Comprehensive Review of the WHO Global Action Plan on Antimicrobial Resistance

Volume 2: Annexes

September 2021

World Health Organization

WHO Evaluation Office

.

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List of Acronyms

ABR	Antibiotic Resistance
ACORN	A Clinically-Orientated AMR Surveillance Network
ADG	Assistant Director-General
AFR	African Region (WHO)
AGISAR	Advisory Group on Integrated Surveillance of Antimicrobial Resistance
AIDS	Acquired Immunodeficiency Syndrome
AMC	Antimicrobial Consumption
AMR	Antimicrobial Resistance
AMR	Region of the Americas (WHO/PAHO)
AMU	Antimicrobial Use
AST	Antimicrobial Susceptibility Testing
ATCC	American Type Culture Collection
ATLASS	Antimicrobial Resistance Surveillance System
AWaRe	Access, Watch, Reserve
BCA	Biennial Collaborative Agreement
CAESAR	Central Asian and European Surveillance of Antimicrobial Resistance
CARB-X	The Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator
CC	Collaborating Centre
CCS	Country Cooperation Strategy
CDC	Centers for Disease Control and Prevention
CO	Country Office
COVID 19	Coronavirus Disease 2019
CPA	Commonwealth Pharmacist Association
CwPAMS	Commonwealth Partnerships for Antimicrobial Stewardship Programme
DNDi	Drugs for Neglected Diseases Initiative
EAR	Emerging Antimicrobial Resistance Reporting
EARS-Net	European Antimicrobial Resistance Surveillance Network
ECDC	European Centre for Disease Control and Prevention
EGASP	Enhanced Gonococcal Anttimicrobial Surveillance Programme
EMR	Eastern Mediterranean Region (WHO)
EQA	External Quality Assessment
ESBL	Extended-Spectrum β-Lactamase
ESBL-EC	Extended-Spectrum β-Lactamase producing E Coli
EU	European Union
EUR	European Region (WHO)
EURO	Regional Office for Europe (WHO)
FAO	Food and Agriculture Organization of the United Nations
FAOLEX	Database of the Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
GAP	Global Action Plan
GARDP	Global Antibiotic and Research Partnership
GCP	Global Coordination and Partnership
GDP	Gross Domestic Product
GLAAS	Global Analysis and Assessment of Sanitation and Drinking-Water
GLASS	Global Antimicrobial Resistance and Use Surveillance System
GPW	General Programme of Work (WHO)
GRAM	Global Research on Antimicrobial Resistance Project
GS	Graduated Scoring
HCAI	Health Care-Associated Infection

HIC	High-Income Countries
HIV	Human Immunodeficiency Virus
HQ	Headquarters
IACG	Inter-Agency Coordination Group
IDEA	Innovation + Design Enabling Access Initiative
ID-IRI	Infectious Diseases International Research Initiative
IHME	International Health Metrics and Evaluation
IHR	International Health Regulations
IPC	Infection Prevention and Control
JEE	Joint External Evaluation
JPIAMR	Joint Programming Initiative on Antimicrobial Research
KII	Key Informant Interview
LIC	Low-Income Countries
LMIC	Lower-Middle-Income Countries
M&E	Monitoring and Evaluation
MDR-TB	Multidrug-Resistant Tuberculosis
MERS	Middle East Respiratory Syndrome
MF	Monitoring Framework
MPTF	Multi-Partner Trust Fund
NAP	National Action Plan
NCC	National Coordination Centre
NHS	National Health Service (UK)
NRL	National Reference Laboratory
OECD-DAC	Organisation for Economic Cooperation and Development – Development Assistance Committee
OIE	World Organisation for Animal Health
PAHO	Pan American Health Organization
PHCC	Primary Healthcare Corporation (Qatar)
PLISA	Health Information Platform for the Americas
PVS	Performance of Veterinary Services
R&D	Research and Development
ReLAVRA	Latin American Network for Antimicrobial Resistance Surveillance
RO	Regional Office
SARS	Severe Acute Respiratory Syndromes
SDG	Sustainable Development Goal
SEAR	South-East Asian Region (WHO)
SORT IT	Structured Operational Research and Training Initiative
SPC	Surveillance, Prevention and Control
STAG	Strategic and Technical Advisory Group
STAR-IDAZ	International Research Consortium on Animal Health
TB	Tuberculosis
TDR	The Special Programme for Research and Training in Tropical Diseases
THET	Tropical Health and Education Trust
TISSA	Tripartite Integrated Surveillance System on Antimicrobial Resistance/Antimicrobial Use
TrACSS	Tripartite AMR Country Self-Assessment Survey
UHC	Universal Health Coverage
UK	United Kingdom
UMIC	Upper-Middle-Income Countries
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund

URL	Uniform Resource Locator
USAID	United States Agency for International Development
WASH	Water, Sanitation and Hygiene
WHA	World Health Assembly
WHO	World Health Organization
WPR	Western Pacific Region (WHO)
WPRACSS	Western Pacific Regional Antimicrobial Consumption Surveillance System
WR	WHO Representative

Annex 1: Evaluation Terms of Reference

OVERALL BACKGROUND

1. Antimicrobial resistance (AMR) is one of the biggest global health threats of our time. AMR occurs when "bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death."[1] As microorganisms develop a resistance to treatments, particularly antibiotics, these become less effective. As a result, there are increased risks of disease spread, prolonged illness, disability and death.

2. To strengthen global efforts to respond to this crisis, the World Health Assembly requested a Global Action Plan (GAP) on Antimicrobial Resistance in May 2014[2] and endorsed this in May 2015.[3] The Plan was further endorsed by the World Assembly of the World Organisation for Animal Health (OIE) Delegates in May 2015[4] and by the Food and Agriculture Organization of the United Nations (FAO) Conference in June 2015.[5] The GAP AMR outlines five primary objectives:
   - **Objective 1:** to improve awareness and understanding of antimicrobial resistance through effective communication, education and training;
   - **Objective 2:** to strengthen the knowledge and evidence base through surveillance and research;
   - **Objective 3:** to reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures;
   - **Objective 4:** to optimize the use of antimicrobial medicines in human and animal health;
   - **Objective 5:** to develop the economic case for sustainable investment that takes account of the needs of all countries and to increase investment in new medicines, diagnostic tools, vaccines and other interventions.

3. The GAP AMR follows on from various global initiatives to address this health threat: the publication of WHO's global strategy for containment of antimicrobial resistance[6] in 2001, several resolutions endorsed by the World Health Assembly[7] [8] and the recognition of the importance of intersectoral engagement to address both human and animal health issues by the WHO Secretariat.[9] WHO also established the Strategic and Technical Advisory Group (STAG) on Antimicrobial Resistance in 2013. The group, re-established by the Director-General in May 2020,[10] advises the Director-General and the WHO AMR Division and has the following functions:
   - To review progress in the implementation of WHO's priority activities to tackle AMR in countries consistent with WHO's mandate, relevant WHA resolutions and decisions, and the strategic objectives of the Global Action Plan on AMR, and make recommendations;
   - To provide an independent evaluation of the major strategic, scientific and technical challenges and opportunities to be addressed by WHO in order to enhance progress in addressing AMR in the context of human health;

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1 Antimicrobial resistance, available at https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance.
2 Resolution WHA67.25, available at https://apps.who.int/gb/ebwha/pdf_files/WHA67/A67_R25-en.pdf.
3 Resolution WHA68.7, available at https://apps.who.int/gb/ebwha/pdf_files/WHA68-REC1/A68_R1_REC1-en.pdf#page=27.
4 Resolutions adopted at the 83rd World Assembly of the OIE Delegates, available at
https://www.oie.int/fileadmin/Home/fr/About_us/docs/pdf/Session/F_RESO_2015_public.pdf
5 39th Session of the FAO Conference, available at http://www.fao.org/3/mo153e/mo153e.pdf
6 WHO Global Strategy for Containment of Antimicrobial Resistance, 2001, available at
https://apps.who.int/iris/bitstream/handle/10665/66860/WHO_CDS_CSR_DRS_2001.2.pdf;jsessionid=64995297E5E6C4C89704F7A762EA9A03?sequence=1.
7 Document WHA60.24, Progress in the Rational Use of Medicines, available at https://apps.who.int/gb/archive/pdf_files/WHA60/A60_24-en.pdf.
8 Document WHA62.20, Prevention and control of multidrug-resistant tuberculosis and extensively drug-resistant tuberculosis, available at
https://apps.who.int/gb/ebwha/pdf_files/A62/A62_20-en.pdf?ua=1.
9 Document EB134.37, Antimicrobial drug resistance, available at https://apps.who.int/gb/ebwha/pdf_files/EB134/B134_37-en.pdf.
10 Terms of Reference, STAG AMR, 2020, available at https://cdn.who.int/media/docs/default-source/antimicrobial-resistance/stag-amr-terms-of-reference.pdf?sfvrsn=1aac0e06_3&Status=Master

- To review the adequacy of WHO's response to emerging national and global public health risks with regard to AMR and make recommendations;
- To review and make recommendations on the status of linkages between AMR and other health interventions, and other relevant sectors;
- To review and make recommendations on WHO's engagement in partnerships to enhance the achievement of global AMR goals.

4. The GAP AMR provides a framework for action for Member States, the WHO Secretariat and international and national stakeholders to strengthen their ability to reduce AMR using communication, education and training; surveillance and research; effective prevention measures and the optimization of the use of antimicrobial medicines in humans and animals.

5. In October 2016, the United Nations General Assembly affirmed the endorsement[11] of the GAP AMR by the World Health Assembly and called on WHO, in collaboration with the FAO and the OIE to:
- [...] "Finalize a global development and stewardship framework, as requested by the World Health Assembly in its resolution 68.7, to support the development, control, distribution and appropriate use of new antimicrobial medicines, diagnostic tools, vaccines and other interventions, while preserving existing antimicrobial medicines, and to promote affordable access to existing and new antimicrobial medicines and diagnostic tools, taking into account the needs of all countries and in line with the Global Action Plan on Antimicrobial Resistance;
- [...] To support the development and implementation of national action plans and antimicrobial resistance activities at the national, regional and global levels."[12]

BACKGROUND FOR THE COMPREHENSIVE REVIEW

6. In accordance with paragraph 4.1 of resolution WHA72.5 of the World Health Assembly,[13] and in conformity with the 2020-2021 biennial evaluation workplan approved by the Executive Board, the Evaluation Office will conduct a Comprehensive Review of the Implementation of the Global Action Plan on Antimicrobial Resistance. The report with its findings and recommendations will be made available to WHO senior management and technical colleagues, Member States, partner institutions and other relevant stakeholders. Furthermore, the report will made available on the webpage of the Evaluation Office, and a summary included in the next report of the Evaluation Office to the Executive Board.

PURPOSE AND OBJECTIVES

7. The overall purpose of this comprehensive review is to enhance current work on AMR. Based on the five primary objectives of the GAP AMR, the review will document successes, challenges and best practices, and will provide lessons learned and recommendations for use by WHO and other GAP AMR stakeholders to guide future implementation of the GAP AMR and to inform decision-making on AMR.

8. The review's main objectives are:
- To document successes, challenges and gaps in the implementation of the GAP AMR since its adoption in 2015;
- To review how efficiently AMR activities are being implemented across the three levels of WHO: Headquarters (HQ), Regional Offices (ROs) and Country Offices (COs);

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11 A/RES/71/3, available at https://undocs.org/en/A/RES/71/3.
12 Ibid
13 Resolution WHA72.5 available at https://apps.who.int/gb/ebwha/pdf_files/WHA72-REC1/A72_2019_REC1-en.pdf#page=25.

- To review how well AMR activities are coordinated, including with relevant United Nations agencies and other relevant stakeholders;
- To provide lessons learned and recommendations to improve the implementation of the GAP AMR at all three levels of WHO.

9. The review will be used to strengthen both organizational learning and accountability. Its overall purpose is to inform WHO senior management in its decision-making in relation to the efficient implementation of the GAP AMR across the three levels of WHO and other United Nations agencies. From a learning standpoint, it will offer WHO an opportunity to clearly understand how the GAP AMR is being implemented, and the challenges and successes associated with it. From an accountability standpoint, it will provide external stakeholders, including Member States and other agencies, with an objective, impartial perspective on these same issues in a manner that can help them better understand these challenges.

EXPECTED USE

10. The main expected use for this review is to provide lessons learned and recommendations to the WHO Secretariat, Member States and other United Nations agencies to strengthen inter-agency coordination on AMR activities and identify areas for improvement in the implementation of activities. Specific potential uses of the review will be identified during the inception phase at the outset of the exercise.

TARGET AUDIENCES

11. The principal target audiences of this review are Member States, the WHO Secretariat and relevant international and national partners.

SCOPE AND FOCUS

12. The scope of the GAP AMR endorsed by the World Health Assembly in 2015 includes a) antibiotic resistance, b) antimicrobial resistance. It will assess GAP AMR implementation since 2015.

13. In conformity with the GAP AMR, this review will consider the efficiency dimension of the implementation of AMR activities across the three levels of WHO and the coordination of joint AMR activities. It will assess the specific challenges, success and gaps in the implementation of activities and in coordination with relevant United Nations agencies, particularly the tripartite collaboration agreed by FAO, OIE and WHO.

14. The review will assess the implementation of the GAP AMR since its endorsement by the World Health Assembly in May 2015 until the completion of this review. The review will be forward-looking and will provide useful and actionable recommendations to facilitate future policy and decision-making.

15. This review will consider the implementation of National Action Plans (NAPs) to combat AMR depending on the availability of data.

REVIEW QUESTIONS

16. High-level review questions are presented below:

- EQ1: What are the successes and challenges in the implementation of the five primary objectives of GAP AMR since 2015?
- EQ2: What have been the main internal and external factors influencing WHO's ability to implement the GAP AMR in the most efficient manner?
- EQ3: To what extent have AMR activities been implemented efficiently across the three levels of WHO?
- EQ4: To what extent have AMR activities been well coordinated with other United Nations agencies and relevant stakeholders?

17. The review questions, corresponding indicative areas for investigation and sub-questions will be further refined during the inception phase, following consultations with relevant stakeholders.

APPROACH AND DELIVERABLES

18. The review team will use a mixed method, participative and consultative approach to conduct this review. The review methodology will demonstrate impartiality by relying on a cross-section of data sources to ensure the triangulation of information and the development of an executive summary, evidence-based findings and recommendations. The review will rely mostly on desk review and key informant interviews. This will include a review of all available reports, policies and progress reports, including the governing bodies reports and updates, STAG AMR meetings reports, minutes of international consultations on AMR, reports from other United Nations agencies and review reports of the Interagency Coordination Group on Antimicrobial Resistance (IACG). Secondary data will be collected from across the three levels of WHO depending on availability. The interviews of internal and external stakeholders will include but not be limited to, STAG AMR members, IACG members, WHO staff, personnel of the FAO and the OIE and members of relevant partner organizations. Consideration will also be given to a short questionnaire for all Member States.

19. The review team will develop an inception report at the inception stage, following the principles set forth in the WHO Evaluation Practice Handbook[14] and the United Nations Evaluation Group's Norms and Standards for Evaluation and Ethical Guidelines for Evaluation.[15] The inception report will include a rigorous and transparent methodology to address the review questions in a way that serves the dual objectives of accountability and learning. The inception report will also include a review matrix as per WHO guidelines, detailing information needs, sources and methods for all review questions. The review team will adhere to WHO cross-cutting evaluation strategies on gender, equity, vulnerable populations and human rights, and include to the extent possible disaggregated data and analysis. In addition, gender-specific sub-questions will be developed at the inception stage and included in the inception report.

20. The review team will develop a draft review report and a final report to present evidence-based conclusions and recommendations directly derived from the review findings and addressing all relevant questions included in the review. It will be relevant to decision-making needs, written in a concise, clear and easily understandable language, of high scientific quality and based on the review information without bias. It will adhere to the principles set forth in the WHO Evaluation Practice Handbook and will include an Executive Summary.

21. The review report will be posted on the WHO Evaluation Office website (www.who.int/about/evaluation/en/).

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14 WHO Evaluation Practice Handbook, available at https://apps.who.int/iris/bitstream/handle/10665/96311/9789241548687_eng.pdf?sequence=1.
15 UNEG Norms and Standards for Evaluation and Ethical Guidelines for Evaluation, available at http://www.uneval.org/document/detail/1914.

22. The management response to the review recommendations will be prepared by WHO and posted on the WHO Evaluation Office website alongside the review report. Dissemination of review results and contribution to organizational learning will be ensured at all levels of the Organization, as appropriate.

23. It is expected that the review will start during the second half of February 2021 and be concluded by July 2021. The inception report is expected to be presented at the end of March 2021.

REVIEW MANAGEMENT

24. The WHO Evaluation Office will manage the review. Roger Drew will be the evaluation lead; Alexandra Thenot will be the co-evaluator. The WHO Evaluation Office may provide additional support where needed.

TIMELINE

25. The timeline, covering the period until July 2021, is as follows:
    − Desk review by mid-March 2021
    − Draft inception report by mid- March 2021, including the specific methodology to be used and stakeholders to be interviewed
    − Final inception report by the end of March 2021
    − Completion of data collection by end of May 2021
    − Preparation of draft report for consideration by mid-June 2021
    − Submission of the final report by July 2021.

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Annex 2: Documents Reviewed

AMR global action plan

1. Global Action Plan on Antimicrobial Resistance, World Health Organization, 2015, https://www.who.int/publications/i/item/9789241509763
2. Monitoring and Evaluation of The Global Action Plan on Antimicrobial Resistance, Framework and recommended indicators, World Health Organization, Food and Agriculture Organization of the United Nations & World Organisation for Animal Health, 2019, https://www.who.int/publications/i/item/monitoring-and-evaluation-of-the-global-action-plan-on-antimicrobial-resistance

STAG AMR meetings

3. Report of first meeting, September 2013, https://www.who.int/antimicrobial-resistance/publications/amr_stag_meetingreport0913.pdf
4. Report of second meeting, April 2014, https://www.who.int/drugresistance/stag/STAG_AMR_Agenda_14-16_April2014finalforSTAGmembers_web.pdf
5. Global action plan on antimicrobial resistance, Draft for consultation with Member States, October 2014, https://www.who.int/drugresistance/AMR_DRAFT_GAP_1_Oct_2014_for_MS_consultation.pdf
6. Report of fourth meeting, February 2015, https://www.who.int/drugresistance/stag/STAG_meeting_report_february_2015.pdf
7. Report of fifth meeting, November 2015, https://apps.who.int/iris/bitstream/handle/10665/204274/WHO_DGO_AMR_2016.1_eng.pdf?sequence=1&isAllowed=y
8. Report of sixth meeting, May 2016, https://www.who.int/antimicrobial-resistance/events/STAG-AMR-meeting-report-May-2016.pdf
9. Report of seventh meeting, November 2016, https://apps.who.int/iris/bitstream/handle/10665/255180/WHO-DGO-AMR-2017.1-eng.pdf?sequence=1&isAllowed=y
10. Report of eight meeting, June 2017, https://www.who.int/antimicrobial-resistance/events/STAG-meeting-report-29.06.2017.pdf
11. Report of ninth meeting, February 2018, https://www.who.int/antimicrobial-resistance/events/26-27-Feb-2018-STAG-meeting-report-and-Recommendations.pdf
12. Terms of Reference, Strategic and Technical Advisory Group for Antimicrobial resistance, May 2020, https://www.who.int/news-room/articles-detail/call-for-members-of-the-who-strategic-and-technical-advisory-group-for-antimicrobial-resistance-(stag-amr)

Biennial Collaborative Agreements

13. Link to the WHO EURO Biennial Collaborative Agreements: https://www.euro.who.int/en/search?q=Biennial+Collaborative+Agreement

Country Cooperation Strategies

14. Country cooperation strategy guide 2020: implementing the Thirteenth General Programme of Work for driving impact in every country, 2020, https://apps.who.int/iris/bitstream/handle/10665/337755/9789240017160-eng.pdf?sequence=1&isAllowed=y
15. Link to the WHO publications repository for Country Cooperation Strategies: https://apps.who.int/iris/discover?query=country+cooperation+strategy

Documents from other UN agencies

FAO
16. Code of Practice to Minimize and Contain Antimicrobial Resistance, FAO, 2005, http://www.fao.org/fao-who-codexalimentarius/thematic-areas/antimicrobial-resistance/en/
17. FAO Responsible Use of Antibiotics in Aquaculture, 2005, http://www.fao.org/3/a-a0282e.pdf
18. Guidelines for Risk Analysis of Foodborne Antimicrobial Resistance, 2011, http://www.fao.org/food/food-safety-quality/a-z-index/antimicrobial/en/
19. REPORT OF THE CONFERENCE OF FAO, Thirty-ninth Session, 2015, http://www.fao.org/3/mo153e/mo153e.pdf
20. The FAO Action Plan on Antimicrobial Resistance 2016-2020, 2016, http://www.fao.org/3/a-i5996e.pdf
21. Evaluation of FAO's role and work on antimicrobial resistance (AMR), 2021, http://www.fao.org/3/cb3680en/cb3680en.pdf

OIE
22. Resolutions adopted by the 83rd OIE World Assembly Delegates, 2015, https://www.oie.int/fileadmin/Home/fr/About_us/docs/pdf/Session/F_RESO_2015_public.pdf
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28. OIE List of Antimicrobial Agents of Veterinary Importance, 2019, https://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/A_OIE_List_antimicrobials_July2019.pdf
29. OIE Tool for the Evaluation of Performance of Veterinary Services, 2019, https://www.oie.int/app/uploads/2021/03/2019-pvs-tool-final.pdf
30. OIE Annual report on the use of antimicrobial agents intended for use in animals, 2020, https://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/A_Fourth_Annual_Report_AMR.pdf

Other UN agencies
31. Frontiers 2017: Emerging Issues of Environmental Concern. United Nations Environment Programme, 2017, https://www.unep.org/resources/frontiers-2017-emerging-issues-environmental-concern
32. Time is Running Out, A Technical Note on Antimicrobial Resistance, UNICEF, 2019, https://www.unicef.org/media/62221/file/Technical%20Note%20on%20Antimicrobial%20Resistance.pdf
33. United Nations Environment Programme News, 2020, https://www.unep.org/news-and-stories/story/unep-joins-three-international-organizations-expert-panel-improve-one-health

34. Summary Progress Update 2021: SDG 6 — water and sanitation for all, UN Water, https://www.unwater.org/publications/summary-progress-update-2021-sdg-6-water-and-sanitation-for-all/

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Annex 3: Respondents
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Annex 4: Detailed Methods

A4.1.   The criteria that were used and the questions that were answered in this review are described in the main report. The review was carried out by a two-person team (Roger Drew and Alexandra Thénot) working in close collaboration with others in the Evaluation Office as envisaged in the terms of reference (see Annex 1).

4.1.   Review framework

A4.2.   The review's inception report identified that the GAP AMR did not have an agreed theory of change but that the monitoring and evaluation (M&E) framework, that was developed jointly by WHO, FAO and OIE in 2019, did contain a results chain diagram (see Figure A4.1) which seeks to map out the expected causal pathways from inputs to activities to outputs to outcomes and impact goals. Following a review of the results chain's strengths and weaknesses, the inception report concluded that this provided a reasonable framework for the planned review. It also concluded that it represented a useful starting point and it was preferable to use this rather than the review team developing a theory of change specifically for the review.

**Figure A4.1: GAP AMR results chain**
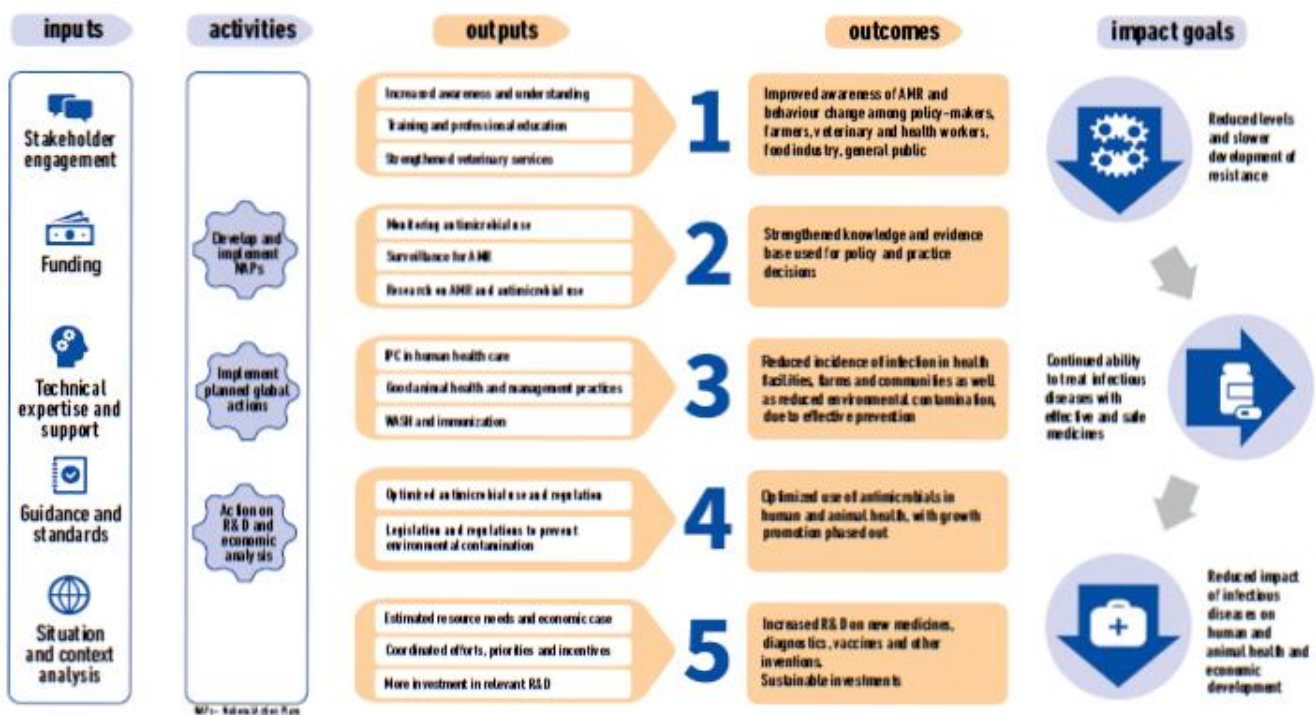
Source: GAP AMR Monitoring and Evaluation Framework

A4.3.   In September 2020, the Surveillance, Prevention and Control Department held a retreat in which staff sought to jointly identify their theory of change based on defining the desired change and identifying how to achieve that change. This process identified two specific AMR goals and seven domains of change. These are illustrated in Figure A4.2. While this theory of change is an internal draft that has not been formally agreed or adopted, it has been extremely useful for the review team as it illustrates how one department has been thinking about an AMR theory of change. It is possible to see how some of the identified domains

of change map to GAP AMR objectives and the review team have annotated Figure A4.3 to show potential linkages to some GAP objectives.[16]

Figure A4.2: Diagrammatic representation of draft theory of change developed by Surveillance, Prevention and Control Department: September 2020 (annotated by review team to show linkages to GAP AMR objectives)
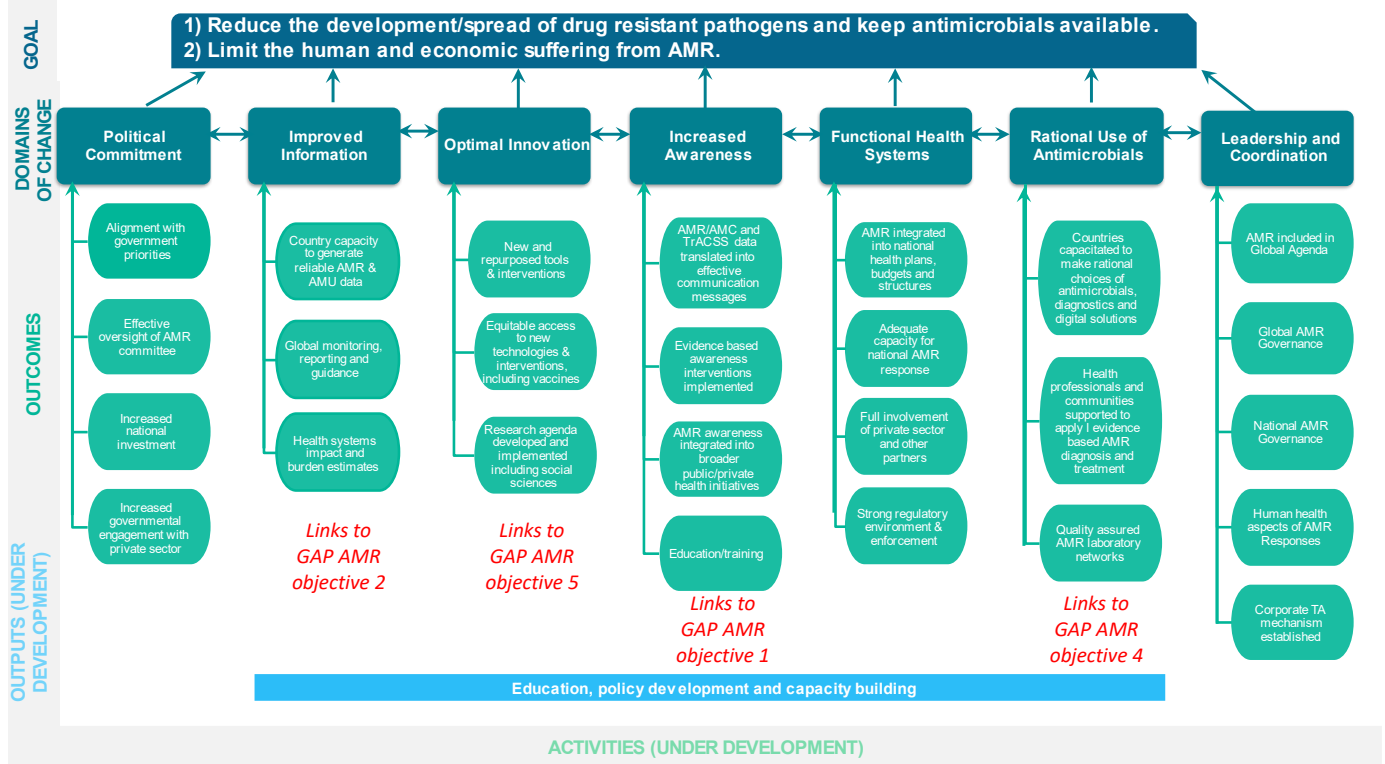
A4.4.   In addition, the diagram clearly shows that there are some domains of change (political commitment, functional health systems, and leadership and coordination) that do not map clearly and explicitly to a particular GAP AMR objective. Nevertheless, these matters are important so the review team decided to treat them as assumptions underlying the results chain in the agreed M&E framework, that is, in order for the results chain to operate as expected there will need to be political commitment, leadership and coordination, and functional health systems. The review and its report considered and analysed these matters.

A4.5.   The review's final report's findings are structured around the GAP AMR's five objectives as envisaged and proposed in the review's inception report. However, there is also an initial overview section which includes consideration of the assumptions of political commitment and leadership and coordination. In addition, the findings section concludes with consideration of a number of crosscutting issues or assumptions including health systems.[17]

4.2.   Review matrix

A4.6.   A review matrix was developed during inception and this is shown in Table A4.1. It identifies the review's main questions, issues that were to be covered, the basis on which these were to be answered and relevant data sources, incorporating methods of data collection.

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[16] 1, 2, 4 and 5. It is less clear to the review team how GAP AMR objective 3, on infection prevention and control, relates
[17] The others are equity and inclusion, coordination, WHO internal structure and systems, and COVID-19.

A4.7.   Every effort was taken to ensure that additional data was only collected when it was going to be used for analysis and generation of findings. This was done by structuring and focusing data collection around the review's main questions. Data collected from different sources, e.g. from document review, key informant interviews and other methods for each question was compared and used to produce a written report of findings. Quality and reliability of data was ensured by triangulating and comparing data of different types and from different sources.

Table A4.1: Review Matrix

Review Questions	Issues	Indicators/measures/data points	Data source
1. What are the successes and challenges in the implementation of the five primary objectives of GAP AMR since 2015?	Issues relating to: - Overall progress - Progress by WHO at the three levels - Coordination - Monitoring and evaluation of progress - Resourcing (human, financial)	- Progress against agreed indicators in the AMR M&E framework - Extent to which the actions planned under the GAP AMR have been conducted by WHO at all three levels - Challenges and gaps reported in the implementation of the GAP AMR across each of the five objectives across the three levels of WHO - Strengths, successes and achievements of implementation of the GAP AMR across each objective	- Document and data review - KIIs with WHO HQ, Regional Offices and Country Offices (as appropriate) - KIIs with international partners
2. What have been the main internal and external factors influencing WHO's ability to implement the GAP AMR in the most efficient manner?	Issues relating to: - Overall progress - Progress by WHO at the three levels - Efficiency - Coordination - Monitoring and evaluation of progress - Resourcing (human, financial)	- Identification of external and internal factors influencing WHO's ability to implement the GAP AMR across the three levels - Assessment of internal (policies, procedures, timeliness, human resources, financial resources etc.) and external (coordination, availability of resources, regional differences in practices, etc.) factors - Monitoring of progress made across the three levels	- Document review including country support strategies and budgets - KIIs with WHO HQ, Regional Offices and Country Offices (as appropriate) - KIIs with international partners
3. To what extent have AMR activities been implemented efficiently across the three levels of WHO?	- Overall progress - Progress by WHO at the three levels - Monitoring and evaluation of progress - Efficiency - Timeliness - Use of human, financial, material resources - Coordination	- Assessment of results of the implementation of the GAP AMR across the three levels of WHO to date - Assessment of the timeliness of the implementation of the GAP AMR across the three levels of WHO - Extent to which the coordination of AMR activities across WHO and with relevant partners sustains efficient delivery of results - Assessment of the use of financial, human and material resources to support the efficient implementation of the GAP AMR	- Document review including country support strategies and budgets - KIIs with WHO HQ, Regional Offices and Country Offices (as appropriate) - KIIs with international partners
4. To what extent have AMR activities been well coordinated with other United Nations agencies and relevant stakeholders?	- Overall progress - Coordination of AMR activities with relevant UN agencies	- Assessment of WHO's role within the Tripartite collaboration architecture - Strengths and successes in the coordination of AMR activities with other UN agencies and relevant partners - Challenges and gaps in the coordination of AMR activities with other UN agencies and relevant partners	- Document review - KIIs with WHO HQ, Regional Offices and Country Offices (as appropriate) - KIIs with international partners

4.2.   Four phases

A4.8.   The review was divided into four phases – inception; review of secondary data; primary data collection; analysis and reporting. The main reason for dividing the data collection phase into two was based on experience of evaluating/reviewing another WHO global action plan where secondary data was reviewed at the same time as primary data collection and it was considered that it would have been helpful if these

had been done sequentially allowing the findings from secondary data to inform the primary data collection processes.

A4.9.   However, the division into phases was not rigid and there was some overlap of activities across phases. For example, some review of secondary data commenced during inception and some interviews (and therefore primary data collection) also took place during inception and during the phase for review of secondary data. In addition, some analysis or re-analysis of secondary data was carried out during the primary data collection phase and a small number of interviews were carried over into the analysis and reporting phase.

Phase 1: Inception

A4.10.   The inception phase of the review was conducted between March and April 2021. It was based on the review's terms of reference (see Annex 1) and focused on identifying and describing how the review would be conducted, providing a clear and actionable plan for that. To do this the team identified and reviewed over 100 documents. Discussions were held with 15 WHO staff from Headquarters and Regional Offices. In addition, discussions were held with two representatives of FAO's Evaluation Office, not least because, in February 2021, they completed an evaluation of their role and work on AMR.[18] [19] In addition, a number of informal discussions and email exchanges were held with WHO Evaluation Office and AMR Division staff. The main product of the inception phase was an inception report which was used as the basis for design and implementation of subsequent review phases.

A4.11.   There have been some areas where there have been developments or changes from the terms of reference or inception report during implementation. These are not major and are briefly outlined here:

* There has been some slippage on dates and timeline. Because of availability of respondents, key informant interviews spilled over into July. As a result, the team agreed to have a draft report available by the end of August 2021.

* Consideration was given to sending a questionnaire to Member States but this was not done mainly because countries submit substantive responses to the Tripartite AMR Country Self-Assessment Survey (TrACSS) annually and they were in the process of compiling responses at the time of the review. In addition, many Member States were facing extreme pressures due to COVID-19 and this was a factor in this decision.

* Interviews were conducted with a small number of WHO Country Offices and the basis for selecting these is explained later in this section. In addition, a small number of questions were shared by email with all other WHO country offices. More detail is provided later in this section.

* Substantial additional support was provided to the review team by the WHO Evaluation Office particularly in terms of reviewing Country Cooperation Strategies (CCSs) and Biennial Collaborative Agreements (BCAs). While the need to review CCSs was included in the inception report, most European countries do not have CCSs but they have BCAs. Information on whether BCAs refer to AMR was provided by EURO and this was cross-checked by Evaluation Office staff.

* The proposed analytical framework was reviewed and adjusted to allow consideration of underlying assumptions, e.g. relating to political commitment, leadership and coordination, and health systems. The format of the report was slightly adjusted. The findings are still presented by objective as planned but there is a preliminary overview section and some final sections on cross cutting issues.

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[18] FAO (2021) *Evaluation of FAO's Role and Work on AMR* available on http://www.fao.org/3/cb3680en/cb3680en.pdf (accessed 15 July 2021)
[19] Similar discussions were not possible with OIE during inception or data collection phases as OIE does not have a dedicated Evaluation Office.

- The availability of data was mixed. There was little if any outcome data available. This issue is discussed in more detail later but it does mean that the review is unable to say anything substantive about progress at outcome level. Process data is more available, for example, particularly through TrACSS reporting. However, relatively little analysis of this data has been carried out and WHO's capacity to do this is limited. While some process data is available from the Global Antimicrobial Resistance and Use Surveillance System (GLASS), for example, the number of countries enrolled and reporting and the status of national surveillance systems, the system is not yet able to produce comparable or aggregatable data at regional or global levels, e.g. of AMR levels for particular pathogens, agents and types of infection. There are some progress reports available, for example reports to the Strategic and Technical Advisory Group (STAG), World Health Assembly etc. but these are not particularly regular or systematic, e.g. reporting on all objectives against agreed indicators and targets quarterly or annually.

- Because of concerns that much of the data, particularly as reported through TrACSS, is self-reported with little, if any, verification, the review team sought to compare data reported through TrACSS and other data sources, particularly Joint External Evaluation (JEEs). Details of how this was done and the findings of this are contained later in this report.

- Key informant interviews were conducted much as planned in the terms of reference and the inception report. More details of how the numbers of people interviewed compare with plans are given later in this report.

- It became apparent that there had been two STAGs during the period under review. The first STAG had completed its time of office and a new, reformulated STAG had been established. The new STAG had had a preliminary meeting only at the time of the review. Interviews were offered to all existing and former STAG members. Some members of the new STAG expressed doubt as to what they could add to the review. However, those members were asked to contribute based on their extensive experience of AMR and to limit any reflections they might have on the STAG to their expectations.

- While the terms of reference and inception report envisaged multiple interviews with members of the IACG, the WHO Secretariat suggested that these interviews were not needed because the IACG's focus had been broader than the GAP AMR and they had fulfilled their remit. However, the review team and Evaluation Office decided that it was important to offer interviews to some IACG members given the perceived importance of their function and their report and that the IACG process had taken place since the GAP had been adopted. Consequently, the review team offered interviews to the three co-convenors of the IACG.

- While the WHO Secretariat did not identify the UN Environment Programme (UNEP) as a partner they wished to have interviewed for the review, many other stakeholders did. Given the potential importance of environmental matters and AMR and discussion about whether UNEP should be included into the tripartite or not, the review team and the Evaluation Office decided to prioritise offering an interview to identified UNEP representatives.

Phase 2: Review of secondary data

A4.12.   The review of secondary data focused on assessing progress, in relation to the indicators in the M&E framework.[20] It was carried out in April 2021 and a report of this process was produced which is included as Annex 6. Other elements of secondary data review, e.g. review of CCSs and JEEs were conducted in early June and initially a supplementary report was produced. However, this was then incorporated into the main report of the secondary data review. It only became apparent after preliminary review of the CCS
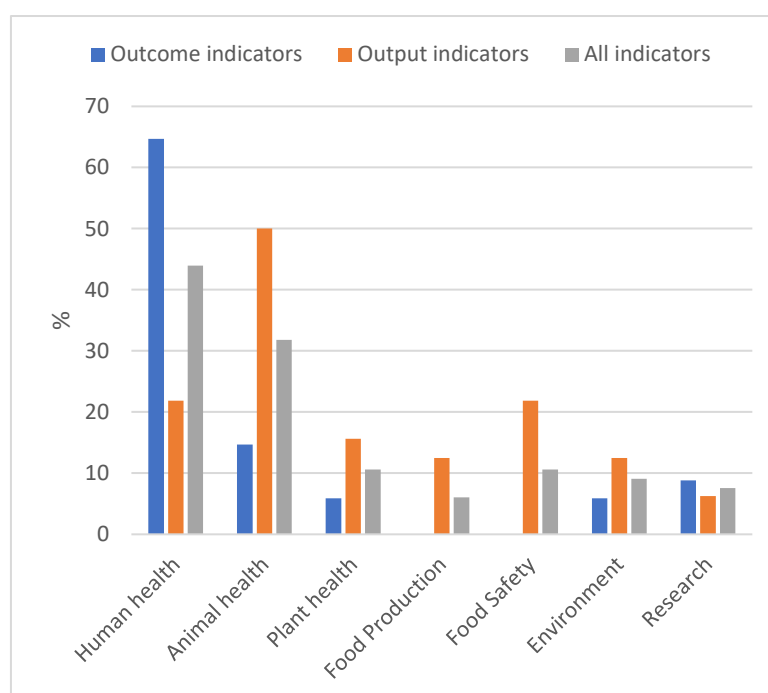
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[20] WHO, FAO and OIE (2019) *Monitoring and Evaluation of the Global Action Plan on Antimicrobial Resistance: Framework and Recommended Indicators* available on https://apps.who.int/iris/bitstream/handle/10665/325006/9789241515665-eng.pdf?ua=1 (accessed 16 July 2021).

data that relatively few European countries had CCSs because they mostly had BCAs. EURO submitted an assessment of whether countries had a BCA which mentions AMR and this has been cross-checked by the Evaluation Office. This data has been included in the analysis and an explanation as to how this has been done comes later in this report.

