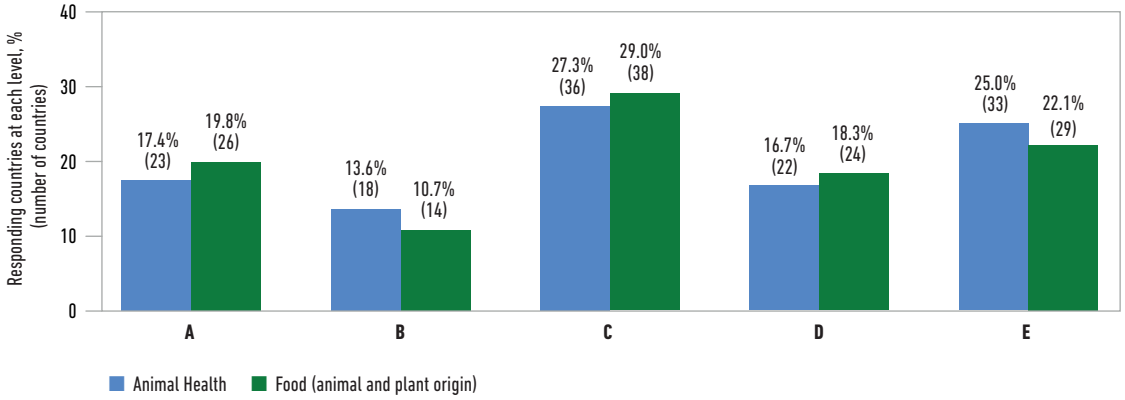
Source: Tripartite AMR country self-assessment survey data.

The main difference between level C and levels D–E is that level C represents nationwide surveillance activities on AMR, while levels D–E build on this existing structure and represent standardized national surveillance systems on AMR. More than a third of the responding countries (35.1%, n=47) have reached level D and reported having functioning national AMR surveillance systems covering common bacterial infections in hospital and community patients,[16] and 20 countries (14.9%) are at level E with a national AMR surveillance system that is integrated across sectors with regular reports on at least one common indicator across sectors. Of the 20 countries at level E, 14 are high-income countries.

Globally, 101 countries reported having nationwide AMR surveillance activities for human health, while 92 countries, territories and areas are currently enrolled in WHO's Global Antimicrobial Resistance Surveillance System (GLASS), and 66 countries are submitting resistance data to GLASS.[17] This discrepancy could be because countries have misunderstood the TrACSS question on AMR surveillance in human health, or they have established surveillance activities for AMR and are potentially submitting AMR data to regional networks but are not yet enrolled in GLASS.

Data from the 2019–2020 TrACSS also revealed that a total of 64.7% of countries amend or inform their national AMR strategy for human health based on relevant antimicrobial consumption and resistance data; 46.3% of countries amend their AMR strategy for animal health based on this data.

Fig. 15 Responses on national surveillance system for AMR in the animal health and food sectors, 2019–2020



Animal Health: no response = 4 (n=132)
Food sector: no response = 5 (n=131)

	ANIMAL HEALTH	FOOD (ANIMAL AND PLANT ORIGIN)
A	No national plan for an AMR surveillance system.	No national plan for an AMR surveillance system.
B	National plan for AMR surveillance in place in place but capacity (including laboratory and reporting) is lacking.	National plan for AMR surveillance in place but capacity (including laboratory and reporting) is lacking.
C	Some AMR data is collected but a standardized approach is not used. National coordination and/or quality management is lacking.	Some AMR data is collected - but a standardized approach is not used. National coordination and/or quality management is lacking.
D	Priority pathogenic/ commensal bacterial species have been identified for surveillance Data systematically collected and reported on levels of resistance in at least one of those bacterial species, involving a laboratory that follows quality management processes e.g. proficiency testing.	Priority food borne pathogenic/ indicator bacterial species have been identified for surveillance. Data systematically collected and reported on levels of resistance in at least one of those bacterial species, involving a laboratory that follows quality management processes e.g. proficiency testing.
E	National system of AMR surveillance established for priority animal pathogens, zoonotic and commensal bacterial isolates which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.	National system of AMR surveillance established for priority foodborne pathogens and/or relevant indicator bacteria which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.

Source: Tripartite AMR country self-assessment survey data.

[16] Community patients would in many instances be outpatients or those patients within 48 hours of admission in line with the GLASS definition.
[17] Global antimicrobial resistance surveillance system (GLASS) report: early implementation 2020. Geneva: World Health Organization; 2020 (https://apps.who.int/iris/handle/10665/332081, accessed 3 November 2020).

When examining the results, it is important to note that the mid-point (level C) on the human health scale and the animal health and food sector scales, differ. For the animal health and food (animal and plant origin) sector, level C indicates that some AMR data are collected locally but may not be collected using standardized approaches, may not have priority pathogen identification, and lack national coordination and/or quality management.

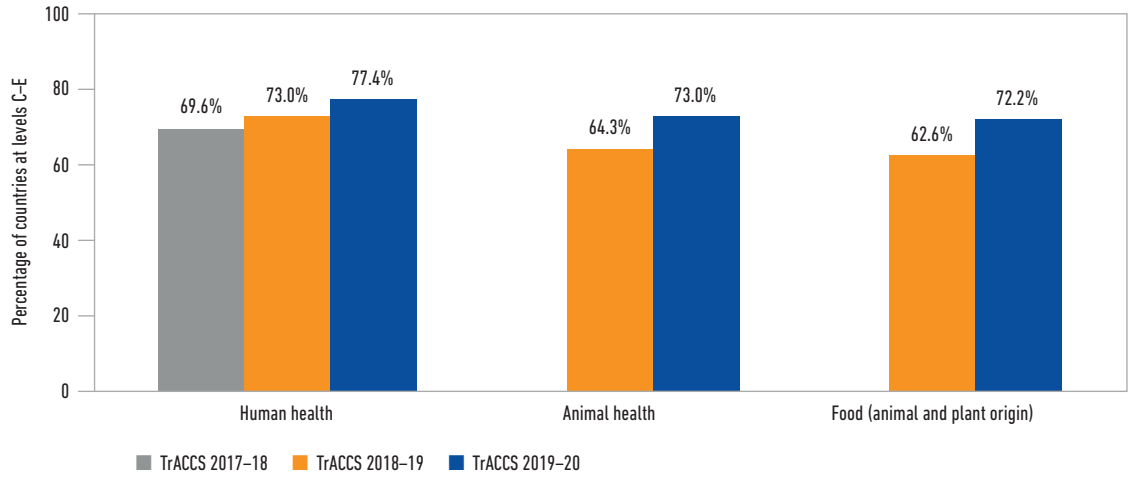
The response distribution is very similar for the animal health and food sectors, with both having around 69% (n=91) of responding countries at or above level C (Fig. 15). For the animal health sector, 16.7% (n=22) of countries have reached level D, represented by having priority pathogen species identified for surveillance and systemic data collection; in the food sector, 18.3% (n=24) of countries have reached level D. Level E, with a national AMR surveillance system established for priority pathogens with a reporting laboratory, is reached in 25% (n=33) of responding countries for the animal sector and 22.1% (n=29) of countries for the food sector.

Trends: Functional AMR surveillance activities across sectors

The sectors vary on data collection for national AMR surveillance activities (levels C–E) but, looking at the 115 countries included in the trend analysis over the past two years, each sector has seen a gradual increase in the percentage of countries reaching levels C–E (Fig. 16).

The TrACSS question on AMR surveillance systems in the animal health and the food sectors was not comparable with the 2017–2018 TrACSS round, so the responses for that year were not used in the trend analysis.

Fig. 16 Trends: Gradual increase in percentage of countries with national AMR surveillance activities, by sector, 2017–2018, 2018–2019 and 2019–2020



n=115

Source: Tripartite AMR country self-assessment survey data.

MONITORING SYSTEM FOR ANTIMICROBIAL CONSUMPTION AND USE

More countries reported national monitoring systems for antimicrobial sale and use in the animal health sector than in the human health sector: 76 countries in human health compared to 83 countries in animal health.

Around 40% of responding countries do not have a national plan or system to monitor the use of antimicrobial pesticides, such as bactericides and fungicides.

The trend analysis showed a gradual increase in the percentage of countries with a national monitoring system for antimicrobial sale and use over the past two TrACSS years – in the human and animal health sectors, and antimicrobial pesticide use in plant production.

Of the 76 countries (56.3%) with a national monitoring system for antibiotic sales in human health (levels C–E), 32 countries (23.7%) are at level E, with regular monitoring and reporting on antimicrobial sales at a national level and antibiotic prescribing in a representative sample of health facilities (Fig.17).

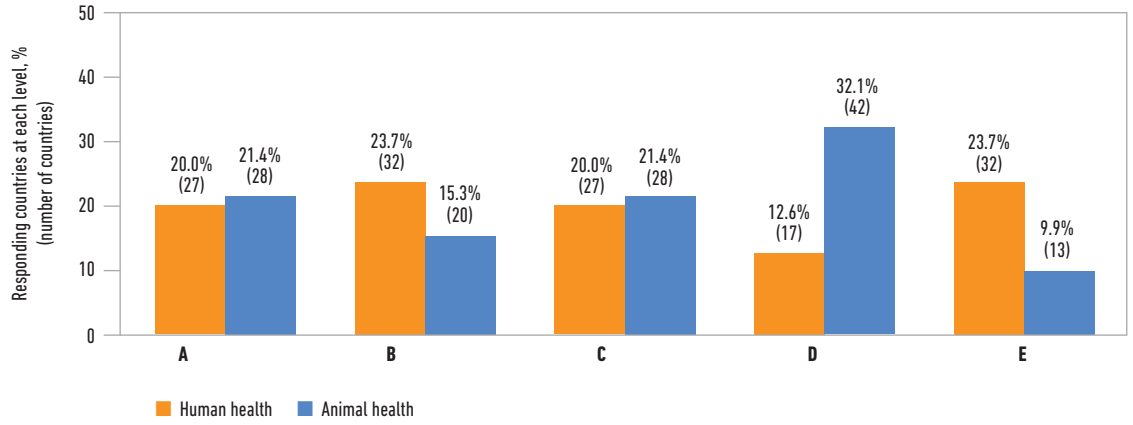
Of the 83 countries (63.4%) who reported national monitoring sales of antibiotics for use in animals (levels C–E), more than half (n=42) have reached level D, with data collected and reported regularly to the OIE.

Although national monitoring systems for antibiotic sale and use are necessary to inform AMR interventions and stewardship practices, 20% (n=27) of reporting countries did not have a national plan or system in place to monitor the use of antimicrobials in human health (level A), and 21.4% (n=28) did not have a monitoring system for the sale of antimicrobials for animal use.

All country responses submitted through the TrACSS on the monitoring of antimicrobial sales for animal use were validated against country reporting in the fifth round of the OIE AMU Data Collection through OIE Members,[18] and 38% of the data submitted through the TrACSS did not correspond with the type of data that countries were reporting to OIE. This shows that, in some countries, the communication between the animal health sector and the multisectoral committee responsible for submitting the TrACSS needs to be strengthened.

[18] OIE Annual Report on Antimicrobial Agents Intended for Use in Animals. February 2020. https://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/A_Fourth_Annual_Report_AMR.pdf

Fig. 17 Responses on monitoring systems for antibiotic sale and use for human and animal health, 2019–2020



Human health: no response = 1 (n=135)
Animal health: no response = 5 (n=131)

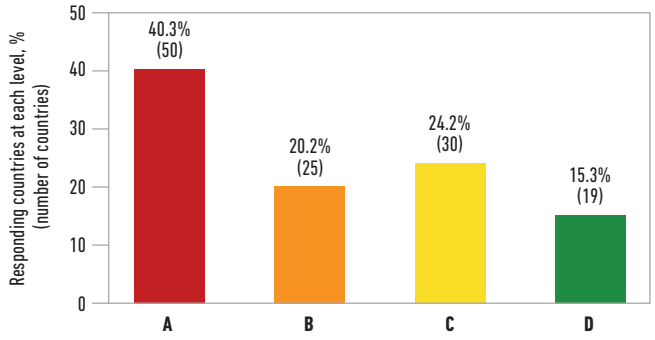
	HUMAN HEALTH	ANIMAL HEALTH
A	No national plan or system for monitoring use of antimicrobials.	No national plan or system for monitoring sales/use of antimicrobials.
B	System designed for surveillance of antimicrobial use, that includes monitoring national level sales or consumption of antibiotics in health services.	Plan agreed for monitoring quantities of antimicrobials sold for/used in animals, based on OIE standards.
C	Total sales of antimicrobials are monitored at national level and/or some monitoring of antibiotic use at sub-national level.	Data collected and reported on total quantity of antimicrobials sold for/used in animals and their intended type of use (therapeutic or growth promotion).
D	Prescribing practices and appropriate antibiotic use are monitored in a national sample of healthcare settings.	On a regular basis, data is collected and reported to the OIE on the total quantity of antimicrobials sold for/used in animals nationally, by antimicrobial class, by species (aquatic or terrestrial), method of administration, and by type of use (therapeutic or growth promotion).
E	On a regular basis (every year/two years) data is collected and reported on: a) antimicrobial sales or consumption at national level for human use; and b) Antibiotic prescribing and appropriate/rational use, in a representative sample of health facilities, public and private.	Data on antimicrobials used under veterinary supervision in animals are available at form level, for individual animal species.