Monitoring and Evaluation (M&E) Framework

A4.13.   The M&E framework for the GAP AMR was published in 2019 some four years after the GAP itself was agreed. It presents a results chain for the GAP AMR and a set of recommended core indicators. It explains how monitoring and evaluation are expected to work at different levels, including country, regional and global level.

A4.14.   The M&E framework contains core, recommended indicators at outcome[21] and output level. Based on numbered indicators, there are 18 outcome indicators and 23 output indicators. But, many of these have sub-indicators and, if these are also counted, there is a total of 34 outcome indicators and 32 output indicators, that is 66 indicators overall. Some details of these indicators are presented in Table 1 of the M&E framework including the sector(s),[22] measurement, indicator name and data source. More detailed metadata is provided for each indicator in the stand-alone Annex 3 to the framework.[23]

A4.15.   Figure A4.3 shows how the different indicators cover the identified sectors of human health, animal health, plant health, food production, food safety, environment and research. While overall indicators related to human health make up almost half of all indicators (29 of 66; 44%), this is the case for almost two thirds of outcome indicators (22 of 34; 65%) but less than one quarter of output indicators (7 of 32; 23%).

Figure A4.3: Percentage of core recommended indicators in the GAP AMR M&E framework of different types (outcome, output, overall) which cover particular sectors (as an indicator may be relevant to more than one sector, these percentages may total more than 100%)

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[21] This level contains indicators for overarching goal, goal and outcomes.

[22] This is done using six symbols. However, no key is provided. While the meaning of some symbols is clear intuitively, e.g. for human health and animal health, there is one symbol (of crops growing) which appears to be taken to mean both plant health and food production. In analyzing the sectors involved, attempts have been made to distinguish these.

[23] WHO, FAO and OIE (2019) *Monitoring and Evaluation of the Global Action Plan on Antimicrobial Resistance: Framework and Recommended Indicators: Annex 3 Methodology Sheets for Recommended Indicators* available on https://www.who.int/antimicrobial-resistance/global-action-plan/monitoring-evaluation/AMR-M-E-indicator-reference-sheets-web-high-December-2019.pdf?ua=1 (accessed 16 July 2021).

A4.16. In terms of monitoring at the global level, the M&E framework identifies a number of existing and emerging data sources. Of these, that are specific for AMR, two are the most well-developed, the Tripartite AMR Country Self-Assessment Survey (TrACSS) and the Global Antimicrobial Resistance and Use Surveillance System (GLASS). TrACSS is identified as a data source for 18 of the indicators in the M&E framework with GLASS being identified for a further five. This review has focused particularly on these two data sources.

A4.17. It is clearly a strength of the GAP AMR that it does have a monitoring and evaluation framework associated with it. It is good that this includes a results chain and an annex with detailed indicator descriptions. It is good that there is data available for some core recommended indicators, particularly those with TrACSS as the data source. However, there are some challenges and/or limitations related to the monitoring and evaluation framework. Specifically:

- The results chain lacks some key elements which might be expected in a theory of change such as an assessment of the evidence base for identified causal pathways and explicit identification of underlying assumptions. One specific assumption which seems to underpin the GAP is that countries (and agencies) will work in a multisectoral manner to address AMR. While there is a question about this in TrACSS, this does not seem to relate to a specific indicator or a particular part of the results chain.[24]

- Similarly, there are other questions in TrACSS, e.g. on National Action Plans on AMR which do not currently relate to any of the core, recommended indicators although, in this case, it does seem to relate to an identified activity in the results chain. While the M&E framework probably does not want to include multiple indicators at activity level, the importance of National Action Plans probably does merit the inclusion of an indicator related to these within the M&E framework.[25]

- While it is good that the M&E framework does identify specific indicators and their data sources, the metadata could be clearer and more specific as to how values for indicators are calculated from particular data sources. This is particularly the case for indicators where data comes from TrACSS. It would be good if there could be much greater clarity as to precisely which TrACSS questions generate data for which indicators and how.

- While the metadata in the M&E framework's Annex 3 is useful, it is clearly a work in progress. Some indicator descriptions are very incomplete, e.g. outcome 1.1, outcome 3.5b, outcome 4.4, output 3.c. With these, it would be good to explain the process and time frame for finalization.

- There are too many indicators to be effectively and feasibly monitored and analyzed for the purposes of understanding progress being made in terms of GAP implementation. Currently, there is no overall process to use the M&E framework and its indicators to collect and analyze data to assess how well the GAP is being implemented. There are concerns from civil society organizations that the framework is not being used to provide benchmarks for accountability. In the framework, there were plans to establish a common platform for TrACSS, GLASS, the OIE annual data collection initiative and the FAO Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance System (ATLASS) and this was referred to as the Tripartite Integrated Surveillance System on Antimicrobial Resistance/Antimicrobial Use (TISSA).[26] WHO's AMR M&E team currently collect data for TrACSS but are not currently collecting or analyzing data for other indicators. As some data is said to be available

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[24] It is also one of the leading indicators for output 3.3.2 in WHO's draft proposed programme budget for 2022/23. One of the strengths of the draft theory of change in Figure A4.2 is that leadership and coordination is identified as one of seven domains of change. Within that domain, specific reference is made to national governance which presumably covers the type of national multisectoral coordination mechanism envisaged.

[25] It is also one of the leading indicators for output 1.3.5 in WHO's draft proposed programme budget for 2022/23. One of the strengths of the draft theory of change in Figure A4.2 is that political commitment is identified as one of seven domains of change.

[26] In a report to the Interagency Coordination Group (IACG) on Antimicrobial Resistance in 2018 (see https://www.who.int/antimicrobial-resistance/interagency-coordination-group/IACG_Surveillance_and_Monitoring_for_AMU_and_AMR_110618.pdf accessed 16 July 2021), this system was said to be in the early stages of development. In March 2021, expressions of interest were requested to develop and deliver an online web-based IT application for TISSA (see https://www.ungm.org/Public/Notice/124127 accessed 16 July 2021).

for some of these from other sources, the AMR M&E team are in the process of establishing an AMR indicator repository[27] to link to other databases, access the relevant data and then populate a dashboard that will be open to the public. However, this would not include FAO and OIE data currently.[28] It seems that potentially two different IT solutions may be being proposed (TISSA and the AMR indicator repository) with risk of duplication and redundancy. In addition, neither of these approaches seems to be directly tied to the monitoring and evaluation framework nor based on a manual assessment/collation of available data.

- The M&E framework was only developed in 2019, some four years after the introduction of the GAP AMR.[29] While data for some indicators does pre-date the M&E framework,[30] there is no formal baseline as such.[31] In addition, some specific issues related to the first round of TrACSS data have meant that reports[32] have discounted that round of data which further exacerbates the lack of baseline/early performance data.

- The GAP AMR identifies actions by three groups of actors, Member States, the Secretariat and international and national partners. While the M&E framework does not explicitly identify which actors indicators refer to, most implicitly appear to relate to Member States. There do not seem to be explicit performance indicators for the Secretariat or for international and national partners.

- It is not clear if the M&E framework is comprehensive or whether there are other frameworks and/or indicators relevant to AMR. Specifically, WHO's Thirteenth General Programme of Work (GPW13) had a results framework attached to it[33] and this contained a number of indicators specifically related to AMR, including two indicators at the outcome level and five leading indicators at the output level.[34] Details of these are provided in Table 2. The four original leading indicators under output 1.3.5 have targets inbuilt into them. It is currently unclear why the GAP AMR M&E framework was not used explicitly as the source of these indicators. The AMR M&E team report that they were asked to reduce the number of leading indicators under output 1.3.5 to three for the Programme Budget 2022 to 2023[35] and these are marked with an asterisk (*). The Programme Budget 2022 to 2023 also added another leading indicator under output 3.3.2, namely "*number of countries with a functioning multisectoral antimicrobial resistance coordination committee*" and this is included in Table A4.2.

- Although there are indicators for research (objective 5) at both outcome and output level, none of these has data that is collected through TrACSS. This means that if a monitoring system was based solely on TrACSS data, this would overlook one objective of the GAP AMR.

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[27] A feasibility study has been conducted by Jean-Patrick Le Gall concerning establishing this central repository. However, one fundamental question/assumption does not seem to be addressed and that is whether the data needed to monitor the indicators in the M&E framework is available elsewhere. The assumption is that it is and the problem is that it cannot be accessed by the AMR M&E team. While this may be part of the problem, a potentially more serious problem is that for many indicators data may simply not be available.

[28] As AMR M&E teams are just being established in those organizations, and some of the data will not be made public as per their guidelines.

[29] Indeed, both TrACSS and GLASS pre-date the M&E framework.

[30] Possible data sources include reports to the World Health Assembly, surveys such as the *Antibiotic Resistance: Multi-Country Public Awareness Survey* published by WHO in 2015, available on http://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf;jsessionid=A4957D2EB7734E11619FB45C202CD61D?sequence=1 (accessed 16 July 2021) and situation analyses, such as the *Worldwide Country Situation Analysis: Response to Antimicrobial Resistance* published by WHO in 2015, available on https://apps.who.int/iris/bitstream/handle/10665/163468/9789241564946_eng.pdf?sequence=1 (accessed 16 July 2021).

[31] Although the 2018 TrACSS report does state explicitly that the 2016/17 survey was intended to provide a baseline.

[32] See WHO, FAO and OIE (2021) *Monitoring Global Progress on Antimicrobial Resistance: Tripartite AMR Country Self-Assessment Survey (TrACSS) 2019-2020: Global Analysis Report* available on https://www.who.int/publications/i/item/monitoring-global-progress-on-antimicrobial-resistance-tripartite-amr-country-self-assessment-survey-(tracss)-2019-2020 (accessed 16 July 2021).

[33] See WHO (2020) *Programme Budget 2020-21: WHO Results Framework: An Update: Report by the Director General to the Executive Board* available on https://apps.who.int/gb/ebwha/pdf_files/EB146/B146_28Rev1-en.pdf (accessed 16 July 2021).

[34] Four of these refer to output 1.3.5 - Countries enabled to address antimicrobial resistance through strengthened surveillance systems, laboratory capacity, infection prevention and control, awareness-raising and evidence-based policies and practices – but one relates to output 1.3.4 - Research and development agenda defined and research coordinated in line with public health priorities

[35] WHO (2021) *Draft Proposed Programme Budget 2022-2023: Building Forward Better* available on https://apps.who.int/gb/ebwha/pdf_files/EB148/B148_25-en.pdf (accessed 16 July 2021)

Table A4.2: Details of AMR-related indicators in GPW13

Indicator name	Level/Type	Metadata?	Link to M&E framework?
Percentage of bloodstream infections due to selected antimicrobial-resistant organisms	Outcome	Yes[36]	Yes, this indicator is included as indicators for Goal IIa and IIb in the framework.
Patterns of antibiotic consumption at the national level[37]	Outcome	Yes[38]	Outcome indicators 4.1-4.3 are relevant and outcome indicator 4.1.b appears to be analogous.
Gaps in the antimicrobial resistance landscape identified, and potential products to fill these gaps identified[39]	Leading for output 1.3.4	No	Not explicitly stated
Functional antimicrobial resistance multisectoral coordination groups established in >=60% of Member States with national action plans to address antimicrobial resistance (medium term – end 2023).[40]	Leading* for output 1.3.5	No	Not explicitly stated but the revised wording for the programme budget 2022/23 focuses on national action plans so fits better with the data collected through TrACSS
Participation in Global Antimicrobial Resistance Surveillance System (GLASS): >=50% of Member States participating in GLASS (short term – end 2021) >=50% of Member States have national antimicrobial resistance surveillance systems and are providing data on the SDG3 antimicrobial resistance indicator (medium term- end 2023) [41]	Leading* for output 1.3.5	No	Not explicitly stated – the revised wording no longer refers to GLASS specifically but data is based on number of countries enrolled in and reporting to GLASS.
Systems for monitoring consumption and rational use of antimicrobials in human health established in 60% of Member States (medium term – end 2023) [42]	Leading* for output 1.3.5	No	Not explicitly stated – revised wording emphasizes national systems but no longer mentions rational use. Data is based on number of countries reporting consumption through GLASS.
National infection prevention and control programmes being implemented nationwide in 40% of Member States (medium term – end 2023)	Leading for output 1.3.5	No	Not explicitly stated. This indicator was not included in the proposed draft programme budget for 2022/23.
Number of countries with a functioning multisectoral antimicrobial resistance coordination committee	Leading for output 3.22	No	Not explicitly stated

The Tripartite AMR Country Self-Assessment Survey (TrACSS)

A4.18. Since 2016, WHO, FAO and OIE have asked countries to complete an annual self-assessment survey on AMR. Progress on establishing this process was reported to WHA70 in 2017[43] noting that the questionnaire covered countries' progress on multisectoral engagement, development of a national action plan and implementation of key actions to tackle antimicrobial resistance. It included questions on four of the objectives of the Global Action Plan.[44] From the outset, most questions required respondents to rank areas on a five-point scale, A-E, where A reflected poor performance and E good or excellent performance. Each question provided respondents with criteria to be used for the purpose of this self-assessment. For each of the four rounds conducted to date, there was a questionnaire and a guidance note.[45]

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[36] This is included as milestone 37 in WHO's GPW13 Impact Framework Metadata (dated 5 August 2019). It is also included as indicator SDG3.d.2 and there is metadata for that indicator

[37] It appears to be implied that this is for human use.

[38] This is included as milestone 37 in WHO's GPW13 Impact Framework Metadata (dated 5 August 2019).

[39] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Development of a global priority and research agenda for addressing antimicrobial drug resistance in fungal infections*

[40] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Number of countries implementing government-approved multisectoral antimicrobial resistance national action plans that involve relevant sectors and have a monitoring framework*

[41] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Number of countries having an antimicrobial resistance surveillance system and providing data to WHO*

[42] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Number of countries with national systems in place to monitor the consumption and use of antimicrobials in human health*

[43] See *Antimicrobial Resistance: Report by the Secretariat* (A70/12, paragraph 15) available on https://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_12-en.pdf (accessed 16 July 2021).

[44] Question 6 refers to objective 1, question 7 to objective 2 etc.

[45] See for example - https://www.who.int/publications/m/item/tripartite-amr-country-self-assessment-survey-(tracss)-2019-2020 (accessed 16 July 2021). However, please note that some links do not work, e.g. the link to guidance for 2018/19 and 2019/20 and the 2017/18 questionnaire.

A4.19.   The questionnaire has changed considerably over time. The AMR M&E team have supplied an Excel file which documents the changes over time. They explain that, for the most part, changes were made over the years, either by the technical teams within WHO to align more with their work or by partner agencies. Other changes were made to simplify either because of feedback from Member States or based on response rates. In brief:

- The number of questions/data points has increased markedly. At a superficial level, only one question (#10) has been added but this masks that the number of data points has increased almost fivefold from 21 in 2016/17 to 104 in 2019/20.[46] This has implications for those providing the data and for those conducting analysis.
- The complexity of the questionnaire has increased. In some cases, respondents are asked to only answer certain questions (e.g. 7.5b and 7.5d) if they answer earlier questions in a particular way.
- While the first questionnaire tended to aggregate sectors, particularly those beyond human health, these are more clearly disaggregated in later rounds.
- A number of issues and areas have been added including:
   - Which sectors have been involved in National Action Plans (from round 2)
   - Legislation on antimicrobial use (from round 2)
   - National AMR laboratory network in animal health and food safety (from round 3)
   - Using the AWaRe classification of antibiotics (from round 4)
   - A national assessment of risks for AMR transmission in the environment and pollution control (from round 3)
- Many criteria have been reworded and, in some cases, the order of these have been changed. Overall, the A-E system has been retained except in one case (Q7.3) where an A-D system is used.
- In Q4.2, WASH was classified as part of environment in round 2 and as part of human health from round 3.

A4.20.   Response rates for TrACSS have, in general been very good. Table A4.3 presents the number of respondents by each round of TrACSS.[47] Response rates for the first three rounds were very similar while the lower rate for the 2019/2020 round is considered by the WHO Secretariat to have been due to the Coronavirus crisis that countries were facing.[48] Over the four rounds of reporting, almost all WHO Member States (187, 96%)

Table A4.3: Number of respondents to TrACSS by round

TrACSS round	Number of responses	Percentage of WHO Member States (n=194)
2016/17	151	78%
2017/18	154	79%
2018/19	159	82%
2019/20	136	70%

have reported at least once to TrACSS.[49] [50] The average number of responses submitted was 3.2 but this varied by WHO region and country income group (see Figure A4.4). The highest mean response rate (4.0) was in SEAR meaning that each country responded to each round of TrACSS. The lowest response rate was in AFR where responding countries submitted a mean of 2.5 responses to the four rounds of TrACSS.[51]

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[46] The new question 10 alone has 34 data points. This is perhaps most clearly seen in the Excel sheets for the raw data. For 2016/17, this extends to column T but for 2019/20 to column DV.

[47] Please note that, when this analysis was done, information was available up to and including the 2019/20 reporting round. This means that this analysis does not consider data from the 2020/21 round.

[48] However, this explanation is challenged by some, for example, see https://www.ignitetheidea.org/whoeb-amrbriefing (accessed 16 July 2021). In the IDEA Initiative's briefing to WHO's Executive Board, they reject the idea that the reduction in participation in TrACSS in 2019/20 was due to the COVID-19 pandemic as responses were due by end February 2020 and the pandemic was only recognised by WHO in March 2020. They express concern that "*more than half of the countries (19/36) that dropped from the 2018-20 TrACSS had not yet developed a NAP on AMR*" and that "*non-response to the TrACSS survey could also be an indicator of country needs for greater technical and financial assistance.*"

[49] Seven Member States have not reported to TrACSS. They are Andorra, Bosnia and Herzegovina, Equatorial Guinea, Gambia, Madagascar, Niue and Senegal.

[50] In addition, in the data available online, there are questionnaires submitted by territories that are not WHO Member States, including Turks and Caicos, Aruba, Bermuda and Sint Maarten (for round 2) and New Caledonia and Palestine (for round 4). In addition, some Member States' responses are included online but not in the source data. It appears this may be where data was submitted late. For round 2, this is the case for Chile and Grenada.

[51] This excludes those countries that did not respond to TrACSS and four of those seven countries are in AFR. Some countries in AFR did submit to all four rounds of TrACSS including Benin, Côte d'Ivoire, Ghana, Guinea, Kenya, Nigeria, Sierra Leone, South Africa and Tanzania.

High-income countries were more likely to respond (mean of 3.6 responses) than low-income countries (mean of 2.6 responses) and this difference was statistically significant ($p<.001$).

Figure A4.4: Mean number of responses to TrACSS (2016-2020, four rounds) per country
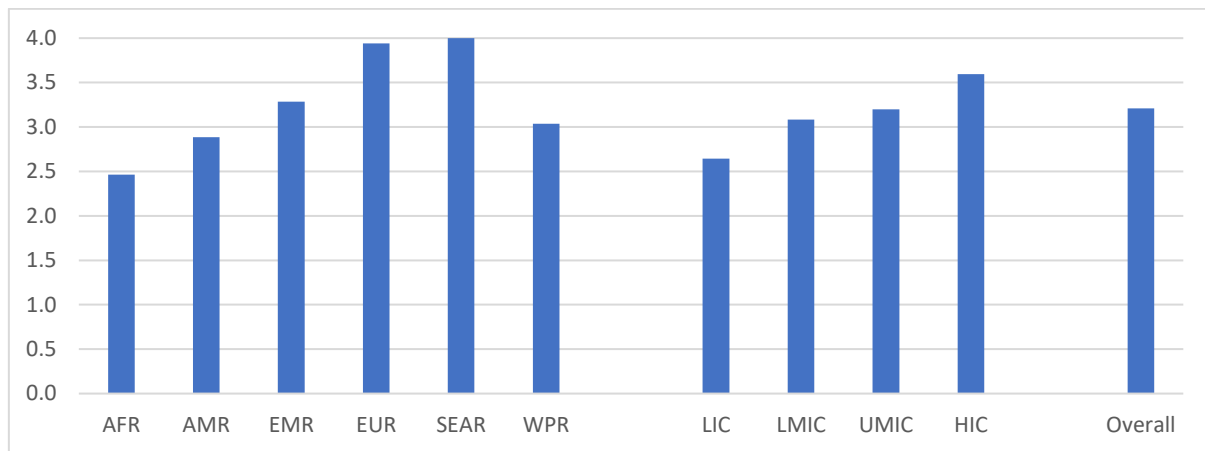
A4.21.   Data from TrACSS is publicly available from a global database.[52] This is available through various views[53] and it is also possible to download responses in Excel format.[54] WHO, FAO and OIE have produced two specific reports based on TrACSS data. The first was produced following the second round of reporting in 2017/18[55] and the latest one was produced in 2021 based on the 2019/20 round of reporting.[56] In addition, AMR M&E staff report that TrACSS data was used to inform the 2019 Report of the Secretary-General produced as a follow-up to the political declaration of the high-level meeting of the General Assembly on AMR.[57] Some WHO technical staff have reviewed TrACSS data in their particular area, e.g. relating to infection prevention and control.

A4.22.   The two specific TrACSS reports (in 2018 after round 2 and in 2021 after round 4) have detailed methodological annexes/appendices.[58] These explain in some detail how data was collected and analyzed. Some points are considered here and used to explain how TrACSS data was analyzed for this review.

- Both reports address the issues raised for trend analysis across different survey rounds by the changes in questions over the lifetime of TrACSS. The 2018 report summarizes these changes as separation of non-human health sector, making questions more specific and "*raising the bar*". It concludes that comparisons with the first round can only be made in relatively few cases (Qs 4.1,5.1, 6.3. 6.6 and 7.1). The 2021 report goes further and completely discounts round 1 responses, focusing only on questions considered comparable in the last three rounds. While the concerns raised have some validity, the approach taken means considerable lost data, particularly from the early years of GAP AMR. Such data may be important for baseline purposes. An alternative approach would be to consider all data collected but to consider the effect of methodological changes when conducting analysis and this is the approach taken in this review. This approach minimizes data loss particularly from the baseline period. The review team consider it an appropriate approach because, in most cases, the basic A-E scoring system was

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[52] See https://amrcountryprogress.org/ (accessed 16 July 2021)
[53] Map view, visualization view, table view and response overview.
[54] Initially, the data for 2019/20 lacked data for Q8.3 and this was supplied manually by AMR M&E staff. This error had not been corrected as of 29 April 2021.
[55] WHO, FAO and OIE (2018) *Monitoring Global Progress on Addressing Antimicrobial Resistance: Analysis Report of the Second Round of Results of AMR Country Self-Assessment Survey 2018* available on https://apps.who.int/iris/handle/10665/273128 (accessed 16 July 2021).
[56] WHO, FAO and OIE (2021) *Monitoring Global Progress on Antimicrobial Resistance: Tripartite AMR Country Self-Assessment Survey (TRACSS) 2019-2020: Global Analysis Report* available on https://www.who.int/publications/i/item/monitoring-global-progress-on-antimicrobial-resistance-tripartite-amr-country-self-assessment-survey-(tracss)-2019-2020 (accessed 16 July 2021)
[57] See https://digitallibrary.un.org/record/3807197?ln=en (accessed 16 July 2021).
[58] Appendix 2 in the 2018 report (p27) and Annex 2 in the 2021 report (p29).

retained and, where questions were split, there was often an identifiable "*dominant*" sector.[59] Overall, there was little evidence of "*raising the bar*" in the changes made to questions. In addition, there could be methodological issues even where the TrACSS reports considered questions comparable across the years.[60] In order to allow this approach, the team compiled detailed tracking tables for each question in TrACSS which showed the question and criteria for each round of TrACSS. An example is shown in Figure A4.5.

Figure A4.5: Example of how the review team tracked changes to TrACSS questions over time (this example refers to question 4 on multisectoral working arrangements)

TOPIC	MULTI-SECTOR AND ONE HEALTH WORKING ARRANGEMENTS			
	2016/17	2017/18	2018/19	2019/20
Question	Multi-sector and One Health working arrangements	Multi-sector and One Health collaboration/coordination	Multi-sector and One Health collaboration/coordination	Multi-sector and One Health collaboration/coordination
A	No formal multi-sectoral governance or coordination mechanism exists.	No formal multi-sectoral governance or coordination mechanism exists.	No formal multi-sectoral governance or coordination mechanism on AMR exists.	No formal multi-sectoral governance or coordination mechanism on AMR exists.
B	Multi-sectoral working group(s) or coordination committee on AMR established that includes representatives of human health, animal health, environment and other sectors, with Government leadership.	Multi-sectoral working group(s) or coordination committee on AMR established with Government leadership.	Multi-sectoral working group(s) or coordination committee on AMR established with Government leadership.	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, funding for its activities and reporting/accountability arrangements defined.	Multi-sectoral working group(s) is (are) functional, with clear terms of reference; regular meetings, and funding for working group(s). Activities and reporting/accountability arrangements are defined.	Multi-sectoral working group(s) is (are) functional, with clear terms of reference; regular meetings, and funding for working group(s). Activities and reporting/accountability arrangements are defined.	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, including restriction of use of critically important antimicrobials.	Joint working on issues including agreement on common objectives, including restriction of use of critically important antimicrobials.	Joint working on issues including agreement on common objectives.	Joint working on issues including agreement on common objectives.
E	Integrated approaches implemented to monitor progress on the national AMR action plan and extent of AMR.	Integrated approaches used to implement the national AMR action plan.	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.	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.

- A second linked point is that the 2021 report only considers data from those countries (115) who had reported to each of the last three rounds of reporting. While this approach may enhance comparability within these 115 countries[61], extreme caution is needed in terms of extrapolating these results to WHO Member States more broadly as it is likely that better performers will be over-represented in the group of more consistent reporters. Table A4.4 presents data to support these concerns. Essentially, the mean performance score[62] is higher in the group of consistent reporters than in those that report less consistently. Similarly, the improvement in mean performance score between baseline and latest[63] is also greater among consistent reporters. While there may be other explanations[64], a key factor seems

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[59] Which was the main influence on responses when that sector was included with others. This sector was human health when it was included and animal health when it was not.

[60] For example, the 2018 report considered five questions comparable across rounds 1 and 2 but there were wording changes in four of these five questions (4.1, 5.1, 6.3 and 7.1) and these do need to be kept in mind when conducting analysis.

[61] It is slightly illogical as it does not necessarily mean that each of these countries reported in each round on any specific indicator

[62] Methods for calculating these scores are explained later in this report.

[63] Definitions for baseline and performance data are provided later in this report.

[64] Such as potentially more members of the consistent reporters reporting in 2018/19.

to be country income group. While only just over one third of low-income countries (36%) are regular reporters, three quarters (75%) of high-income countries are. Consequently, this review considered data from all countries (n=187) that have submitted at least one response to TrACSS. The "*baseline*" for each country was taken to be their first report against any indicator and the "*latest*" data was based on their last report against that indicator.[65]

Table A4.4: Comparison of 115 countries who reported in each of the last three rounds of TrACSS with those 72 countries that reported to TrACSS at least once but not to each of the last three rounds of TrACSS

	Consistent reporters (n=115)	Inconsistent reporters (n=72)
Mean performance score	54%	29%
Mean improvement in performance score baseline to latest	10.8	2.5
What proportion of countries from each income group are in each group?		
LIC (n=28)	36%	64%
LMIC (n=47)	57%	43%
UMIC (n=55)	64%	36%
HIC (n=57)	75%	25%

- Both TrACSS reports (2018 and 2021) identify a set of independent variables for comparison against indicator data. Table A4.5 shows the variables considered in each report. In the analysis for this review, the main focus has been on WHO regions and country income group. Statistical analysis involved simple linear regression using Excel software. Values were considered statistically significant where $p<.05$. Actual values of p are recorded except where $p <.001$.

Table A4.5: Independent variables considered in TrACSS reports 2018 and 2021

	2018	2021
Country income group (World Bank)	✓	✓
WHO region	✓	✓
G20 membership	✓	
GDP	✓	
GDP per capita	✓	
Total population	✓	
World Bank governance indicators	✓	
Top ten producers of beef, chicken and pork (FAO)	✓	
Domestic general government health expenditure (WHO	✓	
Large multi-sectoral working group	✓	
Submission of data to GLASS		✓

- The 2018 TrACSS report talks about the A-E scale in terms of "*progress*" and this is potentially misleading. These scales present a snapshot in time and figures for single years do not implicitly say anything about progress in the absence of baseline (or preceding) data.[66] This report also converts the alphabetic scale to numerical levels on the basis that A=1, B=2, C=3 etc. However, it appears that this conversion is just used for narrative purposes and not for any calculations. It is unclear what this adds beyond talking about A, B, C responses etc.[67]

- Both TrACSS reports (2018 and 2021) refer to dichotomizing data in order to allow some data analysis to occur. Essentially, this means assigning a numerical value (0 or 1) to the alphabetic data. In most cases, this was done on the basis that A or B = 0 and C, D or E =1. In the case of awareness campaigns, a different

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[65] The main advantages of this approach are that it utilizes a bigger data set and creates baseline and endline data for consideration in terms of GAP AMR implementation. Limitations are that baselines and latest data are not necessarily for the same year for different countries (although this may not be problematic, for example, the TrACSS report in 2018 took a similar approach for independent variables) and, where countries have only reported once on a particular indicator, the baseline and latest value will be the same.

[66] Of course, for those countries scoring B or higher, there has been progress at some point but, in the absence of baseline or preceding data, it is not possible to know if this occurred before or after the GAP AMR was adopted.

[67] Apart from perhaps the issue that A may intuitively seem better than E which is not the case in TrACSS reporting.

basis was used, i.e. A, B or C = 0 and D or E =1.[68] While this is one way of making the data numerical, it is not the only way. The major drawback of this approach is that it essentially undermines the alphabetic system. There may as well be a yes, no system based on whether the country fulfils the C criterion. It also means that the numerical system does not reward countries for improving from A to B or from C to either D or E. An alternative and more intuitive approach, which would be more in tune with the alphabetic system, would be to use a graduated numerical system as described in the previous bullet. While it would be possible to use the level system in the 2018 TrACSS report (A=1, B=2, C=3 etc.), this review used a 0-4 scale (A=0, B=1, C=2 etc.) as scoring A as zero seemed more in line with the descriptive criteria. This means the review has generated a mean performance score for each indicator in the range 0 to 4 using this graduated scoring system.

- The 2018 TrACSS report refers, in Appendix 2, to an overall "*implementation score*" based on scoring 16 TrACSS questions on the basis of whether they scored C or higher. This implementation score was only calculated for those countries that scored B or higher on questions 4.1 and 5.1.[69] They distinguished between performance on human sector indicators[70] and indicators for other sectors.[71] However, the report does not specifically mention any further use of this implementation score although it does appear to inform the section on overall implementation and monitoring (p20). This review has also calculated an overall implementation score along similar lines to this. This was done with both dichotomized data (A/B=0, C+=1) and using graduated scoring (A=0, B=1 etc.) The review used 22 data elements[72] and converted these scores to percentages.[73] The two different methods are referred to in this review as C+ and GS (for graduated scoring). In addition to overall implementation scores, the review team calculated implementation scores for each of the first four objectives of the GAP AMR and some core processes (developing NAPs and multisectoral coordination mechanisms). The team also calculated scores for indicators related to human health and other areas. Details of which TrACSS indicator relate to which of these elements is contained in Appendix 3 of the report on secondary data analysis.

A4.23. The review team assessed the strengths and weaknesses of TrACSS as a data source and these are briefly summarized in Table A4.6. Overall, TrACSS has proved to be a valuable data source for the review and is considered by the review team to be the best available data source in terms of monitoring progress of the GAP AMR, particularly in terms of processes.

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[68] The reason for this inconsistency is unclear.

[69] Presumably, on the assumption that a country can only start implementation once the country has a plan and a multisectoral coordination mechanism in place. However, this assumption is not borne out by evidence. In their latest data, ten countries scored both these questions A but only one scored all other questions A. Some countries scored highly overall despite saying they did not have a national plan or a multisectoral coordination mechanism.

[70] Qs 6.1, 6.3, 7.1, 7.4, 8.1 and 9.1

[71] Qs 6.2, 6.4, 6.5, 6.6, 7.2, 7.3, 7.5, 8.2, 9.2 and 9.3

[72] Using the question numbers in the 2019/20 questionnaire, these are 4.1, 5.1, 5.4 (first three elements – as these score Y/N, these are scored as Y=4), 6.1, 6.2, 6.3, 6.4, 6.5 (in addition, data for Q6.2 in the 2017/18 survey was included as an element), 7.1, 7.2, 7.3, 7.4, 7.5a, 7.5c, 8.1, 8.2, 8.3, 9.1 and 9.2.

[73] By dividing by 88 (4x22) and multiplying by 100

Table A4.6: Strengths and weaknesses of TrACSS

Strengths	Weaknesses
It is a tripartite system jointly owned by WHO, FAO and OIE	Data is self-reported by countries and there are limited measures in place to verify or validate the data reported. There may be substantial inter-country variation in terms of reporting
The questionnaire covers human health and other sectors and the delineation of these has become clearer over time	The number of data points has massively expanded over the four rounds of the survey (fivefold increase) placing pressure on those who respond to and analyze the survey
It has generated extensive amounts of data with reporting by multiple countries over multiple rounds	Question 7.3 is inconsistent with the other questions in that it uses an A-D system
TrACSS data represents official data endorsed by Member States	The WHO AMR M&E team have only been able to carry out relatively limited analysis of TrACSS data. There has not been a report after every round and TrACSS data has only been used in a relatively limited way for reporting to World Health Assemblies. The capacity to analyze TrACSS data is relatively limited.
Data from survey responses is publicly available both as a number of different visualizations and as downloadable raw data	Some key elements of TrACSS (e.g. on multisectoral coordination mechanisms and national action plans) are not reflected in the GAP AMR M&E framework. Also indicator metadata could be clearer as to how exactly data is generated from TrACSS.
There has been some analysis and reporting based on TrACSS data, including reporting on progress following the UN General Assembly high level meeting	TrACSS does not cover GAP AMR's fifth objective
Questionnaires have been adapted and strengthened based on technical advice and consideration of response rates and feedback	TrACSS data is mainly focused on process and outputs and does not assess outcomes
The overall A-E system has remained largely consistent over time	TrACSS data only relates to actions by Member States and not to other actors, including the Secretariat and national/international partners
Criteria are described in detail and these descriptions have been improved over time	There are some omissions of data elements from the TrACSS data available to download
The TrACSS survey matches well to the GAP AMR M&E framework and covers four of the five GAP AMR objectives	There seems to be quite a degree of separation between the AMR M&E team and TrACSS on the one hand and GLASS on the other. This means that these systems may function in parallel rather than working together.

Global Antimicrobial Resistance and Use Surveillance System (GLASS)

A4.24.   GLASS was launched in October 2015, to support the GAP AMR, with the aim of supporting global surveillance and research in order to strengthen the evidence base on AMR, helping inform decision-making and drive national, regional, and global actions. GLASS has six objectives, namely (1) to foster national surveillance systems and harmonized global standards, (2) to estimate the extent and burden of AMR globally by selected indicators, (3) to analyse and report global data on AMR on a regular basis, (4) to detect emerging resistance and its international spread, (5) to inform implementation of targeted prevention and control programmes and (6) to assess the impact of interventions. The period 2015-2019 was considered an early implementation period for GLASS.

A4.25.   WHO Member States can enroll in GLASS for antimicrobial resistance (AMR) and/or antimicrobial consumption (AMC). Enrolled countries report information on the status of their national surveillance system and then report AMR and AMC data once their surveillance system is at a stage of development to allow collection of quality data. Based on data supplied by the WHO Secretariat, as of April 2021, 104 WHO Member States[74] were enrolled in GLASS AMR with 20 WHO Member States[75] enrolled in GLASS AMC. Based on this data, Figure A4.6 shows the percentage of WHO Member States enrolled in GLASS AMR overall and by WHO region and country income group, as of April 2021. Overall, more than half (104, 54%) of WHO Member States are enrolled in GLASS. This percentage is highest in SEAR (11 of 11, 100%) and EMR (21 of 21, 100%) but lowest in AMR[76] (6 of 35, 17%). There is no clear pattern by country income group although enrolment rates are lowest among UMIC (19 of 58, 33%). Based on figures provided to the review

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[74] Plus Kosovo and Palestine.
[75] Of these, 15 are enrolled in both AMR and AMC. This means that a total of 109 WHO Member States are enrolled in GLASS for either AMR or AMC.
[76] It appears that one reason for the region's relatively low participation in GLASS has been different approaches between the Regional Office and WHO headquarters. The Regional Office has emphasised quality of data and relevance for national use. Only when this has been achieved does the Regional Office and the country seek to register with GLASS. There has been perceived pressure from headquarters for more countries to enroll in GLASS but countries themselves have been hesitant. Nevertheless, some have joined and more are expected to follow. Concerns that some important partners, e.g CDC have about GLASS may also have influenced the willingness of countries in AMR to join GLASS. In addition, there is an existing Latin American Netowrk for Antimicrobial Resistance Surveillance (ReLAVRA) and countries of the region may place more focus on this than on GLASS.

team by the WHO Secretariat, the number of Member States enrolled in and reporting to GLASS has been steadily rising. Table A4.7 illustrates these figures. These figures differ from those included in GLASS reports and Table A4.7 seeks to analyse these apparent discrepancies which appear to relate to time periods covered.[77]

Figure A4.6: Percentage of WHO Member States enrolled in GLASS AMR by country income group, WHO region and overall (as of April 2021)
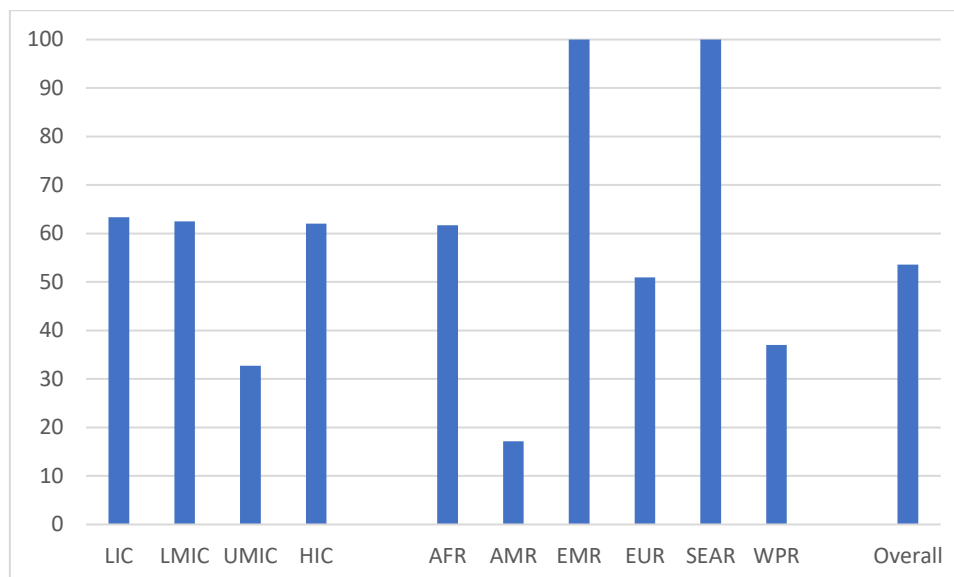

Table A4.7: Number of countries enrolled in and reporting to GLASS: 2016-2019[78]

	2016	2016/17	2017	2017/18	2018	2018/19	2019	2020
Data source	WHO Secretariat	GLASS report 2018	WHO Secretariat	GLASS report 2019	WHO Secretariat	GLASS report 2020	WHO Secretariat	GLASS report 2021
Data period covered	Calendar year 2016	To 8 July 2017	Calendar year 2017	To 31 July 2018	Calendar year 2018	To 31 July 2019	Calendar year 2019	To August 2020
Data call AMR	n/a	1st	n/a	2nd	n/a	3rd	n/a	4th
Data call AMC								1st
Date published	n/a	January 2018[79]	n/a	2018[80]	n/a	May 2020	n/a	2021
Enrolled in GLASS AMR	31	42	51	69	71	82	88	94
Information provided on implementation progress	24	40	45	67	69	77	82	78
Data on AMR for at least one pathogen/specimen combination	6	22	25	48	56	66	67	70
Denominator data	6		25		53		66	
Data on AMR for more than half of the pathogen/specimen combinations, that is six or more	4		18		31		56	
Data on AMR for all 11 pathogen/specimen combinations	1		5		13		14	

A4.26.   GLASS activities are grouped into a number of technical modules (see Figure A4.7) which include routine data surveillance, focused surveillance, and surveys and studies. These modules are reported in detail in

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[77] It has not been easy to verify or to independently analyse these figures. Raw data (disaggregated by country) is not readily available meaning that it is not possible to analyse how patterns relating to region or country income group have changed over time. What is clear is that the number of countries enrolled in GLASS has increased and most of the countries enrolled in GLASS can report process data, although the number doing so may have plateaued. While many enrolled countries are able to report some AMR data, very few (14 of 88, 16%) are able to report on all pathogen/specimen combinations.

[78] It is not entirely clear what these dates are referring to or how they match to published GLASS reports. For example, there have been four GLASS reports to date. The report in 2018 appears to cover 2016/17 data while the report in 2019 covered 2017/18 data. The 2020 report refers to early implementation 2020 and the latest report in 2021 to 2019 data.
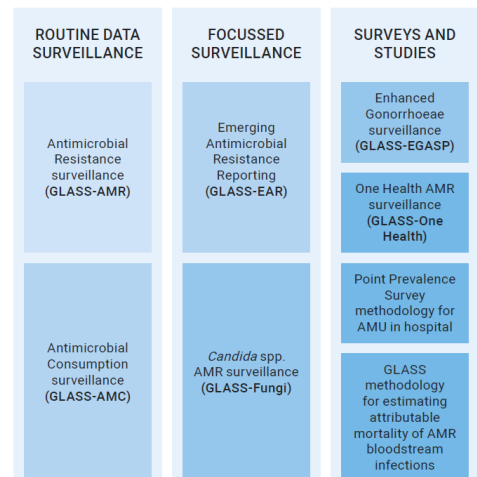
[79] According to the 2019 report. The date on the report is 2017.

[80] This is the copyright date on the report.

Section 2 (from p6) of the 2021 GLASS report. Routine data surveillance includes the first GLASS module of AMR and a newer module on AMC. Focused surveillance modules are focused on emerging antimicrobial resistance (GLASS-EAR) and fungal disease (GLASS-FUNGI). Other modules related to particular surveys and studies. These include:

Figure A4.7: GLASS modules1 (from 2020 GLASS report)

- GLASS-One Health based on the Tricycle project and focused on ESBL-producing E Coli. This module was piloted in nine countries and is being implemented in a further five.
- EGASP has been implemented in two countries and was expanded to a third in 2020.
- Point prevalence survey of AMU at hospital level – a method has been developed and is reported to be being used in 34 countries in three WHO regions (AFR, AMR, EMR).
- GLASS studies for estimating AMR burden[81]

A4.27. There have been a number of GLASS reports to date.[82] In 2014, WHO produced a Global Report on AMR Surveillance.[83] This report preceded the formation of GLASS and provided information on resistance to antibacterial drugs, including in selected bacteria of international concern, the health and economic burden due to antibacterial resistance, and AMR surveillance programmes for tuberculosis, malaria, HIV, influenza and in other areas. It contained very detailed tables in Annex 2 of published resistance rates in common bacterial pathogens by WHO region. GLASS produced early implementation reports for 2016-17[84], 2017-18[85], 2018-19[86] and 2019-20.[82] In 2018, WHO also produced an early implementation report focused on antimicrobial consumption.[87]

A4.28. Data reported by GLASS in relation to AMR is of two main types. First, there is process data on implementation progress and the development of surveillance systems, such as whether a country has a National Coordination Centre (NCC) and a National Reference Laboratory (NRL) and whether those NRLs have received External Quality Assessment (EQA) and which standards are used for Antimicrobial Susceptibility Testing (AST). Secondly, there is data on rates and patterns of antimicrobial resistance. While there is considerable data available in reports, in visualizations and in country profiles/information sheets, raw data in analyzable form is not particularly readily available. Some data on rates of AMR in particular countries is available as supplementary electronic material for each of the three GLASS reports.[88]

A4.29. GLASS is identified as the data source for a number of indicators identified in the GAP AMR M&E framework and in the GPW13 results framework. These are briefly summarized in Table A4.8 along with a brief assessment of data availability.

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[81] Referred to as estimating attributable mortality of AMR bloodstream infections in Figure 8.
[82] These are summarized on https://www.who.int/publications/i/item/9789240027336 (accessed 16 July 2021) but access to the 2019 and 2020 reports requires a WHO login from this page.
[83] Available on https://www.who.int/publications/i/item/9789241564748 (accessed 16 July 2021).
[84] Available on https://www.who.int/publications/i/item/9789241513449 (accessed 16 July 2021).
[85] Available on https://www.who.int/publications/i/item/9789241515061 (accessed 30 April 2021).
[86] Available on https://www.who.int/publications/i/item/9789240005587 (accessed 16 July 2021).
[87] Available on https://www.who.int/publications/i/item/who-report-on-surveillance-of-antibiotic-consumption (accessed 16 July 2021).
[88] However, because there are major differences in how data is collected in different countries (e.g. where samples are collected, when samples are taken etc.) the comparability of data is very limited. In practice this means that, if reported AMR rates are higher in one country than another, it is unclear whether those differences reflect real differences in AMR rates or are due to different sampling processes, e.g. blood cultures being widely available in one country and only offered to the sickest patients in another.

Table A4.8: Indicators where data is (to be) provided from GLASS

Indicator	MF[89]	GPW	SDG	Comment	Data Availability[90]	Comment
Goal IIa – patterns and trends in resistance in human health – prevalence of blood-stream infections caused by Methicillin-resistant Staphylococcus aureus	✓	✓	✓	According to the metadata for the indicator in the M&E framework, the denominator is the number of patients seeking hospital care and from whom the blood specimen was taken due to suspected bloodstream infection and from whom blood specimens have been submitted for blood culture and AST.[91] However, the metadata for the SDG indicator states that the denominator is the total number of patients with growth of S aureus or E coli in tested blood samples. While some raw data is available online, GLASS has to date not published these figures in its report. In its 2020 report, the reason given was that "*capacity to conduct AMR surveillance is still being established in some countries, territories and areas, therefore the data collected by GLASS-AMR are not yet of sufficient representativeness to allow comparison of trends in AMR among countries, territories and areas and regions.*" This is potentially problematic as this indicator is included in both SDG and GPW13 monitoring.[92]	RED	Given major differences between countries' capacity and procedures and policies for when blood cultures are taken, it seems unlikely that a system based on sentinel surveillance will give aggregatable and comparable data at any point in the foreseeable future. Alternative approaches, such as point prevalence studies may need to be considered.
Goal IIb – patterns and trends in resistance in human health – prevalence of blood-stream infections caused by ESBL in E coli	✓	✓	✓		RED	
Outcome 4.1 – use of antimicrobials in humans – including (a) total human consumption of antibiotics for systemic use (Anatomical Therapeutic Chemical classification code J01) in Defined Daily Doses per 1000 population (or inhabitants) per day	✓	✓		Although the M&E framework refers to GLASS as a data source in relation to this indicator, GLASS is not mentioned in the metadata. While GLASS launched a module on AMC in December 2019, only 20 countries have enrolled in it to date.	AMBER	Although WHO's 2018 report on antimicrobial consumption contained a table (4.2) on total consumption of antibiotics for 65 countries, such information is not yet available through GLASS but potentially it could be.
Output for outcome 2a AMR and AMU in humans	✓	✓		This indicator relates to the number of countries reporting through GLASS antimicrobial resistance and antimicrobial use (presumably consumption). Both these indicators are leading indicators in relation to GPW13	GREEN	Process data on total number of countries reporting to GLASS is available but it would be good if raw data could be more available to allow independent review and scrutiny.

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[89] Monitoring framework

[90] The colour coding used here is as follows – green = data already available; amber = data not yet available but there are realistic prospects of data being available; red = data not available and unlikely to be made available using existing systems

[91] The results are likely to be affected by policies in terms of who undergoes AST. There appear to be vastly different rates in different countries among people with confirmed bacterial growth.

[92] This is particularly problematic if the GPW13 target of reducing this by 10% still applies. It will be difficult to assess if this target is reached in the absence of a baseline. Indeed, it is problematic that a target was set without a baseline and presumable without an understanding of trends. For example, if rates of AMR are rising, it may be more realistic to slow the rise than to reduce by 10%.

A4.30. A review of GLASS was conducted between October 2020 and April 2021 including consultation with countries that are and are not enrolled in GLASS. The main focus of this review was a consultation meeting, sponsored by Sweden and the Republic of Korea, and held virtually in April 2021.[93] A total of 415 representatives from 115 countries participated in the consultation. An outcome statement was released following the consultation meeting.[94] This reaffirmed the participants' commitment to GLASS but also requested WHO to "*develop complementary approaches such as surveys to enable all countries to report on SDG indicators in the short and medium term*".[95]

A4.31. In summary, GLASS is seeking to build a systematic and modular approach to obtaining high quality, comparable AMR surveillance data globally based largely on routine data collection but its potential to deliver such data has yet to be fully realized. Strengths and weaknesses of GLASS are briefly summarized in Table A4.9.

Table A4.9: Strengths and weaknesses of GLASS

Strengths	Weaknesses
GLASS represents a systematic, substantial and determined effort to establish and strengthen the global AMR surveillance system to provide important data at the outcome level. In some countries, GLASS has provided a push to establish and strengthen AMR surveillance systems. GLASS has also highlighted the importance of functioning laboratories. Emphasis has been placed on the importance of good quality standardized data. It covers AMR and has expanded to also cover antimicrobial consumption and other modules. A growing number of countries Is enrolling with and reporting to GLASS. This includes low- and middle-income countries.	Only just over half of WHO Member States are currently enrolled with GLASS. Enrollment has been particularly slow in some regions, e.g. the Region of the Americas. Surveillance of AMC has lagged behind AMR surveillance. The only data readily available across countries relates to processes, such as reporting to GLASS and the status of national surveillance systems. GLASS has not yet published data sets at the outcome level, including in relation to the disease burden caused by AMR. Such data is needed, not least for SDG reporting and for demonstrating the critical importance of AMR. While it may be possible to do this in future for AMC, it seems unlikely that this will be possible in the foreseeable future for AMR and alternative approaches, such as surveys, may be needed. There are critical system and capacity issues (including cost and availability of diagnostics and capacity of laboratory services) in many low- and middle-income countries which mean that very few people with suspected bacterial infections receive diagnostic testing, e.g. cultures. GLASS is currently seen as reporting to WHO and the usefulness of GLASS data for action at national level is unclear. GLASS currently collects aggregated data and not isolate-based data. There are concerns that WHO has been slow to respond to country feedback on GLASS. Some stakeholders are concerned that there is perceived European bias within GLASS. This is seen as making it more difficult for even high-income countries outside Europe to report to GLASS. Links with other organizations and networks working on AMR surveillance are variable. For example, the ReLAVRA network has data for more countries in the Region of the Americas than currently available through GLASS. Could GLASS work more with regional centres/collaborating centres? There is no clear road map as to how the different initiatives join up. There are concerns that GLASS may be overambitious and might need to have a more limited focus. Specifically, there are concerns about trying to collect data on 11 pathogens. For example, EARS-Net in Europe only collects data on eight and even that may be too many. While reports contain country data sheets and visualizations are available online, it is not easy or straightforward to obtain the raw data set in an analyzable form. There seems to be quite a degree of separation between the AMR M&E team and TrACSS on the one hand and GLASS on the other. This means that these systems may function in parallel rather than working together.

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[93] See https://glass2020.org/ (accessed 16 July 2021). This meeting had 470 participants, including 290 representatives from 88 WHO Member States.
[94] See https://glass2020.org/Outcome_statement_GLASS2021.pdf (accessed 16 July 2021).
[95] The outcome statement also specified that "*the surveys should benefit from and contribute to the ongoing efforts to build sustainable country capacity to generate reliable and representative AMR and AMC/AMU data through routine data collection*".

Progress Reports

A4.32.   The WHO Secretariat's main way of reporting progress in terms of GAP AMR has been through progress reports submitted to the World Health Assembly. The review team constructed a GAP AMR timeline with summary details from these reports (see Figure A4.8). Table A4.10 briefly summarizes the reports presented to each World Health Assembly.

Table 10: AMR reports to the World Health Assembly 2015-20

Year	Number	Nature of report
2015	WHA68	In addition to presenting a draft Global Action Plan on AMR (A68/20)[96], the Secretariat reported on progress made in implementing resolution WHA67.25 on AMR (A68/19)[97] under four themes – ensuring that all relevant parts of the organization are actively engaged and coordinated, setting aside adequate resources for the work of the Secretariat, strengthening the tripartite collaboration between WHO, FAO and OIE, and exploring with the United Nations Secretary General options for a high-level initiative.
2016	WHA69	The WHO Secretariat presented a progress report (A69/24)[98] and options for a global development and stewardship framework (A69/24 Add.1).[99] The progress report included region by region progress in developing national action plans; establishment in the Secretariat of ten crosscutting workstreams supporting the GAP AMR's five objectives; the results of a public awareness survey[100]; details of the first World Antibiotic Awareness Week; details of a guidance manual on developing AMR national action plans;[101] establishment of a new global infection prevention and control (IPC) unit; details of support provided on the optimal use of antimicrobials; a protocol for collecting data on antimicrobial consumption as part of AMR surveillance; steps taken to establish the Global Antibiotic Research and Development Facility;[102] details of a consultation held on development of point-of-care diagnostic platforms; details of a meeting on biomarkers to distinguish bacterial causes of acute fever; details of the AGISAR five-year strategic plan; details of activities to strengthen laboratory capacity; details of a One Health curriculum and a planned session in Thailand; plans to develop a framework for monitoring the GAP AMR; details of the launch of GLASS, details of work conducted by the UK and the World Bank on the global burden of a continued increase in AMR; details of the high-level dialogue and plans for the high-level meeting.
2017	WHA70	The WHO Secretariat presented a report (A70/12)[103] on progress of the GAP AMR and on follow up of the political declaration of the high-level meeting of the United Nations General Assembly which had been held on 21 September 2016.[104] This report highlighted the commitments of the political declaration and requests to WHO to finalize the global development and stewardship framework, to support national action plans and other activities, and to establish an inter-agency coordination group.[105] The report also provided details of support provided to development of national action plans; details of activities to raise awareness of AMR; details of establishment of GLASS including the number of countries enrolled (43); details of the revised list of Critically Important Antimicrobials for Human Medicine; details of the methodology developed and training provided to monitor AMC; details of new recommendations on IPC; details of the updated antibiotic chapter of the WHO Model List of Essential Medicines; details of a list of priority antibiotic-resistant bacterial pathogens where new medicines are most urgently needed; details of the TrACSS questionnaire; details of expanded efforts to control resistance in tuberculosis, HIV and malaria; and ongoing work to establish a global development and stewardship framework.
2018	WHA71	No report
2019	WHA72	A report (A72/18)[106] was submitted as a follow-up to the high-level meeting of the United Nations General Assembly in 2016. This opened with a section on country-level progress and used data from TrACSS to illustrate this (see Table A4.11). The progress report then had sections on progress of each of the five objectives of the GAP AMR. Table A4.12 briefly summarizes the report's content for each objective. In addition the report had sections on other diseases (HIV, tuberculosis, malaria, neglected tropical diseases and sexually-transmitted infections), multisectoral collaboration, ongoing challenges and emerging threats.
2020	WHA73	No report

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[96] See https://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_20-en.pdf (accessed 19 July 2021)

[97] See https://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_19-en.pdf (accessed 19 July 2021)

[98] See https://apps.who.int/gb/ebwha/pdf_files/WHA69/A69_24-en.pdf (accessed 19 July 2021)

[99] See https://apps.who.int/gb/ebwha/pdf_files/WHA69/A69_24Add1-en.pdf (accessed 19 July 2021)

[100] Covering almost 10,000 people in 12 countries – WHO (2015) *Antibiotic Resistance: Multi-Country Public Awareness Survey* available on http://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf;jsessionid=A4957D2EB7734E11619FB45C202CD61D?sequence=1) (accessed 19 July 2021)

[101] WHO, FAO and OIE (2016) *Antimicrobial Resistance: A Manual for Developing National Action Plans* available on http://apps.who.int/iris/bitstream/handle/10665/204470/9789241549530_eng.pdf?sequence=1 (accessed 19 July 2021)

[102] Now Partnership

[103] See https://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_12-en.pdf (accessed 19 July 2021)

[104] See https://digitallibrary.un.org/record/842813?ln=en (accessed 19 July 2021)

[105] Which was done in March 2017.

[106] See https://apps.who.int/gb/ebwha/pdf_files/WHA72/A72_18-en.pdf (accessed 19 July 2021)
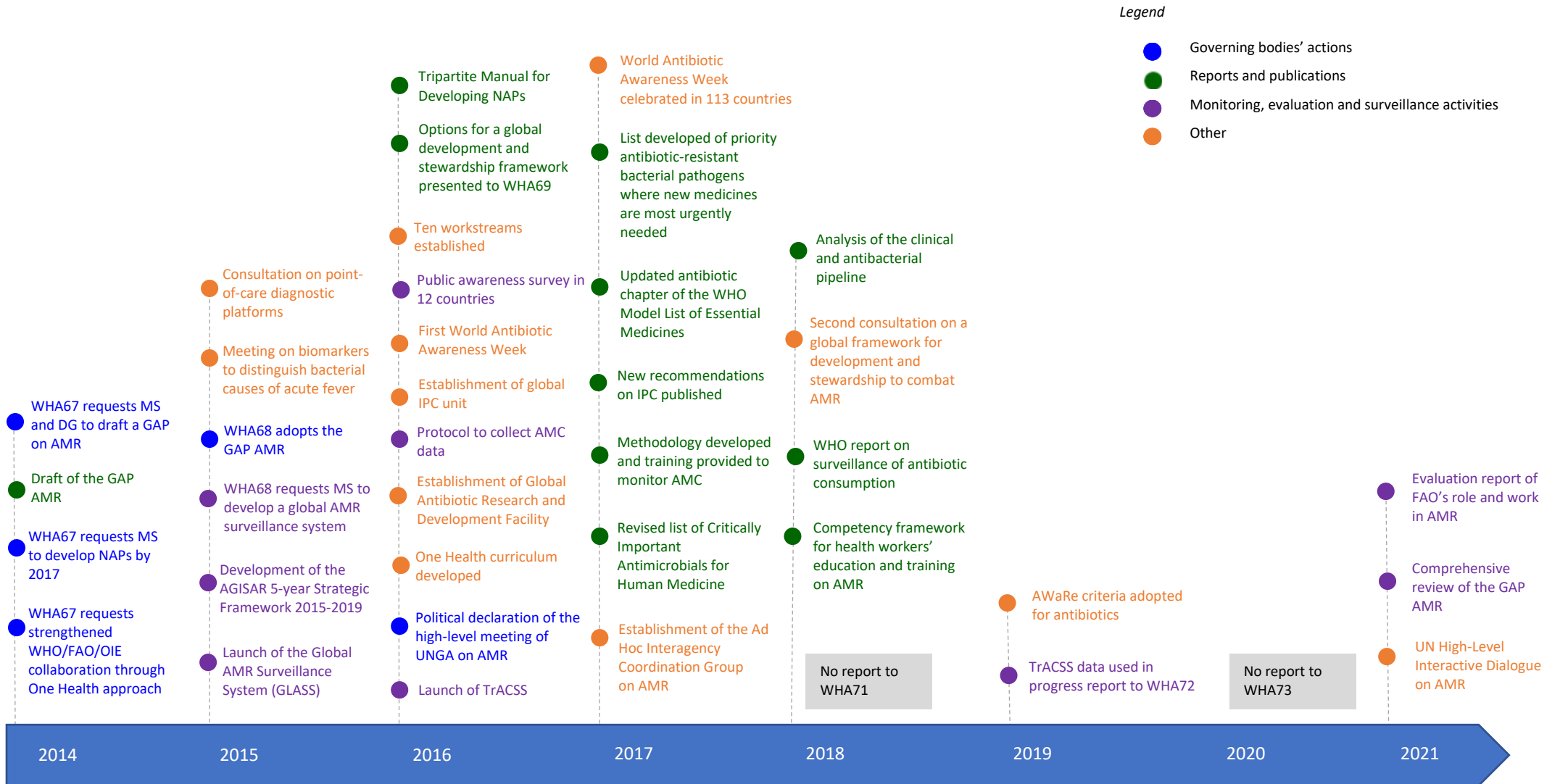
Figure A4.8: GAP AMR timeline

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Table A4.11: TrACSS data used in progress report to World Health Assembly in 2019 (WHA72)

TrACSS data	Comment
Some 50% of responding countries have established a **multisectoral antimicrobial resistance working group**, with representatives from the human, animal and plant health, food safety, food production and environment sectors; these working groups are functional in 53 countries	This statement appears to be based on data from Q4 and 4.2 of TrACSS but is difficult to follow not least because of mixing absolute numbers and percentages. From the data, 150 countries responded to Q4. Of these, 128 (85%) scored this as B or above, i.e. they had a multi-sectoral working group or coordination committee on AMR. But there was another question about active involvement of different sectors in developing and implementing the AMR NAP (not in the coordination committee) but only 39 countries reported all six sectors were involved. Four countries said all sectors were involved even though they said they had no formal coordination mechanism. Only 35 countries meet the criteria specified (23%). It is true that 53 countries reported functional mechanisms but they did not all involve all sectors listed. Of the 53 countries with functioning mechanisms, only 16 reported all six sectors involved in NAP, 15 five sectors, 11 4 sectors, 8 3 sectors, 1 2 sectors, 1 1 sector and 1 no sectors
While 125 countries have conducted **awareness campaigns** about the risks of antimicrobial resistance in human health, additional nationwide efforts are needed; in the animal health and other non-human sectors, one third of countries have conducted awareness campaigns;	It is difficult to reconcile these figures with the raw data. From the raw data 132/137 responding countries (96%) answered Q6.1 B or above, i.e. they had had some awareness raising activities. In terms of other sectors (Q6.2), 99 of 118 countries reported some awareness raising activities in at least one of these sectors (84%)
Although 105 (68%) countries report that they have **a national antimicrobial resistance surveillance system** for some common bacterial pathogens in humans, not all are currently enrolled in the Global Antimicrobial Surveillance System (GLASS); close to 40% of countries are conducting surveillance in the animal and food sectors;	These figures do match responses to Qs 7.4 and 7.5 at C+ using the total number of responses as the denominator. If only those who answered the question are taken as denominator, the results for Q7.4 is 105/148 (71%) and for Q7.5 is 59/124 (48%)
A total of 90 countries report that they have **a national infection prevention and control programme** for health care facilities, with national guidelines; in the animal and food production sectors, far fewer countries report national programmes for infection prevention and control;	This number corresponds to C+ for Q8.1
While 123 countries have **policies** requiring a prescription for antibiotic use in humans, 64 have limited the use of critically important antimicrobials for human medicine for growth promotion in animal food production.	These numbers correspond to those who answered yes to the two parts of Q9.4

Table A4.12: Reporting for each of the GAP AMR objectives to the World Health Assembly in 2019

Objective No.	Report content
1	The report noted that, in 2017, World Antibiotic Awareness Week had been celebrated in 113 countries, that technical consultations had been held and that a competency framework for health workers' education and training on AMR had been produced.[107]
2	The report noted that the second GLASS report had been produced with input from 68 countries; that GLASS was providing support and developing tools and new modules; that GLASS would be revised in 2020; that GLASS was promoting innovative approaches;[108] that WHO was developing a global integrated surveillance protocol, the ESBL EC Tricycle project, and that WHO was working with other relevant UN Agencies to understand the role of inadequate access to water, sanitation and hygiene (WASH) and environmental contamination with antimicrobials residues and resistant microbes as drivers of antimicrobial resistance and its impact on health.
3	The report summarized various guidelines that had been produced since the adoption of the GAP AMR and also discussed safe management of WASH and safe reuse of excreta in food production, and expanding the use of vaccines.
4	The report covered the adoption of the AWaRe criteria for antibiotics; the technical support provided to antibiotic stewardship programmes; the publication of a report on antibiotic consumption;[109] the second consultation on a global framework for development and stewardship to combat AMR; and plans for a further update of the list of critical antibiotics for human health later in 2019.
5	The report covered activities of the Global Antibiotic Research and Development Partnership; plans to update the priority list of antibiotic-resistant bacteria that pose the greatest risk to human health; publication of a comprehensive analysis of the clinical and antibacterial pipeline;[110] plans to develop a WHO research and development priority list of antimicrobial resistance diagnostics; and the formulation of models to enable evidence-based prioritization of research into and the development of new vaccines to address pathogens associated with antibiotic resistance.

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[107] Please note that trying to download this from the WHO site produced an error but the document was downloaded from https://inhwe.org/forum/working-group-interprofessional-education-and-training/who-competency-framework-health-workers (accessed 19 July 2021)

[108] Including genome sequencing and point-of-care diagnostics.

[109] See https://apps.who.int/iris/bitstream/handle/10665/277359/9789241514880-eng.pdf?ua=1 (accessed 19 July 2021)

[110] See https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(18)30513-9/fulltext (accessed 19 July 2021)

A4.33.   In addition, in 2019, the WHO Secretariat prepared the report of the United Nations Secretary General as a follow-up to the political declaration of the high-level meeting of the General Assembly on AMR.[111] This relied heavily on TrACSS data[112] and, indeed, was considered an alternative to a specific TrACSS report for the third round of TrACSS reporting. After presenting an introduction, the report provided an update on the implementation of the political declaration, some details of the ad hoc inter-agency coordination group on AMR and conclusions and ways forward.[113] The part on the implementation of the political declaration was structured into three main sections – (a) implementation of national action plans, (b) global action[114] and (c) collaboration by the Tripartite Organizations to address challenges.

A4.34.   The review team compiled an analytical framework/matrix which summarised data relating to each GAP objective from identified reports. In addition to reports to World Health Assemblies, these included reports to WHO's Executive Board, reports of STAG meetings, reports of IACG meetings, the report of an informal technical consultations on AMR behaviour change[115] and some other reports.[116]

Country Cooperation Strategies (CCSs) and Biennial Collaborative Agreements (BCAs)

A4.35.   Country Cooperation Strategies are documents which guide WHO's work in countries. They provide a medium-term vision for WHO's technical cooperation with particular Member States and support the country's national health policy, strategy or plan.[117]

A4.36.   For this review, we identified 343 CCSs covering 160 countries and territories. There were two types of CCSs – full (169; 49%) and brief (173; 51%). Full CCSs are longer documents covering multiple years while brief CCSs are short summaries covering one year. The review sought to identify whether the CCS mentioned AMR and, if so, what it said. Overall, just over one quarter of the CCSs (88 of 343; 26%) mentioned AMR. Among the 160 countries and territories, a total of 66 (41%) mentioned AMR in at least one of their CCS documents. For each country that had a CCS that mentioned AMR, we also documented the number of CCSs that mentioned AMR and the proportion of their CCSs that mentioned AMR. Perhaps unsurprisingly, a smaller proportion of brief CCSs (36 of 174; 21%) mentioned AMR than full CCSs (52 of 169; 31%).

A4.37.   Among the 160 countries and territories, there were 18 territories that are not WHO Member States.[118] Of these, only one[119] mentioned AMR in a CCS. In addition, five Member States[120] that had not submitted any TrACSS questionnaires had CCSs. None of these mentioned AMR. Of the 187 Member States that had

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[111] See https://digitallibrary.un.org/record/3807197?ln=en (accessed 19 July 2021).

[112] To report on national action plans; awareness-raising campaigns; national AMR surveillance systems (supplemented by data from GLASS); national monitoring systems for consumption and use of antimicrobials; national infection prevention and control programmes; good health, management and hygiene practices in animal husbandry; and policies and regulations on antimicrobial use.

[113] This final section identifies how challenges at the national level and at the regional and global levels can be addressed. It also summarizes the recommendations of the inter-agency coordination group in five critical shifts, namely urgency; one health approach; stakeholder engagement; implementation of national action plans; and resource mobilization.

[114] Which was itself divided into seven sections which have some similarity to the five objectives of GAP AMR – (1) awareness-raising, behaviour change and training; (2) strengthening knowledge and evidence through surveillance; (3) prudent and responsible use of antimicrobials (4) infection prevention and control measures; (5) strengthening regulatory frameworks; (6) financial resources and the economic case for investments in combating AMR; and (7) strengthening public-private partnerships to promote research and development.

[115] Held in Switzerland in 2017, see https://www.who.int/antimicrobial-resistance/AMR-Behaviour-Change-Consultation-Report_6-and-7-Nov-2017.pdf (accessed 19 July 2021).

[116] For example a report by the United Nations Foundation on the roles, responsibilities and remits of UN organizations in relation to AMR, see https://www.who.int/antimicrobial-resistance/interagency-coordination-group/AMR-mapping-synthesis-report-UNF.pdf (accessed 19 July 2021).

[117] The WHO website did have an explanation about CCSs - see https://www.who.int/country-cooperation/what-who-does/ccs/en/ (accessed 27 May 2021). However, this part of the site has been decommissioned and it is not easy to see if there is a similar explanation elsewhere on the main WHO site. However, CCSs are explained on the EMR site, see http://www.emro.who.int/about-who/country-cooperation-strategy/ (accessed 19 July 2021).

[118] American Samoa, Anguilla, Aruba, Bermuda, British Virgin Islands, Cayman Islands, French Polynesia, Guam, Montserrat, New Caledonia, Northern Mariana Islands, Occupied Palestinian Territories, Pacific Island Countries, Pitcairn Islands, Sint Marten, Tokelau, Turks and Caicos Islands and Wallis and Futuna.

[119] Occupied Palestinian Territories

[120] Equatorial Guinea, Gambia, Madagascar, Niue and Senegal.

submitted at least one TrACSS questionnaire, almost three quarters (137 of 187; 73%) had a CCS. Of these, just under half (65 of 137; 47%) mentioned AMR.

A4.38.   Figure A4.9 shows the percentage of Member States, who had submitted at least one TrACSS questionnaire, that have a CCS, analysed by country income group and region. This shows that almost all low- (27 of 28; 96%) and lower-middle income countries (43 of 47; 91%) have CCSs as compared to less than half of high-income countries (25 of 57; 44%). All countries in AFR, EMR and SEAR have CCSs as compared to only one in seven (7 of 51; 14%) countries in EUR.

Figure A4.9: Percentage of Member States that submitted at least one TrACSS questionnaire (n=187) that have at least one CCS – analysed by country income level and WHO region
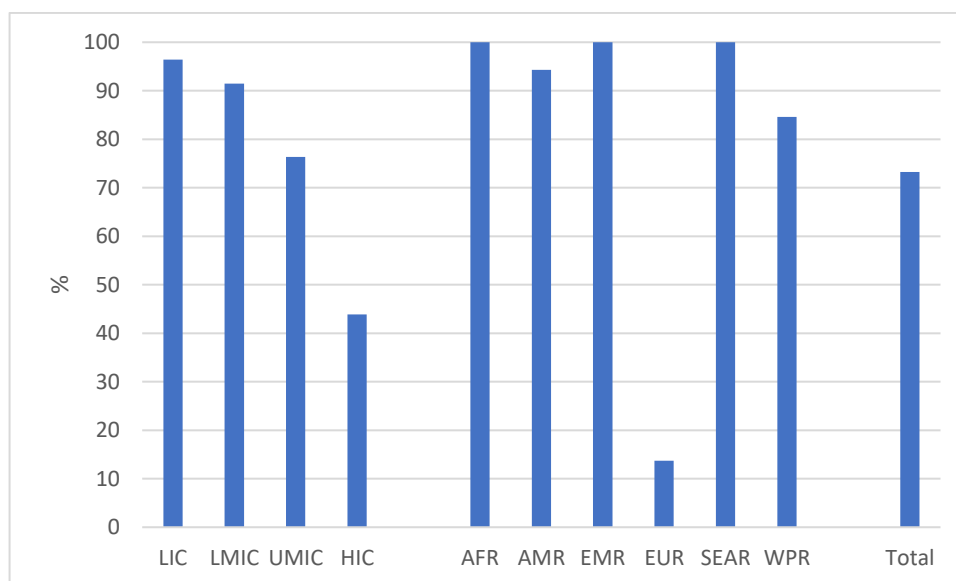
A4.39.   Following this analysis, and as a result of interviews with some WHO Country Offices in EUR, the team became aware that many countries in WHO's European Region have Biennial Collaborative Agreements as opposed to CCSs. Attempts were made to conduct a similar exercise for BCAs as the review had done for CCSs. However, this was initially difficult because there is no central repository for BCAs and these need to be identified country by country. EURO provided a list of countries that have BCAs and whether or not they mention AMR. Based on this information, it appeared that 30 countries in Europe had BCAs which mentioned AMR. The review team then sought to identify these BCAs to verify that they indeed mentioned AMR. This was possible in 19 cases. However, in 11 cases, we could not identify a BCA for the country identified. In two of these cases, they had CCSs and had been included in the previous analysis. In a further two cases, we identified BCAs which appeared to mention AMR even though these had not been reported by EURO.[121] To preserve consistency with the method used for CCSs, the review used figures for BCAs that the team had been able to verify. Of 21 BCAs identified, all mentioned AMR.

A4.40.   The earlier analysis was then repeated.[122] Of Member States that had submitted at least one TrACSS questionnaire, almost all (159 of 187; 85%) had a CCS. Of these, over half (87 of 159; 55%) mentioned AMR.
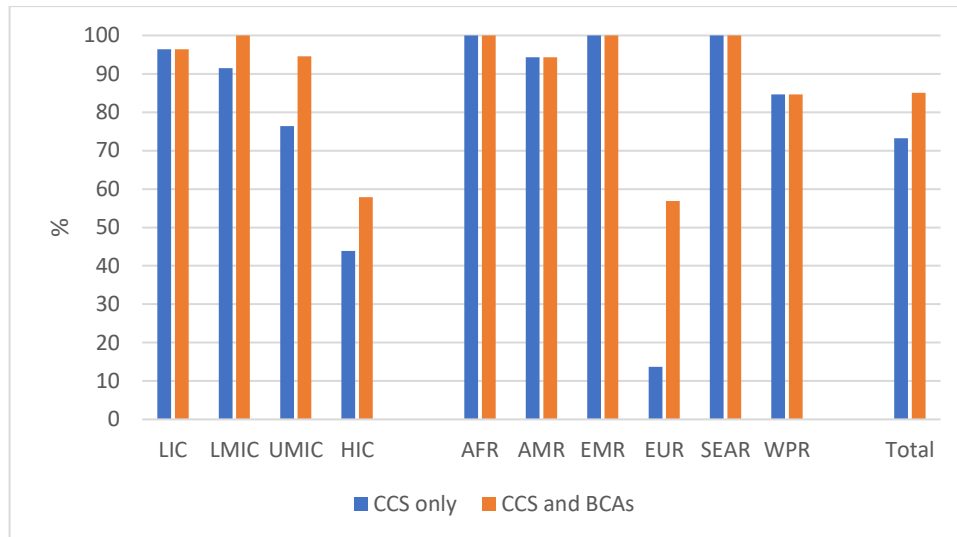
A4.41.   Figure A4.10 shows the percentage of Member States, who had submitted at least one TrACSS questionnaire, that have a CCS or BCA, analysed by country income group and region. Comparative figures for CCS only (see Figure 10) are included. Figure A4.10 shows that inclusions of BCAs means that all lower-middle-income countries (47 of 47, 100%) and almost all upper-middle-income countries (52 of 55, 95%)

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[121] In one case, this was an earlier BCA and the current BCA did not mention AMR. In the other, EURO reported that the BCA had included AMR initially but this was removed on prioritization.
[122] In addition to 25 BCAs, one further CCS was identified through this process and this was included.

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have either a CCS or BCA. While a number of European high-income-countries have BCAs, the proportion of high-income-countries with either a CCS or BCA is still lower than for other income levels (33 of 57, 58%). In terms of WHO regions, the only change between Figures A4.9 and A4.10 relates to EUR. Over half (29 of 51, 57%) of countries in WHO European region have either a CCS or BCA.

Figure A4.10: Percentage of Member States that submitted at least one TrACSS questionnaire (n=187) that have at least one CCS or BCA – analysed by country income level and WHO region

A4.42.   Figure A4.11 presents data on how likely it is that, where a Member State has a CCS or BCA, it mentions AMR. Where countries have a CCS, low-income countries are least likely to mention AMR (5 of 27; 19%). In terms of regions, countries with a CCS or BCA in EUR are most likely to mention AMR (26 of 29; 90%) and those in AFR (18 of 43; 42%) and AMR least likely (12 of 33; 36%).

Figure A4.11: How likely is it that a Member State that has a CCS or BCA (n=159) mentions AMR – analysed by country income level and WHO region
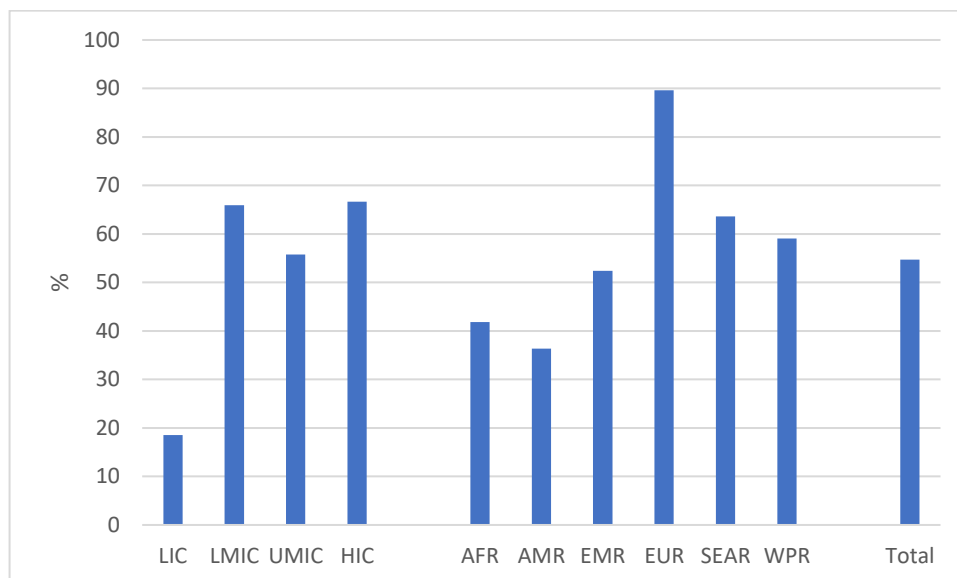
A4.43.   Figure A4.12 combines these two analyses and looks at what percentage of Member States, who had submitted at least one TrACSS questionnaire, have a CCS or BCA that mentions AMR. Overall, this is almost half (87 of 187; 47%). It is highest among lower-middle-income countries (31 of 47; 66%) and lowest among

low-income countries (5 of 28; 18%). While almost two thirds of countries in SEAR (7 of 11; 64%) have a CCS which mentions AMR, only just over one third of countries in AMR do (12 of 35; 34%).

Figure A4.12: Percentage of Member States that submitted at least one questionnaire to TrACSS (n=187) that have a CCS which mentions AMR – analysed by country income level and WHO region
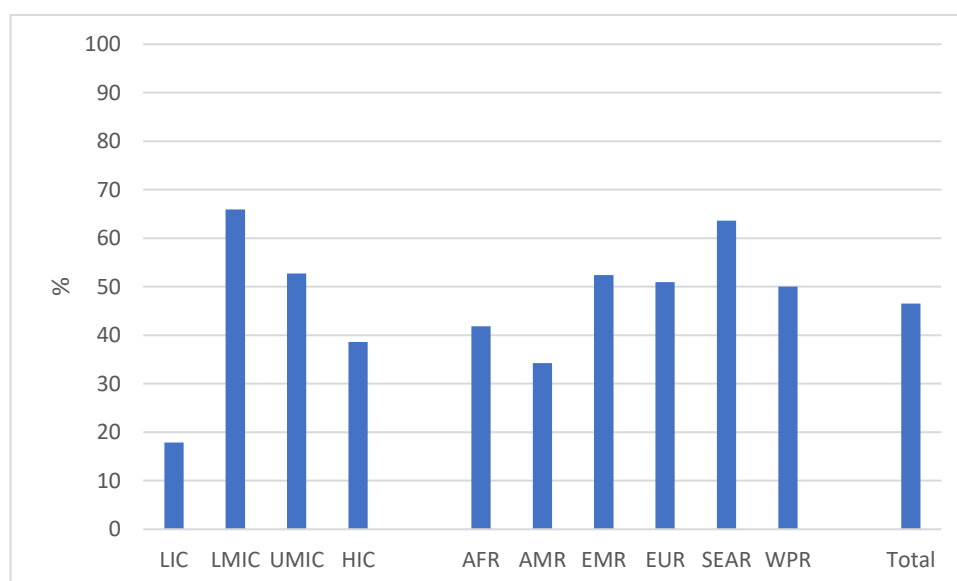
A4.44.   The review conducted statistical (regression) analysis to determine whether there was an association between having a CCS or BCA that mentions AMR and both overall performance score (using the graduated score method) and improvement in performance score. This analysis was carried out considering whether a country has a CCS/BCA that mentions AMR, the number of CCSs/BCAs that mention AMR and the proportion of CCSs/BCAs that mention AMR.[123] The review also identified a sub-set of 25 Member States that had an overall performance score higher than might be expected. This was done primarily to identify which WHO Country Offices to speak with and the details of this approach are described later. Among these countries, more than three quarters (19 of 25; 76%) had a CCS or BCA which mentions AMR.[124]

A4.45.   Information was also recorded from CCSs as to what the document said about AMR. The review carried out qualitative analysis of the content of this. Figure A4.13 shows the percentage of CCSs[125] that mention AMR that cover issues related to particular objectives of the GAP AMR and other relevant topics. While 36 of 88 (41%) CCSs contain material related to objective 2 (surveillance), only one contains material of relevance to objective 5 (focused on research and development). Other topics covered in CCSs include developing and implementing National Action Plans and promoting multisectoral coordination. Broader topics such as health security and health systems strengthening are also included. Box A4.1 summarizes some of the topics identified in CCSs in relation to AMR.

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[123] In one case a country had both a BCA and a CCS. In this case, the review only considered data relating to the CCS.
[124] There were three sub-sets of countries among this group. Of ten countries who had higher level of overall performance when compared to their GNI per capita, eight (80%) had a BCA or CCS that mentions AMR. Of the 12 countries who had a higher level of improvement in performance than might be expected based on GNI per capita, two thirds (8, 67%) had a BCA or CCS that mentions AMR. Of the seven countries that had higher levels of performance on non-human health indicators when compared to their performance on human health indicators, just over half (4, 57%) had a BCA or CCS that mentions AMR
[125] This analysis excludes BCAs and one CCS identified when the BCA analysis was conducted.