Source: Tripartite AMR country self-assessment survey data.

MONITORING PESTICIDE USE

Globally, 40.3% (n=50) of countries did not have any national plan or system to monitor the use of pesticides, including antimicrobial pesticides such as bactericides and fungicides (level A), which can also lead to resistance (Fig. 18). A total of 39.5% (n=49) of the responding countries had a monitoring system for collecting and reporting the total quantity of pesticides, including antimicrobial pesticides such as bactericides and fungicides sold or used at the national level (levels C-D).

Fig. 18 Responses on monitoring system for pesticides in plant production, 2019–2020



No response = 12 (n=124)

A	No national plan or system for monitoring use of pesticides including antimicrobial pesticides such as bactericides and fungicides used for the purpose of controlling bacteria or fungal diseases.
B	Plan agreed for monitoring quantities of pesticides including antimicrobial pesticides such as bactericides and fungicides used for the purpose of controlling bacteria or fungal diseases.
C	Data collected and reported on total quantity of pesticides including antimicrobial pesticides such as bactericides and fungicides sold/ used nationally for the purpose of controlling bacteria or fungal diseases.
D	On a regular basis, data is collected and reported on quantity of pesticides including antimicrobial pesticides such as bactericides and fungicides sold/used in plant production for the purpose of controlling bacteria or fungal diseases, disaggregated by class of active ingredient and plant type/species.

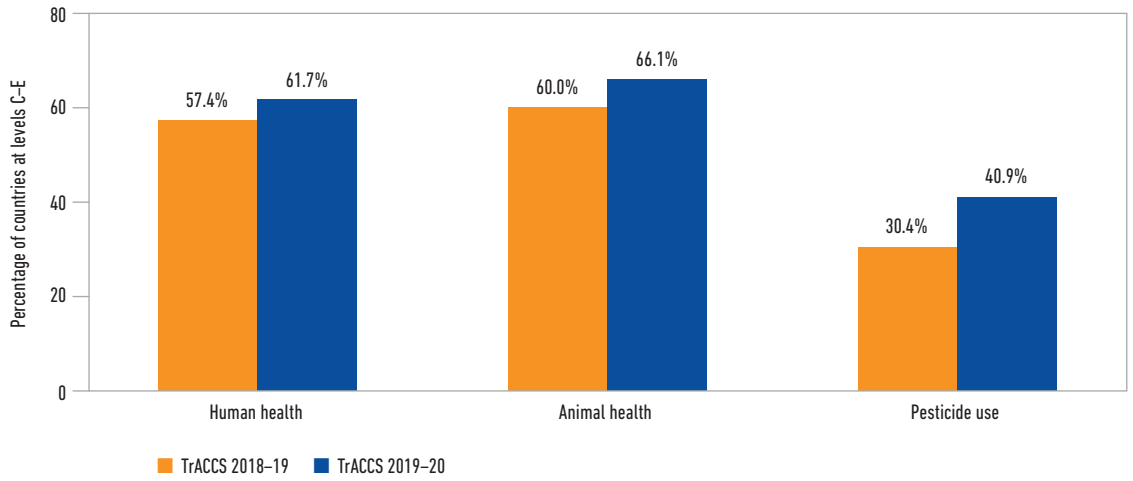
Source: Tripartite AMR country self-assessment survey data.

Trends: National monitoring systems for antimicrobial sale and use

The trend analysis of the 115 countries that participated in the last two TrACSS rounds shows an increase in 2019–2020 compared to the previous year in the percentage of countries with a national monitoring system for antimicrobial sales in the human health and animal health sectors (levels C–E), as shown in Fig. 19.

A greater percentage of countries reported having monitoring systems for sales of antibiotics for animal use compared to monitoring systems for human use or for antimicrobial pesticides. This could be due to the fact that monitoring systems for antimicrobial sale and use in the animal health sector were established earlier than monitoring systems for human health or pesticides.

Fig. 19 Trend: Increase in the percentage of countries with a national monitoring system for antimicrobial sale and use in the human and animal health sectors and pesticide use, 2018–2019 and 2019–2020



n=115

Source: Tripartite AMR country self-assessment survey data.

6. Reducing the incidence of infection through effective sanitation, hygiene and infection prevention measures (GAP-AMR Objective 3)

Even with the lower TrACSS response rate in the latest round, the number of countries with nationwide implementation of their national IPC programmes has increased compared to last year. A total of 50 countries report reaching this level, highlighting a critical area for additional support and resources.

A total of 37.5% of countries reported a national plan on animal production practices in line with international standards, and 48.4% of countries have national plans for food processing.

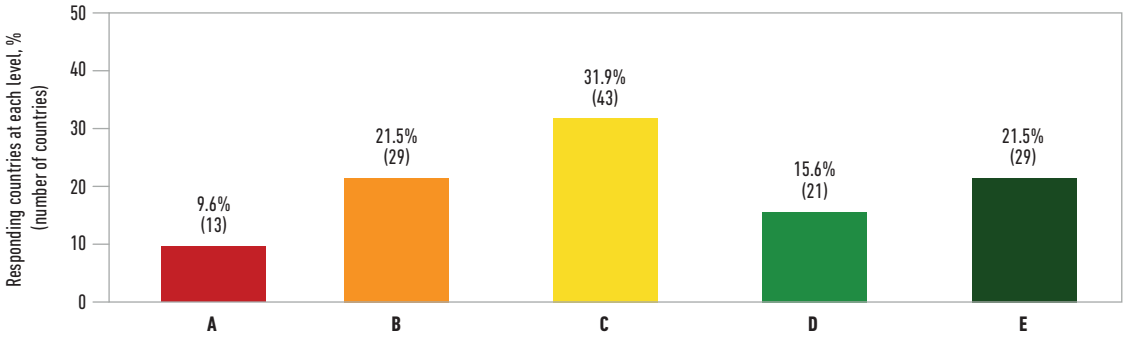
Preventing infections from occurring in the first place reduces the use of antimicrobials and helps prolong the effectiveness of this resource. Measures such as IPC, immunization, proper hand hygiene, basic water, sanitation and hygiene, and enhanced biosecurity in health care facilities, farms and environment will all help lower the incidence of infections and therefore the need to use antimicrobials.

INFECTION PREVENTION IN HUMAN HEALTH CARE

The most common response on this indicator for human health is level C, where 31.9% (n=43) of countries reported that a national IPC programme, operational plan and guidelines for IPC were available, but only selected health care facilities in the country were implementing them (Fig. 20). Because of this, nationwide implementation on this indicator is represented by levels D–E. The systematic nationwide implementation of the national IPC programme, based on the WHO Guidelines on Core Components for IPC, was reported in 37.1% (n=50) countries (levels D–E); 29 countries (21.5%) have reached level E, with compliance and effectiveness of national IPC programmes regularly evaluated and published.

Even with the lower TrACSS participation rate in the latest round, progress on this indicator has been made since last year, with 50 countries in 2019–2020 reporting they implement IPC programmes nationwide (levels D–E), compared to 44 countries in the 2018–2019 TrACSS. The TrACSS question for this indicator changed significantly and thus cannot be compared to data prior to the 2018–2019 TrACSS.

Fig. 20 Responses on the nationwide implementation of IPC programmes in human health care, 2019–2020



No response = 1 (n=135)

	A	No national IPC programme or operational plan is available.
	B	A national IPC programme or operational plan is available. National IPC and water, sanitation and hygiene (WASH) and environmental health standards exist but are not fully implemented.
	C	A national IPC programme and operational plan are available and national guidelines for health care IPC are available and disseminated. Selected health facilities are implementing the guidelines, with monitoring and feedback in place.
	D	National IPC programme available according to the WHO IPC core components guidelines and IPC plans and guidelines implemented nationwide. All health care facilities have a functional built environment (including water and sanitation), and necessary materials and equipment to perform IPC, per national standards.
	E	IPC programmes are in place and functioning at national and health facility levels according to the WHO IPC core components guidelines. Compliance and effectiveness are regularly evaluated and published. Plans and guidance are updated in response to monitoring.

Source: Tripartite AMR country self-assessment survey data.

WATER, SANITATION AND HYGIENE (WASH) IN HEALTH CARE FACILITIES

Access to basic water, hand hygiene facilities and functional sanitation systems in health care facilities is a critical element in preventing infections and reducing the spread of AMR. In the TrACSS survey, countries were asked to estimate the proportion of health care facilities nationally with basic water supplies, basic hand hygiene facilities and functional sanitation facilities.[19] The estimates for the indicators were prone to self-reporting bias, so responses were validated against the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) report on WASH in health care facilities.[20]

The self-reported TrACSS global average for the proportion of health care facilities with basic water services was 90.21%, while the validated WHO/UNICEF JMP report placed the global average at 75% in 2016.[20]

As for functional sanitation systems, the WHO/UNICEF JMP report states the one in five health care facilities globally had no sanitation service in 2016,[20] and the self-reported TrACSS global average for the proportion of health care facilities with functional sanitation was 86.91%.

The WHO/UNICEF JMP report also shows that, worldwide, one in six health care facilities did not have hygiene services in 2016,[20] while the global average for self-reported TrACSS data for the proportion of health care facilities with hand hygiene services was 87.99%.

[19] "Basic" as defined in WASH in health care facility standards or national standards. See Water, sanitation, and hygiene in health care facilities: practical steps to achieve universal access to quality care. Geneva: World Health Organization; 2019 (https://apps.who.int/iris/handle/10665/311618, accessed 5 November 2020).

[20] WASH in health care facilities: global baseline report 2019. Geneva: World Health Organization and United Nations Children's Fund (UNICEF); 2019 (https://washdata.org/sites/default/files/documents/reports/2019-04/JMP-2019-wash-in-hcf.pdf, accessed 4 November 2020).

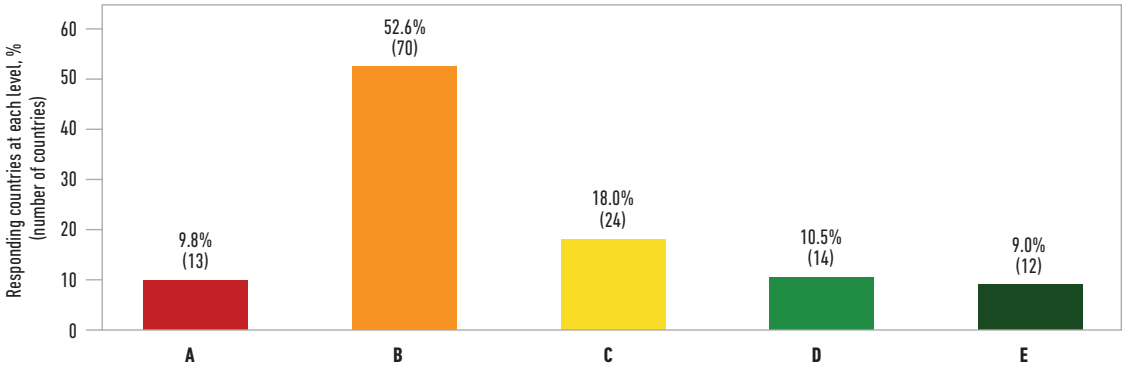
It is important to note that the self-reported TrACSS global averages for basic water, hand hygiene and functional sanitation services in health care facilities are calculated using the most recent country data from 2019–2020, while the WHO/UNICEF JMP report is based on country data from 2016. Some of the discrepancy between the self-reported TrACSS data and the WHO/UNICEF report could be due to the fact that the data are from different years. It is crucial for WASH focal points to be included in AMR multisectoral coordination groups and to be engaged in the implementation of the AMR NAPs and activities; countries should consult and include these focal points when completing future TrACSS to ensure a complete and accurate picture of their basic water, hand hygiene and functional sanitation services in health care facilities are reported.

GOOD HYGIENE AND MANAGEMENT IN ANIMAL PRODUCTION AND FOOD PROCESSING

For the animal production sector (Fig. 21), 37.5% (n=50) of responding countries had a national plan for good animal production practices (levels C–E).

The most commonly reported response was level B, indicating that some measures were in place to develop and promote good practices for animal production (52.6%, n=70). Around 10% of countries reported they did not have systematic efforts to improve good production practices.