Figure A4.13: Percentage of CCSs that mention AMR (n=88) that cover particular objectives of the GAP AMR and other relevant topics in relation to AMR
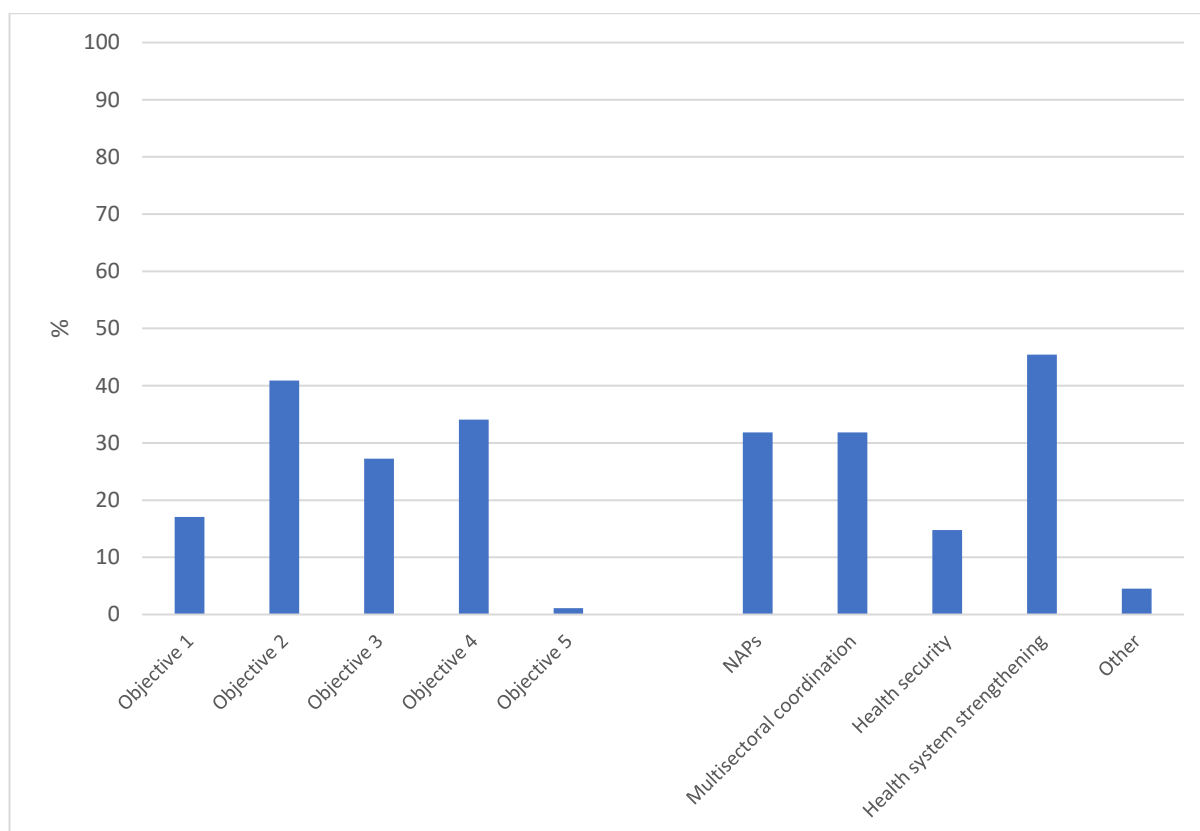
Box A4.1: Examples of issues relating to AMR raised in CCSs

Some CCSs that focused on objective 1 of the GAP AMR identified limited awareness as a barrier to addressing AMR. CCSs included advocacy, education and awareness as focus areas or regional priorities for WHO. Specific activities included the development or updating of training curricula for prescribers or staff at the facility level as a strategic priority and carrying out the Antibiotic Awareness Week to improve awareness of AMR at the national level.

Some CCSs that focused on objective 2 of the GAP AMR identified AMR surveillance as a focus area or programmatic/strategic priority for WHO, specifically ensuring AMR monitoring, building capacity for surveillance and strengthening national surveillance systems. Barriers identified included weak state and/or laboratory surveillance systems.

Some CCSs that focused on objective 3 of the GAP AMR identified infection prevention and control as a strategic and/or regional priority. Some identified inadequate infection prevention and control as a barrier to reducing AMR. Specific activities mentioned included observing Hand Hygiene Day, strengthening capacities for infection prevention and control and developing a framework to address objective 3.

Some CCSs that focused on objective 4 of the GAP AMR1 identified optimizing the use of antimicrobial medicines as a strategic priority. Some mentioned the promotion of rational use of antimicrobial medicines as a focus, while some identified their irrational use as a challenge to reducing AMR. Some CCSs mentioned access to essential medicines as a focus area and some emphasized the importance of strengthening and/or implementing policies and regulations to optimize the use of antimicrobials. Some CCSs mentioned monitoring the consumption of antimicrobials to optimize their use.

Only one CCS referred to objective 5 of the GAP AMR and this recommended increased efforts in research and innovation.

Many CCSs had a focus on supporting the development of national action plans and establishing/strengthening multisectoral coordination mechanisms. CCSs emphasized WHO's role to support national authorities to implement national action plans. Many countries specifically referred to the importance of multisectoral coordination to implement national action plans and to the coordination of multiple technical sectors to develop and implement cross-cutting policies and activities to contain AMR.

Among the health systems strengthening issues identified in CCSs were building capacity at the national level to increase infection prevention and control, strengthening laboratory capacity and improving health service delivery and surveillance. Some CCSs specifies that reinforcing capacities at the ministerial level is important to help contain AMR and to develop and implement relevant policies. Some CCSs referred to the importance of country preparedness for threats and epidemics, and further identify AMR as a threat to health security.

A4.46.   Joint External Evaluations (JEEs) are voluntary, collaborative, multisectoral processes to assess country capacities to prevent, detect and rapidly respond to public health emergencies. They cover 19 technical areas including AMR.[126] They are conducted as part of the process of strengthening health security by implementing the International Health Regulations.[127] JEEs consist of an initial process of self-evaluation by a country's government with this assessment being reviewed by an external expert team ahead of them visiting the country. The team can draw on data from other sources and they then produce a report of their findings which is agreed with the host country's government. The JEEs therefore constitute a negotiated qualitative joint assessment. During the inception report, several respondents from the WHO Secretariat expressed the view that the findings of the JEE might be more robust than the self-reported data in TrACSS and could be seen as one way of validating TrACSS reports.

A4.47.   As part of this review, available JEE mission reports[128] were identified and reviewed. Reports were identified for 97 countries and territories.[129] Two different templates appear to have been used with the transition from one to the other occurring sometime in 2018. The majority of the reviews (81 of 97; 84%) were conducted using the original template. The JEE templates rank elements within each area on a 1-5 scale[130]. The JEEs also provide a qualitative analysis of strengths and best practices and areas that need strengthening and challenges. The review considered the quantitative ratings overall[131] and for AMR[132] specifically. The review also considered the qualitative assessment of AMR (see Box A4.2). Average scores for each element of the JEE are presented in Appendix 4 of the secondary data review report. In general, the average scores for the antimicrobial resistance criteria are amongst the lowest across all the JEE categories.[133] Average scores for immunization are among the highest.

A4.48.   Overall, at the time of this analysis, around half of Member States (93 of 187; 50%), that had submitted at least one TrACSS questionnaire had received a JEE and these are analysed by country income group and WHO region in Figure A4.14. Overall, JEEs had been conducted in more than three quarters of low-income countries (23 of 28; 82%) and over two thirds of lower-middle-income countries (32 of 47; 68%) as compared to just over one third of high-income countries (21 of 57; 37%). Almost all countries in AFR (41 of 43; 95%) had had JEEs as compared to only 2 (2 of 35; 6%) in AMR.[134]

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[126] See https://extranet.who.int/sph/jee (accessed 19 July 2021). The other areas are national legislation, policy and financing; IHR coordination, communication and advocacy; zoonotic disease; food safety; biosafety and biosecurity; immunization; national laboratory system; surveillance; reporting; human resources (animal and human health sectors); emergency preparedness; emergency response operations; linking public health and security authorities; medical countermeasures and personnel deployment; risk communication; points of entry; chemical events and radiation emergencies. In addition to specific AMR issues, many of these issues, e.g. vaccination, laboratory system, surveillance etc. are relevant to AMR.

[127] See https://www.who.int/health-topics/international-health-regulations#tab=tab_1 (accessed 19 July 2021)

[128] Initially, these were available on https://www.who.int/ihr/procedures/mission-reports/en/ (accessed 27 May 2021) but part way through the review this site became inaccessible (as part of process of revamping the WHO website). Similar data was presented on https://extranet.who.int/sph/jee (accessed 19 July 2021) but the format and content was different so the analysis was repeated and updated. One of the most striking features is the inclusion of a score for each capacity by country which is then aggregated by region and globally. However, it is unclear how these scores are calculated. Scores for a particular capacity in a particular country seem to be 20, 40, 60, 80 or 100, so perhaps the capacity overall is being graded A-E and then converted by scoring A as 20, B as 40, C as 60 etc. It does not appear that variations within elements of a capacity would be taken into account using this approach. Another difference is that details for more countries were available, presumably as the site had been updated. These included reports for a further 13 JEEs and details of 11 countries where JEEs were "*in the pipeline*". Details of these countries is available on request. They have not been included in the analysis presented here.

[129] But please also see footnote 128. One was specifically for the United Republic of Tanzania – Zanzibar while there were three for countries that had not submitted any TrACSS questionnaires – Gambia, Madagascar and Senegal.

[130] Where 1 is no capacity; 2 is limited capacity; 3 is developed capacity; 4 is demonstrated capacity and 5 is sustainable capacity

[131] As these cover many areas which are of relevance to AMR, e.g. laboratory capacity, surveillance, infection prevention and control, and immunization.

[132] There are four sub-areas for AMR and they vary slightly by template. In the first template, they were antimicrobial resistance detection; surveillance of infections caused by antimicrobial-resistant pathogens; health care-associated infection (HCAI) prevention and control programmes; and antimicrobial stewardship activities. In the second template, they were effective multisectoral coordination of AMR; surveillance of AMR; infection prevention and control; and optimize use of antimicrobial medicines for human and animal health and agriculture. There is some read across from these categories to the objectives of GAP AMR, particularly objectives 2-4.

[133] In the case of both templates, the average scores for area P3.4 (antimicrobial stewardship activities/optimize use of antimicrobial medicines in human and animal health and agriculture) is the lowest of any area (1.74 in first template and 1.63 in the second). In general, scores on the second template were lower than the first in three areas (P3.2, P3.3 and P3.4). Average scores increased for area P3.1 (from 2.17 to 2.50) but these appear to have been assessing quite different areas – antimicrobial resistance detection in template 1 and effective multisectoral coordination on AMR in template 2.

[134] It should be noted that in AMR the two countries that had JEEs (Canada and the United States of America) were both high-income countries.

Figure A4.14: Percentage of Members States that submitted at least one TrACSS questionnaire (n=187) that had a JEE (based on available data as of May 2021) **– analysed by country income group and WHO region**
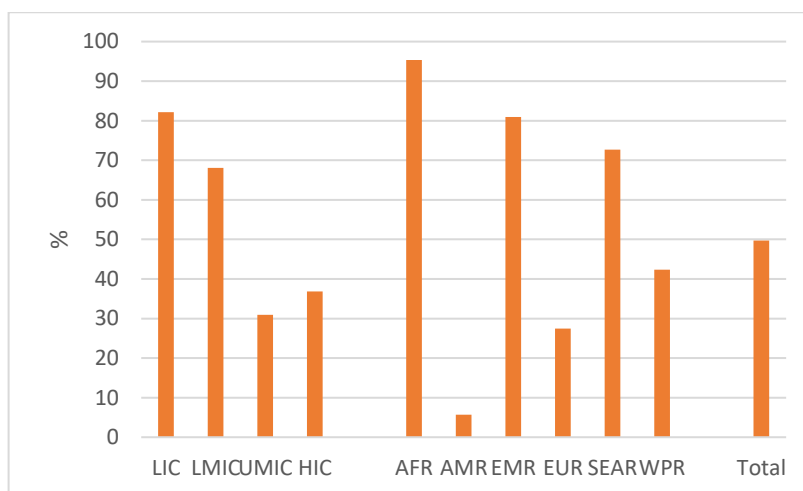
A4.49. Total scores were calculated for each country for the JEE as a whole and for the four AMR elements specifically. These scores were calculated in two ways. First, the score for each element[135] was totalled and converted to a percentage by dividing by the total possible score[136] and multiplying by 100. However, this approach, which is based on a 1-5 scale, gives countries 20% of the possible score even where there is no capacity. To address this[137], the second way of calculation converted the 1-5 scores to a 0-4 scale. These were then totalled and converted to a percentage by dividing by the total possible score[138] and multiplying by 100. The average scores for the JEE as a whole generated by the second method were lower than for the first method (44 vs 55 for template 1 and 33 vs 46 for template 2).[139] However, the second method is considered better than the first and it is this method that is used in the remainder of these notes.

A4.50. Figures A4.15 and A4.16 present data for average scores on JEE overall and AMR specifically analysed by country income level and WHO region. Both graphs show similar patterns. Scores are lowest in low-income countries (25 for JEE overall and 7 for AMR) and highest in high-income countries (76 for JEE overall and 65 for AMR). Scores are lowest in AFR (27 for JEE overall and 11 for AMR) and highest in AMR (86 for JEE overall and 69 for AMR).[140]

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[135] 48 in template 1 and 49 in template 2.
[136] 5*48 for template 1 and 5*49 for template 2.
[137] And to make the method more consistent with the graduated scoring system for assessing performance on the GAP AMR.
[138] 4*48 for template 1 and 4*49 for template 2.
[139] Similar findings were seen for the average AMR scores using the two methods (42 vs 28 for template 1 and 39 vs 24 for template 2).
[140] But, this is based on data from only two countries both of which are high-income.

Figure A4.15: Average percentage scores for JEE overall – analysed by country income group and WHO region
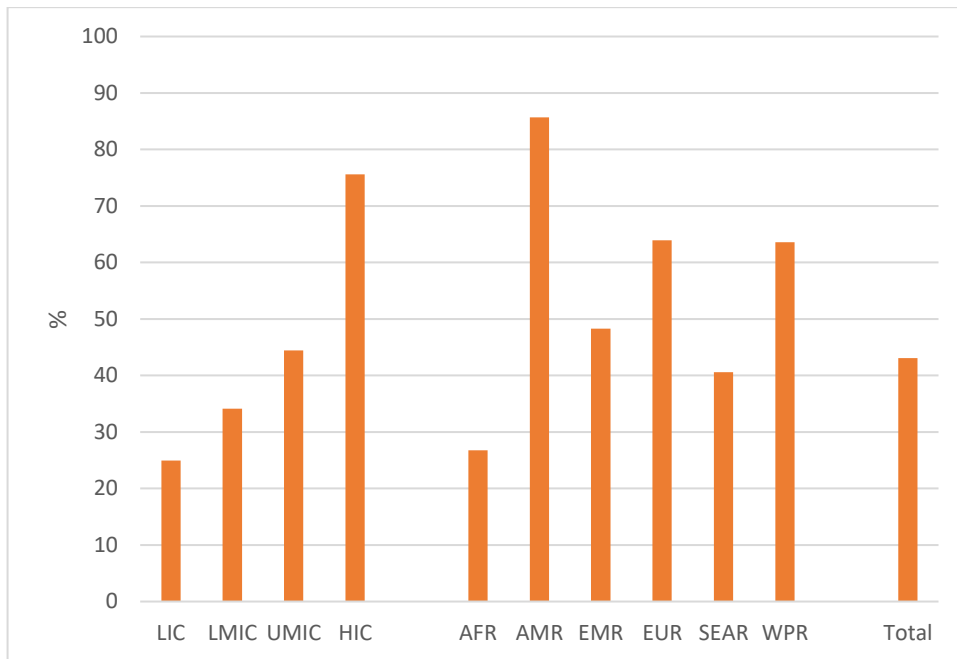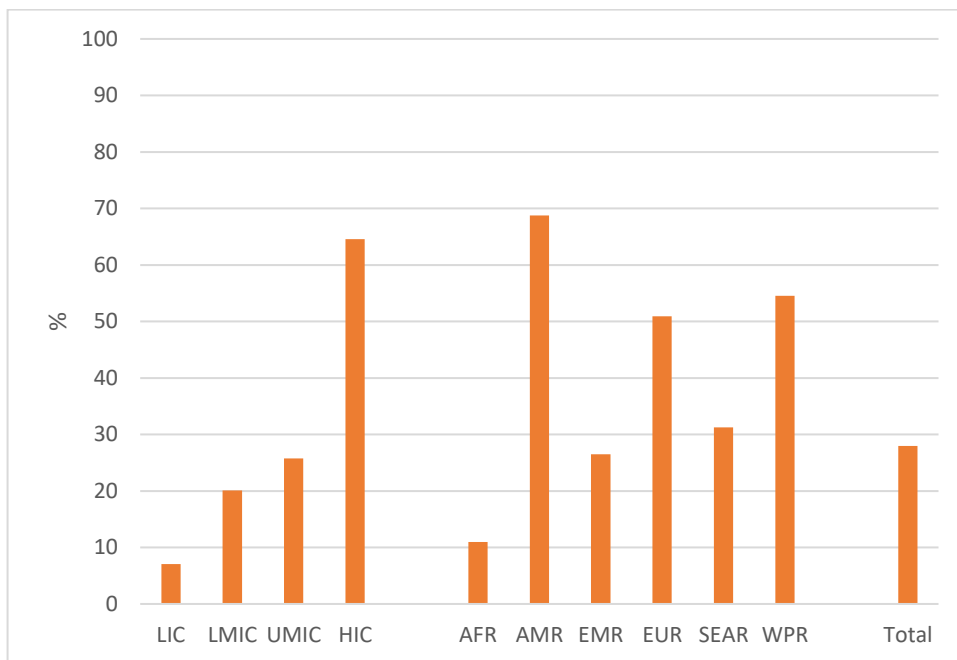

Figure A4.16: Average percentage scores for AMR – analysed by country income group and WHO region

A4.51.   There is a statistically significant correlation (*p<.001*) between both overall score on JEE and the JEE score on AMR and performance score on GAP AMR based on TrACSS data. These correlations are illustrated in Figures A4.17 and A4.18. These findings provide some evidence that data as reported through TrACSS is similar to data reported through JEEs and thus provide a degree of validation of TrACSS data.[141] However, at the individual country level, there may be large variations between performance scores based on TrACSS and scores generated from JEEs. This is particularly the case for countries with relatively low scores on AMR on JEEs. For example, countries which scored 0 for AMR on JEE[142] had performance scores ranging from 0 to 56. Possible explanations for this include:

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[141] Although with the caveat that the JEEs themselves are based on a negotiated, qualitative joint assessment
[142] That is all four elements were scored 1.

- That the AMR assessment in the JEE is based on four elements only while the scores generated through TrACSS are based on many more elements so perhaps present a more nuanced view.

- Timing differences – for example, in the case of the country that scored 0 for AMR on JEE but 56 on the performance score generated through TrACSS, the JEE was conducted in 2017 but the performance score was based on 2019 TrACSS data. This is important, particularly in this case, as this country showed high levels of improvement between baseline and endline based on TrACSS data.

Figure A4.17: Comparison of AMR performance score (using the graduated score method) with the overall score on joint external evaluation
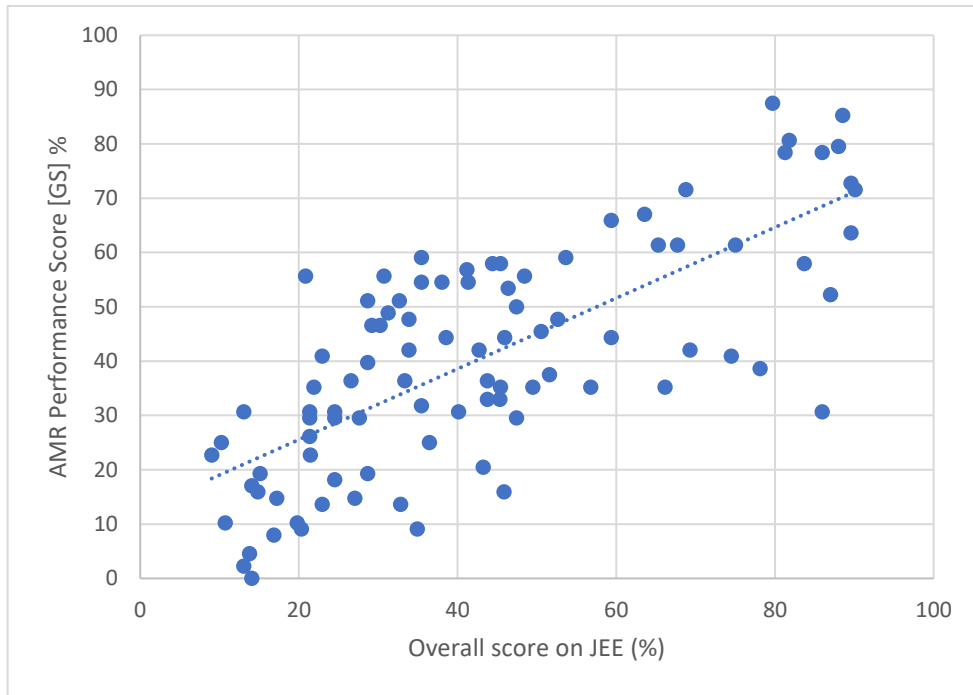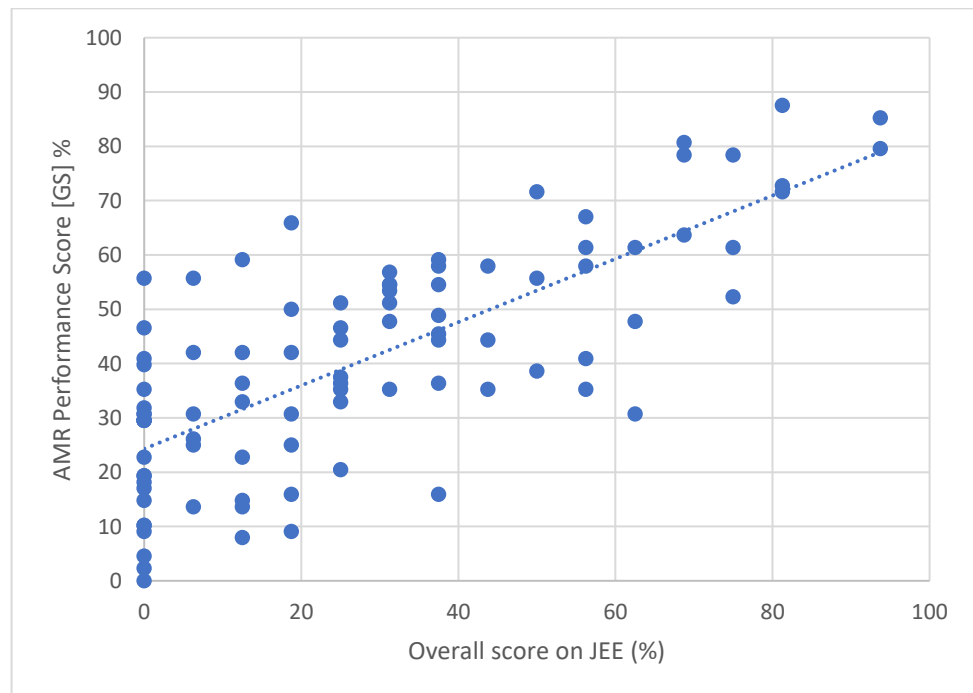

Figure A4.18: Comparison of AMR performance score (using the graduated score method) with the score for AMR elements of joint external evaluations

A4.52.   Table A4.13 briefly summarizes some of the differences and commonalities of using TrACSS and JEEs to assess progress on AMR. Overall, given the number of responses to TrACSS and the repeated nature of the survey, it makes sense to use TrACSS as the main source of routine data on AMR GAP. JEEs remain a useful means of validation of progress on AMR made by countries.

Table A4.13: Differences and commonalities between using TrACSS and JEEs to assess country progress on AMR

Differences	More Member States (187) have reported to TrACSS at least once than have had JEEs (96) although this number is growing.
	TrACSS is an annual process. So, many Member States have submitted multiple responses to TrACSS allowing trend analysis while no country has had more than one JEE.
	TrACSS is focused solely on AMR so allows assessment of more elements than JEE does in its specific AMR section (although other elements of the JEE have relevance to AMR).
	JEEs are more likely to be carried out in low- and middle-income countries. While countries in all income groups respond to TrACSS, there is a significant positive association between response rates and country income group.
	TrACSS is largely based on an A-E grading system while JEE uses a 1-5 system.
	TrACSS responses are official Member State self-assessments while the JEEs include a degree of external evaluation
Commonalities	Both TrACSS and JEEs rely on a five-point ranking/scoring system based on qualitative assessment
	Both TrACSS and JEEs may only reflect the perspectives of those involved in the process. Potentially, the JEEs may involve a broader group of national stakeholders. At least, the extent of involvement of national stakeholders can be observed in JEEs.

A4.53.   A qualitative analysis of the JEEs sought to identify common strengths and challenges raised in the JEEs. These are briefly summarized in Box A4.2.

Baseline Data

A4.54.   One major challenge facing consideration of progress of implementing the GAP AMR is that there is no formal or systematic baseline data. This is perhaps unsurprising as the monitoring and evaluation framework and the main data collection methods (TrACSS, GLASS etc.) were only introduced after the GAP AMR had been adopted. Indicator metadata does not present baseline data nor explain where this might be found. Many indicators are not yet fully defined and many lack any data at all (performance or baseline). While there are a number of reports that could, or are explicitly expected to, provide a baseline, the data in these is only available in an analyzed or aggregated form. Raw data sets do not appear to be available.

A4.55.   This survey and its results could potentially provide baseline data for the indicator[143] for outcome 1 in the GAP AMR monitoring and evaluation framework. However, indicator metadata has not yet been developed so it is not possible to know if questions asked/data collected will be comparable to survey data. In addition, the brief indicator description implies that the focus of the indicator will be on particular stakeholder groups and not the general public. Given this, it is not clear how this survey could provide useful baseline data to monitoring of the GAP AMR M&E framework.

A4.56.   Another potential source of baseline data is a worldwide country situation analysis conducted by WHO in 2015.[144] This was based on asking Member States to complete a questionnaire between 2013 and 2014. A total of 132 Member States (68%) responded which is a similar but lower response rate to the four rounds of TrACSS (see Table A4.3, p36). Response rates by WHO region, country income group and overall are shown in Figure A4.19. In general, response rates were higher in EUR (49 of 53, 92%), SEAR (11 of 11, 100%)

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[143] Percentage of stakeholders (e.g. human and animal health workers, prescribers, farmers, food processing workers) that have knowledge about AMR and implications for antimicrobial use and infection prevention.
[144] See https://apps.who.int/iris/bitstream/handle/10665/163468/9789241564946_eng.pdf?sequence=1 (accessed 19 July 2021).

and WPR (26 of 27, 96%) than in AFR (8 of 47, 17%). Response rates were much higher in high-income countries (46 of 58, 79%) than in low-income countries (10 of 30, 33%). This difference is statistically significant ($p<.001$). Mean number of responses to the four rounds of TrACSS was higher in those Member States that responded to this survey (3.46) than those that did not (2.31).[145] This difference is also statistically significant ($p<.001$).

A4.57. Topics covered in this situation analysis are similar to some of the topics[146] that were covered later in TrACSS including national plans and other strategies; surveillance and laboratory capacity; access to quality-assured antimicrobial medicines; use of antimicrobial medicines; public awareness; and infection prevention and control programmes. The situation analysis report presents data aggregated by region across these topics. This data is potentially useful as it does present the situation that existed prior to the adoption of the GAP AMR and it covers topics and questions that are reflected in TrACSS and the GAP AMR monitoring framework. More than two thirds of Member States responded to this survey. However, there are substantial limitations. First, the source data (i.e. by country) is not publicly available.[147] In addition, there does not seem to be clear metadata[148] and the questionnaire is not annexed to the report.

Figure A4.19: Percentage of Member States responding to survey by country income group, WHO region and overall
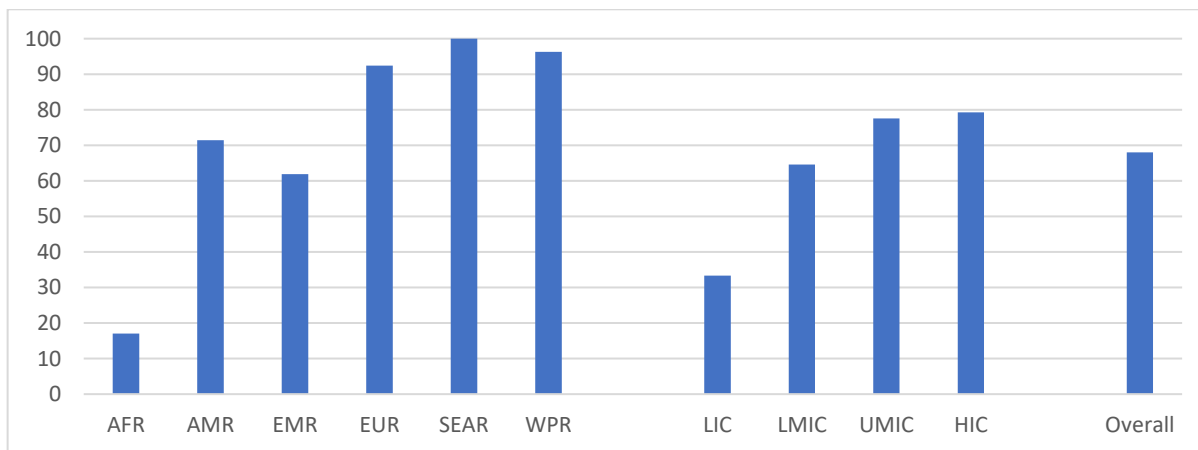
A4.58. In the absence of formal and systematic baseline data, the review team have effectively created baseline data by taking the first data reported (e.g. to TrACSS) as a country baseline. Limitations of this approach include that such data risks overlooking early improvements as it does not pre-date the GAP AMR, may not be fully comparable to later performance data (particularly where questions/indicators have changed) and may be for different dates for different countries. Nevertheless, the importance of baseline data is such that the review team have calculated baseline data for TrACCS responses using this method. In the view of the review team, this approach is preferable (in the context where systematic approaches to baseline data collection are not available) to discounting the issue of baseline and/or taking a much later baseline (when more comparable data sets are considered to be available).

Documents

A4.59. A large number of documents have been provided, particularly by the WHO Secretariat, but also by other informants. Most of these were collected during the secondary data collection phase of this review, but some were collected during inception and also during the primary data collection phase. A full list of all these documents is given as Annex 2 (p6). Where specific documents are referred to in the report's

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[145] Three Member States (Bosnia and Herzegovina, Gambia and Niue) that responded to this survey did not respond to any of the four rounds of TrACSS.

[146] The situation analysis is very focused on the issue of human health.

[147] Nor is it available to or through the AMR M&E team.

[148] For example, it is not clear what denominator calculations are using. Figures in the report seem to use total number of Member States in a region while the narrative seems to use the number of Member States that responded. This is confusing and unclear.

narrative, details are given as a footnote. Where possible, URLs have been provided to aid the reader to quickly access referred material.[149]

A4.60. The primary data collection phase started as expected in May 2021. It ran over into early/mid-July because of some delays in receiving contact information for some stakeholders, delays in responses to requests for interviews and issues of availability for some respondents. The main method for primary data collection was through semi-structured interviews with identified key informants. These interviews used the topic guides identified in the inception report[150] and these were not formally modified for the data collection phase. However, interviews were tailored to specific respondents and respondents were also given considerable freedom to structure and shape the interview as they wished. Interviews were not (audio) recorded but the interviewer took brief notes which were shared among the team. To allow interviews to be conducted as efficiently as possible, most were conducted by a single team member. One team member (AT) took responsibility for interviews with WHO HQ while the other (RD) took responsibility for interviews with WHO COs/ROs and partners. All interviews were conducted remotely (through Zoom or Teams). Almost all interviews were conducted in English although one interview was conducted in French.[151] Most of the interviews were conducted with individuals but some were conducted with small groups where this was requested by respondents.

A4.61. The groups of stakeholders who would be interviewed were identified in the inception report. Specific respondents were identified as follows:

- A list of potential interviewees within WHO headquarters was compiled by the AMR Division. This included people within the Division and also people from other areas of work including IPC, WASH, essential medicines, vaccines, TB etc.
- The AMR Division also provided lists of names and contact details of members of both the former and new STAG.
- Regional leads on AMR had been identified by the review team/ Evaluation Office during inception.
- A list of partners that worked closely with the WHO Secretariat on AMR was provided by the AMR Division. In addition, a small number of additional partners were identified by respondents during interviews. WHO's Evaluation Office identified counterparts within the Evaluation Office of FAO.[152]

A4.62. The various lists of stakeholders were cross-checked and where individuals appeared on more than one list, e.g. partners who were also members of STAG, they were contacted only once.

A4.63. Interviewees during the inception period emphasized the importance of gaining perspectives from WHO Country Offices. They also stressed that fuller and more accurate details would probably be gained by interviewing those in country offices working on AMR than from sending them a survey or questionnaire. With this in mind, it was decided to offer interviews to some Country Offices. These were identified based on country submissions to TrACSS as follows:

- A graph was constructed of implementation score (based on TrACSS reports) and GNI per capita. Ten countries above the trend line were identified, i.e. these countries were reporting that they were performing better than might be expected based on income level.

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[149] A note of caution is needed here. The review coincided with a major revamp of the WHO website. Every effort has been made to ensure working links are provided and a date is provided as to when the team last checked this. However, given the ongoing work to revamp the WHO website and the experience of the team, it is likely that some links may not operate fully in future.

[150] See Annex 5 of the inception report.

[151] The review team was unable to offer interviews in Spanish. One WHO Country Office declined to be interviewed in English but offered to send written responses in Spanish. However, the review team did not receive any such written responses.

[152] OIE does not have a separate Evaluation Office.

- A similar graph was constructed of change in implementation score (based on TrACSS reports) from baseline and GNI per capita. Twelve countries above the trend line were identified, i.e. these countries had reported more marked improvements than might be expected.
- A graph was constructed comparing implementation score on areas of health other than human health with implementation score on human health. Seven countries above the trendline were identified, i.e. these countries had reported higher levels of performance on areas of health other than human health as compared to their performance with regard to human health.[153]

A4.64. Once potential respondents had been identified, they were contacted by email inviting them to take part in an interview. These invitations were sent either by WHO's Evaluation Office or by a member of the review team. The email provided some details of the review (including the terms of reference), some idea of what the interview might cover and an explanation of more practical matters. Once a response was received a suitable date and time slot was agreed. In general, interviews lasted between 45 minutes and one hour. On starting the interview, an explanation was given as to the nature of the review, the purpose of the call and logistical matters. Respondents were given the opportunity to comment or to ask questions. Where no response was received to the initial email, a follow up email was sent after about a week. If there was still no response, a decision was taken by the review team whether to ask for assistance with securing an interview, either through the Evaluation Office or through the AMR Division.

A4.65. For the proposed interviews with Country Offices, the Country Offices proposed were first discussed with the relevant Regional Office. In a few cases, the Regional Office suggested additional Country Offices that might also be interviewed. This was usually on the basis of ensuring representativeness across and within regions. In the case of WPR, it was not possible to offer interviews to Country Offices in that region because of delays in scheduling the interview with WPRO. In other regions, following discussions with the relevant Regional Office, email invitations were sent by WHO's Evaluation Office to the relevant WHO Representative. In addition to the offer of interviews, all other Country Offices were sent a short set of questions by email to which they were invited to respond. These questions were either sent directly by the Evaluation Office or by the relevant Regional Office.[154] Five responses were received.

A4.66. Table A.14 provides details of the different stakeholder groups interviewed including an analysis of the expectations expressed in the inception report. Fuller details are provided in Annex 3 (p23). Respondents were advised that they would not be directly cited but that their names would be included in a list as an annex. One respondent asked not to be identified in this way and this wish was respected.

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[153] In two cases, countries appeared in two categories and one country appeared in all three categories. As a result, the total number of country offices initially identified for interview was 25.
[154] The questions asked were:
- To what extent is antimicrobial resistance (AMR) a priority issue for WHO in your country?
- What financial resources are available to the country office in relation to AMR? (Please give amounts and sources distinguishing flexible and non-flexible/project funding)
- Do you have a focal point on AMR within your country office? If yes, what proportion of their time do they dedicate to AMR?
- In terms of the country's response to AMR what is going well and what challenges or bottlenecks exist?
- In terms of WHO support to the country's response to AMR what is going well and what challenges or bottlenecks exist?

Table A.14: Details of different stakeholder groups interviewed

Stakeholder Group	Number Expected	Number Interviewed	Comment
WHO Headquarters	20-30	28	Potential respondents in WHO headquarters were identified by the AMR Division on the basis of key people they were working with. However, seven people declined to be interviewed on the basis that they knew little about AMR or had little to contribute.
WHO Regional Offices	6-18	9	
WHO Country Offices	Not stated	37	Of these respondents, five responded in writing. Responses were received from the following country offices (* indicates written response) – Azerbaijan, Bangladesh, Belarus, Burkina Faso, Chad*, Democratic People's Republic of Korea*, Ghana, Jordan, Liberia*, Mexico, Myanmar, Nepal, Papua New Guinea*, Philippines*,Russia, Tajikistan, Tanzania, Thailand, Zimbabwe.
STAG Members	Not stated	9	Of these, seven were current STAG members and two were former STAG members. In two cases, these responses were submitted in writing.
IACG convenors	Not stated	2	Two of the co-convenors were interviewed. The AMR Division suggested that there was no need to interview IACG members as they had completed their work and the IACG was not specifically mandated by the GAP. However, given the relevance of their work to the GAP and the potential importance of both their work and their report, the Evaluation Office decided that the review team should seek to interview the three co-convenors. Responses were received from two of them.
FAO/OIE/UNEP	Not stated	6	Although no-one from UNEP was identified initially by the AMR Division when asked to identify key partners for interview, it became clear that many stakeholders saw UNEP as a (potential) key partner. So, the Evaluation Office decided that the review team should interview someone from UNEP and this was arranged directly.
Partners	Not stated	24	
Total	**35-65**	**115**	

A4.67. As can be seen from Table A4.14, the number of people interviewed was almost double the maximum expected in the inception report. This was partly because the number of partner interviews was underestimated but also because a decision was taken to offer interviews to some WHO Country Offices and the number of people interviewed in this way was relatively large.

A4.68. Finally, the review team received an invitation from one of the former co-convenors of the IACG to attend a civil society virtual meeting on 26 July 2021 and this meeting was attended.[155] Details of participants are included in Annex 3 (p23).

Phase 4: Analysis and reporting

A4.69. Following the data collection phase, on 13 July 2021, the review team met virtually to review and summarize the evaluation's main findings and to begin to identify key conclusions and recommendations. These were consolidated into a summary and main report (this document). Throughout this analysis process, comparisons were made between quantitative and qualitative data from different sources in order to answer and address the agreed evaluation questions. The reports were then shared with WHO's Evaluation Office.

4.3. Limitations

A4.70. As with all reviews of this nature, there are a number of potential limitations and these are briefly discussed here. First, there are some limitations imposed by the scope of the review. Although the GAP AMR was developed as a WHO document, subsequent endorsement by FAO and OIE and establishment of the tripartite means that, in many ways, it is implemented as a joint initiative albeit with WHO leading. However, rather than initiating a joint review, this review was established as a WHO review, led by the WHO Evaluation Office. This made sense as, for example, FAO had recently completed an evaluation of their own work on AMR. This approach did create some tensions between the expectation of conducting a

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[155] A set of PowerPoint slides were used for this meeting and these were made available to the review team. They are titled *Comprehensive Review of the Implementation of the WHO Global Action Plan on Antimicrobial Resistance*

comprehensive review of the GAP AMR and the mandate of the review which was perhaps restricted to WHO. This issue was addressed during inception by using the concept of a WHO lens meaning that the review would look at the actions of WHO Member States and Secretariat and WHO's interaction with others. This approach was followed during the remainder of the review and has proved relatively unproblematic. The review team has sought to collaborate closely with other tripartite partners, FAO and OIE.

A4.71.   The absence of an agreed theory of change for the GAP AMR meant that the review team needed to use an alternative framework for the review. This used the results chain in the GAP's M&E framework linked to the GAP AMR's own objectives. A draft theory of change developed by one of the AMR Division's departments was used to interrogate this approach and to identify a number of additional areas to explore beyond those mentioned explicitly in the results chain/GAP objectives. The framework for this review is discussed in more detail in paragraphs A4.2-A4.5 (pp27-28).

A4.72.   Given the review's reliance on secondary data (particularly from GLASS and TrACSS), the quality and availability of such data is a major factor in determining the quality and rigour of the review. These matters have been discussed in some detail in paragraphs A4.18-A4.31, pp35-45 but they are briefly summarized here. First, there is very limited availability of outcome data, e.g. on AMR rates. Where such data exists, e.g. from GLASS, there are significant doubts over the quality and representativeness of the data. As a result, the review has mostly focused on process issues. While this is appropriate for a review of this nature, this issue is likely to be more problematic for subsequent reviews and evaluations.

A4.73.   The review relies largely on TrACSS data and there are concerns that this is largely self-reported by country governments. This is a valid concern and needs to be considered when reviewing TrACSS data. However, this review has shown very strong correlation between TrACSS and JEE data providing a degree of validation of the former. Understanding the processes followed for TrACSS reporting and obtaining feedback from others, e.g. development partners, civil society, on the data reported, are probably the most practical and effective means of verifying TrACSS data. There are also some issues about trend analysis of TrACSS data given changes in questions over time. However, these issues may have been overstated in previous TrACSS reports and do not justify exclusion of entire rounds of TrACSS data. The review's approach has been to include all data collected and to consider possible methodological artifacts when analyzing the results observed.

A4.74.   The absence of formal and systematic baseline data is a major limitation and it is of concern that maximal use of baseline data is not being made (see paragraphs A4.54-A4.58, pp58-60). The review team dealt with this by using countries' first reported data (e.g. to TrACSS) as a baseline. However, this means that some implementation time has been lost and different countries have different baseline dates.

A4.75.   In general, the indicators in the M&E framework are mainly focused on Member States and there does not appear to be an agreed indicator set for assessing the progress of the WHO Secretariat and partners. This is a limitation. In the case of WHO, the review team has sought to refer back to expected actions of the Secretariat in the GAP AMR. However, these are not defined in particular concrete terms and there are no performance indicators. In addition, the WHO Secretariat has not been reporting systematically against these or any other framework.

A4.76.   The review team had some issues in accessing data, particularly raw data. For example, raw data for GLASS is not readily available and the WHO Secretariat were unable to provide raw data for sources of potential baseline data, e.g. the worldwide country situation analysis (see paragraph A4.56, p59). This has meant that, in some cases, the review team has needed to rely on aggregated or analysed data. In general, the review team has tended to focus more on data sets where raw data is readily available, e.g. from TrACSS. There was also a specific issue relating to the WHO website which was revamped during the review. Links

to the old site no longer worked and there was no redirection facility. This had two implications for the review. First, it meant that some documents could not be identified and second, it meant that all the documented weblinks had to be checked to identify whether they were affected by the revamp or not. If they were, the link either had to be excluded or the correct link had to be found, usually through the use of an Internet search engine. There were particular problems with accessing reports of the joint external evaluations following the website revamp. There were also difficulties accessing financial data in terms of funds needed and available to AMR responses including within the WHO Secretariat.

A4.77. The review was carried out during the COVID-19 pandemic. This meant that all interviews were conducted virtually. It also meant that some respondents were either not available due to COVID-related responsibilities or their responses were delayed. There were also some other events going on at the same time as the review which had some effect on stakeholders' responsiveness. These included the World Health Assembly and a major consultation about GLASS.

A4.78. It was not possible to conduct country case studies and these might have been the best way of determining why particular countries are (or are not) making progress. The review did seek to try to understand these factors but then presented these in aggregated format rather than as specific country case studies.

A4.79. However, while there were some limitations to the evaluation and its processes, efforts were made to mitigate these producing a robust, rigorous and high-quality review of the GAP AMR.

Annex 5: Progress in Implementing Secretariat Actions from the GAP

Action	Assessment of progress	Progress rating
Objective 1: Improve awareness and understanding of antimicrobial resistance through effective communication, education and training		
i. Develop and implement global communication programmes and campaigns, including an annual world antibiotic awareness campaign, building on existing regional and national campaigns and in partnership with other organizations (e.g. UNESCO and UNICEF). Provide core communication materials and tools (including those for social media and for assessing public awareness and understanding) that can be adapted and implemented by Member States and others.	WHO has conducted World Awareness Week campaigns since 2016, engaged in year-long campaigns (Handle with Care, Smartphone for Change) with FAO, OIE and other organizations. WHO distributes toolkits for countries during these campaigns and does outreach throuhg social media platforms. WHO has also produced guidance for countries (curriculum for health workers' education and training on antimicrobial resistance; competency framework for health workers; curriculum for cleaning staff in maternity wards).	Good progress
ii. Develop, with FAO and OIE through the tripartite collaboration, core communication, education and training materials that can be adapted and implemented regionally and nationally, on subjects that include the need for responsible use of antibiotics, the importance of infection prevention in human and animal health and agricultural practice, and measures to control spread of resistant organisms through food and the environment. Provide support to Member States with the integration of education on antimicrobial resistance into professional training, education and registration.	Some products were developed (see above) by WHO. WAAW is a joint event of the Tripartite. However, there are limited join training materials on AMR for countries to implement. Some countries have integrated education on AMR in their NAPs; but this does not necessarily mean that this education is taking place.	Some progress
iii. Publish regular reports on progress in implementing the global action plan and progress towards meeting impact targets, in order to maintain commitment to reducing antimicrobial resistance.	The Secretariat provides updates through TrACCS and reports to the governing bodies. However, there are challenges in reporting at the impact level. In addition, not all TrACCS rounds have been documented in a report.	Some progress
iv. Maintain antimicrobial resistance as a priority for discussion with Member States through the regional committees, the Executive Board and Health Assembly, and with other intergovernmental organizations, including the United Nations.	AMR is consistently in the agenda of governing bodies' meetings (except for 2020-2021, with fewer reports). Some reports are made in the UNGA.	Good progress
Objective 2: Strengthen the knowledge and evidence base through surveillance and research		
i. Develop and implement a global programme for surveillance of antimicrobial resistance in human health, including surveillance and reporting standards and tools, case definitions, external quality assessment schemes, and a network of WHO Collaborating Centres to support surveillance of antimicrobial resistance and external quality assessment in each WHO region.	•GLASS launched in October 2015, with number of countries reporting data increasing each year. •GLASS provides a standardize approach to the collection, analysis, and sharing of AMR data. Most NRLs participate in an EQA scheme, and, in most countries, territories and areas enrolled in GLASS, reporting laboratories perform AST according to internationally recognized standards (GLASS report 2020) •GLASS is supported by the WHO AMR Surveillance and Quality Assessment Collaborating Centres Network.	Good progress
ii. Develop, in consultation with Member States and other multisectoral stakeholders, standards for the reporting, sharing and publication of data on antimicrobial resistance that take into account established practices for global disease surveillance and reporting, as well as legal and ethical requirements.	Reporting of data through GLASS is standardized.	Good progress
iii. Report regularly on global and regional trends in the prevalence of antimicrobial resistance in human health.	GLASS is not able to generate comparable data at the regional and global levels on the prevalence of AMR in human health due to differences in sampling, capacity, etc. It's unlikely that a sentinel surveillance system could do that.	Little progress
iv. Work with FAO and OIE, within the tripartite collaboration, to support integrated surveillance and reporting of antimicrobial resistance in human and animal health and agriculture, and develop measures of antimicrobial resistance in the food chain for use as indicators of risk to human health.	Since 2018, the Tripartite Organizations have been working towards an integrated surveillance system on antimicrobial resistance, starting with the establishment of a platform to link initiatives and work towards a standardized data-sharing methodology: TISSA (Tripartite Integrated Surveillance System for AMR).	Some progress
v. Develop a framework for monitoring and reporting on antimicrobial consumption in human health, including standards for collection and reporting of data on use in different settings, building on the work of OECD.	WHO developed a M&E framework with recommended indicators, which include human consumption.	Some progress
vi. With FAO and OIE, within the tripartite collaboration, collect, consolidate and publish information on the global consumption of antimicrobial medicines.	The monitoring of global antimicrobial consumption and use has been incorporated into the GLASS platform. In 2018, WHO published a Report on Surveillance of Antibiotic Consumption. No joint products published yet.	Some progress
vii. Consult Member States and other multisectoral stakeholders for the development of a global public health research agenda for filling major gaps in knowledge on antimicrobial resistance, including methods to assess the health and economic burdens of antimicrobial resistance, cost–effectiveness of actions, mechanisms of development and spread of resistance, and research to underpin development of new interventions, diagnostic tools and vaccines. Monitor and report on implementation of the research agenda, for instance through the use of WHO's Global Health Research and Development Observatory.	No global research agenda to date.	Little progress
viii. Work with partners to establish a sustainable repository for information on antimicrobial resistance and on the use and efficacy of antimicrobial medicines that is integrated with the global health research and development observatory and with a programme for independent evidence assessment and evaluation	Global Observatory on Health R&D gives users access to a variety of health R&D-related information on the WHO website. No evidence of a programme for independent evidence assessment and evaluationto review the materials going to the Global Observatory on Health R&D.	Some progress

Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

i. Facilitate the design and implementation of policies and tools to strengthen hygiene and infection prevention and control practices, particularly to counter antimicrobial resistance, and promote the engagement of civil society and patient groups in improving practices in hygiene and infection prevention and control.	WHO developed Advanced Infection Prevention and Control Training to combat AMR in 2019; published Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, Acinetobacter baumannii and Pseudomonas aeruginosa in health care facilities; Minimum requirements for IPC programmes; global guidelines for the prevention of surgical site infection. Insufficient evidence of promoting the engagement of civil society and patient groups.	Some progress
ii. Ensure that policy recommendations for new and existing vaccines take into account the prospects for restricted treatment options because of antimicrobial resistance, and the additional benefits of reduced use of antimicrobial agents, including antibiotics.	WHO developed an action framework that describes a vision for vaccines to contribute fully, sustainably and equitably to the prevention and control of antimicrobial resistance by preventing infections and reducing antimicrobial use.	Some progress
iii. Work with partners and other organizations to facilitate the development and clinical evaluation of specific priority vaccines for the prevention of difficult-to-treat or untreatable infections.	Global Vaccine Action Plan (GVAP) framework, involving several partners, was in place from 2012 to 2020. Next decade's global immunization strategy has not been drafted to date.	Little progress
iv. Work with FAO and OIE, within the tripartite collaboration, to develop recommendations for the use of vaccines in food-producing animals, including recommendations for new vaccines, as a means to prevent foodborne diseases in humans and animals and reduce antimicrobial use.	WHO developed the GUIDELINES ON USE OF MEDICALLY IMPORTANT ANTIMICROBIALS IN FOOD-PRODUCING ANIMALS in 2017 (not a Tripartite document)	Little progress

Objective 4: Optimize the use of antimicrobial medicines in human and animal health

i. Strengthen and align, within the tripartite collaboration with FAO and OIE, the concepts of critically important antibiotics for human and animal health, and ensure that these concepts include use of new antibiotics so that a common position on restriction of antimicrobial medicines for human use can be established.	WHO revised its Critically Important Antimicrobials for human medicine list in 2018 after Tripartite meetings and consultations. OIE published its list of antimicrobials of veterinary importance. The WHO Model Lists of Essential Medicines also helps guide the use of antibiotics.	Some progress
ii. Provide support to Member States in the development and enforcement of relevant regulations so that only, quality assured, safe and effective antimicrobial products reach users.	The WHO regional offices are working to establish and strengthen antimicrobial stewardship programmes. This includes antimicrobial stewardship training-of-trainers workshops and webinars; support for the adoption of the AWaRe classification in national essential medicines lists and/or national formulary; implementing and promoting programmes on antimicrobial stewardship in hospital and community settings; webinars and advocacy on food safety and its links to antimicrobial resistance; and a pooled procurement mechanism in small island developing States and the Southern African Development Community, to ensure that first-line antibiotics are available and affordable. WHO published Antimicrobial stewardship programmes in health care facilities in low- and middle-income countries: A practical toolkit, to guide country implementation of antimicrobial stewardship at national and facility level. The toolkit is available in multiple languages. It is also developing new policy guidance for national authorities on establishing integrated antimicrobial stewardship activities.	Some progress
iii. Develop technical guidelines and standards to support access to, and evidence-based selection and responsible use of, antimicrobial medicines, including follow-up to treatment failure.	•In 2021, WHO published a guidance document on integrated antimicrobial stewardship activities. Its package of integrated AMS activities include ensuring access to an regulation of antimicrobials. •WHO Model List of Essential Medicines (EML) and Access, Watch, Reserve (AWaRe) classification can be used to develop national policies on the use of antimicrobial medicines. • A Practical Toolkit on Antimicrobial Stewardship in health facilities has been published (in all UN langs) which includes selection and use of quality antimicrobials for patients: https://www.who.int/publications/i/item/9789241515481 •A complimentary infographic: https://apps.who.int/iris/bitstream/handle/10665/330270/WHO-MVP-EMP-IAU-2019.14-eng.pdf?sequence=1&isAllowed=y	Some progress
iv. Provide leadership to strengthen medicines regulatory systems at national and regional levels, so that appropriate practices for optimizing use of antimicrobial medicines are supported by appropriate and enforceable regulation, and that promotional practices can be adequately regulated.	WHO supports national regulatory authorities in combating antimicrobial resistance by: (a) Strengthening their ability to oversee the development, evaluation, marketing and surveillance of medical products through the objective assessment of regulatory systems against international standards; (b) Accelerating the registration and access to pre-qualified, quality-assured medical products for the treatment and prevention of priority infectious diseases; (c) Strengthening their ability to prevent, detect and respond to substandard and falsified antimicrobial products, which are a major risk in the development of antimicrobial resistance, including through the Global Surveillance and Monitoring System and a member State mechanism on substandard and falsified medical products •WHO Model List of Essential Medicines (EML) and Access, Watch, Reserve (AWaRe) classification can be used to develop national policies on the use of antimicrobial medicines.	Some progress

v. Consult with Member States and pharmaceutical industry associations on innovative regulatory mechanisms for new antimicrobial medicines, for example considering them as a class of medicine that will require a different set of regulatory controls, and on new approaches to product labelling that focus on public health needs rather than marketing claims, in order to address the need for preservation of effectiveness and for global access.	•Development of a Global Framework for Development and Stewardship – based on member states consultation: https://www.who.int/phi/news/WHO_OIE_FAO_UNEP_Working_paper_of_the_framework_FINAL.pdf •Collaboration with the Global AMR R&D Hub: https://globalamrhub.org/ •A important new initiative is the AMR Action Fund, a partnership that was set up by a coalition of pharmaceutical companies, philanthropies, the European Investment Bank, with the support of the WHO, that aims to strengthen and accelerate antibiotic development through global pooled funding. The Fund is expected to play an important role in ensuring that the most innovative and promising products receive the required funding. •A new initiative has been established SECURE. SECURE is an access initiative that accelerates and expands access to essential antibiotics. Cited by G7 Health Ministers in communique, June 2021 "We appreciate the SECURE initiative to develop proposals for a new international antibiotic pooled procurement scheme."	Some progress
vi. Develop standards and guidance (within the tripartite collaboration with FAO and OIE), based on best available evidence of harms, for the presence of antimicrobial agents and their residues in the environment, especially in water, wastewater and food (including aquatic and terrestrial animal feed).	No new guidance found apart from the existing WHO Briefing Note Antimicrobial Resistance: An Emerging Water, Sanitation and Hygiene Issue (2014)	Little progress
Objective 5: Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions		
i. Work with the United Nations Secretary-General and bodies in the United Nations system to identify the best mechanism(s) to realize the investment needed to implement the global action plan on antimicrobial resistance, particularly with regard to the needs of developing countries.	The UN high-level political declaration on AMR (Resolution A/RES/71/3) states that all R&D efforts should be "needs-driven". Needs-driven R&D in draft Global Framework for Development and Stewardship. •Refer to follow up from the IACG recommendations, and in particular the establishment of the AMR Multi-Partner Trust Fund: http://mptf.undp.org/factsheet/fund/AMR00. •https://www.who.int/activities/fostering-international-cooperation-on-antimicrobial-resistance for more details on multilateral cooperation on AMR.	Some progress
ii. Work with the World Bank and with other development banks to develop and implement a template or models to estimate the investment needed to implement national action plans on antimicrobial resistance, and to collate and summarize these needs.	Collaborated with the World Bank to support a landscape analysis of the Tools for NAP implementation, including for Costing of NAPs.	Insufficient evidence
iii. Work with the World Bank and with FAO and OIE, within the tripartite collaboration, to assess the economic impact of antimicrobial resistance and of implementation of the action plan in animal health and agriculture.	World Bank report: Drug-Resistant Infections: A Threat to Our Economic Future (2017) responds to "WHO's direct request to the World Bank to help make the case for AMR investments." WB estimated that AMR could cause a 3.8 percent reduction in annual gross domestic product (GDP) by 2050.	Little progress
iv. Explore with Member States, intergovernmental organizations, industry associations and other stakeholders, options for the establishment of a new partnership or partnerships:	Establishment of the Global Antibiotic Research and Development Partnership in 2015 to promote innovative solutions to the challenge of antibiotic resistance; mobilize funding and provide strategic direction, advocacy and support to connect leadership from the public and private sector	Some progress

• to coordinate the work of many unlinked initiatives aiming to renew investment in research and development of antibiotics (including followup initiatives from the Consultative Expert Working Group on Research and Development);		Good progress
• to identify priorities for new treatments, diagnostics and vaccines on the basis of emergence and prevalence of serious or lifethreatening infections caused by resistant pathogens;	•Priority Pathogens List published by WHO in 2017 •GARDP aims to accelerate development of new treatment options for those who need them most, while ensuring	Good progress
• to act as the vehicle(s) for securing and managing investment in new medicines, diagnostics, vaccines and other interventions;	• A European Union-based joint programming initiative on antimicrobial resistance has mapped the funding of research on antimicrobial resistance in relation to therapeutics, diagnostics, surveillance, transmission, the environment and interventions.	Some progress
• to facilitate affordable and equitable access to existing and new medicines and other products while ensuring their proper and optimal use;	•WHO Model List of Essential Medicines (EML) and Access, Watch, Reserve (AWaRe) classification provide guidance on the use of antimicrobial agents;	Little progress
• to establish open collaborative models of research and development in a manner that will support access to the knowledge and products from such research, and provide incentives for investment.	•See details of pipeline analyses, target product profiles to guide R&D (also available in Global Health Observatory) and collaboration with GARDP. https://www.who.int/activities/coordinating-r-and-d-on-antimicrobial-resistance	
Other actions not specifically included in the framework		
Objective 1		
Country-level accountability mechanisms; and Global accountability mechanisms – to ensure political commitment		
Importance of behavior change among targeted populations, and use of social science methodologies and behavioural insights to advance AMR mitigation		
Objective 2		
Diagnostics and Laboratory strengthening – at national and sub-national level to support surveillance		
Support for establishing Information Systems to capture AMR, AMU, AMC data in countries – at national, regional and facility level		
Objective 5		
Need for engaging with the private sector and import/export trade associations to support surveillance of Antimicrobial Consumption (AMC)		
Health systems		
Coordination with Health Systems Strengthening (UHC/PHC) strategies, and the Global Health Security Agenda (emergency preparedness and response activities)		
Multisectoral collaboration/One Health		
Supporting multisectoral governance (how to establish effective and functioning multisectoral coordination and collaboration in countries)		
GAP/NAPs		
Establish a multi-year GAP Operational Budget and resource mobilization strategy to support the implementation and monitoring of GAP AMR		
Establish Global goals/ targets; and guidance for national goals and targets;		

Insufficient evidence	
Little progress	
Some progress	
Good progress	

Annex 6: Secondary Data Review (April 2021)

Summary

A6.S1. This report is a review of secondary data carried out as phase two of a comprehensive review of the Global Action Plan on Antimicrobial Resistance (GAP AMR). It is based on the GAP AMR monitoring and evaluation (M&E) framework. It identifies a results chain for the GAP AMR, indicators to monitor progress and a range of data sources, including the Tripartite AMR Country Self-Assessment Survey (TrACSS) and the Global Antimicrobial Resistance and Use Surveillance System (GLASS). If sub-indicators are included, the framework contains 66 indicators overall but no-one is currently systematically tracking these to understand progress in implementation of the GAP AMR. There are other AMR indicator sets beyond the M&E framework, e.g. as part of the results framework for the thirteenth General Programme of Work (GPW13) and the relationship between indicators in the two different sets is not always clear. As the framework was developed some time after the GAP AMR was adopted, most indicators lack baseline data. However. Some opportunities to systematically document and use baseline data have been missed.

A6.S2. TrACSS is a key data source and there have been four rounds of reporting with many areas relevant to AMR ranked on a five-point (A-E) scale. The questionnaire has changed markedly over time and this reflects technical advances on AMR, such as the AWaRe (Access, Watch, Reserve) categorization of antibiotics, and a clearer delineation of sectors beyond human health. But, the number of data points has increased fivefold and multiple changes in wording have limited the ability to conduct trend analysis. Response rates to TrACCS have been very good with almost all WHO Member States (187 of 194, 96%) having submitted at least one response to TrACSS. Mean number of responses was highest in WHO's South East Asian Region (SEAR) (4.0) and lowest in WHO's African Region (AFR) (2.5), and was highest in high-income countries (HIC) (3.6) and lowest in low-income countries (2.6). TrACSS data is readily available from a global database. Two specific TrACSS reports have been produced and data from the third round of TrACSS was used for the 2019 Report of the Secretary-General produced as a follow-up to the political declaration of the high-level meeting of the General Assembly on AMR. The TrACSS-specific reports try to distinguish questions that are comparable from those that are not. However, this leads to considerable data loss, including completely discounting the first round of TrACSS reporting in the latest report, and means that differences caused by changes in wording of questions may be overlooked. Focusing only on countries that reported in the last three rounds of TrACSS inevitably means that the results presented are more positive than if all countries were considered.

A6.S3. GLASS is another important data source and the number of Member States enrolled in and reporting to GLASS has steadily risen from 40 in 2016-2017, to 76 in 2000 and to 97 enrolled currently. However, this is still only half of WHO Member States. The rates of enrolment are higher in some WHO regions (SEAR and Eastern Mediterranean Region (EMR)) than others (Region of the Americas (AMR)). Responses to GLASS are received from countries from a range of income levels. There have been four GLASS reports to date. Data reported by GLASS is of two main types, process data on the development of surveillance systems and data on rates and patterns of AMR. In general, source data is not very readily available and GLASS reports do not contain comparative country data on AMR rates.

A6.S4.   The WHO Secretariat has submitted some reports on the progress of implementing GAP AMR to World Health Assemblies, particularly in 2017 and 2019. While the 2019 report did cover each of the five GAP AMR objectives, this did not systematically report against indicators in the M&E framework. The WHO Secretariat also prepared the report for the United Nations Secretary General as a follow-up to the political declaration of the high-level meeting of the General Assembly on AMR. This used indicator data more than reports to the World Health Assembly and was structured around the implementation of the political declaration.

A6.S5.   Country Cooperation Strategies (CCSs) are documents which guide WHO's work in countries. The review considered whether CCSs specifically referred to AMR. Of the 343 CCSs reviewed, just over one quarter (26%) mention AMR. In general, a higher proportion of full CCSs (31%) mention AMR than brief CCSs (21%). The CCSs were from 160 countries and territories. Of these, 41% mention AMR in at least one. Among Member States that had submitted at least one report to TrACSS, just under half (47%) had a CCS that mentioned AMR. Among countries that the review identified as having shown particularly strong improvements in responses to AMR, two thirds (8 of 12, 67%) had a CCS that mentioned AMR. There is a statistically significant association between whether or not a country has a CCS that mentions AMR and overall reported scores on TrACSS. Content analysis of CCSs show that they cover four of the five objectives of the GAP AMR, with particular emphasis on objective 2 related to surveillance. Other topics covered include national AMR action plans, multisectoral coordination mechanisms, health security and, in particular, health system strengthening.

A6.S6.   Joint External Evaluations (JEE) are conducted as part of the process of strengthening health security by implementing the International Health Regulations. JEE reports were identified for 97 countries and territories. Joint External Evaluations were more likely to be conducted in low-income countries. There were statistically significant associations between JEE scores (both overall and for AMR specifically) and scores calculated from TrACSS reporting (see Figure A6.S1). Content analysis of JEEs identified strengths and areas to improve relating to objectives 2-4 of the GAP AMR and in other areas including AMR detection, developing and implementing national action plans, improving intersectoral coordination, strengthening health systems, raising awareness and understanding of AMR and linking AMR to well-developed disease systems, e.g. related to TB, HIV and malaria.

Figure A6.S1: Comparison of AMR performance score (using the graduated score method) with the overall score on joint external evaluation
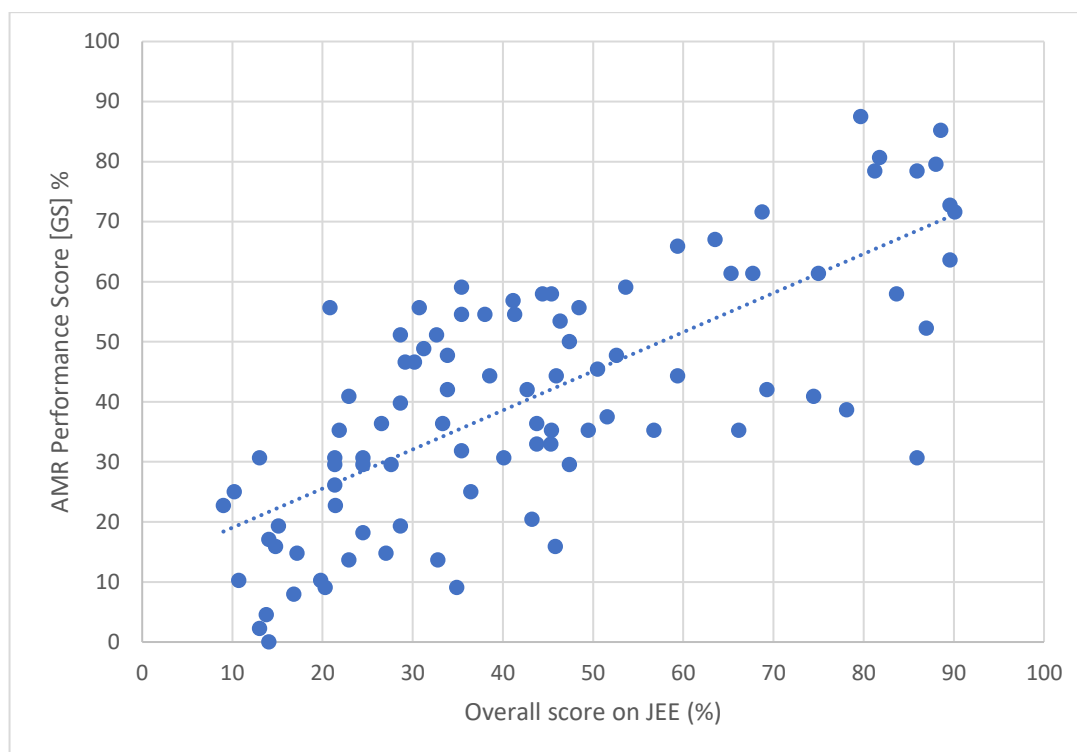
A6.S7. A key challenge facing the review is lack of a formal or systematic baseline. There is potentially some baseline data, e.g. a multi-country public awareness survey from 2015 and a worldwide country situation analysis. Although there are reports for both, source data is not publicly available. Given this lack of baseline data, the approach taken by the review has been to take the first data reported by a country to TrACSS as its baseline for that indicator. The main advantage of this approach is that it means data can be considered for all 187 countries that have reported at least once to TrACSS. However, it does mean that the baseline data may include any early progress made following the adoption of GAP AMR and that dates of baseline data differ between countries.

A6.S8. While the review would be interested in understanding progress made towards expected GAP AMR outcomes and goals, there is currently very little data available in this area. Of 34 indicators (and sub-indicators) identified in the M&E framework, the review considers that three (9%) are incompletely defined and more than half (19, 55%) lack any data. A further seven (21%) have some data but this is considered insufficient for outcome monitoring at a country level while only four (12%)[156] have country-level data available, including baseline data. Currently, the AMR M&E team are not actively tracking progress on outcomes but there is presumably an expectation of reporting on at least the two outcomes included in the GPW13 results framework.

A6.S9. In order to understand overall progress in implementing the GAP AMR, the review team have calculated an implementation score based on 22 indicators reported through TrACSS. Two slightly different calculation methods were used. The first, based on the 2018-19 TrACSS report, dichotomizes the data by scoring A or B as zero and C, D or E as one. This system is referred to as C+ in this report. The second approach uses graduated scoring (GS) with A scoring zero, B scoring

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[156] Three of these are SDG indicators and the fourth relates to levels of resistant TB.

one etc. For the GAP AMR as a whole, scores from both systems are converted to percentages. For individual indicators, scores from the C+ system are expressed as percentages while scores from the GS system fall between the range 0 and 4. While the two approaches generate similar scores, the GS system sets the bar higher and would be better able to distinguish improvements at the higher level, i.e. from C to E.

A6.S10. Table A6.S1 presents data for the two ways of calculating implementation scores across all included indicators. Data is similar between the two calculation methods. The biggest improvements are seen in relation to multisectoral coordination and national action plans with little if any change seen in infection prevention and control in human health and optimizing antimicrobial use in animal health. Figure A6.S2 shows the mean overall implementation score across the indicator set for both calculation methods. Overall, the mean implementation score on the C+ method was 52.9% as compared to 41.0% at baseline. The mean implementation score on the GS method was 44.3% as compared to 36.7% at baseline. In general, the highest mean implementation score is seen in EUR and the lowest in AFR. There is marked variation in mean implementation scores between low-income countries (C+ 26.9, GS 24.8) and high-income countries (C+ 72.2, GS 60.9). Figure A6.S3 shows the mean change in overall implementation score from baseline to performance data again using both methods. Again, the change documented with the C+ method (12.0) was higher than for the GS method (7.6). The highest change in implementation score occurred in SEAR. There was no clear pattern by country income group.

Table A6.S1: Implementation scores across GAP AMR indicators
Colour coding
- *for GS scores – amber 0-1.50; yellow 1.51-2.00; 2.01-3.00 light green; dark green >3.01*
- *for C+ scores – amber 0-40; yellow 41-60; light green 61-80; dark green >80*
- *for GS change – amber 0-0.25; yellow 0.26-0.50; light green >0.50*
- *for C+ change – amber 0-10; yellow 11-20; light green >21*

Indicator	Baseline		Performance		Change	
	GS	C+	GS	C+	GS	C+
Multi-sector and one health working arrangements	1.09	20	1.80	45	0.71	25
National action plan	1.51	48	2.32	75	0.81	27
Awareness and understanding of AMR risks and response (human health)	1.73	49	2.20	78	0.48	28
Awareness and understanding of AMR risks and response (animal health, plant health, food production, food safety and environment)	1.15	29	1.25	47	0.10	17
Training and professional education on AMR in the human health sector	1.73	60	1.92	71	0.19	11
Training and professional education on AMR in the veterinary sector	1.28	33	1.55	50	0.27	17
Training and professional education on AMR in farming sector, food production, food safety and the environment	0.68	16	0.74	19	0.06	3
Progress with strengthening veterinary services	1.36	39	1.65	52	0.29	13
National monitoring system for consumption and rational use of antimicrobials in human health	1.36	41	1.63	47	0.27	6
National monitoring system for antimicrobials intended to be used in animals	1.16	33	1.54	51	0.39	18
National monitoring system for antimicrobial use in plant production	0.50	18	0.86	33	0.36	15
National surveillance system for AMR in humans	1.74	53	2.10	67	0.36	14
National surveillance system for AMR in animals	1.31	38	1.73	55	0.42	18
National surveillance system for AMR in food (animal and plant origin)	1.47	53	1.60	60	0.13	7
Infection prevention control in human health care	1.89	61	1.96	61	0.07	0
Good health, management and hygiene practices to reduce the use of antimicrobials and minimize development and transmission of AMR in animal production	1.14	31	1.40	33	0.25	2
Good management and hygiene practices to reduce the development and transmission of AMR in food processing	1.26	38	1.44	44	0.18	6
Optimizing antimicrobial use in human health	1.36	44	1.80	67	0.44	24
Optimizing antimicrobial use in animal health (terrestrial and aquatic)	1.46	44	1.49	44	0.03	0
Laws or regulations on prescription and sale of antimicrobials for human use	3.08	77	3.44	86	0.36	9
Laws or regulations on prescription and sale of antimicrobials for animal use	2.44	61	2.59	65	0.15	4
Laws or regulations that prohibit the use of antibiotics for growth promotion	1.63	41	1.99	50	0.36	9

Figure A6.S2: Mean overall implementation score (both methods) by WHO region, country income group and overall
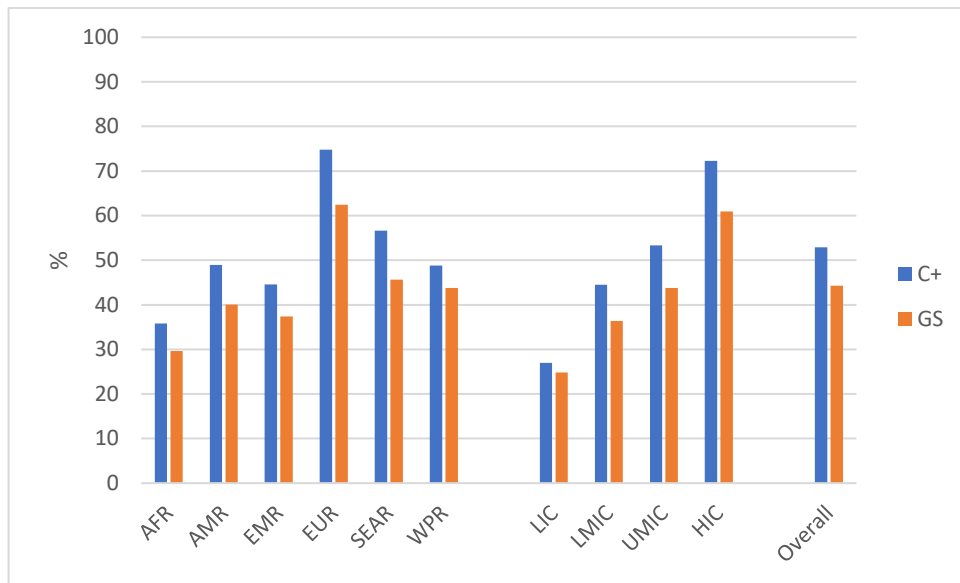
Figure A6.S3: Mean change in overall implementation score from baseline to performance data (both methods) by WHO region, country income group and overall
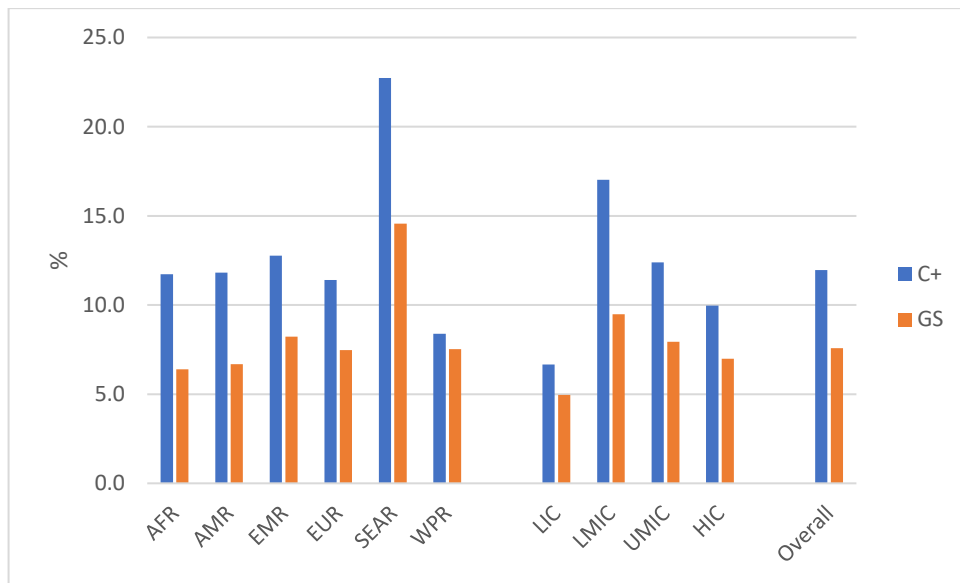
A6.S11. Figures A6.S4 and A6.S5 show respectively the mean implementation score and the improvement in mean implementation score across core indicators and indicators for four of the objectives of GAP AMR. The highest mean implementation score is for objective 4 (C+ 62%; GS 57%) and for the core areas of multisectoral collaboration and national action plans (C+ 60%; GS 51%). Scores for the other three objectives are similar. The increase in implementation score is highest for core indicators, i.e. the main improvement that has occurred is the introduction of multisectoral coordination mechanisms and national action plans (C+ increase of 26 percentage points; GS increase of 19 percentage points).
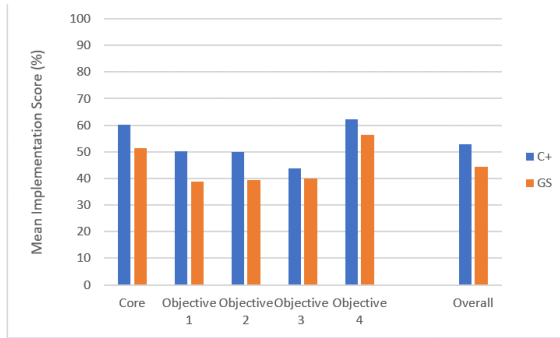
Figure A6.S4: Mean implementation score (both methods) across core indicators and indicators for four objectives of GAP AMR
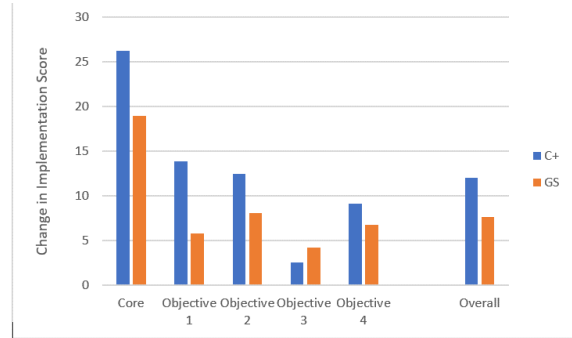
FigureA6.S5: Change in mean implementation score (both methods) between baseline and performance data across core indicators and indicators for four objectives of GAP AMR

A6.S12. There is an association between countries' national action plans and multisectoral coordinating mechanisms and overall implementation scores. Perhaps more importantly, there is also a positive association between improvements in national action plans and multisectoral coordinating mechanisms and improvements in overall implementation scores. This is illustrated for national action plans in Figure A6.S6.

Figure A6.S6: Is there an association between change in the grade a country gives for its national action plan between baseline and performance data and change in mean modified implementation score
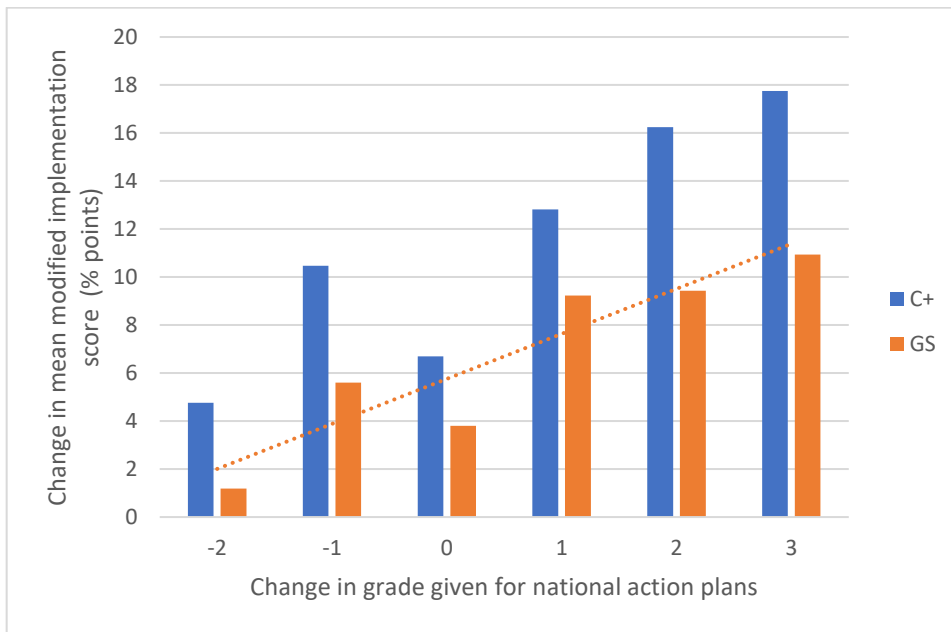
A6.S13. Mean implementation scores are higher for indicators of human health (C+ 68%; GS 54%) than for other areas (C+ 44%; GS 38%) (see Figure A6.S7). Figure A6.S8 shows similar levels of change in indicators of human health and other areas. The gap is not narrowing and, if anything, is potentially widening.
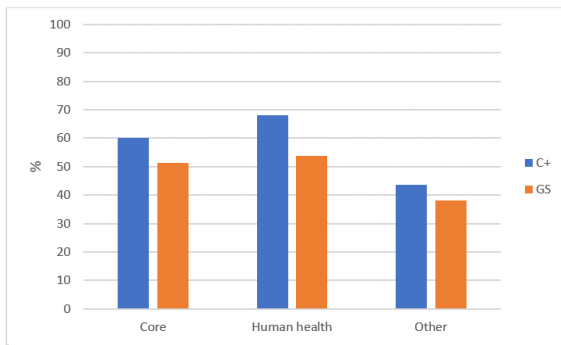
Figure A6.S7: Mean implementation scores for core indicators, indicators related to human health and other indicators
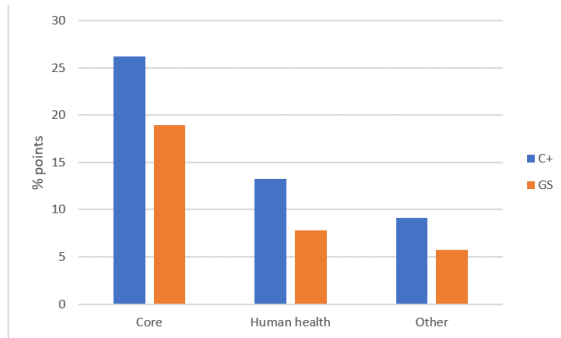
Figure A6.S8: Change in mean implementation scores for core indicators, indicators related to human health and other indicators between baseline and performance data

A6.S14. Conclusions from and implications of the findings of this secondary data review for the implementation phase of this review are included at the end of this report.