Fig. 21 Responses on good management and hygiene practices in the animal production sector, 2019–2020



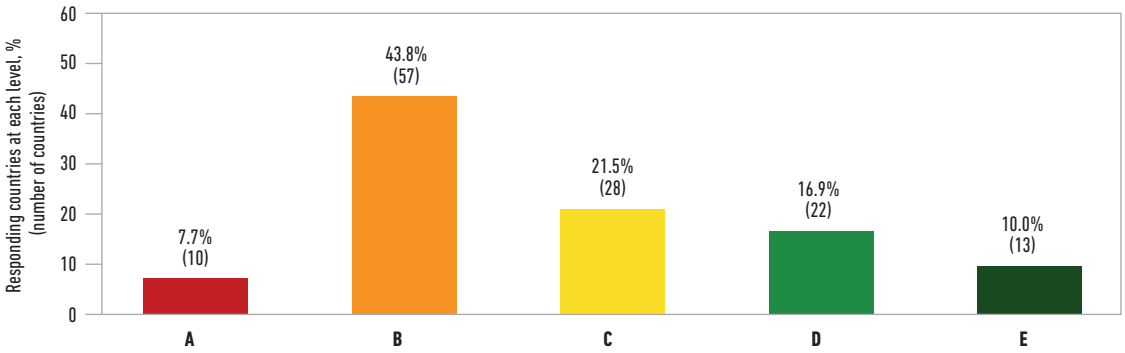
No response = 3 (n=133)

■	A	No systematic efforts to improve good production practices.
■	B	Some activities in place to develop and promote good production practices.
■	C	National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
■	D	Nationwide implementation of plan to ensure good production practices and national guidance published and disseminated.
■	E	Implementation of the nation-wide plan is monitored periodically.

Source: Tripartite AMR country self-assessment survey data.

For the food processing sector, Figure 22 shows that around half of reporting countries (48.4%, n=63) had a nationally agreed plan and guidance developed for good food processing practices in line with international standards (levels C–E). The most common response by countries was level B, indicating that around 40% (43.8%, n=57) of countries have some activities in place to develop good management and hygiene practices for food processing.

Fig. 22 Responses on good management and hygiene practices in the food processing sector, 2019–2020



No response =6 (n=130)

	A	No systematic efforts to improve good production practices.
	B	Some activities in place to develop and promote good production practices.
	C	National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
	D	Nationwide implementation of plan to ensure good production practices and national guidance published and disseminated.
	E	Implementation of the nation-wide plan is monitored periodically.

Source: Tripartite AMR country self-assessment survey data.

7. Optimizing the use of antimicrobial medicines in human and animal health (GAP-AMR Objective 4)

A total of 91.9% of countries reported having laws or regulations on the prescription and sale of antimicrobials for human use.

Almost three quarters (71.8%) of countries reported having policies to optimize the use of antimicrobials in human health, such as guidelines for treatment and practices to assure appropriate antimicrobial use.

Regarding the animal sectors, a total of 62.8% of countries reported having laws prohibiting the use of antibiotics for growth promotion.

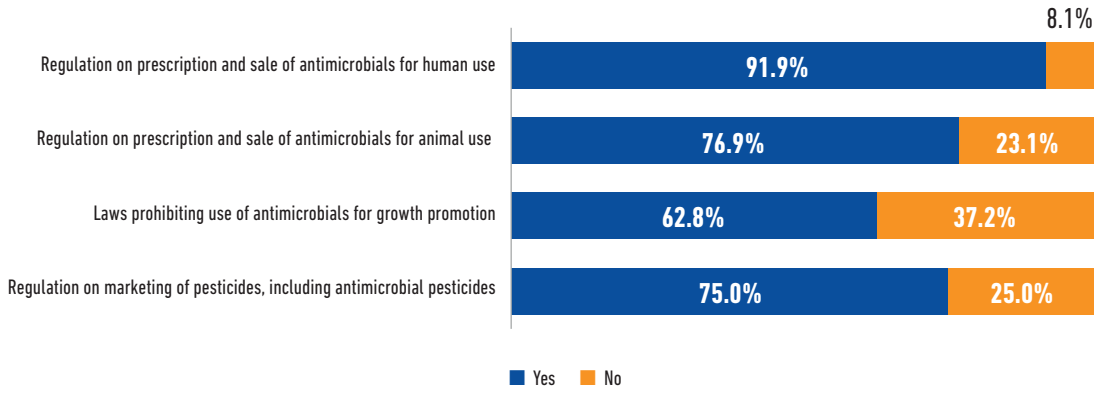
Over half (56.4%) of countries reported having policies to optimize the use of antimicrobials in animal health, including national legislation that covers all aspects of the national manufacture, import and marketing of antimicrobials.

LEGISLATION ON ANTIMICROBIAL USE

Ensuring the effectiveness of antimicrobials is a key pillar in the GAP-AMR, and antimicrobial stewardship programmes, clinical guidelines, policies, regulations and their enforcement are crucial ways to preserve antimicrobial effectiveness.

Over 90% of responding countries (91.9%, n=125) reported having regulations on the prescription and sale of antimicrobials for human use (Fig. 23). Of these 125 countries, 74 had a national-level monitoring system for antimicrobial consumption/sale in human health (Fig. 24), indicating that the remaining 51 countries might have

Fig. 23 Percentage of countries with regulations on antimicrobial use, sale or consumption, 2019–2020



Source: Tripartite AMR country self-assessment survey data.

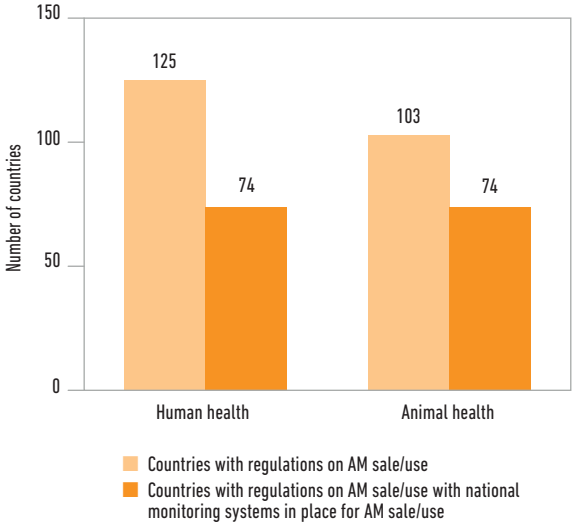
regulations on antimicrobials for human use, but their national monitoring system for antimicrobial sale might not be sufficient to track the results of these regulations and policies to inform necessary updates.

In animal health, 76.9% (n=103) of countries reported enacting regulations on the prescription and use in animals, with 74 of these countries reporting consistent data collection on the total quantity of antimicrobials sold for animal use at a national level (Fig. 24). However, in 38% of cases, the TrACSS responses differ from the data reported to the OIE AMU Data Collection.

Around 75% (n=90) of countries have regulations on the marketing of pesticides, including antimicrobial pesticides used in plant production (Fig. 23).

The TrACSS responses show 62.8% (n=81) of countries reported having laws against the use of antimicrobials for growth promotion in the absence of risk analysis (Fig. 23). Animal health data submitted through the OIE on 160 countries indicate that 60% have legislation on growth promotion. However, the presence of legislation on the use of antimicrobials for growth promotion is not always indicative of their use in the field. For instance, several countries report not using these growth promotion molecules, but also do not have legislation in place against the use of antimicrobials for growth promotion; instead, they use other approaches.

Fig. 24 Discrepancy between number of countries with regulations on antimicrobial sale/use and countries with monitoring systems for antimicrobial sale/use, 2019–2020



Source: Tripartite AMR country self-assessment survey data.

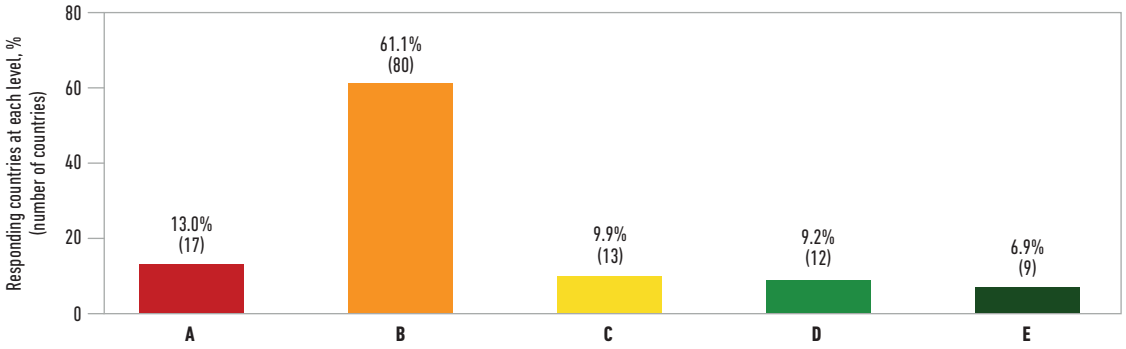
ADOPTING AWaRe IN THE NATIONAL ESSENTIAL MEDICINES LIST

AWaRe classifies antibiotics into three groups (Access, Watch and Reserve) to guide antimicrobial stewardship activities and emphasize the importance of their optimal uses and potential for developing drug resistance. It is a tool for countries to better support antibiotic monitoring and the optimal use of antibiotics.

- **Access** – A first or second choice for treatment should always be available.
- **Watch** – These antibiotics are recommended for only specific, limited indications as drug-resistance could potentially develop; this includes most antibiotics listed as critically important for human medicine.
- **Reserve** – These antibiotics and antibiotic classes should be reserved for treatment of confirmed or suspected infections due to multidrug-resistant organisms.

In total, 34 countries (26%) have adopted the AWaRe classification in their national EML. More than half of responding countries (61.1%, n=80) have knowledge about the AWaRe classification and plan to adopt it over the new few years, while 17 countries (13%) have no knowledge or information about AWaRe (Fig. 25).

Fig. 25 Responses on countries adopting AWaRe classification in their national Essential Medicines List, 2019–2020



No response = 5 (n=131)

■	A	Country has no knowledge or information about the AWaRe classification of antibiotics.
■	B	Country has knowledge about the AWaRe classification of antibiotics and country has intention to adopt it in the next few years.
■	C	Country has adopted the AWaRe classification of antibiotics in their National Essential Medicines List.
■	D	Country is monitoring its antibiotic consumption based on the AWaRe classification of antibiotics.
■	E	Country has incorporated AWaRe classification of antibiotics into its antimicrobial stewardship strategies.

Source: Tripartite AMR country self-assessment survey data.

OPTIMIZING ANTIMICROBIAL USE IN HUMAN HEALTH

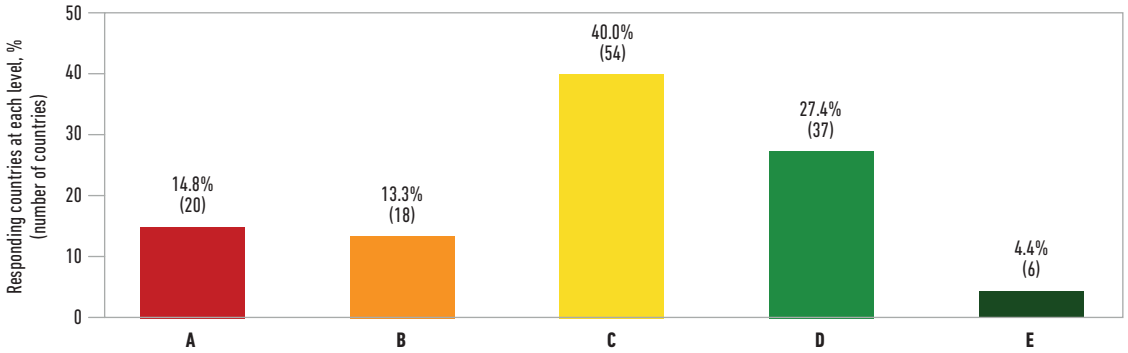
Optimizing antimicrobial use (AMU) in human health means ensuring that appropriate AMU practices and structures are in place to promote antimicrobial stewardship activities, including the availability of and adherence to guidelines, and monitoring and evaluating AMU. As many as 97 (71.8%) of countries reported they have practices to assure that appropriate AMU is implemented in at least some health care facilities as well as guidelines for their appropriate use (levels C–E).

Of these, 43 countries (levels D–E) have guidelines for the appropriate use of antimicrobials implemented nationwide in most health care facilities (Fig. 26). These 43 countries also reported using monitoring and surveillance results to inform action and update treatment guidelines. Globally, only 6 countries (4.4%) are sending data on AMU systematically back to prescribers, which is a practice that has been shown to reduce antimicrobial prescribing among doctors.[21]

Since over 70% of countries already report having reached levels C–E, the global movement on this indicator has been slow. The trend analysis of the 115 countries that responded to all TrACSS rounds for the past three years showed that the number of countries with nationwide implementation (levels C–E) on this indicator increased slightly from 81 countries in 2017–2018 to 85 countries in 2018–2019, but the number stayed constant at 85 countries as reported in the 2019–2020 TrACSS.

[21] Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. Cochrane Database Syst. Rev. 2017;(2).