Contents

Glossary

AFR	African Region (WHO)
AGISAR	Advisory Group on Integrated Surveillance of Antimicrobial Resistance
AMR	Antimicrobial Resistance
AMR	Region of the Americas (WHO)
AST	Antimicrobial Susceptibility Testing
ATLASS	Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance System
AWaRe	Access, Watch, Reserve
DG	Director General
EGASP	Enhanced Gonococcal Antimicrobial Surveillance Programme
EMR	Eastern Mediterranean Region (WHO)
EQA	External Quality Assessment
ESBL	Extended-Spectrum β-Lactamase
EUR	European Region (WHO)
FAO	Food and Agriculture Organization of the United Nations
GAP	Global Action Plan
GBD	Global Burden of Disease
GLASS	Global Antimicrobial Resistance and Use Surveillance System
GLASS EAR	GLASS Emerging Antimicrobial Resistance Reporting
GNI	Gross National Income
GPW13	Thirteenth General Programme of Work
HIC	High-Income Countries
HIV	Human Immunodeficiency Virus
IHNE	Institute for Health Metrics and Evaluation
IPC	Infection Prevention and Control
IT	Information Technology
JPIAMR	Joint Programming Initiative on Antimicrobial Resistance
LIC	Low-income Countries
LMIC	Lower-Middle-Income Countries
M&E	Monitoring and Evaluation
MS	Member State
NAP	National Action Plan
NCC	National Coordination Centre
NRL	National Reference Laboratory
OIE	World Organisation for Animal Health
SDG	Sustainable Development Goal
SEAR	South-East Asian Region (WHO)
TB	Tuberculosis
TISSA	Tripartite Integrated Surveillance System on Antimicrobial Resistance/Antimicrobial Use
TrACSS	Tripartite AMR Country Self-Assessment Survey
UMIC	Upper-Middle-Income Countries
WASH	Water, Sanitation and Hygiene
WHA	World Health Assembly
WHO	World Health Organization
WPR	Western Pacific Region (WHO)

Section 1: Introduction and the GAP AMR monitoring and evaluation framework

A6.1.   This is a report of the review of secondary data carried out as the second phase of a comprehensive review of the Global Action Plan on Antimicrobial Resistance (GAP AMR). Plans for this phase were outlined in the comprehensive review's inception report.[157] As outlined there, this review of secondary data focuses on identifying and analyzing data for indicators contained in the GAP AMR monitoring and evaluation (M&E) framework.[158] That framework was published in 2019 and presents a results chain for the GAP AMR and a set of recommended core indicators. It explains how monitoring and evaluation are expected to work at different levels, including country, regional and global level.

A6.2.   The M&E framework contains core, recommended indicators at outcome[159] and output level. Based on numbered indicators, there are 18 outcome indicators and 23 output indicators. But, many of these have sub-indicators and, if these are also counted, there is a total of 34 outcome indicators and 32 output indicators, that is 66 indicators overall. Some details of these indicators are presented in Table 1 of the M&E framework including the sector(s)[160], measurement, indicator name and data source. More detailed metadata is provided for each indicator in the stand-alone Annex 3 to the framework.[161]

A6.3.   Figure A6.1 shows how the different indicators cover the identified sectors of human health, animal health, plant health, food production, food safety, environment and research. While overall indicators are related to human health in the case of almost half of all indicators (29 of 66; 44%), this is the case for almost two thirds of outcome indicators (22 of 34; 65%) but less than one quarter of output indicators (7 of 32; 23%).

Figure A6.1: Percentage of core recommended indicators in the GAP AMR M&E framework of different types (outcome, output, overall) which cover particular sectors (as an indicator may be relevant to more than one sector, these percentages may total more than 100%)
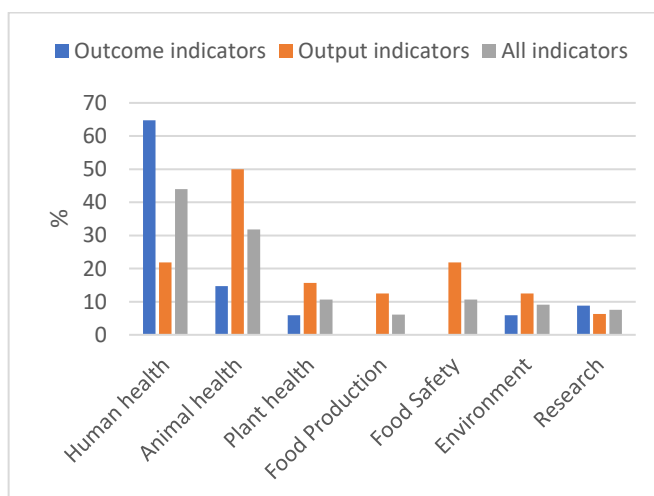
A6.4.   In terms of monitoring at the global level, the M&E framework (p7) identifies a number of existing and emerging data sources. Of these, that are specific for AMR, two are the most well-developed, the Tripartite AMR Country Self-Assessment Survey (TrACSS) and the Global Antimicrobial Resistance and Use Surveillance System (GLASS). TrACSS is identified as a data source for 18 of the indicators in the M&E framework with GLASS being identified for a further five. This review has focused particularly on these two

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[157] See WHO Evaluation Office (2021) *Comprehensive Review of the WHO Global Action Plan (GAP) on Antimicrobial Resistance (AMR): Inception Report*
[158] WHO, FAO and OIE (2019) *Monitoring and Evaluation of the Global Action Plan on Antimicrobial Resistance: Framework and Recommended Indicators* available on https://apps.who.int/iris/bitstream/handle/10665/325006/9789241515665-eng.pdf?ua=1 (accessed 22 April 2021).
[159] This level contains indicators for overarching goal, goal and outcomes.
[160] This is done using six symbols. However, no key is provided. While the meaning of some symbols is clear intuitively, e.g. for human health and animal health, there is one symbol (of crops growing) which appears to be taken to mean both plant health and food production. In analyzing the sectors involved, attempts have been made to distinguish these.
[161] WHO, FAO and OIE (2019) *Monitoring and Evaluation of the Global Action Plan on Antimicrobial Resistance: Framework and Recommended Indicators: Annex 3 Methodology Sheets for Recommended Indicators* available on https://www.who.int/antimicrobial-resistance/global-action-plan/monitoring-evaluation/AMR-M-E-indicator-reference-sheets-web-high-December-2019.pdf?ua=1 (accessed 22 April 2021).

data sources while considering other data sources where available, such as reports to the World Health Assembly.

A6.5.   It is clearly a strength of the GAP AMR that it does have a monitoring and evaluation framework associated with it. It is good that this includes a results chain and an annex with detailed indicator descriptions. It is good that there is data available for some core recommended indicators, particularly those with TrACSS as the data source. However, there are some challenges and/or limitations related to the monitoring and evaluation framework. Specifically:

- The results chain lacks some key elements which might be expected in a theory of change such as an assessment of the evidence base for identified causal pathways and explicit identification of underlying assumptions. One specific assumption which seems to underpin the GAP is that countries (and agencies) will work in a multisectoral manner to address AMR. While there is a question about this in TrACSS, this does not seem to relate to a specific indicator or a particular part of the results chain.[162]

- Similarly, there are other questions in TrACSS, e.g. on National Action Plans on AMR which do not currently relate to any of the core, recommended indicators although, in this case, it does seem to relate to an identified activity in the results chain. While the M&E framework probably does not want to include multiple indicators at activity level, the importance of National Action Plans probably does merit the inclusion of an indicator related to these within the M&E framework.[163]

- While it is good that the M&E framework does identify specific indicators and their data sources, the metadata could be clearer and more specific as to how values for indicators are calculated from particular data sources. This is particularly the case for indicators where data comes from TrACSS. It would be good if there could be much greater clarity as to precisely which TrACSS questions generate data for which indicators and how.

- While the metadata in Annex 3 of the M&E framework is useful, it is clearly a work in progress. Some indicator descriptions are very incomplete, e.g. outcome 1.1, outcome 3.5b, outcome 4.4, output 3.c. With these it would be good to explain the process and time frame for finalization.

- There are too many indicators to be effectively and feasibly monitored and analyzed for the purposes of understanding progress being made in terms of GAP implementation. Currently, there is no overall process to use the M&E framework and its indicators to collect and analyze data to assess how well the GAP is being implemented. In the framework, there were plans to establish a common platform for TrACSS, GLASS, the OIE annual data collection initiative and the FAO Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance System (ATLASS) and this was referred to as the Tripartite Integrated Surveillance System on Antimicrobial Resistance/Antimicrobial Use (TISSA).[164] WHO's AMR M&E team currently collect data for TrACSS but are not currently collecting or analyzing data for other indicators. As some data is said to be available for some of these from other sources, the AMR M&E team are in the process of establishing an AMR indicator repository[165] to link to other databases, access the relevant data and then populate a dashboard that will be open to the public. However, this would

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[162] It is also one of the leading indicators for output 3.3.2 in WHO's draft proposed programme budget for 2022/23.

[163] It is also one of the leading indicators for output 1.3.5 in WHO's draft proposed programme budget for 2022/23.

[164] In a report to the Interagency Coordination Group (IACG) on Antimicrobial Resistance in 2018 (see https://www.who.int/antimicrobial-resistance/interagency-coordination-group/IACG_Surveillance_and_Monitoring_for_AMU_and_AMR_110618.pdf accessed 23.04.21), this system was said to be in the early stages of development. In March 2021, expressions of interest were requested to develop and deliver an online web-based IT application for TISSA (see https://www.ungm.org/Public/Notice/124127 accessed 23.04.21).

[165] A feasibility study has been conducted by Jean-Patrick Le Gall concerning establishing this central repository. However, one fundamental question/assumption does not seem to be addressed and that is whether the data needed to monitor the indicators in the M&E framework is available elsewhere. The assumption is that it is and the problem is that it cannot be accessed by the AMR M&E team. While this may be part of the problem, a potentially more serious problem is that for many indicators data may simply not be available.

not include FAO and OIE data currently.[166] It seems that potentially two different IT solutions may be being proposed (TISSA and the AMR indicator repository) with risk of duplication and redundancy. In addition, neither of these approaches seems to be directly tied to the monitoring and evaluation framework nor based on a manual assessment/collation of available data.

- The M&E framework was only developed in 2019, some four years after the introduction of the GAP AMR. While data for some indicators does pre-date the M&E framework,[167] there is no formal baseline as such.[168] In addition, some specific issues related to the first round of TrACSS data have meant that reports[169] have discounted that round of data which further exacerbates the lack of baseline/early performance data.

- The GAP AMR identifies actions by three groups of actors, Member States, the Secretariat and international and national partners. While the M&E framework does not explicitly identify which actors indicators refer to, most implicitly appear to relate to Member States. There do not seem to be explicit performance indicators for the Secretariat or for international and national partners.

- It is not clear if the M&E framework is comprehensive or whether there are other frameworks and/or indicators relevant to AMR. Specifically, WHO's Thirteenth General Programme of Work (GPW13) had a results framework attached to it[170] and this contained a number of indicators specifically related to AMR, including two indicators at the outcome level and five leading indicators at the output level.[171] Details of these are provided in Table A6.1. The four original leading indicators under output 1.3.5 have targets inbuilt into them. It is currently unclear why the GAP AMR M&E framework was not used explicitly as the source of these indicators. The AMR M&E team report that they were asked to reduce the number of leading indicators under output 1.3.5 to three for the Programme Budget 2022 to 2023[172] and these are marked with an asterisk (*). The Programme Budget 2022 to 2023 also added another leading indicator under output 3.3.2, namely "*number of countries with a functioning multisectoral antimicrobial resistance coordination committee*" and this is included in Table A6.1.

- Although there are indicators for research (objective 5) at both outcome and output level, none of these has data that is collected through TrACSS. This means that if a monitoring system was based solely on TrACSS data, this would overlook one objective of the GAP AMR.

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[166] As AMR M&E teams are just being established in those organizations, and some of the data will not be made public as per their guidelines.

[167] Possible data sources include reports to the World Health Assembly, surveys such as the *Antibiotic Resistance: Multi-Country Public Awareness Survey* published by WHO in 2015, available on http://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf;jsessionid=A4957D2EB7734E11619FB45C202CD61D?sequence=1 (accessed 29 April 2021) and situation analyses, such as the *Worldwide Country Situation Analysis: Response to Antimicrobial Resistance* published by WHO in 2015, available on https://apps.who.int/iris/bitstream/handle/10665/163468/9789241564946_eng.pdf?sequence=1 (accessed 29 April 2021).

[168] Although the 2018 TrACSS report does state explicitly that the 2016/17 survey was intended to provide a baseline.

[169] See WHO, FAO and OIE (2021) *Monitoring Global Progress on Antimicrobial Resistance: Tripartite AMR Country Self-Assessment Survey (TrACSS) 2019-2020: Global Analysis Report* available on https://www.who.int/publications/i/item/monitoring-global-progress-on-antimicrobial-resistance-tripartite-amr-country-self-assessment-survey-(tracss)-2019-2020 (accessed 23 April 2021).

[170] See WHO (2020) *Programme Budget 2020-21: WHO Results Framework: An Update: Report by the Director General to the Executive Board* available on https://apps.who.int/gb/ebwha/pdf_files/EB146/B146_28Rev1-en.pdf (accessed 23 April 2021).

[171] Four of these refer to output 1.3.5 - Countries enabled to address antimicrobial resistance through strengthened surveillance systems, laboratory capacity, infection prevention and control, awareness-raising and evidence-based policies and practices – but one relates to output 1.3.4 - Research and development agenda defined and research coordinated in line with public health priorities

[172] WHO (2021) *Draft Proposed Programme Budget 2022-2023: Building Forward Better* available on https://apps.who.int/gb/ebwha/pdf_files/EB148/B148_25-en.pdf (accessed 27.04.21)

Table A6.1: Details of AMR-related indicators in GPW13

Indicator name	Level/Type	Metadata?	Link to M&E framework?
Percentage of bloodstream infections due to selected antimicrobial-resistant organisms	Outcome	Yes[173]	Yes, this indicator is included as indicators for Goal IIa and IIb in the framework.
Patterns of antibiotic consumption at the national level[174]	Outcome	Yes[175]	Outcome indicators 4.1-4.3 are relevant and outcome indicator 4.1.b appears to be analogous.
Gaps in the antimicrobial resistance landscape identified, and potential products to fill these gaps identified[176]	Leading for output 1.3.4	No	Not explicitly stated
Functional antimicrobial resistance multisectoral coordination groups established in >=60% of Member States with national action plans to address antimicrobial resistance (medium term – end 2023).[177]	Leading* for output 1.3.5	No	Not explicitly stated but the revised wording for the programme budget 2022/23 focuses on national action plans so fits better with the data collected through TrACSS
Participation in Global Antimicrobial Resistance Surveillance System (GLASS): >=50% of Member States participating in GLASS (short term – end 2021) >=50% of Member States have national antimicrobial resistance surveillance systems and are providing data on the SDG3 antimicrobial resistance indicator (medium term- end 2023)[178]	Leading* for output 1.3.5	No	Not explicitly stated – the revised wording no longer refers to GLASS specifically but data is based on number of countries enrolled in and reporting to GLASS.
Systems for monitoring consumption and rational use of antimicrobials in human health established in 60% of Member States (medium term – end 2023)[179]	Leading* for output 1.3.5	No	Not explicitly stated – revised wording emphasizes national systems but no longer mentions rational use. Data is based on number of countries reporting consumption through GLASS.
National infection prevention and control programmes being implemented nationwide in 40% of Member States (medium term – end 2023)	Leading for output 1.3.5	No	Not explicitly stated. This indicator was not included in the proposed draft programme budget for 2022/23.
Number of countries with a functioning multisectoral antimicrobial resistance coordination committee	Leading for output 3.22	No	Not explicitly stated

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[173] This is included as milestone 37 in WHO's GPW13 Impact Framework Metadata (dated 5 August 2019). It is also included as indicator SDG3.d.2 and there is metadata for that indicator

[174] It appears to be implied that this is for human use.

[175] This is included as milestone 37 in WHO's GPW13 Impact Framework Metadata (dated 5 August 2019).

[176] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Development of a global priority and research agenda for addressing antimicrobial drug resistance in fungal infections*

[177] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Number of countries implementing government-approved multisectoral antimicrobial resistance national action plans that involve relevant sectors and have a monitoring framework*

[178] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Number of countries having an antimicrobial resistance surveillance system and providing data to WHO*

[179] This was the original wording. In the draft proposed programme budget for 2022/23, the wording of this indicator is *Number of countries with national systems in place to monitor the consumption and use of antimicrobials in human health*

Section 2: The Tripartite AMR Country Self-Assessment Survey (TrACSS)

A6.6.   Since 2016, WHO, FAO and OIE have asked countries to complete an annual self-assessment survey on AMR. Progress on establishing this process was reported to WHA70 in 2017[180] noting that the questionnaire covered countries' progress on multisectoral engagement, development of a national action plan and implementation of key actions to tackle antimicrobial resistance. It included questions on four of the objectives of the Global Action Plan.[181] From the outset, most questions required respondents to rank areas on a five-point scale, A-E, where A reflected poor performance and E good or excellent performance. Each question provided respondents with criteria to be used for the purpose of this self-assessment. For each of the four rounds conducted to date, there was a questionnaire and a guidance note.[182]

A6.7.   The questionnaire has changed considerably over time. The AMR M&E team have supplied an Excel file which documents the changes over time. They explain that, for the most part, changes were made over the years, either by the technical teams within WHO to align more with their work or by partner agencies. Other changes were made to simplify either because of feedback from Member States or based on response rates. In brief:

- The number of questions/data points has increased markedly. At a superficial level, only one question (#10) has been added but this masks that the number of data points has increased almost fivefold from 21 in 2016/17 to 104 in 2019/20.[183] This has implications for those providing the data and for those conducting analysis.
- The complexity of the questionnaire has increased. In some cases, respondents are asked to only answer certain questions (e.g. 7.5b and 7.5d) if they answer earlier questions in a particular way.
- While the first questionnaire tended to aggregate sectors, particularly those beyond human health, these are more clearly disaggregated in later rounds.
- A number of issues and areas have been added including:
  - Which sectors have been involved in National Action Plans (from round 2)
  - Legislation on antimicrobial use (from round 2)
  - National AMR laboratory network in animal health and food safety (from round 3)
  - Using the AWaRe classification of antibiotics (from round 4)
  - A national assessment of risks for AMR transmission in the environment and pollution control (from round 3)
- Many criteria have been reworded and, in some cases, the order of these have been changed. Overall, the A-E system has been retained except in one case (Q7.3) where an A-D system is used.
- In Q4.2, WASH was classified as part of environment in round 2 and as part of human health from round 3.

A6.8.   Response rates for TrACSS have, in general been very good. Table A6.2 presents the number of respondents by each round of TrACSS. Response rates for the first three rounds were very similar while the lower rate for the 2019/2020 round is largely considered to have been due to the Coronavirus crisis that countries were facing. Over the four rounds of reporting, almost all WHO Member States (187, 96%) have reported at least once

Table A6.2: Number of respondents to TrACSS by round

TrACSS round	Number of responses	Percentage of WHO Member States (n=194)
2016/17	151	78%
2017/18	154	79%
2018/19	159	82%
2019/20	136	70%

[180] See *Antimicrobial Resistance: Report by the Secretariat* (A70/12, paragraph 15) available on https://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_12-en.pdf (accessed 29 April 2021).
[181] Question 6 refers to objective 1, question 7 to objective 2 etc.
[182] See for example - https://www.who.int/publications/m/item/tripartite-amr-country-self-assessment-survey-(tracss)-2019-2020 (accessed 29 April 2021). However, please note that some links do not work, e.g. the link to guidance for 2018/19 and 2019/20 and the 2017/18 questionnaire.
[183] The new question 10 alone has 34 data points. This is perhaps most clearly seen in the Excel sheets for the raw data. For 2016/17, this extends to column T but for 2019/20 to column DV.

to TrACSS.[184][185] The average number of responses submitted was 3.2 but this varied by WHO region and country income group (see Figure A6.2). The highest mean response rate (4.0) was in SEAR meaning that each country responded to each round of TrACSS. The lowest response rate was in AFR where responding countries submitted a mean of 2.5 responses to the four rounds of TrACSS.[186] High-income countries were more likely to respond (mean of 3.6 responses) than low-income countries (mean of 2.6 responses) and this difference was statistically significant ($p<.001$).

Figure A6.2: Mean number of responses to TrACSS (2016-2020, four rounds) per country
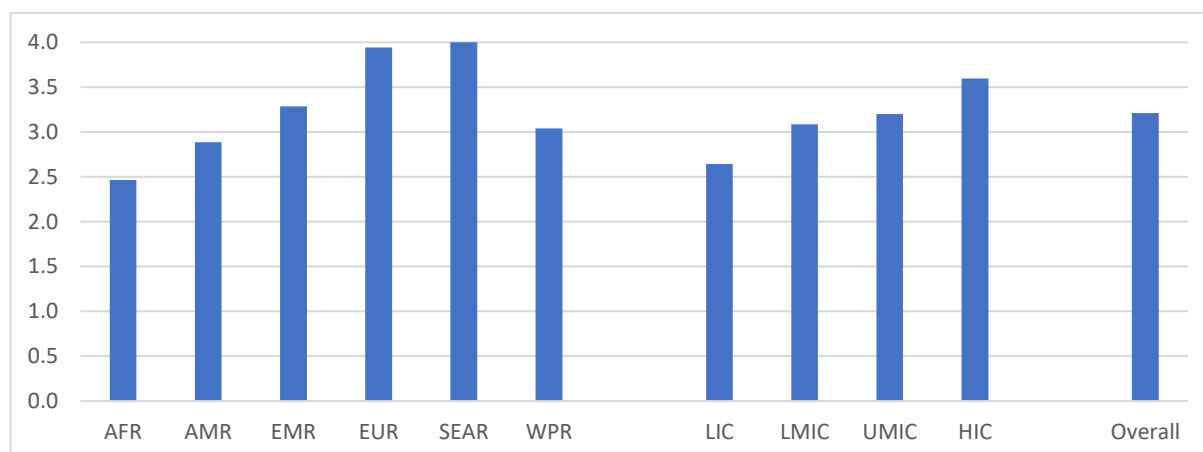
A6.9.   Data from TrACSS is publicly available from a global database[187]. This is available through various views[188] and it is also possible to download responses in Excel format.[189] WHO, FAO and OIE have produced two specific reports based on TrACSS data. The first was produced following the second round of reporting in 2017/18[190] and the latest one was produced in 2021 based on the 2019/20 round of reporting.[191] In addition, AMR M&E staff report that TrACSS data was used to inform the 2019 Report of the Secretary-General produced as a follow-up to the political declaration of the high-level meeting of the General Assembly on AMR.[192]

A6.10.   The two specific TrACSS reports (in 2018 after round 2 and in 2021 after round 4) have detailed methodological annexes/appendices.[193] These explain in some detail how data was collected and analyzed. Some points are considered here, particularly where this analysis takes a different approach.

- Both reports address the issues raised for trend analysis across different survey rounds by the changes in questions over the lifetime of TrACSS. The 2018 report summarizes these changes as separation of non-human health sector, making questions more specific and "*raising the bar*". It concludes that comparisons with the first round can only be made in relatively few cases (Qs 4.1,5.1, 6.3. 6.6 and 7.1). The 2021 report goes further and completely discounts round 1 responses, focusing only on questions

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[184] Seven Member States have not reported to TrACSS. They are Andorra, Bosnia and Herzegovina, Equatorial Guinea, Gambia, Madagascar, Niue and Senegal.
[185] In addition, in the data available online, there are questionnaires submitted by territories that are not WHO Member States, including Turks and Caicos, Aruba, Bermuda and Sint Maarten (for round 2) and New Caledonia and Palestine (for round 4). In addition, some Member States' responses are included online but not in the source data. It appears this may be where data was submitted late. For round 2, this is the case for Chile and Grenada.
[186] This excludes those countries that did not respond to TrACSS and four of those seven countries are in AMR. Some countries in AFR did submit to all four rounds of TrACSS including Benin, Côte d'Ivoire, Ghana, Guinea, Kenya, Nigeria, Sierra Leone, South Africa and Tanzania.
[187] See https://amrcountryprogress.org/
[188] Map view, visualization view, table view and response overview.
[189] Initially, the data for 2019/20 lacked data for Q8.3 and this was supplied manually by AMR M&E staff. This error had not been corrected as of 29 April 2021.
[190] WHO, FAO and OIE (2018) *Monitoring Global Progress on Addressing Antimicrobial Resistance: Analysis Report of the Second Round of Results of AMR Country Self-Assessment Survey 2018* available on https://apps.who.int/iris/handle/10665/273128 (accessed 29 April 2021).
[191] WHO, FAO and OIE (2021) *Monitoring Global Progress on Antimicrobial Resistance: Tripartite AMR Country Self-Assessment Survey (TRACSS) 2019-2020: Global Analysis Report* available on https://www.who.int/publications/i/item/monitoring-global-progress-on-antimicrobial-resistance-tripartite-amr-country-self-assessment-survey-(tracss)-2019-2020 (accessed 29 April 2021)
[192] See https://digitallibrary.un.org/record/3807197?ln=en (accessed 29 April 2021).
[193] Appendix 2 in the 2018 report (p27) and Annex 2 in the 2021 report (p29).

considered comparable in the last three rounds. While the concerns raised have some validity, the approach taken means considerable lost data, particularly from the early years of GAP AMR. Such data may be important for baseline purposes. An alternative approach would be to consider all data collected but to consider the effect of methodological changes when conducting analysis. We prefer this approach, to minimize data loss (particularly from the baseline period). We consider it appropriate because, in most cases, the basic A-E scoring system was retained and where questions were split, there was often an identifiable "*dominant*" sector.[194] Overall, there was little evidence of "*raising the bar*" in the changes made to questions. In addition, there could be methodological issues even where the TrACSS reports considered questions comparable across the years.[195]

- A second linked point is that the 2021 report only considers data from those countries (115) who had reported to each of the last three rounds of reporting. While this approach may enhance comparability within these 115 countries[196], extreme caution is needed in terms of extrapolating these results to WHO Member States more broadly as it is likely that better performers will be over-represented in the group of more consistent reporters. Table A6.3 presents data to support these concerns. Essentially, the mean performance score[199] is higher in the group of consistent reporters than in those that report less consistently. Similarly, the improvement in mean performance score between baseline and latest is also less.[199] While there may be other explanations[197], a key factor seems to be country income group. While only just over one third of low-income countries (36%) are regular reporters, three quarters (75%) of high-income countries are. Consequently, we have considered data from all countries (n=187) that have submitted at least one response to TrACSS. We created a "*baseline*" for each country by taking their first report against any indicator and a "*latest*" by taking their last report against that indicator.[198]

Table A6.3: Comparison of 115 countries who reported in each of the last three rounds of TrACSS with those 72 countries that reported to TrACSS at least once but not to each of the last three rounds of TrACSS

	Consistent reporters (n=115)	Inconsistent reporters (n=72)
Mean performance score[199]	54%	29%
Mean improvement in performance score baseline to latest[199]	10.8	2.5
What proportion of countries from each income group are in each group?		
LIC (n=28)	36%	64%
LMIC (n=47)	57%	43%
UMIC (n=55)	64%	36%
HIC (n=57)	75%	25%

- Both TrACSS reports (2018 and 2021) identify a set of independent variables for comparison against indicator data. Table A6.4 shows the variables considered in each report. In our analysis, our main focus has been on WHO regions and country income group.

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[194] Which was the main influence on responses when that sector was included with others. This sector was human health when it was included and animal health when it was not.
[195] For example, the 2018 report considered five questions comparable across rounds 1 and 2 but there were wording changes in four of these five questions (4.1, 5.1, 6.3 and 7.1) and these do need to be kept in mind when conducting analysis.
[196] It is slightly illogical as it does not necessarily mean that each of these countries reported in each round on any specific indicator
[197] Such as potentially more members of the consistent reporters reporting in 2018/19.
[198] The main advantages of this approach are that it utilizes a bigger data set and creates baseline and endline data for consideration in terms of GAP AMR implementation. Limitations are that baselines and latest data are not necessarily for the same year for different countries (although this may not be problematic, for example, the TrACSS report in 2018 took a similar approach for independent variables) and, where countries have only reported once on a particular indicator, the baseline and latest value will be the same.
[199] Methods for calculating these scores are explained later in this report

Table A6.4: Independent variables considered in TrACSS reports 2018 and 2021

	2018	2021
Country income group (World Bank)	✓	✓
WHO region	✓	✓
G20 membership	✓	
GDP	✓	
GDP per capita	✓	
Total population	✓	
World Bank governance indicators	✓	
Top ten producers of beef, chicken and pork (FAO)	✓	
Domestic general government health expenditure (WHO	✓	
Large multi-sectoral working group	✓	
Submission of data to GLASS		✓

- The 2018 TrACSS report talks about the A-E scale in terms of "*progress*" and this is potentially misleading. These scales present a snapshot in time and do not implicitly say anything about progress in the absence of baseline (or preceding) data.[200] This report also converts the alphabetic scale to numerical levels on the basis that A=1, B=2, C=3 etc. However, it appears that this conversion is just used for narrative purposes and not for any calculations. It is unclear what this adds beyond talking about A, B, C responses etc.[201]

- Both TrACSS reports (2018 and 2021) talk about dichotomizing data in order to allow some data analysis to occur. Essentially, this means assigning a numerical value (0 or 1) to the alphabetic data. In most cases, this was done on the basis that A or B = 0 and C, D or E =1. In the case of awareness campaigns, a different basis was used, i.e. A, B or C = 0 and D or E =1.[202] While this is one way of making the data numerical, it is not the only way. The major drawback of this approach is that it essentially undermines the alphabetic system. There may as well be a yes, no system based on whether the country fulfils the C criterion. It also means that the numerical system does not reward countries for improving from A to B or from C to either D or E. An alternative and more intuitive approach, which would be more in tune with the alphabetic system, would be to use a graduated numerical system. While it would be possible to use the level system in the 2018 TrACSS report (A=1, B=2, C=3 etc.), we used a 0-4 scale (A=0, B=1, C=2 etc.) as scoring A as zero seemed more in line with the descriptive criteria. This means we have generated a mean performance score for each indicator in the range 0 to 4.

- The 2018 TrACSS report talks, in Appendix 2, about an overall "*implementation score*" based on scoring 16 TrACSS questions on the basis of whether they scored C or higher. This implementation score was only calculated for those countries that scored B or higher on questions 4.1 and 5.1.[203] They distinguished between performance on human sector indicators[204] and indicators for other sectors.[205] However, the report does not specifically mention any further use of this implementation score although it does appear to inform the section on overall implementation and monitoring (p20). We have calculated an overall implementation score along similar lines to this. We have done this with both

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[200] Of course, for those countries scoring B or higher, there has been progress at some point but, in the absence of baseline or preceding data, it is not possible to know if this occurred before or after the GAP AMR was adopted.

[201] Apart from perhaps the issue that A may intuitively seem better than E which is not the case in TrACSS reporting.

[202] The reason for this inconsistency is unclear.

[203] Presumably, on the assumption that you can only start implementation once you have a plan and a multisectoral coordination mechanism in place. However, this assumption is not borne out by evidence. In their latest data, ten countries scored both these questions A but only one (Djibouti) scored all other questions A. Some surprisingly high scoring countries were in this group, e.g. Poland and San Marino.

[204] Qs 6.1, 6.3, 7.1, 7.4, 8.1 and 9.1

[205] Qs 6.2, 6.4, 6.5, 6.6, 7.2, 7.3, 7.5, 8.2, 9.2 and 9.3

dichotomized data (C+=1) and using graduated scoring (A=0, B=1 etc.) We have used 22 data elements[206] and have converted these scores to percentages[207] (see paragraph A6.67, p112).

A6.11.   TrACSS is an extremely valuable data source in terms of monitoring progress of the GAP AMR but it does have some limitations. Strengths and limitations of TrACSS are briefly summarized in Table A6.5.

Table A6. 5: Strengths and limitations of TrACSS

Strengths	Limitations
It is a Tripartite system jointly owned by WHO, FAO and OIE	Data is self-reported by countries and there are limited measures in place to verify or validate the data reported. There may be substantial inter-country variation in terms of reporting
The questionnaire covers human health and other sectors and the delineation of these has become clearer over time	
	The number of data points has massively expanded over the four rounds of the survey (fivefold increase) placing pressure on those who respond to and analyze the survey
It has generated extensive amounts of data with reporting by multiple countries over multiple rounds	
	Question 7.3 is inconsistent with the other questions in that it uses an A-D system
TrACSS data represents official data endorsed by Member States	
	The WHO AMR M&E team have only been able to carry out relatively limited analysis of TrACSS data. There has not been a report after every round and TrACSS data has only been used in a relatively limited way for reporting to World Health Assemblies. The capacity to analyze TrACSS data is relatively limited.
Data from survey responses is publicly available both as a number of different visualizations and as downloadable raw data	
There has been some analysis and reporting based on TrACSS data, including reporting on progress following the UN General Assembly high level meeting	Some key elements of TrACSS (e.g. on multisectoral coordination mechanisms and national action plans) are not reflected in the GAP AMR M&E framework. Also indicator metadata could be clearer as to how exactly data is generated from TrACSS.
Questionnaires have been adapted and strengthened based on technical advice and consideration of response rates and feedback	TrACSS does not cover GAP AMR's fifth objective
	TrACSS data is mainly focused on process and outputs and does not assess outcomes
The overall A-E system has remained largely consistent over time	
	TrACSS data only relates to actions by Member States and not to other actors, including the Secretariat and national/international partners
Criteria are described in detail and these descriptions have been improved over time	
	There are some omissions of data elements from the TrACSS data available to download
The TrACSS survey matches well to the GAP AMR M&E framework and covers four of the five GAP AMR objectives	There seems to be quite a degree of separation between the AMR M&E team and TrACSS on the one hand and GLASS on the other.

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[206] Using the question numbers in the 2019/20 questionnaire, these are 4.1, 5.1, 5.4 (first three elements – as these score Y/N, these are scored as Y=4), 6.1, 6.2, 6.3, 6.4, 6.5 (in addition, data for Q6.2 in the 2017/18 survey was included as an element), 7.1, 7.2, 7.3, 7.4, 7.5a, 7.5c, 8.1, 8.2, 8.3, 9.1 and 9.2.
[207] By dividing by 88 (4x22) and multiplying by 100

Section 3: Global Antimicrobial Resistance and Use Surveillance System (GLASS)[208] [209]

A6.12.   GLASS was launched in October 2015, to support the GAP AMR, with the aim of supporting global surveillance and research in order to strengthen the evidence base on AMR, helping inform decision-making and drive national, regional, and global actions. GLASS has six objectives, namely (1) to foster national surveillance systems and harmonized global standards, (2) to estimate the extent and burden of AMR globally by selected indicators, (3) to analyse and report global data on AMR on a regular basis, (4) to detect emerging resistance and its international spread, (5) to inform implementation of targeted prevention and control programmes and (6) to assess the impact of interventions. The period 2015-2019 was considered and early implementation period for GLASS.

A6.13.   WHO Member States can enroll in GLASS for antimicrobial resistance (AMR) and/or antimicrobial consumption (AMC). Enrolled countries report information on the status of their national surveillance system and then report AMR and AMC data once their surveillance system is at a stage of development to allow collection of quality data. According to WHO's website[210], 97 WHO Member States are currently enrolled in GLASS.[211] Figure A6.3 shows the percentage of WHO Member States currently enrolled to GLASS overall and by WHO region and country income group. While overall half (97, 50%) of WHO Member States are enrolled in GLASS, this percentage is highest in SEAR (11 of 11, 100%) and EMR (20 of 21, 95%) but lowest in AMR (6 of 35, 17%). There is no clear pattern by country income group although enrolment rates are lowest among UMIC (19 of 56, 34%). The number of Member States enrolled in and reporting to GLASS has been steadily rising. For the first report in 2016-17, 40 Member States reported, this rose to 68 in 2017-18 and to 76 in 2020.[212]

Figure A6.3: Percentage of WHO Member States enrolled in GLASS by country income group, WHO region and overall
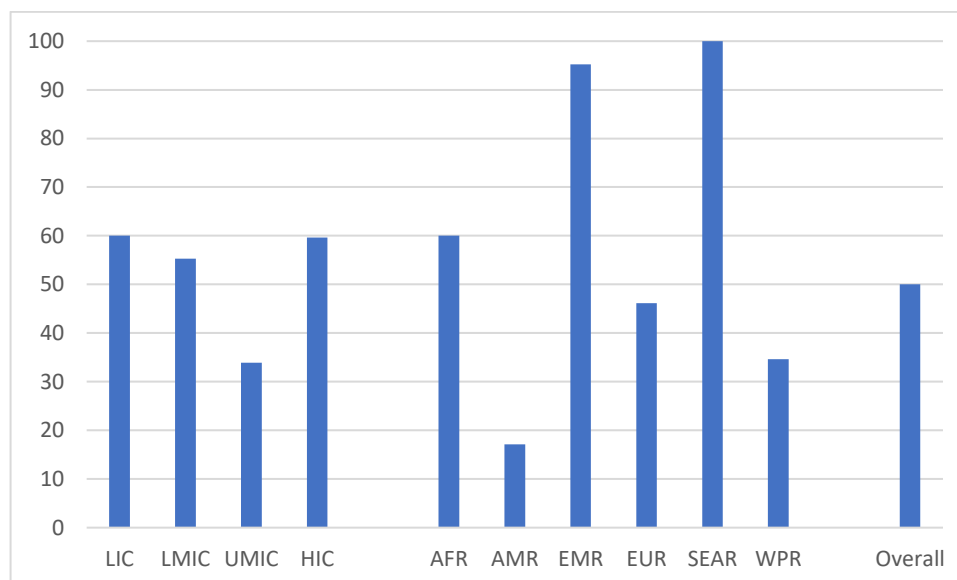
A6.14.   GLASS activities are grouped into a number of technical modules. According to the latest report[209], there are five of these but it is not completely clear what the five are. Potential modules mentioned in that report are shown in Table A6.6.

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[208] This section is based only on secondary data as it has not yet been possible to discuss GLASS with WHO staff but such discussions are planned.
[209] In the latest report, the early implementation report in 2020 – available on https://www.who.int/glass/resources/publications/early-implementation-report-2020/en/ (accessed 30 April 2021) – GLASS is referred to as the Global Antimicrobial Resistance and Use Surveillance System but the GLASS website (see https://www.who.int/glass/en/) still refers to it as the Global Antimicrobial Resistance Surveillance System. It has been assumed that the 2020 report reflects current terminology and this term has been used in this report.
[210] https://docs.google.com/spreadsheets/d/14QJ4tUfqmS5YF60BOpXZzZffwr6cRlu_vEZ9_oYfpRA/edit#gid=0
[211] Plus Kosovo and Palestine.
[212] In addition, in 2020, both Kosovo and Palestine reported.

Table A6.6: GLASS modules (based on 2020 report)

Name of module	Description
Antimicrobial resistance (AMR)	The first module, launched in 2016, focused on antimicrobial resistance in bacteria that cause common human infections and against which antibiotics are becoming increasingly ineffective.
Antimicrobial consumption (AMC)	Introduced in 2019 and first data call was in 2020.
GLASS-One Health	Based on the extended-spectrum β-lactamase (ESBL) E Coli Tricycle project. This was pilot-tested in six countries with another nine countries selected for implementation in 2020
Enhanced Gonococcal Antimicrobial Surveillance Programme (EGASP)	Pilot-tested in the Philippines and Thailand
Emerging Antimicrobial Resistance Reporting (GLASS-EAR)	This supports detection, early warning and risk assessment capacities of national AMR surveillance programmes (see https://www.who.int/glass/ear/en/)
Candida spp. AMR surveillance (GLASS-Fungi)	This is a global collaboration for data on antifungal-resistant infections.

A6.15.   There have been a number of GLASS reports to date. In 2014, WHO produced a Global Report on AMR Surveillance.[213] This report preceded the formation of GLASS and provided information on resistance to antibacterial drugs, including in selected bacteria of international concern, the health and economic burden due to antibacterial resistance, and AMR surveillance programmes for tuberculosis, malaria, HIV, influenza and in other areas. It contained very detailed tables in Annex 2 of published resistance rates in common bacterial pathogens by WHO region. GLASS produced early implementation reports for 2016-17[214], 2018-19[215] and 2020.[216] The 2016-17 report covered the development of GLASS, the first data call, synergies and collaborations. In common with subsequent reports, it included country profiles. The 2017/18 report contained a reader's guide to results which was annexed in the 2020 report. The 2020 report provided some details of various GLASS modules and also some details of AMR surveillance in other pathogens, such as tuberculosis, HIV and malaria, and details of regional activities.

A6.16.   Data reported by GLASS is of two main types. First, there is process data on the development of surveillance systems, such as whether a country has a National Coordination Centre (NCC) and a National Reference Laboratory (NRL) and whether those NRLs have received External Quality Assessment (EQA) and which standards are used for Antimicrobial Susceptibility Testing (AST). Secondly, there is data on rates and patterns of antimicrobial resistance. While there is considerable data available in reports, in visualizations and in country profiles/information sheets, raw data in analyzable form is not particularly readily available. Some data on rates of AMR in particular countries is available as supplementary electronic material for each of the three GLASS reports.

A6.17.   GLASS is identified as the data source for a number of indicators identified in the GAP AMR M&E framework and in the GPW13 results framework. These are briefly summarized in Table A6.7.

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[213] Available on https://apps.who.int/iris/bitstream/handle/10665/112642/9789241564748_eng.pdf;jsessionid=52B36C494B8AD645462054786B5E7E97?sequence=1 (accessed 30 April 2021)
[214] Available on https://www.who.int/glass/resources/publications/early-implementation-report/en/ (accessed 30 April 2021)
[215] Available on https://www.who.int/glass/resources/publications/early-implementation-report-2017-2018/en/ (accessed 30 April 2021)
[216] Available on https://www.who.int/glass/resources/publications/early-implementation-report-2020/en/ (accessed 30 April 2021)

Table A6.7: Indicators where data is (to be) provided from GLASS

Indicator	MF[217]	GPW	SDG	Comment
Goal IIa – patterns and trends in resistance in human health – prevalence of blood-stream infections caused by Methicillin-resistant Staphylococcus aureus	✓	✓	✓	According to the metadata for the indicator in the M&E framework, the denominator is the number of patients seeking hospital care and from whom the blood specimen was taken due to suspected bloodstream infection and from whom blood specimens have been submitted for blood culture and AST.[218] However, the metadata for the SDG indicator states that the denominator is the total number of patients with growth of S aureus or E coli in tested blood samples. While some raw data is available online, GLASS has to date not published these figures in its report. In its 2020 report, the reason given was that "*capacity to conduct AMR surveillance is still being established in some countries, territories and areas, therefore the data collected by GLASS-AMR are not yet of sufficient representativeness to allow comparison of trends in AMR among countries, territories and areas and regions.*" This is potentially problematic as this indicator is included in both SDG and GPW13 monitoring.[219]
Goal IIb – patterns and trends in resistance in human health – prevalence of blood-stream infections caused by ESBL in E coli	✓	✓	✓	
Outcome 4.1 – use of antimicrobials in humans – including (a) total human consumption of antibiotics for systemic use (Anatomical Therapeutic Chemical classification code J01) in Defined Daily Doses per 1000 population (or inhabitants) per day	✓	✓		Although the M&E framework refers to GLASS as a data source in relation to this indicator, GLASS is not mentioned in the metadata. While GLASS launched a module on AMC in December 2019, only nine countries had enrolled for it when the last report was issued in 2020.
Output for outcome 2a AMR and AMU in humans	✓	✓		This indicator relates to the number of countries reporting through GLASS antimicrobial resistance and antimicrobial use (presumably consumption). Both these indicators are leading indicators in relation to GPW13. At the end of the last reporting period (July 2019), 82 countries, territories and areas were enrolled in GLASS. Of these, 78 reported in the last round. Of those, 12 reported details of the status of their surveillance system, one reported AMR data and 65 reported data on both the status of their surveillance system and AMR data. At the time of the last report, details of antimicrobial consumption had not yet started being reported through GLASS.