Fig. 26 Responses on policies to optimize the use of antimicrobials in human health, 2019–2020



No response = 1 (n=135)

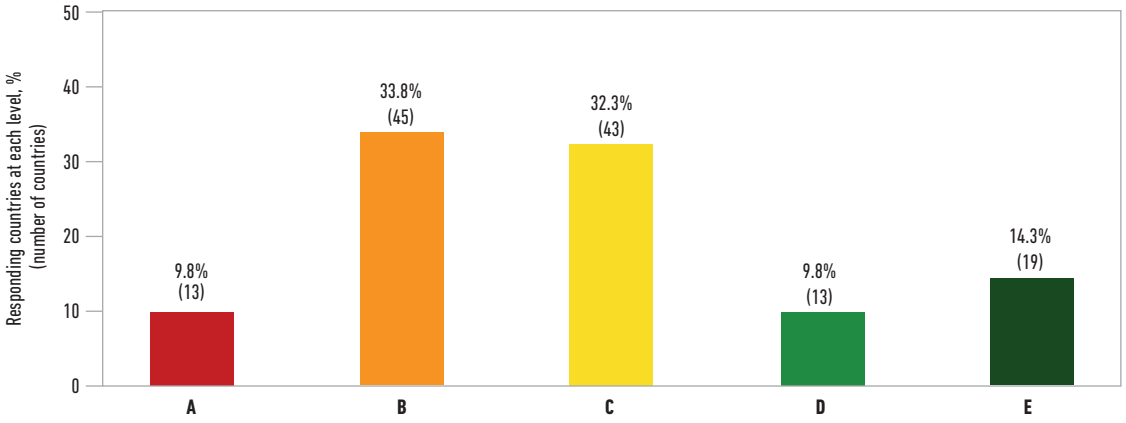
	A	No/weak national policies for appropriate use.
	B	National policies for antimicrobial governance developed for the community and health care settings.
	C	Practices to assure appropriate antimicrobial use being implemented in some healthcare facilities and guidelines for appropriate use of antimicrobials available.
	D	Guidelines and other practices to enable appropriate use are implemented in most health facilities nationwide. Monitoring and surveillance results are used to inform action and to update treatment guidelines and essential medicines lists.
	E	Guidelines on optimizing antibiotic use are implemented for all major syndromes and data on use is systematically fed back to prescribers.

Source: Tripartite AMR country self-assessment survey data.

OPTIMIZING ANTIMICROBIAL USE IN ANIMAL HEALTH AND PLANT PRODUCTION SECTORS

As seen in Figure 27, over half of the responding countries (56.4%, n=75) have national legislation that covers all aspects of the manufacturing, use and sale of antimicrobials in animal health. Around one third of responding countries have national legislation in place that covers some aspects of optimizing use of antimicrobials in animal health. However, around 10% of countries do not have any such policy or legislation in place.

Fig.27 Responses on policies to optimize the use of antimicrobials in the animal health sector, 2019–2020



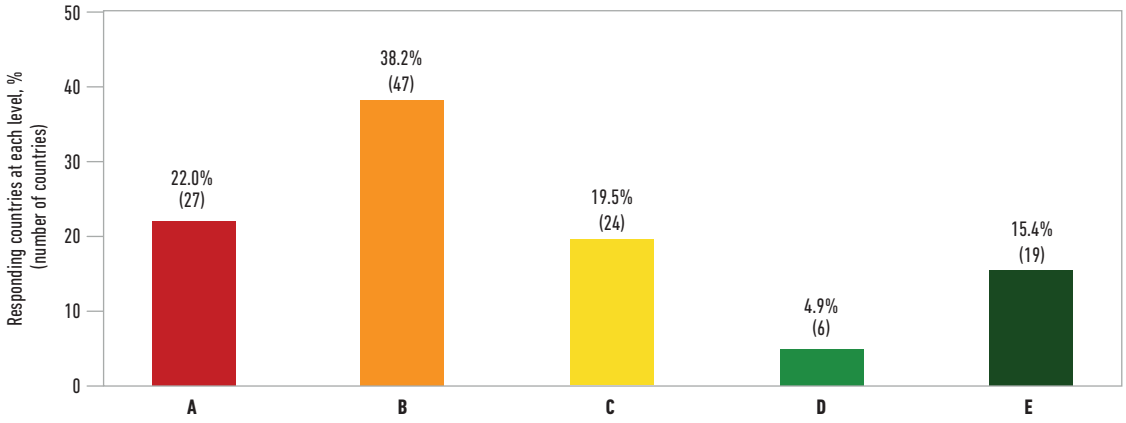
No response = 3 (n=133)

■	A	No national policy or legislation regarding the quality, safety and efficacy of antimicrobial products.
■	B	National legislation covers some aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of antimicrobial products.
■	C	National legislation covers all aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of antimicrobial products.
■	D	The national regulatory framework or AM products incorporates all the elements included in the related international standards on responsible and prudent use of antimicrobials.
■	E	Enforcement processes and control are in place to ensure compliance with legislation.

Source: Tripartite AMR country self-assessment survey data.

More than half of the responding countries (n=74, 60.2%) report having either no national legislation, or national legislation that covers only some aspects of the sale or use of antimicrobial pesticides in plant production (levels A–B), as shown in Fig. 28. However, the remaining 39.8% (n=49) of responding countries for this indicator have national legislation that covers all aspects of pesticide manufacturing, marketing, use and sale (levels C–E), and around 15% of countries reported having enforcement processes in place to ensure compliance with legislation.

Fig. 28 Responses on policies to optimize the use of antimicrobials in plant production sector, 2019–2020



No response = 13 (n=123)

	A	No national policy or legislation regarding the quality, safety and efficacy of pesticides, including antimicrobial pesticides and their sale/use.
	B	National legislation covers some aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of pesticides including antimicrobial pesticides such as bactericides and fungicides.
	C	National legislation covers all aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of pesticides including antimicrobial pesticides.
	D	The national regulatory framework for antimicrobial pesticides incorporates all the elements in the related international standards on responsible and prudent use according to plant type/species.
	E	Enforcement processes and control are in place to ensure compliance with legislation on use of antimicrobial pesticides.

Source: Tripartite AMR country self-assessment survey data.

8. Economic breakdown: Classification by World Bank income group

While the trend analysis shows global movement towards addressing AMR over the past few years, it is important to examine if achievement towards GAP-AMR objectives has occurred across all income groups. The prevailing assumption is that higher-income countries would have higher levels of achievement on TrACSS indicators due to greater access to resources and/or starting from a higher baseline. The response breakdown in Table 2 does show this to be an accurate assumption for most indicators, highlighting the critical need for additional technical and financial support for lower-income countries to advance in their NAP implementation. Since AMR is a borderless threat, the World Bank Group's final report on drug-resistant infections predicts that, if unchecked, AMR spread in 2050 could cause greater drops in economic growth in low-income countries than in wealthier countries, widening the gap of economic inequality between the two.[22]

Some of the main indicators from the 2019–2020 TrACSS were selected for comparison across income groups, including the development of NAPs, training on AMR in the human and animal health sectors, the implementation of national IPC programmes, monitoring systems for antimicrobial consumption/use in human and animal health, and data provision to WHO on AMR through GLASS. The submission of AMR data to GLASS is not a TrACSS indicator; the data were provided by the WHO GLASS team based on the countries' 2019 data submission and merged with our data set for analysis. These selected indicators were coded into dichotomous variables representing levels A–B (having no nationwide implementation) and levels C–E (having reached nationwide implementation). Countries were classified into their respective income groups based on the latest World Bank income group classification. Owing to the smaller sample size, a global test of independence called Fisher's exact test, was performed to verify if there was a significant relationship between levels of achievement and World Bank income group. Fisher's exact test was chosen instead of Chi-squared because more than 20% of cells had expected frequencies < 5. When used on rxc tables, which are tables bigger than the standard 2x2, it is called the Fisher Freeman-Haltman.[23] The significance level was set to $p<0.05$; a more detailed methodology can be found in Annex 2.

National action plans: The development of NAPs was one of two indicators where there was no significant relationship found between level of achievement and income group ($p=0.06$). Since over 90% of responding countries reported having a NAP (levels C–E), the differences between the income groups are not as drastic. Technical support from all the Tripartite and development agencies for the development of NAPs, especially in lower-middle-income countries seems likely to be a factor in this result.

GLASS data submissions: Country submission of AMR data to GLASS was the other indicator of interest in which the differences between level of achievement across income groups were not statistically significant ($p=0.09$). This could be because GLASS promotes a feasible standardized approach to AMR data collection and reporting, and both WHO headquarters and regional offices provide strong technical support to all countries, especially low- and middle-income countries that might be setting up their national AMR surveillance systems from scratch.

For the remaining indicators of interest, however, the results show that level of achievement is significantly associated with income levels in nationwide implementation for each indicator (levels C–E), indicating a significant relationship between the level of achievement and income groups. For most indicators, low-income countries had the

[22] Jonas O, Irwin A, Berthe F, Le Gall F, Marquez P. Drug-resistant infections: a threat to our economic future (Vol. 2): final report. HNP/Agriculture Global Antimicrobial Resistance Initiative. Washington (DC): World Bank; 2017 (https://documents.worldbank.org/en/publication/documents-reports/documentdetail/323311493396993758/final-report, accessed 5 November 2020).

[23] G.H. Freeman, J.H. Halton, Note on an exact treatment of contingency, goodness of fit and other problems of significance, Biometrika, Volume 38, Issue 1-2, June 1951, Pages 141-149, https://doi.org/10.1093/biomet/38.1-2.141

lowest percentage of countries that reached levels C–E, followed by lower-middle-income countries, upper-middle-income and high-income countries. This trend is understandable, since countries with greater access to resources can increase investments in infrastructure, systems and human resources to tackle AMR. Moreover, several higher-income countries had already begun investing in AMR prior to the approval of GAP-AMR and might have started from a higher baseline for the indicators compared to countries that started after the GAP-AMR was approved in 2015.

Training and education on AMR: In human health, low-income and lower-middle-income countries have 43.8% (7/16) and 57.1% (20/35) of countries offering some level of training on AMR in human health (levels C–E), compared to 91.8% (45/49) of high-income countries. Training for AMR in the veterinary sector showed similar trends, with 18.8% (3/16) low-income and 57.1% (20/35) lower-middle-income countries offering some level of training on AMR, compared to 69.4% (34/49) of high-income countries.

There was a significant association found between World Bank income groups and levels of achievement on training on AMR in health ($p<0.001$) and veterinary sectors ($p=0.002$).

Infection prevention and control: For IPC, levels D–E indicate nationwide implementation of IPC programmes according to the WHO Guidelines on Core Components for IPC; 0% (0/16) of low-income countries report reaching that level. Even among other income groups, few countries report reaching nationwide implementation of IPC programmes, with only 14.4% (5/35) of lower-middle-income countries, 27.7% (10/36) of upper-middle-income countries and 51.0% (25/49) of high-income countries having reached levels D–E on this indicator.

The implementation of national IPC programmes is one of the areas in which the largest differences between income levels are observed, and there was a significant difference ($p<.001$) found between levels of achievement on this indicator and income groups.

Optimizing antimicrobial use: Optimizing antimicrobial use (AMU) in human health includes structures and practices to assure appropriate AMU, such as up-to-date treatment guidelines for major syndromes. Levels C–E for this indicator showed that countries have appropriate AMU practices in some health care facilities; 43.8% (7/16) of low-income countries, 57.1% (20/35) of lower-middle-income countries, 72.2% (26/36) of upper-middle-income countries and 90% (44/49) of high-income countries report reaching higher levels (C–E) in this indicator.

There was a significant relationship found between levels of achievement and income groups ($p <0.001$).

National monitoring system for antimicrobial sale and use in humans: Around 18.8% (3/16) of low-income countries and 28.6% (10/35) of lower-middle-income countries had a national monitoring system of antimicrobial consumption in human health (levels C–E), compared to 69.4% (25/36) of upper-middle-income and 77.6% (38/49) of high-income countries. The TrACSS data indicate that over half (56.3%, 9/16) of low-income countries are at level A with no national plan or system to monitor the use of antimicrobials in human health. This is an area in which additional global support is needed to help these countries develop a system for monitoring antimicrobial consumption.

There was a significant association found between levels of achievement on national monitoring systems for antimicrobial sale/use and World Bank income groups in human health ($p<0.001$).

National monitoring system for antimicrobial use in animals: For national monitoring systems of AMU in animal health, 18.8% (3/16) of low-income countries report reaching levels C–E, and around 55% of both lower-middle-income (19/35) and upper-middle-income (20/36) countries report reaching higher levels (C–E) on this indicator, compared to 83.7% (41/47) of high-income countries.

There was a significant relationship found between the levels of achievement on national monitoring systems for antimicrobial sale/use in animal health and World Bank income groups ($p<0.001$).

Most of these indicators reflect unequal global achievement, with higher-income countries reporting higher levels of achievement (levels C–E) on indicators, compared to lower-income countries. The analysis reveals an opportunity to identify areas where additional support and resources could be directed when addressing AMR.