A6.18. GLASS is building a systematic approach to obtaining high quality, comparable AMR surveillance data globally but its potential to deliver such data has yet to be fully realized. Strengths and limitations of GLASS are briefly summarized in Table A6.8.

Table A6.8: Strengths and limitations of GLASS

Strengths	Limitations
GLASS represents a systematic and determined effort to establish and strengthen the global AMR surveillance system to provide important data at the outcome level. It covers AMR and is expanding to also cover antimicrobial consumption. A growing number of countries Is enrolling with and reporting to GLASS. This includes low- and middle-income countries.	Only around half of WHO Member States are currently enrolled with GLASS. The only data readily available across countries relates to processes, such as reporting to GLASS and the status of national surveillance systems. GLASS has not yet published data sets at the outcome level and it may be difficult to assess progress in the absence of comparable baseline data. While reports contain country data sheets and visualizations are available online, it is not easy or straightforward to obtain the raw data set in an analyzable form. The review team have not yet managed to speak to anyone from GLASS. This may be in part due to timing and overlap with an important GLASS meeting but it may also indicate capacity issues. There seems to be quite a degree of separation between the AMR M&E team and TrACSS on the one hand and GLASS on the other.

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[217] Monitoring framework
[218] The results are likely to be affected by policies in terms of who undergoes AST. There appear to be vastly different rates in different countries among people with confirmed bacterial growth.
[219] This is particularly problematic if the GPW13 target of reducing this by 10% still applies. It will be difficult to assess if this target is reached in the absence of a baseline. Indeed, it is problematic that a target was set without a baseline and presumable without an understanding of trends. For example, if rates of AMR are rising, it may be more realistic to slow the rise than to reduce by 10%.

Section 4: Progress Reports including to the World Health Assembly (WHA)

A6.19. The WHO Secretariat's main way of reporting progress in terms of GAP AMR has been through progress reports submitted to the World Health Assembly. Summary details of these reports are included in a GAP AMR timeline in Figure A6.4. In 2015 (WHA68), in addition to presenting a draft Global Action Plan on AMR (A68/20)[220], the Secretariat reported on progress made in implementing resolution WHA67.25 on AMR (A68/19)[221] under four themes – ensuring that all relevant parts of the organization are actively engaged and coordinated, setting aside adequate resources for the work of the Secretariat, strengthening the tripartite collaboration between WHO, FAO and OIE, and exploring with the United Nations Secretary General options for a high-level initiative.

A6.20. In 2016 (WHA69), the WHO Secretariat presented a progress report (A69/24)[222] and options for a global development and stewardship framework (A69/24 Add.1).[223] The progress report included region by region progress in developing national action plans; establishment in the Secretariat of ten crosscutting workstreams supporting the GAP AMR's five objectives; the results of a public awareness survey[224]; details of the first World Antibiotic Awareness Week; details of a guidance manual on developing AMR national action plans;[225] establishment of a new global infection prevention and control (IPC) unit; details of support provided on the optimal use of antimicrobials; a protocol for collecting data on antimicrobial consumption as part of AMR surveillance; steps taken to establish the Global Antibiotic Research and Development Facility;[226] details of a consultation held on development of point-of-care diagnostic platforms; details of a meeting on biomarkers to distinguish bacterial causes of acute fever; details of the AGISAR five-year strategic plan; details of activities to strengthen laboratory capacity; details of a One Health curriculum and a planned session in Thailand; plans to develop a framework for monitoring the GAP AMR; details of the launch of GLASS, details of work conducted by the UK and the World Bank on the global burden of a continued increase in AMR; details of the high-level dialogue and plans for the high-level meeting.

A6.21. In 2017 (WHA70), the WHO Secretariat presented a report (A70/12)[227] on progress of the GAP AMR and on follow up of the political declaration of the high-level meeting of the United Nations General Assembly which had been held on 21 September 2016.[228] This report highlighted the commitments of the political declaration and requests to WHO to finalize the global development and stewardship framework, to support national action plans and other activities, and to establish an inter-agency coordination group.[229] The report also provided details of support provided to development of national action plans; details of activities to raise awareness of AMR; details of establishment of GLASS including the number of countries enrolled (43); details of the revised list of Critically Important Antimicrobials for Human Medicine; details of the methodology developed and training provided to monitor AMC; details of new recommendations on IPC; details of the updated antibiotic chapter of the WHO Model List of Essential Medicines; details of a list of priority antibiotic-resistant bacterial pathogens where new medicines are most urgently needed; details of the TrACSS questionnaire; details of expanded efforts to control resistance in tuberculosis, HIV and malaria; and ongoing work to establish a global development and stewardship framework.

[220] See https://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_20-en.pdf (accessed 1 May 2021)
[221] See https://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_19-en.pdf (accessed 1 May 2021)
[222] See https://apps.who.int/gb/ebwha/pdf_files/WHA69/A69_24-en.pdf (accessed 1 May 2021)
[223] See https://apps.who.int/gb/ebwha/pdf_files/WHA69/A69_24Add1-en.pdf (accessed 1 May 2021)
[224] Covering almost 10,000 people in 12 countries – WHO (2015) *Antibiotic Resistance: Multi-Country Public Awareness Survey* available on
http://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf;jsessionid=A4957D2EB7734E11619FB45C202CD61D?sequence=1)
(accessed 1 May 2021)
[225] WHO, FAO and OIE (2016) *Antimicrobial Resistance: A Manual for Developing National Action Plans* available on
http://apps.who.int/iris/bitstream/handle/10665/204470/9789241549530_eng.pdf?sequence=1 (accessed 1 May 2021)
[226] Now Partnership
[227] See https://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_12-en.pdf (accessed 1 May 2021)
[228] See https://digitallibrary.un.org/record/842813?ln=en (accessed 1 May 2021)
[229] Which was done in March 2017.

A6.22. The WHO Secretariat did not submit an AMR progress report in 2018 (WHA71) but, in 2019 (WHA72), a report (A72/18)[230] was submitted as a follow-up to the high-level meeting of the United Nations General Assembly in 2016. This opened with a section on country-level progress and used data from TrACSS to illustrate this (see Table A6.9).

Table 6.9: TrACSS data used in progress report to World Health Assembly in 2019 (WHA72)

TrACSS data	Comment
Some 50% of responding countries have established a **multisectoral antimicrobial resistance working group**, with representatives from the human, animal and plant health, food safety, food production and environment sectors; these working groups are functional in 53 countries	This statement appears to be based on data from Q4 and 4.2 of TrACSS but is difficult to follow not least because of mixing absolute numbers and percentages. From the data, 150 countries responded to Q4. Of these, 128 (85%) scored this as B or above, i.e. they had a multi-sectoral working group or coordination committee on AMR. But there was another question about active involvement of different sectors in developing and implementing the AMR NAP (not in the coordination committee) but only 39 countries reported all six sectors were involved. Four countries (Central African Republic, Micronesia, St Vincent and Tuvalu) said all sectors were involved even though they said they had no formal coordination mechanism. Only 35 countries meet the criteria specified (23%). It is true that 53 countries reported functional mechanisms but they did not all involve all sectors listed. Of the 53 countries with functioning mechanisms, only 16 reported all six sectors involved in NAP, 15 five sectors, 11 4 sectors, 8 3 sectors, 1 2 sectors, 1 1 sector and 1 (Greece) no sectors
While 125 countries have conducted **awareness campaigns** about the risks of antimicrobial resistance in human health, additional nationwide efforts are needed; in the animal health and other non-human sectors, one third of countries have conducted awareness campaigns;	It is difficult to reconcile these figures with the raw data. From the raw data 132/137 responding countries (96%) answered Q6.1 B or above, i.e. they had had some awareness raising activities. In terms of other sectors (Q6.2), 99 of 118 countries reported some awareness raising activities in at least one of these sectors (84%)
Although 105 (68%) countries report that they have **a national antimicrobial resistance surveillance system** for some common bacterial pathogens in humans, not all are currently enrolled in the Global Antimicrobial Surveillance System (GLASS); close to 40% of countries are conducting surveillance in the animal and food sectors;	These figures do match responses to Qs 7.4 and 7.5 at C+ using the total number of responses as the denominator. If only those who answered the question are taken as denominator, the results for Q7.4 is 105/148. 71% and for Q7.5 is 59/124 i.e. 48%
A total of 90 countries report that they have **a national infection prevention and control programme** for health care facilities, with national guidelines; in the animal and food production sectors, far fewer countries report national programmes for infection prevention and control;	This number corresponds to C+ for Q8.1
While 123 countries have **policies** requiring a prescription for antibiotic use in humans, 64 have limited the use of critically important antimicrobials for human medicine for growth promotion in animal food production.	These numbers correspond to those who answered yes to the two parts of Q9.4

A6.23. The progress report then had sections on progress of each of the five objectives of the GAP AMR. Table A6.10 briefly summarizes the report's content for each objective. In addition the report had sections on other diseases (HIV, tuberculosis, malaria, neglected tropical diseases and sexually-transmitted infections), multisectoral collaboration, ongoing challenges and emerging threats. As in 2018, there was no progress report in 2020 (WHA73).

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[230] See https://apps.who.int/gb/ebwha/pdf_files/WHA72/A72_18-en.pdf (accessed 1 May 2021)

Table A6.10: Reporting for each of the GAP AMR objectives to the World Health Assembly in 2019

Objective No.	Report content
1	The report noted that, in 2017, World Antibiotic Awareness Week had been celebrated in 113 countries, that technical consultations had been held and that a competency framework for health workers' education and training on AMR had been produced.[231]
2	The report noted that the second GLASS report had been produced with input from 68 countries; that GLASS was providing support and developing tools and new modules; that GLASS would be revised in 2020; that GLASS was promoting innovative approaches;[232] that WHO was developing a global integrated surveillance protocol, the ESBL EC Tricycle project, and that WHO was working with other relevant UN Agencies to understand the role of inadequate access to water, sanitation and hygiene (WASH) and environmental contamination with antimicrobials residues and resistant microbes as drivers of antimicrobial resistance and its impact on health.
3	The report summarized various guidelines that had been produced since the adoption of the GAP AMR and also discussed safe management of WASH and safe reuse of excreta in food production, and expanding the use of vaccines.
4	The report covered the adoption of the AWaRe criteria for antibiotics; the technical support provided to antibiotic stewardship programmes; the publication of a report on antibiotic consumption;[233] the second consultation on a global framework for development and stewardship to combat AMR; and plans for a further update of the list of critical antibiotics for human health later in 2019.
5	The report covered activities of the Global Antibiotic Research and Development Partnership; plans to update the priority list of antibiotic-resistant bacteria that pose the greatest risk to human health; publication of a comprehensive analysis of the clinical and antibacterial pipeline;[234] plans to develop a WHO research and development priority list of antimicrobial resistance diagnostics; and the formulation of models to enable evidence-based prioritization of research into and the development of new vaccines to address pathogens associated with antibiotic resistance.

A6.24.   In addition, in 2019, the WHO Secretariat prepared the report of the United Nations Secretary General as a follow-up to the political declaration of the high-level meeting of the General Assembly on AMR. [235] This relied heavily on TrACSS data[236] and, indeed, was considered an alternative to a specific TrACSS report for the third round of TrACSS reporting. After presenting an introduction, the report provided an update on the implementation of the political declaration, some details of the ad hoc inter-agency coordination group on AMR and conclusion and ways forward.[237] The part on the implementation of the political declaration was structured into three main sections – (a) implementation of national action plans, (b) global action[238] and (c) collaboration by the Tripartite Organizations to address challenges.[239]

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[231] See https://www.who.int/hrh/resources/WHO-HIS-HWF-AMR-2018.1/en/ (accessed 1 May 2021) Please note that the download from the WHO site produced an error but the document was downloaded from https://inhwe.org/forum/working-group-interprofessional-education-and-training/who-competency-framework-health-workers (accessed 1 May 2021)

[232] Including genome sequencing and point-of-care diagnostics.

[233] See https://apps.who.int/iris/bitstream/handle/10665/277359/9789241514880-eng.pdf?ua=1 (accessed 1 May 2021)

[234] See https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(18)30513-9/fulltext (accessed 1 May 2021)

[235] See https://digitallibrary.un.org/record/3807197?ln=en (accessed 29 April 2021).

[236] To report on national action plans; awareness-raising campaigns; national AMR surveillance systems (supplemented by data from GLASS); national monitoring systems for consumption and use of antimicrobials; national infection prevention and control programmes; good health, management and hygiene practices in animal husbandry; and policies and regulations on antimicrobial use.

[237] This final section identifies how challenges at the national level and at the regional and global levels can be addressed. It also summarizes the recommendations of the inter-agency coordination group in five critical shifts, namely (a) urgency, (b) one health approach, (c) stakeholder engagement, implementation of national action plans, and resource mobilization.

[238] Which was itself divided into seven sections which are similar to the five objectives of GAP AMR – (1) awareness-raising, behaviour change and training; (2) strengthening knowledge and evidence through surveillance; (3) prudent and responsible use of antimicrobials (4) infection prevention and control measures; (5) strengthening regulatory frameworks; (6) financial resources and the economic case for investments in combating AMR; and strengthening public-private partnerships to promote research and development.

[239] Which covered collaboration and the joint workplan of the Tripartite Organizations and the global development and stewardship framework.

Figure A6.4: GAP AMR timeline

Legend
- 🔵 Governing bodies' actions
- 🟢 Reports and publications
- 🟣 Monitoring, evaluation and surveillance activities
- 🟠 Other

2014
- 🔵 WHA67 requests MS and DG to draft a GAP on AMR
- 🟢 Draft of the GAP AMR
- 🔵 WHA67 requests MS to develop NAPs by 2017
- 🔵 WHA67 requests strengthened WHO/FAO/OIE collaboration through One Health approach

2015
- 🟠 Consultation on point-of-care diagnostic platforms
- 🟠 Meeting on biomarkers to distinguish bacterial causes of acute fever
- 🔵 WHA68 adopts the GAP AMR
- 🟣 WHA68 requests MS to develop a global AMR surveillance system
- 🟣 Development of the AGISAR 5-year Strategic Framework 2015-2019
- 🟣 Launch of the Global AMR Surveillance System (GLASS)

2016
- 🟢 Tripartite Manual for Developing NAPs
- 🟢 Options for a global development and stewardship framework presented to WHA69
- 🟠 Ten workstreams established
- 🟣 Public awareness survey in 12 countries
- 🟠 First World Antibiotic Awareness Week
- 🟠 Establishment of global IPC unit
- 🟣 Protocol to collect AMC data
- 🟠 Establishment of Global Antibiotic Research and Development Facility
- 🟠 One Health curriculum developed
- 🔵 Political declaration of the high-level meeting of UNGA on AMR
- 🟣 Launch of TrACSS

2017
- 🟠 World Antibiotic Awareness Week celebrated in 113 countries
- 🟢 List developed of priority antibiotic-resistant bacterial pathogens where new medicines are most urgently needed
- 🟢 Updated antibiotic chapter of the WHO Model List of Essential Medicines
- 🟢 New recommendations on IPC published
- 🟢 Methodology developed and training provided to monitor AMC
- 🟢 Revised list of Critically Important Antimicrobials for Human Medicine
- 🟠 Establishment of the Ad Hoc Interagency Coordination Group on AMR

2018
- 🟢 Analysis of the clinical and antibacterial pipeline
- 🟠 Second consultation on a global framework for development and stewardship to combat AMR
- 🟢 WHO report on surveillance of antibiotic consumption
- 🟢 Competency framework for health workers' education and training on AMR
- No report to WHA71

2019
- 🟠 AWaRe criteria adopted for antibiotics
- 🟣 TrACSS data used in progress report to WHA72

2020
- No report to WHA73

2021
- 🟣 Evaluation report of FAO's role and work in AMR
- 🟣 Comprehensive review of the GAP AMR
- 🟠 UN High-Level Interactive Dialogue on AMR

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Section 5: Country Cooperation Strategies[240]

A6.25.   Country Cooperation Strategies are documents which guide WHO's work in countries. They provide a medium-term vision for WHO's technical cooperation with particular Member States and support the country's national health policy, strategy or plan.[241]

A6.26.   For this review, we identified 343 CCSs covering 160 countries and territories. There were two types of CCSs – full (169; 49%) and brief (173; 51%). Full CCSs are longer documents covering multiple years while brief CCSs are short summaries covering one year. We sought to identify whether the CCS mentioned AMR and, if so, what it said. Overall, just over one quarter of the CCSs (88 of 343; 26%) mentioned AMR. Among the 160 countries and documents, a total of 66 (41%) mentioned AMR in at least one of their CCS documents. For each country that had a CCS that mentioned AMR, we also documented the number of CCSs that mentioned AMR and the proportion of their CCSs that mentioned AMR. Perhaps unsurprisingly, a smaller proportion of brief CCSs (36 of 174; 21%) mentioned AMR than full CCSs (52 of 169; 31%).

A6.27.   Among the 160 countries and territories, there were 18 territories that are not WHO Member States.[242] Of these, only one[243] mentioned AMR in a CCS. In addition, five Member States[244] that had not submitted any TrACSS questionnaires had CCSs. None of these mentioned AMR. Of the 187 Member States that had submitted at least one TrACSS questionnaire, almost three quarters (137 of 187; 73%) had a CCS. Of these, just under half (65 of 137; 47%) mentioned AMR.

A6.28.   Figure A6.5 shows the percentage of Member States, who had submitted at least one TrACSS questionnaire, that have a CCS, analysed by country income group and region. This shows that almost all low- (27 of 28; 96%) and lower-middle income countries (43 of 47; 91%) have CCSs as compared to less than half of high-income countries (25 of 57; 44%). All countries in AFR, EMR and SEAR have CCSs as compared to only one in seven (7 of 51; 14%) countries in EUR.

A6.29.   Figure A6.6 presents data on how likely it is that a Member State that has a CCS mentions AMR. It also presents data for the average number of CCSs per country that mention AMR and the average proportion of CCSs per country that mention AMR. Where countries have a CCS, low-income countries are least likely to mention AMR (5 of 28; 18%). In terms of region, countries in SEAR are most likely to mention AMR (7 of 11; 64%) and those in AFR (18 of 43; 42%) and AMR least likely (12 of 35; 34%).

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[240] This work does not include review of Biennial Cooperative Agreements (BCAs) but the analysis of these was included in the main report.
[241] See https://www.who.int/country-cooperation/what-who-does/ccs/en/ (accessed 27 May 2021)
[242] American Samoa, Anguilla, Aruba, Bermuda, British Virgin Islands, Cayman Islands, French Polynesia, Guam, Montserrat, New Caledonia, Northern Mariana Islands, Occupied Palestinian Territories, Pacific Island Countries, Pitcairn Islands, Sint Marten, Tokelau, Turks and Caicos Islands and Wallis and Futuna.
[243] Occupied Palestinian Territories
[244] Equatorial Guinea, Gambia, Madagascar, Niue and Senegal.

Figure A6.5: Percentage of Member States that submitted at least one TrACSS questionnaire (n=187) that have at least one CCS – analysed by country income level and WHO region
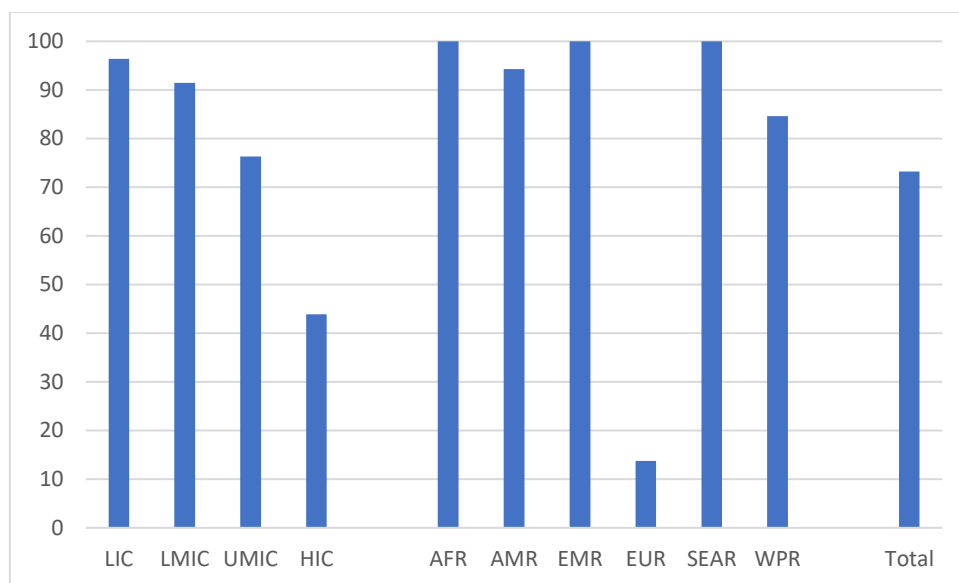
Figure A6.6: How likely is it that a Member State that has a CCS (n=137) mentions AMR – analysed by country income level and WHO region
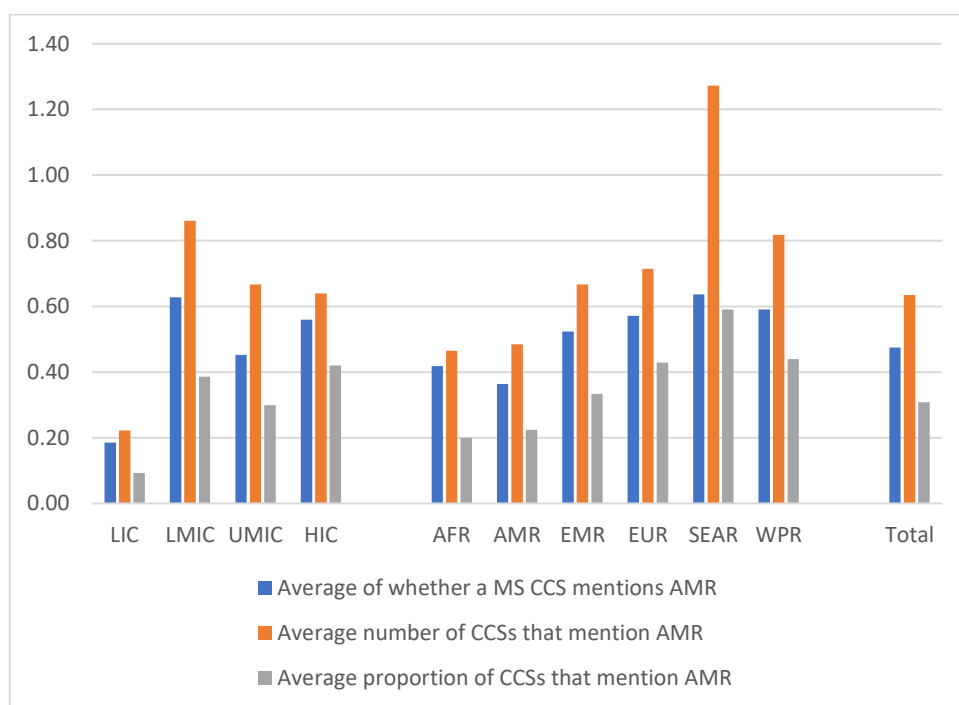
A6.30. Figure A6.7 combines these two analyses and looks at what percentage of Member States, who had submitted at least one TrACSS questionnaire, have a CCS that mentions AMR. Overall, this is just over one third (65 of 187; 35%). It is highest among lower-middle-income countries (27 of 47; 57%) and lowest among low-income countries (5 of 28; 18%). While almost two thirds of countries in SEAR (7 of 11; 64%) have a CCS which mentions AMR, only four countries in EUR do (4 of 51; 7%).[245]

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[245] But this largely reflects that relatively few countries in EUR have CCSs.
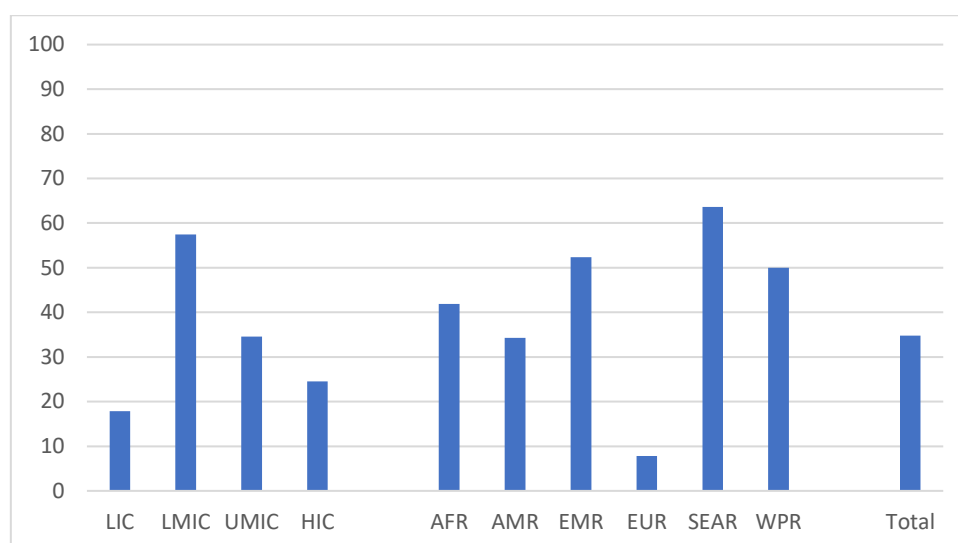
A6.31.   Table A6.11 seeks to answer the question whether having a CCS that mentions AMR is associated with performance in relation to GAP AMR. This is calculated by comparing overall performance scores (using the graduated score method) and improvement in that score with whether a country has a CCS that mentions AMR, the number of CCSs that mention AMR and the proportion of CCSs that mention AMR. There is a statistically significant association between having a CCS which mentions AMR and overall performance score on GAP AMR and (to a lesser degree) improvement in GAP AMR performance score. While this is seen among all countries that mention AMR in their CCS, the association is stronger if the number or proportion of CCSs that mention AMR is taken onto account. This does not establish causality. While it is certainly possible that WHO technical support provided on the basis of the CCS is contributing to countries' performance on GAP AMR, there could be other factors. Country income level is unlikely to be a major factor but other factors, such as national political commitment to AMR, could plausibly be a factor in both progress on AMR and reflecting AMR in the CCS.

Table A6.11: Is performance score and improvement in performance score on GAP AMR associated with having a CCS that mentions AMR

	Having a CCS that mentions AMR	Number of CCSs that mentions AMR	Proportion of CCS that mention AMR
GAP AMR performance score (GS method)	$p=.009$	$p<.001$	$p<.001$
Improvement in GAP AMR performance score (GS method)	$p=.03$	$p=.006$	$p=.004$
Country income level	$p=.06$	$p=.16$	$p=.01$

A6.32.   Based on our qualitative data review, we identified 25 Member States who performed better than might be expected in one of three areas – overall performance score vis a vis country income level, improvement in performance score vis a vis country income level, and performance on non-human health metrics vis a vis human health metrics. Among these countries, almost two thirds (16 of 25; 64%) had a CCS which mentions AMR. This was highest among the second group. Of those countries that were identified as having improved their AMR GAP performance score more than might be expected, two thirds of them (8 of 12; 67%) had a CCS which mentions AMR. This finding provides some evidence that technical

support provided by WHO on the basis of an agreed CCS with a focus on AMR may have contributed to improvement in GAP AMR performance scores in at least some countries.

A6.33.   In terms of content analysis of AMR in CCSs, Figure A6.8 shows the percentage of CCSs that mention AMR that cover issues related to particular objectives of the GAP AMR and other relevant topics. While 36 of 88 (41%) CCSs contain material related to objective 2 (surveillance), only one contains material of relevance to objective 5 (focused on research and development). Other topics covered in CCSs include developing and implementing National Action Plans and promoting multisectoral coordination. Broader topics such as health security and health systems strengthening are also included.

Figure A6.8: Percentage of CCSs that mention AMR (n=88) that cover particular objectives of the GAP AMR and other relevant topics in relation to AMR
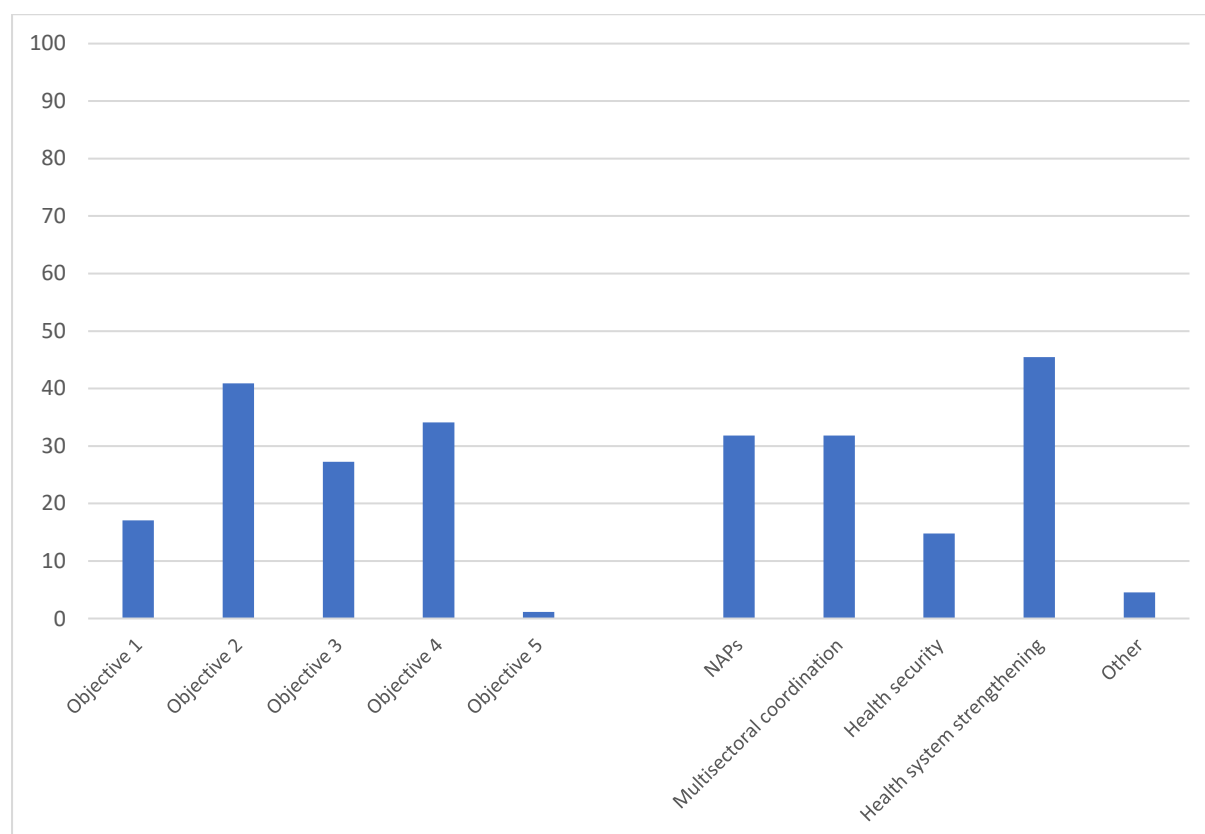
A6.34.   Some CCSs that focused on objective 1 of the GAP AMR[246] identified limited awareness as a barrier to addressing AMR. CCSs included advocacy, education and awareness as focus areas or regional priorities for WHO. Specific activities included the development or updating of training curriculum for prescribers or staff at the facility level as a strategic priority and carrying out the Antibiotic Awareness Week to improve awareness of AMR at the national level.

A6.35.   Some CCSs that focused on objective 2 of the GAP AMR[247] identified AMR surveillance as a focus area or programmatic/strategic priority for WHO, specifically ensuring AMR monitoring, building capacity for surveillance and strengthening national surveillance systems. Barriers identified included weak state and/or laboratory surveillance systems.

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[246] Improve awareness and understanding of antimicrobial resistance through effective communication, education and training.
[247] Strengthen the knowledge and evidence base through surveillance and research

A6.36.   Some CCSs that focused on objective 3 of the GAP AMR[248] identified infection prevention and control as a strategic and/or regional priority. Some identified inadequate infection prevention and control as a barrier to reducing AMR. Specific activities mentioned included observing Hand Hygiene Day, strengthening capacities for infection prevention and control and developing a framework to address objective 3.

A6.37.   Some CCSs that focused on objective 4 of the GAP AMR[249] identified optimising the use of antimicrobial medicines as a strategic priority. Some mentioned the promotion of rational use of antimicrobial medicines as a focus, while some identified their irrational use as a challenge to reducing AMR. Some CCSs mentioned access to essential medicines as a focus area and some emphasised the importance of strengthening and/or implementing policies and regulations to optimize the use of antimicrobials. Some CCSs mentioned monitoring the consumption of antimicrobials to optimize their use.

A6.38.   Only one CCS referred to objective 5 of the GAP AMR[250] and this recommended increased efforts in research and innovation.

A6.39.   Many CCSs had a focus on supporting the development of national action plans and establishing/strengthening multisectoral coordination mechanisms. CCSs emphasized WHO's role to support national authorities to implement national action plans. Many countries specifically referred to the importance of multisectoral coordination to implement national action plans and to the coordination of multiple technical sectors to develop and implement cross-cutting policies and activities to contain AMR.

A6.40.   Among the health systems strengthening issues identified in CCSs were building capacity at the national level to increase infection prevention and control, strengthening laboratory capacity and improving health service delivery and surveillance. Some CCSs specifies that reinforcing capacities at the ministerial level is important to help contain AMR and to develop and implement relevant policies. Some CCSs referred to the importance of country preparedness for threats and epidemics, and further identify AMR as a threat to health security.

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[248] Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures
[249] Optimize the use of antimicrobial medicines in human and animal health
[250] Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

Section 6: Joint External Evaluations

A6.41.   Joint External Evaluations (JEEs) are conducted as part of the process of strengthening health security by implementing the International Health Regulations.[251] They help countries identify the most critical gaps within their human and animal health systems in order to prioritize opportunities for enhanced preparedness and response.[252] JEEs consist of an initial process of self-evaluation by a country's government with this assessment being reviewed by an external expert team ahead of them visiting the country. The team can draw on data from other sources and they then produce a report of their findings which is agreed with the host country's government. The JEEs therefore constitute a negotiated qualitative joint assessment.

A6.42.   As part of this review, available JEE mission reports[253] were identified and reviewed. Reports were identified for 97 countries and territories.[254] Two different templates appear to have been used with the transition from one to the other occurring sometime in 2018. The majority of the reviews (81 of 97; 84%) were conducted using the original template. The JEE templates cover a wide range of areas[255] ranking these on a 1-5 scale[256] and also providing a qualitative analysis of strengths and best practices and areas that need strengthening and challenges. In our review, we considered the quantitative ratings overall[257] and for AMR[258] specifically. We also considered the qualitative assessment of AMR (see from paragraph A6.A4.53).

A6.43.   Appendix 4 presents average scores for the different categories using the two different templates. While, in general, scores seem lower in relation to the second template as compared to the first, extreme caution is needed in interpreting this as the number and identity of countries has changed between the two periods. There have also been quite a lot of changes between the two templates and it may be that the bar has been raised. In general, the average scores for the antimicrobial resistance criteria are amongst the lowest across all the JEE categories.[259] Average scores for immunization are among the highest.

A6.44.   Overall, around half of Member States (93 of 187; 50%), that had submitted at least one questionnaire had received a JEE and these are analysed by country income group and WHO region in Figure A6.9. Overall, JEEs were conducted in more than three quarters of low-

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[251] See https://www.who.int/health-topics/international-health-regulations#tab=tab_1 (accessed 27 May 2021)
[252] See https://www.who.int/ihr/procedures/joint-external-evaluations/en/ (accessed 27 May 2021)
[253] See https://www.who.int/ihr/procedures/mission-reports/en/ (accessed 27 May 2021)
[254] One was specifically for the United Republic of Tanzania – Zanzibar while there were three for countries that had not submitted any TrACSS questionnaires – Gambia, Madagascar and Senegal.
[255] National legislation, policy and financing; IHR coordination, communication and advocacy; antimicrobial resistance; zoonotic diseases; food safety; biosafety and biosecurity; immunization; national laboratory system; real-time surveillance (just surveillance in latest template); reporting; workforce development (human resources – animal and health sectors in latest template); emergency preparedness; emergency response operations; linking public health and security authorities; medical countermeasures and personnel deployment; risk communication; points of entry; chemical events and radiation emergencies.
[256] Where 1 is no capacity; 2 is limited capacity; 3 is developed capacity; 4 is demonstrated capacity and 5 is sustainable capacity
[257] As these cover many areas which are of relevance to AMR, e.g. laboratory capacity, surveillance, infection prevention and control, and immunization.
[258] There are four sub-areas for AMR and they vary slightly by template. In the first template, they were antimicrobial resistance detection; surveillance of infections caused by antimicrobial-resistant pathogens; health care-associated infection (HCAI) prevention and control programmes; and antimicrobial stewardship activities. In the second template, they were effective multisectoral coordination of AMR; surveillance of AMR; infection prevention and control; and optimize use of antimicrobial medicines for human and animal health and agriculture. There is some read across from these categories to the objectives of GAP AMR, particularly objectives 2-4.
[259] In the case of both templates, the average scores for area P3.4 (antimicrobial stewardship activities/optimize use of antimicrobial medicines in human and animal health and agriculture) is the lowest of any area (1.74 in first template and 1.63 in the second). In general, scores on the second template were lower than the first in three areas (P3.2, P3.3 and P3.4). Average scores increased for area P3.1 (from 2.17 to 2.50) but these appear to have been assessing quite different areas – antimicrobial resistance detection in template 1 and effective multisectoral coordination on AMR in template 2.

income countries (23 of 28; 82%) and over two thirds of lower-middle-income countries (32 of 47; 68%) as compared to just over one third of high-income countries (21 of 57; 37%). Almost all countries in AFR (41 of 43; 95%) had JEEs as compared to only 2 (2 of 35; 6%) in AMR.[260]

Figure A6.9: Percentage of Members States that submitted at least one TrACSS questionnaire (n=187) that had a JEE – analysed by country income group and WHO region
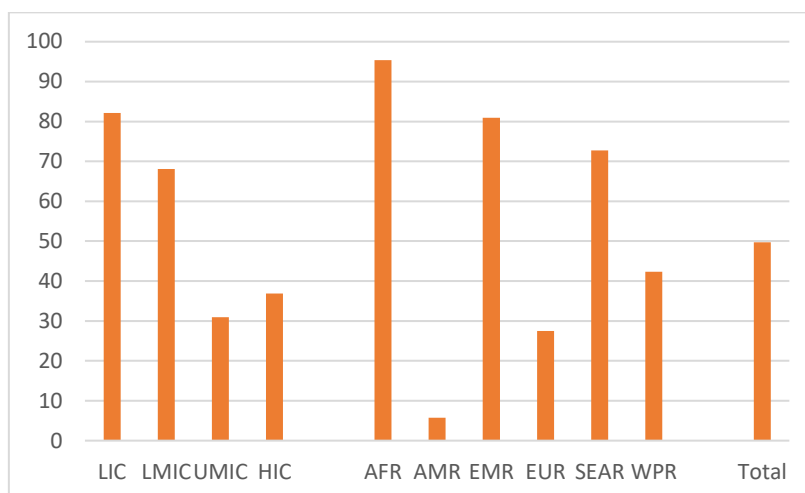
A6.45. Total scores were calculated for each country for the JEE as a whole and for the four AMR elements specifically. These scores were calculated in two ways. First, the score for each element[261] was totalled and converted to a percentage by dividing by the total possible score[262] and multiplying by 100. However, this approach, which is based on a 1-5 scale, gives countries 20% of the possible score even where there is no capacity. To address this[263], the second way of calculation converted the 1-5 scores to a 0-4 scale. These were then totalled and converted to a percentage by dividing by the total possible score[264] and multiplying by 100. The average scores for the JEE as a whole generated by the second method were lower than for the first method (44 vs 55 for template 1 and 33 vs 46 for template 2).[265] However, the second method is considered better than the first and it is this method that is used in the remainder of these notes.

A6.46. Figures A6.10 and A6.11 present data for average scores on JEE overall and AMR specifically analysed by country income level and WHO region. Both graphs show similar patterns. Scores are lowest in low-income countries (25 for JEE overall and 7 for AMR) and highest in high-income countries (76 for JEE overall and 65 for AMR). Scores are lowest in AFR (27 for JEE overall and 11 for AMR) and highest in AMR (86 for JEE overall and 69 for AMR).[266]

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[260] It should be noted that in AMR the two countries that had JEEs (Canada and the United States of America) were both high-income countries.
[261] 48 in template 1 and 49 in template 2.
[262] 5*48 for template 1 and 5*49 for template 2.
[263] And to make the method more consistent with the graduated scoring system for assessing performance on the GAP AMR.
[264] 4*48 for template 1 and 4*49 for template 2.
[265] Similar findings were seen for the average AMR scores using the two methods (42 vs 28 for template 1 and 39 vs 24 for template 2).
[266] But, this is based on data from only two countries both of which are high-income.