Table 2. Responses on achievement of TrACSS indicators by World Bank country income classification, and Fisher exact test of independence on association between TrACSS indicator levels of achievement and World Bank income group

	Levels[a]	High-income n=49	Upper-middle-income n=36	Lower-middle-income n=35	Low-income n=16	p-value	[†] No response
2019–2020 TrACSS participating countries, n=136		49 (36.0%)	36 (26.5%)	35 (25.7%)	16 (11.8%)		
Development of NAPs						0.06	0
	A–B	8	1	3	4		
	C–E	41	35	32	12		
Countries submitting AMR data to GLASS						0.09	N/A
	Y	27	14	12	4		
	N	22	22	23	12		
Training in AMR in human health						<0.001***	1
	A–B	3	6	15	9		
	C–E	45	30	20	7		
Training in AMR in veterinary sector						0.002**	3
	A–B	13	15	16	6		
	C–E	34	20	19	10		
National IPC programme						<0.001***	1
	A–C	14	26	29	16		
	D–E[b]	35	10	5	0		
Optimizing the use of antimicrobials in human health						<0.001***	1
	A–B	5	10	14	9		
	C–E	44	26	20	7		
National monitoring systems for antimicrobial sale and use in humans						<0.001***	1
	A–B	11	11	25	12		
	C–E	38	25	10	3		

	Levels[a]	High-income n=49	Upper-middle-income n=36	Lower-middle-income n=35	Low-income n=16	p-value	† No response
National monitoring systems for antimicrobial sale and use in animals						<0.001***	5
	A–B	6	15	16	11		
	C–E	41	20	19	3		

p<0.001 '***' p<0.01 '**' p<0.05 '*'

[a] Levels C–E represent nationwide implementation for most indicators.

[b] Levels D–E represent nationwide implementation for this indicator.

† Non responses, or missing values, for the indicator questions were excluded in the test of independence.

Source: Tripartite AMR country self-assessment survey data (2019–2020 TrACSS).

9. Conclusion

The 2019–2020 TrACSS represented the fourth round of the survey. As a result of the COVID-19 pandemic, the response rates for the latest 2019–2020 round were 11.8% lower than the previous year. A total of 136 (70.1%) countries out of 194 WHO Member States responded to the latest 2019–2020 TrACSS.

Areas of progress: Despite the lower response rate, the results show global progress on several indicators that align with GAP-AMR implementation, including an increase in the number of countries with developed NAPs compared to previous years, an increase in the number of countries with functional multisectoral working groups on AMR, and an increase in the number of countries with nationwide implementation of national IPC programmes according to the WHO Guidelines on Core Components for IPC. The data indicate that countries are working on implementing their AMR NAPs towards achievement of the GAP-AMR objectives.

Positive trends between the 2017 and 2020 TrACSS rounds: The trend analysis of the past three TrACSS rounds examined the 115 countries that responded in each of the last three years to evaluate whether they had advanced to nationwide implementation – represented by levels C–E for most indicators and D–E for the indicator on raising awareness. The data show that over the past three years, these 115 countries have advanced gradually, with increases in the percentage of countries with nationwide AMR awareness-raising campaigns, along with increases in the following areas: training and education on AMR, a national monitoring system for antimicrobial consumption and use, and a national surveillance system for resistance in human and animal health.

Income levels and achievement: Addressing AMR solely in higher-income countries will not be enough to reduce the burden of AMR globally, especially since lower-income countries might bear the brunt of the economic and health consequences of unchecked AMR.[24] Select indicators were chosen from the 2019–2020 TrACSS for comparison across income groups, including the implementation of NAPs, data provision to WHO on AMR through GLASS, training on AMR in the human and animal health sectors, the implementation of national IPC programmes, and monitoring systems for antimicrobial consumption and use in human and animal health. Aside from the implementation of NAPs and the submission of data to GLASS, there was a significant relationship between levels of achievement on these indicators and World Bank income groups, showing that the differences observed in income groups on levels of achievement were significant. Observing this for almost all the indicators reveals that a comprehensive system strengthening approach in all sectors is necessary to help lower-income countries address AMR. Given scarce resources, the need for additional assessments on the cost-effectiveness of interventions is clear, particularly in low-resource countries. In addition, increased awareness of AMR and an economic rationale for making additional investments are urgently required to seek the full commitment of national authorities, policy-makers and external development partners.

Areas in need of additional efforts: Based on the analysis of the TrACSS data, countries could further dedicate their efforts to addressing AMR in the following areas:

- **Strengthening multisectoral coordination and collaboration:** The discrepancies found in the validation process between TrACSS submissions and the OIE's data on the monitoring of antimicrobial sales for use in animals in countries, and between the TrACSS self-reported data on WASH in health care facilities and the WHO/UNICEF JMP report, indicate that gaps in communication and coordination efforts might exist across and between sectors. Despite an increase in the number of countries with functional multisectoral groups responsible for AMR NAP implementation, better communication and processes are needed to strengthen collaboration across and within sectors.

[24] Jonas O, Irwin A, Berthe F, Le Gall F, Marquez P. Drug-resistant infections: a threat to our economic future (Vol. 2): final report. HNP/Agriculture Global Antimicrobial Resistance Initiative. Washington (DC): World Bank; 2017 (https://documents.worldbank.org/en/publication/documents-reports/documentdetail/323311493396993758/final-report, accessed 5 November 2020).

- **Promoting targeted AMR awareness-raising campaigns:** Globally, fewer than 50% of countries have nationwide, government funded AMR awareness campaigns targeting key stakeholders (levels D–E). Additionally, the human health and animal health sectors are the main sectors involved in awareness-raising campaigns. Better representation and involvement are needed from the food production, food processing, plant health and environment sectors.
- **Increasing the monitoring and enforcement of legislation involving antimicrobials:** A total of 91.9% (n=125) of responding countries reported they have laws and regulations on the prescription and sale of antimicrobials for human use, but only 54% (n=74) reported they have national monitoring systems for antimicrobial consumption, indicating that several countries have a gap in monitoring legislation involving antimicrobials. Additionally, the presence of legislation does not always indicate enforcement of legislation and regulations. Policies regarding the prescription, dispensing, sale and disposal of antimicrobials need to be strengthened, monitored and enforced appropriately through regulations.
- **Strengthening access to essential antimicrobials and diagnostics:** Encouraging countries to adopt the AWaRe classification tool in their national EML will help them better support antibiotic monitoring and the optimal use of antibiotics. As of now, only 26% (n=34) of countries have included AWaRe in their national EML. Additionally, ensuring access to diagnostic tools will help contribute to the surveillance of resistance and the optimal use of antimicrobials.
- **Strengthening data monitoring and reporting:** Strengthening data collection for AMR surveillance and antimicrobial consumption/use and ensuring better data reporting and sharing across sectors are needed to guarantee that the development of national policies and strategies are informed by the country situation in an effective way.

Limitations: Self-assessment surveys such as the TrACSS come with intrinsic limitations, including issues of self-response bias, or exaggerated responses. One specific limitation of self-assessment surveys is their validity – whether they accurately measure what they are supposed to measure, especially as the risk of overestimating strengths or underreporting weaknesses when responding is real. To help ensure that the analysis is more robust, independent validation is needed for self-assessment surveys such as the TrACSS. When possible, responses have been validated against external data, but not all TrACSS indicators have external data that can be used for validation. Country participation in the TrACSS is intended to encourage national-level review and reflection of country progress and brings sectors together to encourage coordination and help identify priorities for next steps. In the future, investing in independent validation will strengthen TrACSS results and make the analysis more robust.

The purpose of the TrACSS is to provide a snapshot of country progress in implementing key actions to address AMR at the national level. Global and national systems for capturing representative data on AMR and AMU are in development or can still be improved, but data are needed to identify areas where technical support and assistance are required on AMR. The TrACSS fills this gap by providing an opportunity to gather, analyse and identify areas where additional support and resources could be provided by Tripartite organizations when addressing AMR.

Annex 1.
Country participation in the TrACSS

The breakdown of income groups is based on the latest World Bank income group classification. The 136 countries that submitted data to the 2019–2020 TrACSS are included below.

Countries used in trend analysis (n=115) that have submitted TrACSS consistently for the past three years are marked with *

High-income n=49	**Upper-middle-income n=36**	**Lower-middle-income n=35**	**Low-income n=16**
Australia*	Albania*	Bangladesh*	Afghanistan*
Austria*	Argentina*	Benin*	Burkina Faso*
Bahamas*	Armenia*	Bhutan*	Burundi
Bahrain*	Azerbaijan*	Bolivia (Plurinational State of)	Democratic People's Republic of Korea*
Belgium*	Belarus*	Cambodia*	Democratic Republic of the Congo*
Canada*	Brazil*	Côte d'Ivoire*	Ethiopia
Chile	Bulgaria*	Djibouti	Guinea*
Croatia*	China*	Egypt*	Liberia*
Cyprus*	Colombia*	Eswatini	Niger*
Czech Republic*	Costa Rica*	Ghana*	Sierra Leone*
Denmark*	Cuba	India*	Somalia
Estonia*	Ecuador*	Kenya*	South Sudan
Finland*	Fiji	Kyrgyzstan*	Sudan*
France*	Georgia*	Lao People's Democratic Republic*	Syrian Arab Republic*
Germany*	Guatemala*	Mauritania*	Tajikistan*
Greece*	Guyana*	Micronesia (Federated States of)	Yemen
Hungary*	Indonesia*	Mongolia	
Iceland*	Iran (Islamic Republic of) *	Morocco*	
Ireland*	Iraq*	Myanmar*	
Israel*	Jordan*	Nepal*	
Italy*	Kazakhstan*	Nicaragua*	
Japan*	Lebanon*	Nigeria*	
Kuwait	Libya*	Pakistan	
Latvia*	Malaysia*	Papua New Guinea*	
Lithuania*	Maldives*	Philippines*	

High-income n=49	Upper-middle-income n=36	Lower-middle-income n=35	Low-income n=16
Luxembourg*	Montenegro*	Republic of Moldova*	
Malta*	North Macedonia*	Solomon Islands	
Monaco	Paraguay*	Sri Lanka*	
Netherlands*	Peru*	Timor-Leste*	
New Zealand*	Russian Federation*	Tunisia*	
Norway*	Serbia*	Ukraine*	
Panama	South Africa*	United Republic of Tanzania*	
Poland	Suriname*	Uzbekistan*	
Portugal*	Thailand*	Viet Nam*	
Qatar*	Turkey*	Zambia*	
Republic of Korea*	Turkmenistan*		
Romania*			
San Marino*			
Saudi Arabia*			
Singapore*			
Slovakia*			
Slovenia*			
Spain*			
Sweden*			
Switzerland*			
Trinidad and Tobago*			
United Arab Emirates*			
United Kingdom*			
United States of America*			

Annex 2.
Methods

Survey design and distribution

The purpose of the Tripartite AMR country self-assessment survey (TrACSS) is twofold: 1) to review and summarize country progress on implementing key actions within NAPs to address AMR for annual reporting at the global level; and 2) to encourage national-level review of country progress and help identify priorities for next steps. Comparable questions from the 2017–2018, 2018–2019 and the latest 2019–2020 TrACSS rounds are used throughout the report to review progress over the past three years.

The questionnaire additionally seeks input from relevant sectors for each question, including the human health, animal health, plant health, food production, food safety, plant health and environment sectors. The TrACSS multisectoral survey questionnaire is meant to closely reflect the global action plan on antimicrobial resistance. It starts by investigating the presence of multisectoral working groups on AMR within the country, followed by the country's progress on developing a NAP on AMR, and the presence of national regulations on antimicrobials. The subsequent questions address four of the five strategic objectives of the GAP-AMR that require country-level action: 1) raising awareness and understanding of AMR; 2) strengthening the knowledge and evidence base through surveillance and research; 3) reducing the incidence of infections; and 4) optimizing the use of antimicrobial medicines in human and animal health.

Questions were structured on a five-point scale from A to E, which roughly corresponds to: no capacity, limited, developed, demonstrated and sustained capacity. For most survey questions, the countries reporting levels C–E (or developed, demonstrated and sustained capacity, respectively) are considered to have nationwide implementation for that indicator. For indicators on raising awareness of AMR and IPC programmes, levels D–E are recognized as having nationwide implementation.

The questionnaire was sent to WHO regional offices on 27 November 2019, through which it was disseminated to WHO country offices and AMR focal points in the ministries of health. FAO and OIE also shared information emails to their counterparts in their respective regions and countries to ensure coordination across the sectors. Each country was asked to submit one official response, validated by all sectors involved. Countries had to submit a response online via a unique link provided to each country to avoid multiple versions and responses. The initial deadline for submission was 29 February 2020 but it was extended due to the COVID-19 pandemic. The survey was closed on 10 July 2020 and all responses were locked.

Validation

WHO staff at headquarters undertook a review of the data from mid-April 2020. All country responses were sent back to the responders for validation, at which time some countries chose to amend their responses.

The TrACSS submissions were also validated using JEE missions. In the 17 countries that both hosted a JEE mission over the past two years and submitted TrACSS data, the TrACSS data were found to broadly correspond to JEE findings. The capacities that JEE assess include multisector coordination and NAP development, AMR surveillance, IPC and antimicrobial stewardship.

When possible, specific indicators were validated with external data. OIE validated data on animal health, including the TrACSS question on the monitoring of antimicrobial use in countries, against country reporting in the fifth round

of the OIE AMU Data Collection. Responses to the TrACSS self-reported data on WASH in health care facilities were validated with the WHO/UNICEF JMP report.[25]

Independent variables

Countries were divided into income groups based on the latest World Bank classification of high-income countries (HIC), upper-middle-income countries (UMIC), lower-middle-income countries (LMIC) and low-income countries (LIC). Any mention of regions in the report is based on countries grouped into six regions as defined by WHO (i.e. African Region, Region of the Americas, Eastern Mediterranean Region, European Region, South-East Asia Region, Western Pacific Region). As the FAO, OIE and WHO group countries into different regional blocs, the regions of the three organizations do not directly correspond to each other. Instead, the report focused on reviewing and analysing the global responses of participating countries and presenting the global progress on AMR.

The variables on income group classification were incorporated from the World Bank database and were used following the World Bank's definitions.

The variable on the submission of AMR data to GLASS is not a TrACSS indicator; the data were provided by the WHO GLASS team based on the 2019 country data and were merged with the TrACSS data set for analysis.

The trend analysis and economic breakdown required that TrACSS responses be dichotomized: Level C was used as the threshold unless otherwise stated, whereby levels C–E indicate nationwide implementation of the indicator, or higher levels of achievement, and levels A–B indicate lower levels of achievement. The answers to the TrACSS questions on raising awareness and understanding of AMR and on implementing national IPC programmes were the only responses where levels D–E were considered as nationwide implementation.

Analysis

Microsoft Excel and RStudio 3.6.3 (R Foundation for Statistical Computing) were used for data preparation, review and analysis.

Descriptive statistics on country participation in the TrACSS over the past three years were presented through stratification by WHO regions and World Bank income groups (Table 1).

Descriptive statistics were tabulated and visualized on country responses for all indicator questions from the 2019–2020 TrACSS, using the number of countries that had responded to each indicator question as the denominator, to calculate the percentage of countries responding to levels A–E. The indicators analysed were the following: the development of NAPs, the presence of multisectoral working groups on AMR, awareness raising on AMR, training and education on AMR in all sectors, monitoring systems for AMR in all sectors, monitoring systems for the sale and use of antimicrobials in all relevant sectors, the implementation of national IPC programmes, good hygiene and management practices in animal production and food processing sectors, the adoption of the AWaRe classification tool in the national EML, the presence of country legislation on antimicrobials, and policies to optimize the use of antimicrobials in human, animal and plant health.

A trend analysis was performed using the same 115 countries that had consistently responded to each of the past three TrACSS rounds in order to assess the evolution of their responses and determine what percentage had advanced to nationwide implementation (levels C–E) over the years. The trend analysis was performed on all indicators, with the exception of those on the adoption of AWaRe classification in the national EML, legislation on antimicrobials, and good management and hygiene practices in animal production and food processing, because the questions were not

[25] WASH in health care facilities: global baseline report 2019. Geneva: World Health Organization and United Nations Children's Fund (UNICEF); 2019 (https://washdata.org/sites/default/files/documents/reports/2019-04/JMP-2019-wash-in-hcf.pdf, accessed 4 November 2020).

comparable across the years or had been recently introduced. Since some of the indicator questions have changed over the years, only comparable years were analysed. Even within the past three years, some indicators regarding nationwide implementation are only compared for the past two years because of changes to indicator questions.

The economic breakdown sought to examine whether there was a significant association between levels of achievement on the TrACSS indicators and World Bank income groups. After reviewing the data, the assumptions for a test of independence held and, due to the smaller sample size, a Fisher's exact test was performed to verify if there was a significant relationship between levels of achievement on indicators and World Bank income groups. The Fisher's exact test was used instead of the chi-squared test since >20% of cells had an expected value of <5. While Fisher's exact test is often done on 2x2 tables, it can be used on bigger rxc tables[26] such as our 2x4 tables on indicator level of achievement and World Bank income groups in Table 2. The Fisher exact test on rxc tables is also referred to as the Fisher Freeman-Halton test.

Some of the main indicators from the 2019–2020 TrACSS were selected for comparison across income groups, including the development of NAPs, training on AMR in the human and animal health sectors, the implementation of national IPC programmes, monitoring systems for antimicrobial consumption/use in human and animal health, and data provision to WHO on AMR through GLASS. The submission of AMR data to GLASS is not a TrACSS indicator; the data were provided by the WHO GLASS team based on the countries' 2019 data submission and merged with our data set for analysis. These selected indicators were coded into dichotomous variables representing levels A–B (having no nationwide implementation) and levels C–E (having reached nationwide implementation). Countries were classified into their respective income groups based on the latest World Bank income group classification.

[26] G.H. Freeman, J.H. Halton, Note on an exact treatment of contingency, goodness of fit and other problems of significance, Biometrika, Volume 38, Issue 1-2, June 1951, Pages 141-149, https://doi.org/10.1093/biomet/38.1-2.141

Annex 3.
Trend analysis responses

Demographic breakdown and responses of countries used in the trend analysis (n=115)

	High-income	Upper-middle-income	Lower-middle-income	Low-income
Countries in the trend analysis that responded to the TrACSS over the past three years (n=115)	44	34	27	10
TrACSS indicator		Number of countries in the trend analysis that reached nationwide implementation of indicators (n=115)		Percentage of countries (n=115)
Raising awareness of AMR (levels D–E)				
	2017–2018	48		41.7
	2018–2019	51		44.3
	2019–2020	53		46.1
Training in AMR in human health (levels C–E)				
	2017–2018	75		65.2
	2018–2019	81		70.4
	2019–2020	90		78.3
Training in AMR in the veterinary sector (levels C–E)				
	2017–2018	47		40.9
	2018–2019	58		50.4
	2019–2020	71		61.7
Training in AMR in the farming sector (levels C–E)				
	2017–2018	23		20.0
	2018–2019	27		23.5
	2019–2020	29		25.2

	High-income	Upper-middle-income	Lower-middle-income	Low-income
National surveillance systems for resistance in humans (levels C–E)				
	2017–2018	80	69.6	
	2018–2019	84	73.0	
	2019–2020	89	77.4	
National surveillance systems for resistance in animal health (levels C–E)				
	2018–2019	74	64.3	
	2019–2020	84	73.0	
National surveillance systems for resistance in the food sector (levels C–E)				
	2018–2019	72	62.6	
	2019–2020	83	72.2	
National monitoring system for antimicrobial sales and use in human health (levels C–E)				
	2018–2019	66	57.4	
	2019–2020	71	61.7	
National monitoring system for antimicrobial sales and use in animal health (levels C–E)				
	2018–2019	69	60.0	
	2019–2020	76	66.1	
National monitoring system for antimicrobial pesticides (levels C–E)				
	2018–2019	35	30.4	
	2019–2020	47	40.9	

	High-income	Upper-middle-income	Lower-middle-income	Low-income
Nationwide implementation of national IPC programmes (levels C–E)				
	2018–2019		38	33.0
	2019–2020		45	39.1
Optimize the use of antimicrobials in human health (levels C–E)				
	2017–2018		81	70.4
	2018–2019		85	73.9
	2019–2020		85	73.9
Optimize the use of antimicrobials in animal health (levels C–E)				
	2018–2019		64	55.7
	2019–2020		66	57.4

Annex 4.
TrACSS Questionnaire

(the full TrACSS questionnaire starts on following page)

Food and Agriculture Organization of the United Nations

WORLD ORGANISATION FOR ANIMAL HEALTH

World Health Organization

01 November, 2020

Dear Colleagues,

On behalf of the Tripartite organizations, the Food and Agricultural Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE), and the World Health Organization (WHO), we are pleased to share with you the fourth round of the Tripartite AMR Country Self-assessment Survey (TrACSS).

To ensure effective tracking of country progress in addressing antimicrobial resistance (AMR), we would urge the national AMR focal points in all countries to fully engage all the relevant sectors to help complete the questionnaire. It would also be an opportunity for the national Multisectoral Coordination Group on AMR to come together to assess national progress and provide a consolidated response approved by all the relevant sectors.

We would like to thank you for your contributions to this survey as information from TrACSS has been invaluable to monitor country progress in the implementation of the national action plan on AMR, and help refine global strategies. Information from the third round of the TrACSS, including the list of countries that responded, was also published in the UN Secretary-General's report on AMR to the UN General Assembly in June 2019 (https://undocs.org/en/A/73/869). Additionally, data from TrACSS will contribute to the monitoring of various multisectoral indicators of the Tripartite monitoring and evaluation framework[1] of the Global Action Plan on AMR.

We request you to submit one consolidated country response coordinated by the national AMR focal point by the deadline of 29 February, 2020. For any additional questions or clarifications, or for support regarding the questionnaire, please write to: tracss@who.int. We will provide the results of the survey, including country reports, at https://amrcountryprogress.org/ in June 2020.

We thank you for your continued strong efforts to implement and monitor multisectoral national action plans on AMR in your country. Various tools and guidance documents developed by the Tripartite relevant to each question have been included in the ANNEX to the accompanying guidance note. Through our joint efforts we can help address one of the greatest challenges to human and animal health, food security, livelihoods, and economic growth, and that impacts a number of Sustainable Development Goals.

Sincerely,

Ms Maria Helena M.Q. Semedo Deputy Director-General Climate and Natural Resources **FAO – Headquarters**	Dr Matthew Stone, Deputy Director General International Standards and Science **World Organisation for Animal Health (OIE) - Headquarters**	Dr Hannan Balkhy Assistant Director-General AMR Division **WHO – Headquarters**

[1] https://apps.who.int/iris/bitstream/handle/10665/325006/9789241515665-eng.pdf?ua=1

Tripartite AMR Country Self-assessment Survey (TrACSS)

Deadline for Submission: 29 February, 2020

Version 4.0

Introduction

The Global Action Plan on Antimicrobial Resistance (AMR)[2] was adopted in 2015 by all countries through decisions in the World Health Assembly, the Food and Agriculture Organization of the United Nations (FAO) Governing Conference and the World Assembly of World Organisation for Animal Health (OIE) Delegates. Countries agreed to have a national action plan on AMR that is consistent with the Global Action Plan, and to implement relevant policies and plans to prevent, control and monitor AMR. To monitor country progress in the implementation of the national actions plans, an annual Tripartite AMR country self-assessment survey (TrACSS) has been jointly administered by FAO, OIE and WHO since 2016.

The results of the previous three rounds of country self-assessment surveys (2016/17, 2017/18, 2018/19) are available at https://amrcountryprogress.org/

Process of completing the questionnaire: Information on the process for completing the questionnaire is available in the Guidance Note: (https://www.who.int/antimicrobial-resistance/global-action-plan/monitoring-evaluation/AMR-country-self-assessment-2019/en/). It is important that countries involve a multi-sectoral group in assessing national progress and provide consolidated responses agreed by all. Many countries have found that the process of completing the questionnaire is a useful review of progress for the national action plan (NAP) implementation team.

Each country is asked to submit one official response, validated by all involved sectors, which summarises national progress. The national response should be submitted using the online questionnaire. One access key will be sent through WHO to the Ministry of Health, to ensure only one version of the questionnaire is submitted per country.

Focal points from FAO and OIE in the countries will also receive a soft copy of the questionnaire to facilitate the completion of relevant sections of the questionnaire and to coordinate closely with the national AMR focal point to ensure they are accurately reflected in the final submission.

Responses are requested by 29 February 2020. Data will be analyzed and published by May 2020.

[2] WHO, 2015, http://www.who.int/antimicrobial-resistance/publications/global-action-plan/en/. The Global Action Plan was developed by WHO with the support of FAO and OIE.

Structure of the questionnaire: The questionnaire has 5 sections: section one requests key contact details, information on progress with multi-sectoral working on AMR, and information on completing a multi-sectoral national action plan on AMR. The next three sections cover progress on the first four strategic objectives in the Global Action Plan on AMR. The questions cover areas of human health, animal health and production aspects, plant production, the environment, and food safety concerns. The final section covers national assessment of risks for AMR transmission in the environment and pollution control and legislations to prevent environmental contamination with antimicrobials. Strategic objective 5 of the global action plan is equally important, but this data will be collected through other channels.

Countries that have only recently started to develop their response to AMR may not be able to respond to all the questions (especially, questions towards the end of each section and concerning the environment and surveillance capacity in the food sector); partial responses are acceptable. In this case, we would encourage you to please complete the mandatory questions, and any other questions that you can respond to and then submit your Country response. If the response needs to be amended after submission, please contact tracss@who.int.

Responses will only be accepted via the unique online link provided to each national AMR focal point.

The questionnaire was developed jointly between WHO, FAO and OIE, with WHO coordinating this annual global monitoring process. WHO will act as liaison point with FAO and OIE at global, regional and national levels. If there are questions on the process or the questionnaire, please contact Pravarsha Prakash in WHO at tracss@who.int.

Questions marked with * are mandatory.

Name of country* …… **Date of completion …….**

1. Name and email of-existing AMR focal points for relevant sectors:

Human Health Name ……Email……

Animal Health (terrestrial and aquatic) Name……..Email……

Plant Health Name……Email……

Food Production Name……Email……

Food Safety Name…… Email……

Environment Name……Email……

2. Details of person(s) who coordinated the national response to this self-assessment*

Name……..Title ……..Email……

Name……..Title ……..Email……

Name……..Title ……..Email……

3. 1 Name and email of AMR Focal point in WHO country or regional office

Name……Email……..

3.2 Name and email of AMR Focal Point in FAO country or regional office

Name……Email……..

3.3 Name and email of OIE National Focal Point on veterinary products

Name……Email……..

4. Multi-sectoral approach to addressing AMR*

Please select one rating that most closely matches the country situation.

		4.1 Multi-sector and One Health collaboration/coordination[3]
O	**A**	No formal multi-sectoral governance or coordination mechanism on AMR exists.
O	**B**	Multi-sectoral working group(s) or coordination committee on AMR established with Government leadership.
O	**C**	Multi-sectoral working group(s) is (are) functional, with clear terms of reference, regular meetings, and funding for working group(s) with activities and reporting/accountability arrangements defined.
O	**D**	Joint working on issues including agreement on common objectives.
O	**E**	Integrated approaches used to implement the national AMR action plan with relevant data and lessons learned from all sectors used to adapt implementation of the action plan.

[3] https://www.who.int/antimicrobial-resistance/publications/workingpaper1multisectoralcoordinationAMR/en/

4.2 Which sectors are actively involved in developing and implementing the AMR National Action Plan? (multiple choice)

- Human Health including WASH[4]
- Animal Health (terrestrial and aquatic)
- Plant Health
- Food Production
- Food Safety
- Environment

5. Country progress with development of a national action plan on antimicrobial resistance (AMR)

Please select one rating that most closely matches the country situation.

		5.1 Country progress with development of a national action plan on AMR*[5]
O	**A**	No national AMR action plan.
O	**B**	National AMR action plan under development.
O	**C**	National AMR action plan developed.
O	**D**	National AMR action plan approved by government that reflects Global Action Plan objectives, with a budgeted operational plan and monitoring arrangements.
O	**E**	National AMR action plan has funding sources identified, is being implemented, and has relevant sectors involved with a defined monitoring and evaluation process in place.

5.2 Is your country's national action plan on AMR linked to any other existing action plans, strategies or targets related to HIV, tuberculosis, malaria, sexually transmitted diseases or neglected tropical diseases?*

- Yes.

If so, please select the relevant item (mark all diseases that are relevant):

  - HIV
  - Tuberculosis
  - Malaria
  - Neglected tropical diseases
  - Sexually Transmitted Diseases (STIs)

- No

5.3 If you have published your AMR national action plan, please upload here……

If you wish to share a link to the AMR national action plan, please insert here……

Or, if you wish to share via email, please send to tracss@who.int.

[4] Effective Water, Sanitation and Hygiene (WASH) is critical to limiting spread of infection and an essential component of the response to AMR.

[5] https://www.who.int/antimicrobial-resistance/national-action-plans/manual/en/

5.4 Country legislations on antimicrobial use*

 **5.4 Country legislations on antimicrobial use**	
Country has laws or regulations on prescription and sale of antimicrobials, for human use.	☐ Yes ☐ No ☐ Don't know
Country **has laws or regulations** on prescription and sale of antimicrobials for animal use.	☐ Yes ☐ No ☐ Don't know
Country **has laws or regulations** that prohibits the use of antibiotics for growth promotion in the absence of risk analysis.	☐ Yes ☐ No ☐ Don't know
Country **has legislation** on marketing of pesticides including antimicrobial pesticides, such as bactericides and fungicides used in plant production.	☐ Yes ☐ No ☐ Don't know

If you wish to share the relevant legislation, please upload here……

If you wish to share a link to the relevant legislation, please insert here……

Or, if you wish to share via email, please send to tracss@who.int.

6. Country progress on Strategic Objective 1: Improve awareness and understanding of AMR through effective communication, education and training.

Please select the rating (A-E) for each question that most closely matches the country situation. Please note that for each question, higher ratings are expected to have achieved the progress level covered in lower ratings (e.g. countries selecting "D" should have achieved progress listed in both "B" and "C" as well as "D"). For questions covering multiple sectors, please select the appropriate rating for each sector separately, as indicated.

 **6.1 Raising awareness and understanding of AMR risks and response *[6]**		
O	**A**	No significant awareness-raising activities on relevant aspects of risks of antimicrobial resistance.
O	**B**	Some activities in parts of the country to raise awareness about risks of antimicrobial resistance and actions that can be taken to address it.
O	**C**	Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders.
O	**D**	Nationwide, government-supported antimicrobial resistance awareness campaign targeting all or the majority of priority stakeholder groups, based on stakeholder analysis, utilizing targeted messaging accordingly within sectors.
O	**E**	Targeted, nationwide government-supported activities regularly implemented to change behavior of key stakeholders within sectors, with monitoring undertaken over the last 2-5 years.

[6] World Antibiotic Awareness Week Toolkit | FAO OIE WHO https://trello.com/b/tBoXeVae

6.1.1 For the level selected above, please indicate the extent of involvement of the sectors below.

- Human Health including WASH :
  - ☐ this sector is a main focus for activities
  - ☐ some activities done in this sector
  - ☐ this sector not involved
- Animal Health (terrestrial and aquatic) :
  - ☐ this sector is a main focus for activities,
  - ☐ some activities done in this sector
  - ☐ this sector not involved
- Plant Health :
  - ☐ this sector is a main focus for activities,
  - ☐ some activities done in this sector
  - ☐ this sector not involved
- Food Production :
  - ☐ this sector is a main focus for activities,
  - ☐ some activities done in this sector
  - ☐ this sector not involved
- Food Safety :
  - ☐ this sector is a main focus for activities,
  - ☐ some activities done in this sector
  - ☐ this sector not involved
- Environment
  - ☐ this sector is a main focus for activities,
  - ☐ some activities done in this sector
  - ☐ this sector not involved

6.2 Training and professional education on AMR in the human health sector[7]

O	**A**	No training for human health workers on AMR.
O	**B**	Ad hoc AMR training courses in some human health related disciplines.
O	**C**	AMR is covered in 1) some pre-service training and in 2) some in-service training or other continuing professional development (CPD) for human health workers.
O	**D**	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.
O	**E**	AMR is systematically and formally incorporated in pre-service training curricula for all relevant human health cadres. In-service training or other CPD on AMR is taken up by relevant groups for human health nationwide, in public and private sectors.

[7] WHO Competency Framework for Health Workers' Education and Training on Antimicrobial Resistance & Curricula Guide
https://www.who.int/hrh/resources/WHO-HIS-HWF-AMR-2018.1/en/
https://apps.who.int/iris/bitstream/handle/10665/329380/9789241516358-eng.pdf

6.3 Training and professional education on AMR in the veterinary sector[8]

O	**A**	No training of veterinary related professionals (veterinarians and veterinary paraprofessionals) related to AMR.
O	**B**	Ad hoc AMR training courses available for veterinary related professionals.
O	**C**	AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.
O	**D**	Continuing professional training on antimicrobial resistance and antimicrobial use is available nationwide for veterinary related professionals.
O	**E**	AMR is systematically and formally incorporated in curricula for graduating veterinarians and veterinary paraprofessionals and continuing professional training is a formal requirement.

6.4 Training and professional education on AMR in farming sector (animal and plant), food production, food safety and the environment

O	**A**	No training provision on AMR for key stakeholders, e.g. farmers and farm workers, extension workers, food and feed processors and retailers, environmental specialists.
O	**B**	Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
O	**C**	Tailored ad hoc AMR training courses are available for all or the majority of key stakeholders.
O	**D**	Tailored AMR training courses are routinely available nationwide for all key stakeholders and completion of training is a formal requirement for at least two groups of key stakeholders.
O	**E**	Tailored AMR training courses are routinely available nationwide and completion of training is a formal requirement for all key stakeholders.

6.5 Progress with strengthening veterinary services

O	**A**	No systematic approach at national level to strengthening Veterinary Services.
O	**B**	Veterinary services assessed and plans developed to improve capacity, through a structured approach such as OIE Performance of Veterinary Services (PVS) Evaluation and PVS Gap Analysis missions.
O	**C**	Implementation of plan to strengthen capacity gaps in Veterinary Services underway.
O	**D**	Monitoring of Veterinary Services performance carried out regularly, e.g. through PVS Evaluation Follow Up missions.
O	**E**	Documented evidence of strong capacity in compliance with OIE standards on the quality of Veterinary Services[9].

[8] https://www.oie.int/en/solidarity/options-for-targeted-support/veterinary-and-veterinary-paraprofessional-education/
[9] http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_vet_serv.htm

7. Country progress on Strategic Objective 2: Strengthen the knowledge and evidence base through surveillance and research.

Please select one rating for each question that most closely matches the country situation.

7.1 National monitoring system for consumption and rational use of antimicrobials in human health

O	**A**	No national plan or system for monitoring use of antimicrobials.
O	**B**	System designed for surveillance of antimicrobial use, that includes monitoring national level sales or consumption of antibiotics in health services.
O	**C**	Total sales of antimicrobials are monitored at national level and/or some monitoring of antibiotic use at sub-national level.
O	**D**	Prescribing practices and appropriate antibiotic use are monitored in a national sample of healthcare settings.
O	**E**	On a regular basis (every year/two years) data is collected and reported on: a) Antimicrobial sales or consumption at national level for human use; and b) Antibiotic prescribing and appropriate/rational use, in a representative sample of health facilities, public and private.

7.2 National monitoring system for antimicrobials intended to be used in animals (terrestrial and aquatic) (sales/use)

O	**A**	No national plan or system for monitoring sales/use of antimicrobials in animals.
O	**B**	Plan agreed for monitoring quantities of antimicrobials sold for/used in animals, based on OIE standards[10].
O	**C**	Data collected and reported on total quantity of antimicrobials sold for/used in animals and their intended type of use (therapeutic or growth promotion).
O	**D**	On a regular basis, data is collected and reported to the OIE on the total quantity of antimicrobials sold for/used in animals nationally, by antimicrobial class, by species (aquatic or terrestrial), method of administration, and by type of use (therapeutic or growth promotion).
O	**E**	Data on antimicrobials used under veterinary supervision in animals are available at farm level, for individual animal species.

7.3 National monitoring system for pesticide use in plant production including antimicrobial pesticides such as bactericides and fungicides

O	**A**	No national plan or system for monitoring use of pesticides including antimicrobial pesticides such as bactericides and fungicides used for the purpose of controlling bacteria or fungal diseases[11].
O	**B**	Plan agreed for monitoring quantities of pesticides including antimicrobial pesticides such as bactericides and fungicides used for the purpose of controlling bacteria or fungal diseases.
O	**C**	Data collected and reported on total quantity of pesticides including antimicrobial pesticides such as bactericides and fungicides sold/ used nationally for the purpose of controlling bacteria or fungal diseases.
O	**D**	On a regular basis, data is collected and reported on quantity of pesticides including antimicrobial pesticides such as bactericides and fungicides sold/used in plant production for the purpose of controlling bacteria or fungal diseases, disaggregated by class of active ingredient and plant type/species.

[10] http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_antibio_monitoring.htm ; http://www.oie.int/index.php?id=171&L=0&htmfile=chapitre_antibio_quantities_usage_patterns.htm ; https://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/ENG_AMUse_Guidance_Final_2019.pdf

[11] Pesticides applied to plants include bactericides and fungicides, which may impact development of resistance in bacteria on plants or in the surrounding environment. The impact this has in respect to the overall burden of pesticide resistance, contribution to AMR and impact on human and animal health, and indeed on our ability to treat plant diseases, is an important area of research. Note that the terminology commonly used for chemicals or products in plant health varies from that applied in animal and human health, as reflected in the wording of this question.

		7.4 National surveillance system for antimicrobial resistance (AMR) in humans
O	**A**	No capacity for generating data (antibiotic susceptibility testing and accompanying clinical and epidemiological data) and reporting on antibiotic resistance.
O	**B**	AMR data is collated locally for common bacteria, but data collection may not use a standardized approach and lacks national coordination and/or quality management.
O	**C**	National AMR surveillance activities for common bacterial infections follow national standards, and a national reference laboratory that participates in external quality assurance.
O	**D**	There is a functioning national AMR surveillance system covering common bacterial infections in hospitalized and community patients[12], with external quality assurance, and a national coordinating centre producing reports on AMR.
O	**E**	The national AMR surveillance system integrates surveillance of AMR across sectors, and generates regular reports covering at least one common indicator.

		7.5 (a) National surveillance system for antimicrobial resistance (AMR) in animals (terrestrial and aquatic)
O	**A**	No national plan for an AMR surveillance system.
O	**B**	National plan for AMR surveillance in place in place but capacity (including laboratory and reporting) is lacking.
O	**C**	Some AMR data is collected but a standardized approach is not used. National coordination and/or quality management is lacking.
O	**D (if selected D, move to 7.5 b)**	Priority pathogenic/ commensal bacterial species have been identified for surveillance Data systematically collected and reported on levels of resistance in at least one of those bacterial species, involving a laboratory that follows quality management processes e.g. proficiency testing.
O	**E (if selected E, move to 7.5 b)**	National system of AMR surveillance established for priority animal pathogens, zoonotic and commensal bacterial isolates which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.

Please answer this next question **only** if you have selected either D or E to 7.5 (a) (check all that apply)

	7.5 (b) AMR surveillance is routinely undertaken in animals for the following categories:
O	Animal (terrestrial and/or aquatic) isolates linked to animal disease.
O	Zoonotic pathogenic bacteria
O	Commensal isolates
O	Specific resistance phenotypes such as ESBL producing indicator E.coli obtained from healthy animals in key food producing species

[12] Community patients would be in many instances outpatients or those patients within 48 hours of admission in line with GLASS definition.

		7.5 (c) National surveillance system for antimicrobial resistance (AMR) in food (animal and plant origin)
O	**A**	No national plan for an AMR surveillance system.
O	**B**	National plan for AMR surveillance in place but capacity (including laboratory and reporting) is lacking.
O	**C**	Some AMR data is collected - but a standardized approach is not used. National coordination and/or quality management is lacking.
O	**D [If selected move to 7.5d]**	Priority food borne pathogenic/ indicator bacterial species have been identified for surveillance. Data systematically collected and reported on levels of resistance in at least one of those bacterial species, involving a laboratory that follows quality management processes e.g. proficiency testing.
O	**E [If selected move to 7.5d]**	National system of AMR surveillance established for priority foodborne pathogens and/or relevant indicator bacteria which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.

Please answer this next question **only** if you have selected either D or E to 7.5 (c)

		7.5 (d) AMR surveillance is systematically undertaken in food (animal and plant origin) in the following categories:
A	**Food borne pathogenic bacteria**	Animal origin : ☐ yes ☐ no Plant origin : ☐ yes ☐ no
B	**Indicator bacteria**	Animal origin : ☐ yes ☐ no Plant origin : ☐ yes ☐ no

7.6 Is the country using relevant antimicrobial consumption/use and/or antimicrobial resistance data to amend national strategy and/or inform decision making, at least annually?

If yes, for which sector/s

- Human Health including WASH
- Animal Health (terrestrial and aquatic)
- Plant Health
- Food Production
- Food Safety
- Environment

7.7 National AMR Laboratory network in animal health and food safety sectors+

+includes laboratories that process samples from food producing terrestrial and aquatic animals and from food; countries which also have a national programme for AMR surveillance in plant health and/or the environment should include these laboratories too.

a) Effective integration of laboratories in the AMR surveillance		
O	**A**	Information not available.
O	**B**	Laboratories perform antimicrobial susceptibility testing (AST) for own purposes and are not included in the national AMR surveillance system.
O	**C**	Some laboratories performing AST are integrated in the national AMR surveillance system.
O	**D**	All laboratories performing AST are integrated in the AMR surveillance system but the role should be better formalized and the network better and developed.
O	**E**	All laboratories performing AST are integrated in the national AMR surveillance system, have a clear position, and are linked to a national network coordinated by a National Reference Laboratory.
b) Level of the standardization and harmonization of procedures among laboratories included in the AMR surveillance system		
O	**A**	Information not available.
O	**B**	No standardized national AST guidelines are in place or Less than 30% laboratories follow the same AST guidelines.
O	**C**	Between 30% to 79% of laboratories follow the same AST guidelines.
O	**D**	Between 80% and < 100% of laboratories use the same AST guidelines.
O	**E**	100% of laboratories use the same AST guidelines.
c) Relevance of diagnostic (bacteriology) techniques used by laboratories included in the AMR surveillance system		
O	**A**	Information not available.
O	**B**	AST, bacterial isolation and identification protocols are not relevant considering the national AMR surveillance objectives.
O	**C**	Major modifications in the AST, bacterial isolation and identification protocols used are required to improve their adaptation to national AMR surveillance objectives.
O	**D**	Minor modifications in the AST, bacterial isolation and identification protocols used would improve their adaptation to the national AMR surveillance objectives.
O	**E**	AST, bacterial isolation and identification protocols are perfectly suited to the national AMR surveillance objectives.
d) Technical level of data management of the laboratory network in the AMR surveillance system		
O	**A**	Information not available.
O	**B**	AST data are handled manually, or AST data management is not computerized in all laboratories of the network and/or there are problems in the recording of the samples and their traceability along the analysis chain.
O	**C**	Most laboratories of the network use computers to manage part of their data but important improvements in the system are required.
O	**D**	Some minor improvements are required in some laboratories of the network to improve the computerized management of AMR laboratory data (sample input procedures, sample storage information, computerized transmission of data , etc.…).
O	**E**	All laboratories use ongoing optimal data management (e.g. samples and test results are identified using a complete computerized management system covering each step in the analysis chain, including the storage of epidemiological information, data validation protocol and the computerized transmission of results, conforming perfectly to the requirements of the national AMR surveillance system).

8. Country progress on Strategic Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures.

Please select one rating for each question that most closely matches the country situation.

		8.1 Infection Prevention and Control (IPC) in human health care
O	**A**	No national IPC programme or operational plan is available.
O	**B**	A national IPC programme or operational plan is available. National IPC and water, sanitation and hygiene (WASH) and environmental health standards exist but are not fully implemented.
O	**C**	A national IPC programme and operational plan are available and national guidelines for health care IPC are available and disseminated. Selected health facilities are implementing the guidelines, with monitoring and feedback in place.
O	**D**	National IPC programme available according to the WHO IPC core components guidelines[13] and IPC plans and guidelines implemented nationwide. All health care facilities have a functional built environment (including water and sanitation), and necessary materials and equipment to perform IPC, per national standards.
O	**E**	IPC programmes are in place and functioning at national and health facility levels according to the WHO IPC core components guidelines. Compliance and effectiveness are regularly evaluated and published. Plans and guidance are updated in response to monitoring.

		8.2 Good health, management and hygiene practices to reduce the use of antimicrobials and minimize development and transmission of AMR in animal production (terrestrial and aquatic)
O	**A**	No systematic efforts to improve good production practices.
O	**B**	Some activities in place to develop and promote good production practices.
O	**C**	National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
O	**D**	Nationwide implementation of plan to ensure good production practices and national guidance published and disseminated.
O	**E**	Implementation of the nation-wide plan is monitored periodically.

		8.3 Good management and hygiene practices to reduce the development and transmission of AMR in food processing
O	**A**	No systematic efforts to improve good management and hygiene practices.
O	**B**	Some activities in place to develop and promote good management and hygiene practices.
O	**C**	National plan agreed to ensure good management and hygiene practices in line with international standards (e.g. Codex Alimentarius). Nationally agreed guidance for good practices developed, and adapted for implementation according to local food processing approaches.
O	**D**	Nationwide implementation of plan to ensure good management and hygiene practices and national guidance published and disseminated.
O	**E**	Implementation of the nation-wide plan is monitored periodically.

[13] WHO Guidelines on core components of IPC programmes at the national and acute health care facility level, http://www.who.int/infection-prevention/publications/core-components/en/
https://www.who.int/infection-prevention/campaigns/ipc-global-survey-2019/en/

8.4 Coverage with critical measures (water supplies, sanitation, hygiene and immunization) to reduce spread of infections in communities and health care facilities[14]

Estimated national coverage with critical measures (water supplies, hygiene and immunization) to reduce spread of infections in communities and health care facilities	Latest national coverage rate (in %)	Year
Immunisation coverage rate of pneumococcus vaccine.		
Immunisation coverage rate of Haemophilus influenzae type b (Hib) vaccine.		
Proportion of health care facilities with basic[15] water supplies.		
Proportion of health care facilities with basic[16] hand hygiene facilities.		
Proportion of health care facilities with functional sanitation facilities.		

9. Country progress on Strategic Objective 4: Optimize the use of antimicrobials in human, animal and plant health.

Please select one rating for each question that most closely matches the country situation.

9.1 Optimizing antimicrobial use in human health [17]

O	**A**	No/weak national policies for appropriate use.
O	**B**	National policies for antimicrobial governance developed for the community and health care settings.
O	**C**	Practices to assure appropriate antimicrobial use being implemented in some healthcare facilities and guidelines for appropriate use of antimicrobials available.
O	**D**	Guidelines and other practices to enable appropriate use are implemented in most health facilities nationwide. Monitoring and surveillance results are used to inform action and to update treatment guidelines and essential medicines lists.
O	**E**	Guidelines on optimizing antibiotic use are implemented for all major syndromes and data on use is systematically fed back to prescribers.

[14] These issues are critical to AMR containment, but the relevant data is already being submitted to WHO through other channels in most instances. If this questionnaire is being used to review country progress at national level, we recommend that at a minimum the data is downloaded and reviewed from the following websites. Ideally local data should be reviewed and discussed, and if appropriate included in the return. http://www.who.int/immunization/monitoring_surveillance/routine/coverage/en/index4.html https://www.washinhcf.org/home/

[15] "Basic" as defined in WASH in health care facilities standards or national standards. See https://www.washinhcf.org/home/

[16] As per footnote #15.

[17] WHO Practical Toolkit: Antimicrobial Stewardship Programmes in Health-Care Facilities in Low- and Middle-Income Countries. See https://apps.who.int/iris/bitstream/handle/10665/329404/9789241515481-eng.pdf

		9.1.1 Adoption of "AWaRe" classification of antibiotics[18] in the National Essential Medicines List
O	**A**	Country has no knowledge or information about the AWaRe classification of antibiotics.
O	**B**	Country has knowledge about the AWaRe classification of antibiotics and country has intention to adopt it in the next few years.
O	**C**	Country has adopted the AWaRe classification of antibiotics in their National Essential Medicines List.
O	**D**	Country is monitoring its antibiotic consumption based on the AWaRe classification of antibiotics.
O	**E**	Country has incorporated AWaRe classification of antibiotics into its antimicrobial stewardship strategies.

Please answer these next questions only if you have selected either C, D or E to 9.1.1

9.1.1. a Are the country's antibiotic stewardship strategies at:

- National Level
- Community Level
- Facility Level

If you wish to share the a copy of the National Essential Medicines List that includes the AWaRe classification of antibiotics, please upload here……

If you wish to share a link to the National Essential Medicines List that includes the AWaRe classification of antibiotics, please insert here……

Or, if you wish to share via email, please send to tracss@who.int.

		9.2 Optimizing antimicrobial use in animal health (terrestrial and aquatic)
O	**A**	No national policy or legislation regarding the quality, safety and efficacy of antimicrobial products, and their distribution, sale or use.
O	**B**	National legislation covers some aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of antimicrobial products.
O	**C**	National legislation covers all aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of antimicrobial products.
O	**D**	The national regulatory framework19 for AM products incorporates all the elements included in the related international standards on responsible and prudent use of antimicrobials (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius) according to animal species and/or production sector. 20
O	**E**	Enforcement processes and control are in place to ensure compliance with legislation.

[18] https://adoptaware.org/

[19] Including legislation, standards, guidelines and other regulatory instruments

[20] OIE: Responsible and prudent use of antimicrobial agents in veterinary medicine
https://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_antibio_use.htm
https://www.oie.int/index.php?id=171&L=0&htmfile=chapitre_antibio_resp_prudent_use.htm

		9.3 Optimizing antimicrobial pesticide such as bactericides and fungicides use in plant production[21]
O	**A**	No national policy or legislation regarding the quality, safety and efficacy of pesticides including antimicrobial pesticides such as bactericides and fungicides and their distribution, sale or use.
O	**B**	National legislation covers some aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of pesticides including antimicrobial pesticides such as bactericides and fungicides
O	**C**	National legislation covers all aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of pesticides including antimicrobial pesticides such as bactericides and fungicides.
O	**D**	The national regulatory framework for antimicrobial pesticides such as bactericides and fungicides incorporates all the elements in the related international standards on responsible and prudent use according to plant type/species.
O	**E**	Enforcement processes and control are in place to ensure compliance with legislation on use of antimicrobial pesticides such as bactericides and fungicides.

[21] http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/ipm/en/

10. National assessment of risks for AMR transmission in the environment and pollution control. Legislation and/or regulations to prevent contamination of the environment with antimicrobials

	Risks for AMR transmission	Risk assessments		Are there legislation and/or regulation and policies to mitigate risks		
		Have high risk locations been identified?	Are risk reduction actions underway?	That specifically addresses AMR[22]	That impacts AMR[23]	That has a functioning system for monitoring compliance and enforcement
1	Areas of a low community access to safe water and sanitation.	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No			
2	Human health facilities without access to safe water supply and sanitation.	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No			
3	Human sewage (including wastewater and sludge) quality a) disposal in the environment	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
	Human sewage (including wastewater and sludge) quality b) Re-use	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
4	Wastewater discharges from health facilities for disposal in the environment.	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
5	Discharges from intensive animal (terrestrial and aquatic) production (liquid waste and manure) a) disposal into the environment	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
	Discharges from intensive animal (terrestrial and aquatic) production (liquid waste and manure) b) Re-use	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
6	Wastewater discharges from manufacturing sites for antimicrobial agents (either as Active Pharmaceutical Ingredient (API) or finished products).	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

[22] This column refers to policy, legal and other regulatory mechanisms that specifically address AMR.

[23] This column refers to legislation that does not include specific references to AMR but where existing regulatory mechanisms (licenses, permits) may serve to address AMR.

7	Disposal of unused medicines antimicrobial agents.*	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
8	Disposal of products contaminated with AM residues **	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

(*) unused should include left-over product and also product containers (including pesticides)
(**) such as food, plant or animal products with residues over the MRL (maximum residue limit)

World Health Organization

For more information contact:
World Health Organization
Antimicrobial Resistance Division
Avenue Appia 20
1211 Geneva 27
Switzerland
E-mail: tracss@who.int
Web site: http://www.who.int/antimicrobial-resistance/en/

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