Figure A6.10: Average percentage scores for JEE overall – analysed by country income group and WHO region
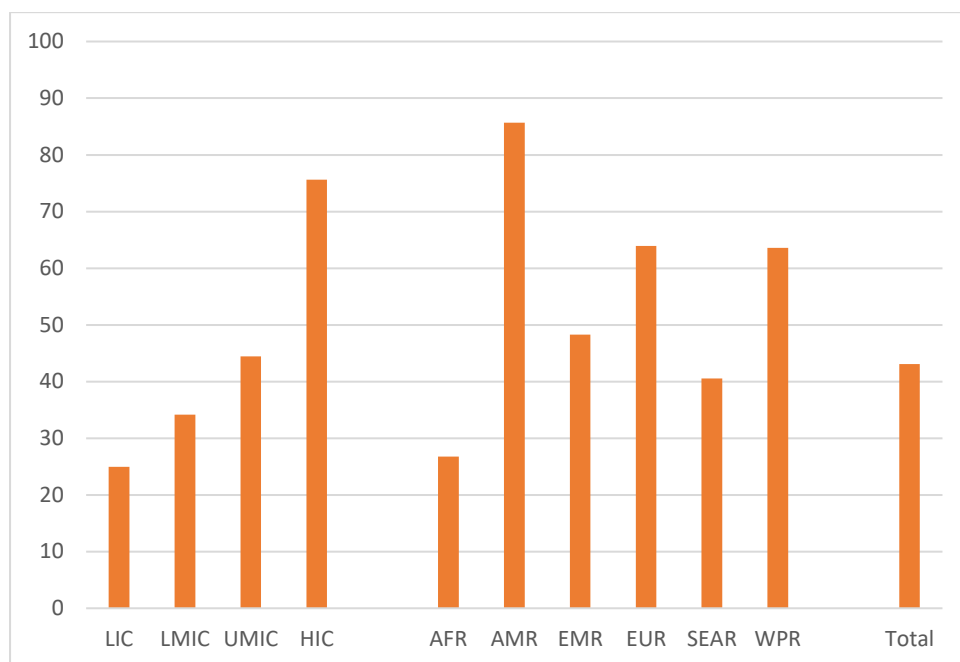
Figure A6.11: Average percentage scores for AMR – analysed by country income group and WHO region
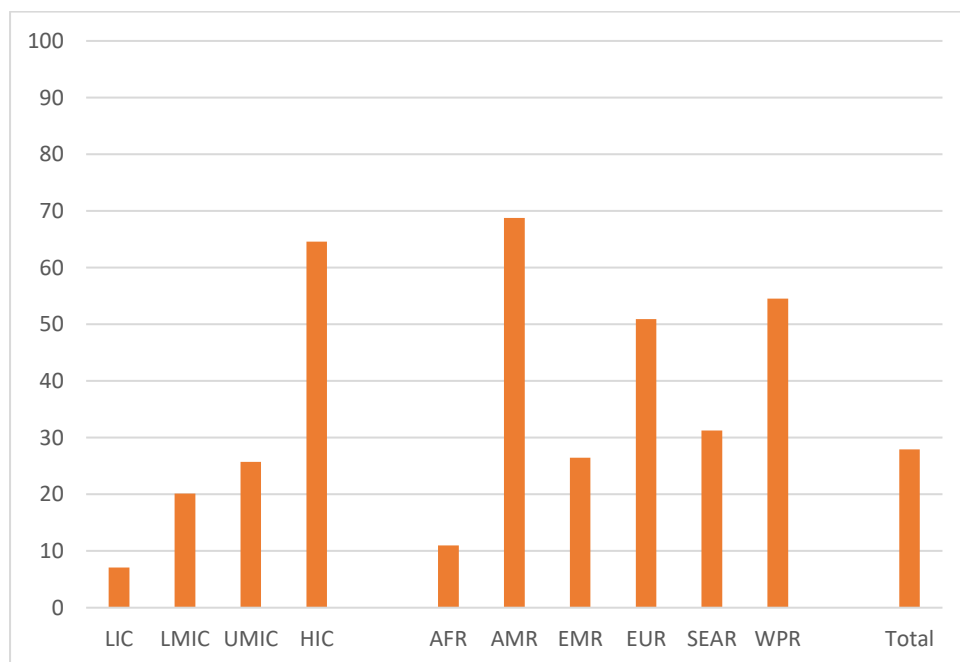
A6.47.   There is a statistically significant correlation (*p<.001*) between both overall score on JEE and the JEE score on AMR and performance score on GAP AMR based largely on TrACSS data. These correlations are illustrated in Figures A6.12 and A6.13. These findings provide some evidence that data as reported through TrACSS is similar to data reported through JEEs and thus provide a degree of validation of TrACSS data.[267] However, at the individual country level, there may be large variations between performance scores based on TrACSS and scores generated from JEEs. This is particularly the case for countries with relatively low

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[267] Although with the caveat that the JEEs themselves are based on a negotiated, qualitative joint assessment

scores on AMR on JEEs. For example, countries which scored 0 for AMR on JEE[268] had performance scores ranging from 0 to 56. Possible explanations for this include:

- That the AMR assessment in the JEE is based on four elements only while the scores generated through TrACSS are based on many more elements so perhaps present a more nuanced view.
- Timing differences – for example, in the case of the country that scored 0 for AMR on JEE but 56 on the performance score generated through TrACSS, the JEE was conducted in 2017 but the performance score was based on 2019 TrACSS data. This is important, particularly in this case, as this country showed high levels of improvement between baseline and endline based on TrACSS data.

Figure A6.12: Comparison of AMR performance score (using the graduated score method) with the overall score on joint external evaluation

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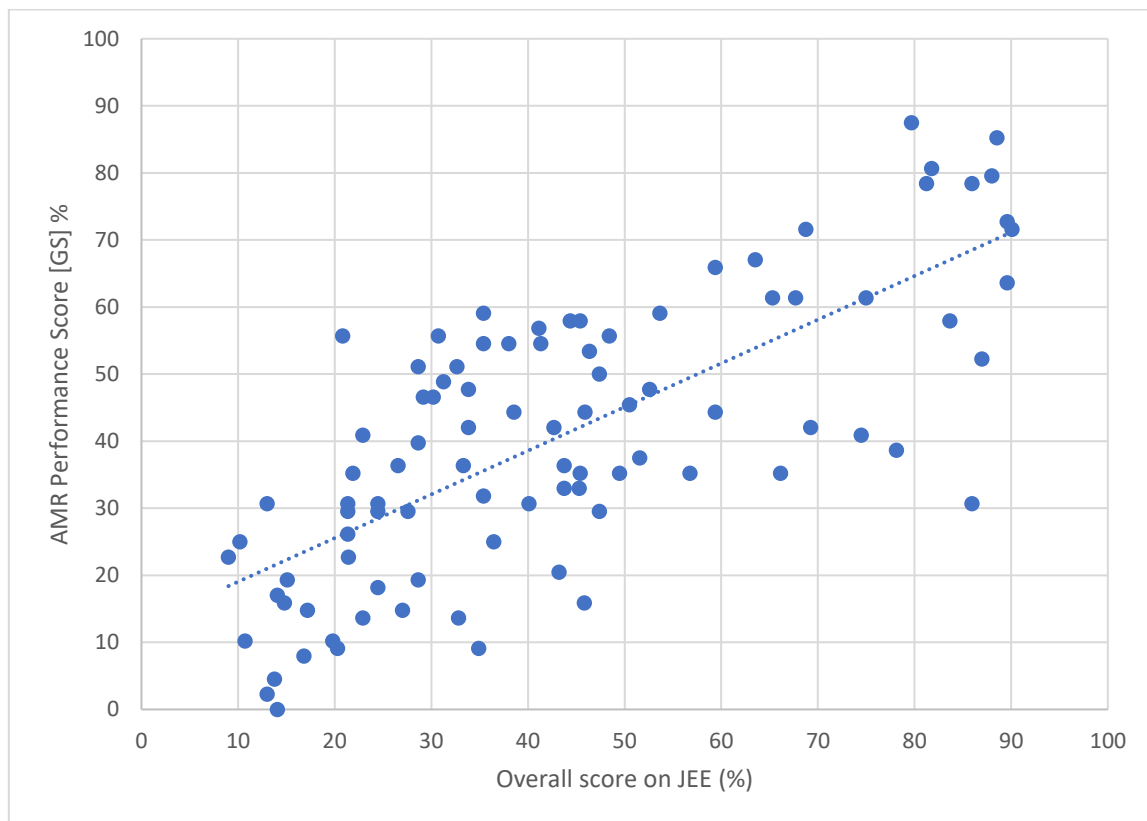
[268] That is all four elements were scored 1.

Figure A6.13: Comparison of AMR performance score (using the graduated score method) with the score for AMR elements of joint external evaluations
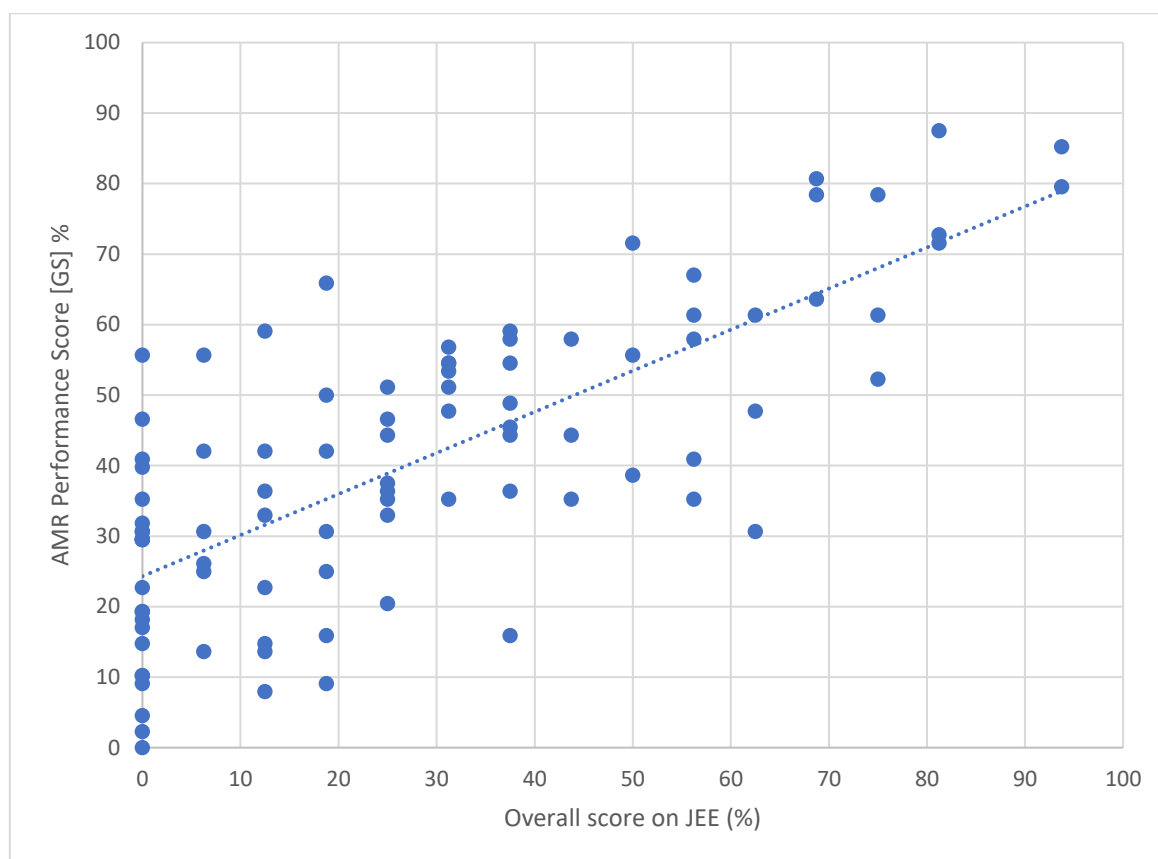
A6.48. Table A6.12 briefly summarises some of the differences and commonalities of using TrACSS and JEEs to assess progress on AMR. Overall, given the number of responses to TrACSS and the repeated nature of the survey, it makes sense to use TrACSS as the main source of routine data on AMR GAP. JEEs remain a useful means of validation of progress on AMR made by countries.

Table A6.12: Differences and commonalities between using TrACSS and JEEs to assess country progress on AMR

Differences	More Member States (187) have reported to TrACSS than have had JEEs (96).
	TrACSS is an annual process. So, many Member States have submitted multiple responses to TrACSS allowing trend analysis while no country has had more than one JEE.
	TrACSS is focused solely on AMR so allows assessment of more elements than JEE does in its specific AMR section (although other elements of the JEE have relevance to AMR).
	JEEs are more likely to be carried out in low- and middle-income countries. While countries in all income groups respond to TrACSS, there is a significant positive association between response rates and country income group.
	TrACSS is largely based on an A-E grading system while JEE uses a 1-5 system.
	TrACSS responses are official Member State self-assessments while the JEEs include a degree of external evaluation
Commonalities	Both TrACSS and JEEs rely on a five-point ranking/scoring system based on qualitative assessment
	Both TrACSS and JEEs may only reflect the perspectives of those involved in the process. Potentially, the JEEs may involve a broader group of national stakeholders. At least, the extent of involvement of national stakeholders can be observed in JEEs.

A6.49. A qualitative analysis of the JEEs sought to identify common strengths and challenges raised in the JEEs. These are considered in relation to objectives 2, 3 and 4 of the GAP AMR and additional topics including AMR detection, development and implementation of the National

Action Plans, multisectoral coordination, health systems (including human resources for health; health information systems) and infectious diseases (including HIV, TB, malaria).

A6.50. Strengths and best practices identified in relation to objective 2 of the GAP AMR[269] included the identification and functioning of national reference laboratories to detect AMR, the existence of veterinary laboratories to detect resistance in animals, the designation of national hospitals as sentinel sites for surveillance, and existing and operational surveillance systems. Areas identified that needed strengthening in relation to this objective included that several countries do not have an established surveillance system or a surveillance plan for AMR. Many JEEs pointed to the lack of designated sentinel sites or reference laboratories for surveillance as a challenge, as well as the absence of integrated information systems to collect relevant data. Some JEEs also mentioned limited collaboration and information sharing between national actors (e.g. clinics, hospitals, laboratories) and insufficient staff capacity as barriers to AMR surveillance. Some JEEs commented on the lack of surveillance systems for at-risk groups

A6.51. Strengths and best practices identified in relation to objective 3 of the GAP AMR[270] included the existence of a plan, guidelines, standard operating procedures or protocols for infection prevention and control. In addition, some JEEs commented positively on training IPC programmes for staff at the facility level, while others noted good staff capacity on infection prevention and control. Some JEEs also mentioned the existence of isolation wards or facilities to contain the spread of infections. Areas that need strengthening to improve progress against this objective include: the development or implementation of IPC guidelines and addressing limited capacity in managing infectious diseases.

A6.52. Strengths and best practices identified in relation to objective 4 of the GAP AMR[271] included the existence and use of essential medicines lists and policies or regulations requiring the use of prescriptions for antibiotics. Additionally, many JEEs mentioned existing policies to regulate the use of antibiotics at the national level. Some JEEs mentioned committees, either at the provincial or national level, in place to draft and ensure the implementation of antimicrobial use and consumption guidelines. The JEEs identified some areas that need strengthening to improve progress against this objective. These included the absence of policies to regulate the use and prescription of antibiotics, limited data or surveillance system to analyze patterns of consumption of antibiotics, the lack of required prescriptions for antibiotics for humans and animals and limited staff capacity to enforce guidelines.

A6.53. Some of the JEEs also mentioned strengths in AMR detection, including the existence of a national plan or guidelines to detect AMR, the identification and capacity of laboratories to detect and report resistance, infrastructure and staff capabilities to detect most priority pathogens, and the existence of quality assurance programmes for national laboratories. However, some JEEs identify the following issues as barriers to AMR detection: limited staff capacity for AMR detection, testing, the lack of detection guidelines, the absence of national reference laboratories with the necessary capacity to detect AMR and the lack of standardized protocols for resistance detection, testing and reporting.

A6.54. This qualitative analysis of JEEs also identified the development or implementation of NAPs as a key issue raised by some evaluations. Some countries do not have national plans in place to contain AMR. This is particularly an issue for low- and lower-middle-income countries. In

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[269] Strengthen the knowledge and evidence base through surveillance and research
[270] Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures
[271] Optimize the use of antimicrobial medicines in human and animal health

addition, several JEEs reported the lack of national plans for AMR surveillance, detection or use. Another barrier identified in some JEEs is limited coordination between the human, animal and environmental sectors, as well as between national level facilities (e.g. clinics, hospitals, laboratories). In that regard, some JEEs pointed to the lack of multisectoral coordination as a hindering factor at country-level.

A6.55.   Many JEEs identified barriers to AMR containment related to health systems, mainly human resources for health and information systems. Issues related to human resources included inadequate staffing levels, limited capacity to detect, test and report AMR, limited availability of staff training programmes and insufficient laboratory capacity. Issues related to information systems included the lack of surveillance systems for human and/or animal health, limited data sharing among national stakeholders and the absence of a centralized system on surveillance.

A6.56.   Some JEEs also identified low awareness of AMR and the use of antibiotics among healthcare staff and/or the general public as an important issue to address. A few JEEs mentioned existing awareness or behaviour change campaigns to address this issue.

A6.57.   Some JEEs also refer to existing disease-specific surveillance systems, such as for HIV, TB (including MDR-TB) and malaria, as they provide data on resistant pathogens. Specifically, some of these JEEs mention laboratory and staff capacity to detect and report resistant pathogens by national tuberculosis programmes. This is particularly an issue for low- and lower-middle-income countries that are being supported by the Global Fund to Fight AIDS, Tuberculosis and Malaria.

Section 7: Baseline Data

A6.58.   One challenge facing consideration of progress of implementing the GAP AMR is that there is no formal or systematic baseline data. This is perhaps unsurprising as the monitoring and evaluation framework was only developed some years after the GAP AMR was adopted and the main data collection methods (TrACSS, GLASS etc.) were only introduced subsequent to the GAP AMR being adopted. Indicator metadata does not present baseline data nor explain where this could be found. Many indicators are not yet fully defined and many lack any data at all (performance or baseline). While there are a number of reports that could, or are explicitly expected to, provide a baseline, the data in these is only available in an analyzed or aggregated form. Raw data sets do not appear to be available.

A6.59.   In the WHO Secretariat's report to the World Health Assembly in 2015 (WHA69), reference is made to a multi-country public awareness survey of antibiotic resistance[272] and the report explicitly states that "*the survey will serve as a baseline against which to measure progress in awareness over time*". However, it does not appear that the survey has yet been used in that way. The survey consisted of 14 questions in three areas (antibiotic use, knowledge of antibiotics, knowledge of antibiotic resistance) and was administered[273] between September and October 2015 to 9,722 respondents from 12 Member States, two from each WHO region.[274] In terms of knowledge of antibiotic resistance, respondents were asked:

- If they had heard of key terms (antibiotic resistance, drug resistance, antibiotic-resistant bacteria, superbugs, antimicrobial resistance, AMR).
- Whether a number of statements (8) on the issue of antibiotic resistance were true or false.[275]
- Whether a number of actions (8) would help address the problem.[276]
- Whether they agreed or disagreed with a number of statements (6) related to whether respondents understand the scale of the problem of antibiotic resistance and whether it will affect them personally.[277]
- If antibiotics were widely used in agriculture in their country.[278]

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[272] See http://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf;jsessionid=A4957D2EB7734E11619FB45C202CD61D?sequence=1) (accessed 2 May 2021)

[273] Online (South Africa, Mexico, India, Indonesia, Russian Federation, China, Viet Nam) or face-to-face (Nigeria, Barbados, Serbia, Egypt, Sudan), Target sample size was 1,000 for online data collection and 500 for face-to-face.

[274] The countries were Nigeria, South Africa, Barbados, Mexico, India, Indonesia, Russian Federation, Serbia, Egypt, Sudan, China and Viet Nam.

[275] There were five true statements ([1] many infections are becoming increasingly resistant to treatment by antibiotics **[72]**; [2] If bacteria are resistant to antibiotics, it can be very difficult or impossible to treat the infections they cause **[70]**; [3] antibiotic resistance is an issue that could affect me or my family **[64]**; [4] bacteria which are resistant to antibiotics can be spread from person to person **[44]**; antibiotic-resistant infections could make medical procedures like surgery, organ transplants and cancer treatment much more dangerous **[67]**) and three false ones ([1] antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well **[12]**; [2] antibiotic resistance is an issue in other countries but not here **[62]**; [3] antibiotic resistance is only a problem for people who take antibiotics regularly **[39]**). The figure in bold is the percentage of respondents who identified correctly whether a statement was true or false.

[276] The actions were [1] people should use antibiotics only when they are prescribed by a doctor or nurse **[87]**; [2] farmers should give fewer antibiotics to food-producing animals **[73]**; [3] people should not keep antibiotics and use them later for other illnesses **[70]**; [4] parents should make sure all of their children's vaccinations are up-to-date **[87]**; [5] people should wash their hands regularly **[91]**; [6] doctors should only prescribe antibiotics when they are needed **[89]**; [7] governments should reward the development of new antibiotics **[78]**; [8] pharmaceutical companies should develop new antibiotics **[79]**. All of these actions are considered helpful and the percentage of respondents identifying this is given in bold.

[277] The statements were [1] antibiotic resistance is one of the biggest problems the world faces **[63]**; [2] medical experts will solve the problem of antibiotic resistance before it becomes too serious **[64]**; [3] everyone needs to take responsibility for using antibiotics responsibly **[88]**; [4] there is not much people like me can do to stop antibiotic resistance **[57]**; [5] I am worried about the impact that antibiotic resistance will have on my health, and that of my family **[75]**; [6]I am not at risk of getting an antibiotic-resistant infection, as long as I take my antibiotics correctly **[63]**. The percentage of respondents agreeing with particular statements are given in bold.

[278] Overall, 62% of respondents agreed with this statement.

A6.60.   This survey and its results could potentially provide baseline data for the indicator[279] for outcome 1 in the GAP AMR monitoring and evaluation framework. However, indicator metadata has not yet been developed so it is not possible to know if questions asked/data collected will be comparable to survey data. In addition, the brief indicator description implies that the focus of the indicator will be on particular stakeholder groups and not the general public. Given this, it is not clear how this survey could provide useful baseline data to monitoring of the GAP AMR M&E framework.

A6.61.   Another potential source of baseline data is a worldwide country situation analysis conducted by WHO in 2015.[280] This was based on asking Member States to complete a questionnaire between 2013 and 2014. A total of 132 Member States (68%) responded which is a similar but lower response rate to the four rounds of TrACSS (see Table 2, p36). Response rates by WHO region, country income group and overall are shown in Figure A6.14. In general, response rates were higher in EUR (49 of 53, 92%), SEAR (11 of 11, 100%) and WPR (26 of 27, 96%) than in AFR (8 of 47, 17%). Response rates were much higher in high-income countries (46 of 58, 79%) than in low-income countries (10 of 30, 33%). This difference is statistically significant ($p<.001$). Mean number of responses to the four rounds of TrACSS was higher in those Member States that responded to this survey (3.46) than those that did not (2.31).[281] This difference is also statistically significant ($p<.001$).

Figure A6.14: Percentage of Member States responding to survey by country income group, WHO region and overall
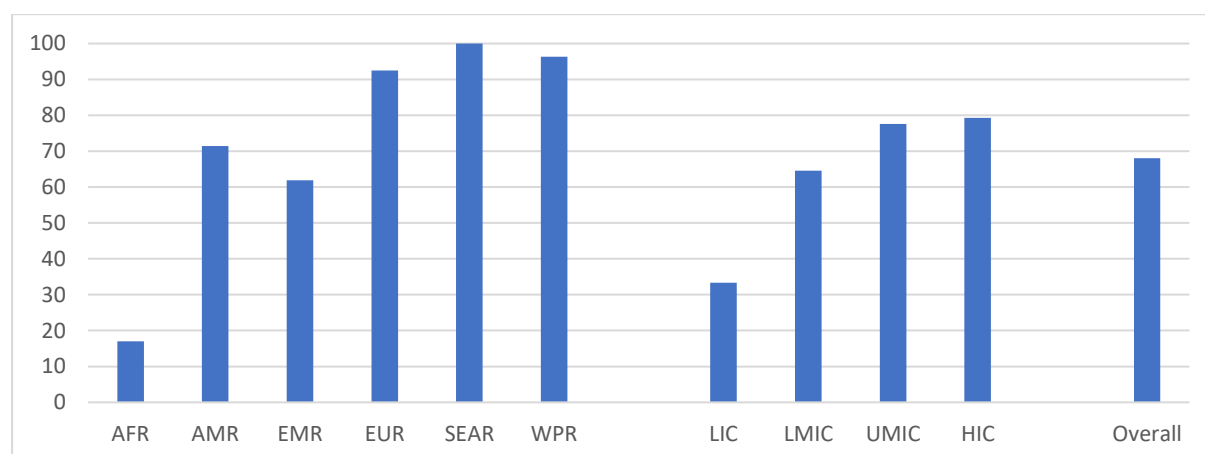
A6.62.   Topics covered in this situation analysis are similar to some of the topics[282] covered later in TrACSS and included national plans and other strategies; surveillance and laboratory capacity; access to quality-assured antimicrobial medicines; use of antimicrobial medicines; public awareness; and infection prevention and control programmes. The situation analysis report presents data aggregated by region across these topics. This data is potentially useful as it does present the situation that existed prior to the adoption of the GAP AMR and it covers topics and questions that are reflected in TrACSS and the GAP AMR monitoring framework. More than two thirds of Member States responded to this survey. However, there are substantial limitations. First, the source data (i.e. by country) is not publicly

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[279] Percentage of stakeholders (e.g. human and animal health workers, prescribers, farmers, food processing workers) that have knowledge about AMR and implications for antimicrobial use and infection prevention.

[280] See https://apps.who.int/iris/bitstream/handle/10665/163468/9789241564946_eng.pdf?sequence=1 (accessed 2 May 2021).

[281] Three Member States (Bosnia and Herzegovina, Gambia and Niue) that responded to this survey did not respond to any of the four rounds of TrACSS.

[282] The situation analysis is very focused on the issue of human health.

available.[283] In addition, there does not seem to be clear metadata[284] and the questionnaire is not annexed to the report.

A6.63. Another option for baseline data is to take the first data reported (e.g. to TrACSS) as a country baseline. Limitations of this approach include that such data risks overlooking early improvements as it does not pre-date the GAP AMR, may not be fully comparable to later performance data (particularly where questions/indicators have changed) and may be for different dates for different countries. Nevertheless, the importance of baseline data is such that we have calculated baseline data for TrACSS responses using this method. In our view this approach is preferable (in the context where systematic approaches to baseline data collection are not available) to discounting the issue of baseline and/or taking a much later baseline (when more comparable data is considered to be available).

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[283] Nor is it available to or through the AMR M&E team.
[284] For example, it is not clear what denominator calculations are using. Figures in the report seem to use total number of Member States in a region while the narrative seems to use the number of Member States that responded. This is confusing and unclear.

Section 8: Assessing GAP implementation and progress overall

Progress towards outcomes, objectives and goals

A6.64. One option when looking at GAP AMR implementation is to look at progress made towards identified outcomes, objective and goals. Caution is needed in any such approach as there is unlikely to be a simple causal relationship between GAP AMR actions and outcomes. Many other factors may be at play. Nevertheless, tracking progress made towards outcomes will be important if contribution of GAP AMR (beyond activities and outputs) is to be understood. At worst, outcome data provides useful contextual understanding.

A6.65. The GAP AMR M&E framework identifies a large number of indicators to be tracked at overarching goal, goal and outcome level and these are listed in Appendix 1 (p131) along with details of whether the indicator is included for the purpose of monitoring SDGs and GPW13. The review team have attempted to identify data for these indicators and comments on progress made are included in Appendix 1. Currently, of the 34 outcome indicators identified, three (9%) appear to be incompletely defined while more than half (19, 55%) seem to lack any data. A further seven (21%) have some data but this is considered insufficient for outcome monitoring at a country level while only four (12%)[285] have country-level data available, including baseline data. It is important to note that currently no outcome data is being actively analysed in relation to the GAP AMR, e.g. by the AMR M&E team, although there are plans to establish an AMR data portal to address this issue. It would also be helpful if the indicator metadata had clear links to available data sets and reports (where available). It is currently difficult to do much, if any, analysis at the outcome level. There are too many outcome indicators and most of them have insufficient data for analytical purposes.

A6.66. Figure A6.15 presents available data for the prevalence of bloodstream infections resistant to identified pathogens based on available SDG data for 2018. Data is available for just over one quarter of Member States, 52 (27%) countries for E coli and for 53 (27%) countries for S aureus. Rates of reporting vary by region and by country income group. For example, while only three low-income countries (10%) reported data on S aureus resistance, this figure was almost half (26, 45%) of high-income countries. Rates of resistance were also associated with country income group and this association was statistically significant (for E coli *p*<.001 and for S aureus p=.009).[286]

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[285] Three of these are SDG indicators and the fourth relates to levels of resistant TB.
[286] Caution is needed in interpreting these results, particularly given the caveat included in the latest GLASS report (see Table 7, p15).

Figure A6.15: Percentage of Member States responding to survey by country income group, WHO region and overall

Percentage of Member States reporting data on rates of resistant E Coli (SDGs 2018)
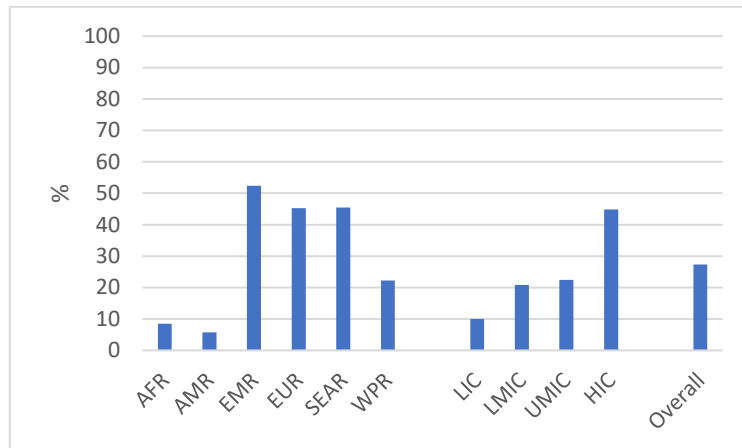
Average rates of resistant E coli reported by Member States (SDGs 2018)
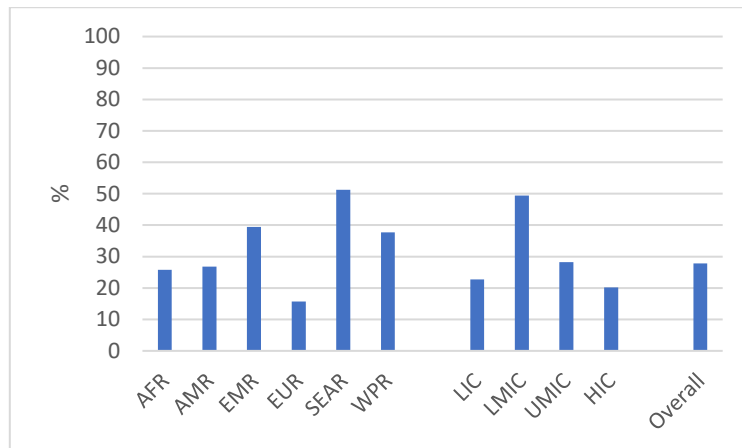
Percentage of Member States reporting data on rates of resistant S aureus (SDGs 2018)
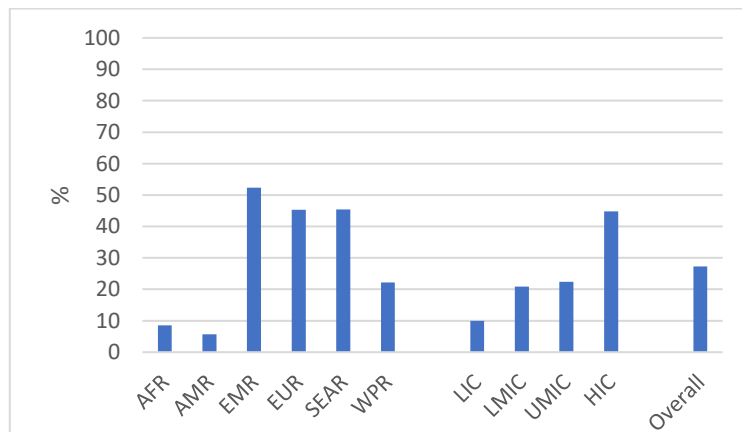
Average rates of resistant S aureus reported by Member States (SDGs 2018)

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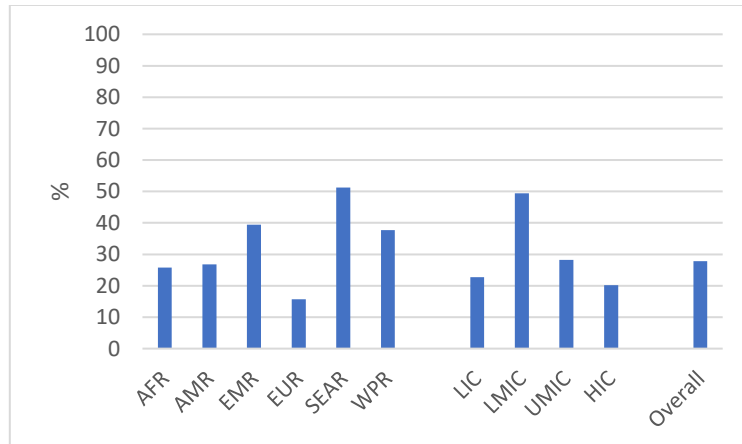
<u>Implementation progress overall</u>

A6.67. One way of getting an overview of GAP AMR implementation is through the use of an implementation score based on aggregating results across a number of output-level indicators. Such an implementation score was calculated in the report of the second round of TrACSS (see final bullet of paragraph A4.22, p40). Relatively limited analysis was done in that report (p20) including a graph of country scores across all indicators and across human and non-human indicators (Figure 9). It does not appear that this approach was used in subsequent rounds of reporting on TrACSS. WHO's Evaluation Office has used this approach in evaluations of other global action plans, for example on non-communicable diseases.[287]

A6.68. For the purposes of this review, the review team calculated an overall implementation score in two ways. The first way dichotomizes data in a similar way to that done in the TrACSS reports, i.e. a score of A or B scores zero and a score of C to E scores one.[288] The second way uses a graduated score where A scores zero, B scores one, C scores two, D scores three and E scores four. These methods allow mean scores to be generated per indicator which, for the first method (C+), are expressed as percentage of countries scoring C or above and, for the second method (graduated score GS) are expressed in the range 0-4. Both methods generate scores for 22 indicators[289] and overall implementation scores are expressed as percentages. The 22 indicators can be broken down in two different ways. First, they can be divided into core indicators (2) and then indicators related to the first four objectives of GAP AMR (objective 1, 6; objective 2, 6; objective 3, 3; and objective 4, 5). Secondly, the objective-related indicators can be divided into those related to human health (7) and those related to other areas (13). More details of those indicators are provided in Appendix 3.

A6.69. Table A6.13 presents data for the two ways of calculating implementation scores across all included indicators. Data is the mean across all Member States that submitted at least one response to TrACSS (n=187). Baseline data reflects the first data set reported by a Member State on a particular indicator and performance data reflects the last data set so reported. The change is the mean difference between these two figures. Data is similar between the two calculation methods.[290] The biggest improvements are seen in relation to multisectoral coordination and national action plans with little if any change seen in infection prevention and control in human health and optimizing antimicrobial use in animal health.

A6.70. Figure A6.16 shows the mean overall implementation score across the indicator set for both calculation methods. This shows that the two methods produce similar results although the C+ method produces consistently higher results. Overall, the mean implementation score on the C+ method was 52.9% as compared to 41.0% at baseline. The mean implementation score on the GS method was 44.3% as compared to 36.7% at baseline. In general, the highest mean implementation score is seen in EUR and the lowest in AFR. There is marked variation in mean implementation scores between low-income countries (C+ 26.9, GS 24.8) and high-income countries (C+ 72.2, GS 60.9) and this difference is statistically significant for both methods ($p<.001$). Figure A6.17 shows the mean change in overall implementation score from baseline to performance data again using both methods. Again, the change documented with the C+ method (12.0) was higher than for the GS method (7.6). The highest

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[287] See https://cdn.who.int/media/docs/default-source/documents/about-us/evaluation/ncd-gap-final-report.pdf?sfvrsn=55b22b89_22&download=true (accessed 3 May 2021).

[288] We have used this approach across all indicators which differs slightly from the approaches used in earlier TrACSS reports.

[289] As compared to 18 indicators used in the TrACSS 2017/18 report. It should be noted that three indicators which relate to TrACSS Q5.4 already have dichotomised data based on yes/no responses. In the C+ system, yes is scored as equivalent to C+, i.e. 1 and no is scored as 0. In the GS system, yes is scored as equivalent to E (4) and no as 0.

[290] In general, the scores are slightly higher in the C+ method. This is essentially because this system does not distinguish between C and higher levels of performance. The GS system effectively sets the bar higher as full marks are only given to a score of E.

change in implementation score occurred in SEAR. There was no clear pattern by country income group (for C+ method p=0.80; for GS method p=0.86).

Table A6.13: Implementation scores across GAP AMR indicators
Colour coding
- *for GS scores – amber 0-1.50; yellow 1.51-2.00; 2.01-3.00 light green; dark green >3.01*
- *for C+ scores – amber 0-40; yellow 41-60; light green 61-80; dark green >80*
- *for GS change – amber 0-0.25; yellow 0.26-0.50; light green >0.50*
- *for C+ change – amber 0-10; yellow 11-20; light green >21*

Indicator	Baseline		Performance		Change	
	GS	C+	GS	C+	GS	C+
Multi-sector and one health working arrangements	1.09	20	1.80	45	0.71	25
National action plan	1.51	48	2.32	75	0.81	27
Awareness and understanding of AMR risks and response (human health)	1.73	49	2.20	78	0.48	28
Awareness and understanding of AMR risks and response (animal health, plant health, food production, food safety and environment)	1.15	29	1.25	47	0.10	17
Training and professional education on AMR in the human health sector	1.73	60	1.92	71	0.19	11
Training and professional education on AMR in the veterinary sector	1.28	33	1.55	50	0.27	17
Training and professional education on AMR in farming sector, food production, food safety and the environment	0.68	16	0.74	19	0.06	3
Progress with strengthening veterinary services	1.36	39	1.65	52	0.29	13
National monitoring system for consumption and rational use of antimicrobials in human health	1.36	41	1.63	47	0.27	6
National monitoring system for antimicrobials intended to be used in animals	1.16	33	1.54	51	0.39	18
National monitoring system for antimicrobial use in plant production	0.50	18	0.86	33	0.36	15
National surveillance system for AMR in humans	1.74	53	2.10	67	0.36	14
National surveillance system for AMR in animals	1.31	38	1.73	55	0.42	18
National surveillance system for AMR in food (animal and plant origin)	1.47	53	1.60	60	0.13	7
Infection prevention control in human health care	1.89	61	1.96	61	0.07	0
Good health, management and hygiene practices to reduce the use of antimicrobials and minimize development and transmission of AMR in animal production	1.14	31	1.40	33	0.25	2
Good management and hygiene practices to reduce the development and transmission of AMR in food processing	1.26	38	1.44	44	0.18	6
Optimizing antimicrobial use in human health	1.36	44	1.80	67	0.44	24
Optimizing antimicrobial use in animal health (terrestrial and aquatic)	1.46	44	1.49	44	0.03	0
Laws or regulations on prescription and sale of antimicrobials for human use	3.08	77	3.44	86	0.36	9
Laws or regulations on prescription and sale of antimicrobials for animal use	2.44	61	2.59	65	0.15	4
Laws or regulations that prohibit the use of antibiotics for growth promotion	1.63	41	1.99	50	0.36	9

Figure A6.16: Mean overall implementation score (both methods) by WHO region, country income group and overall
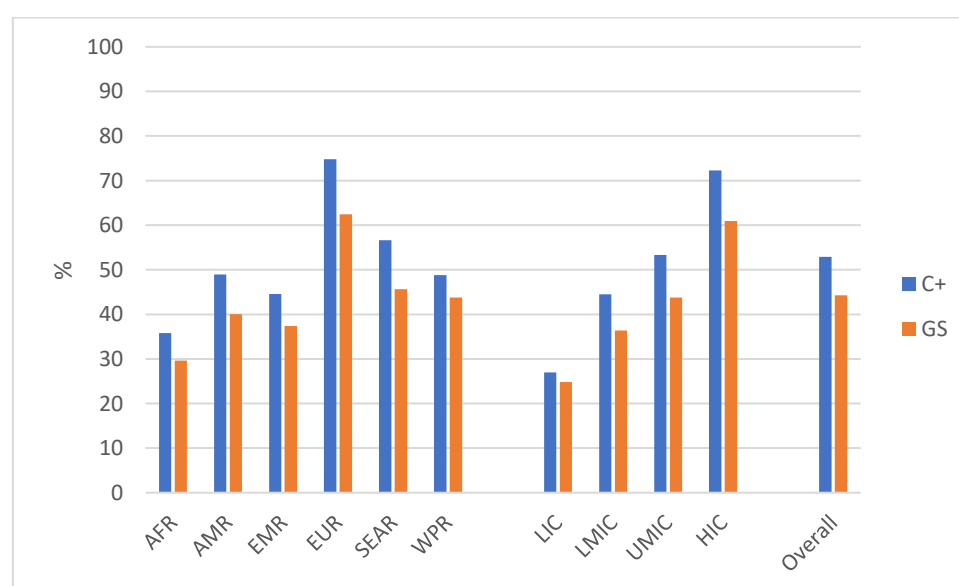
Figure A6.17: Mean change in overall implementation score from baseline to performance data (both methods) by WHO region, country income group and overall
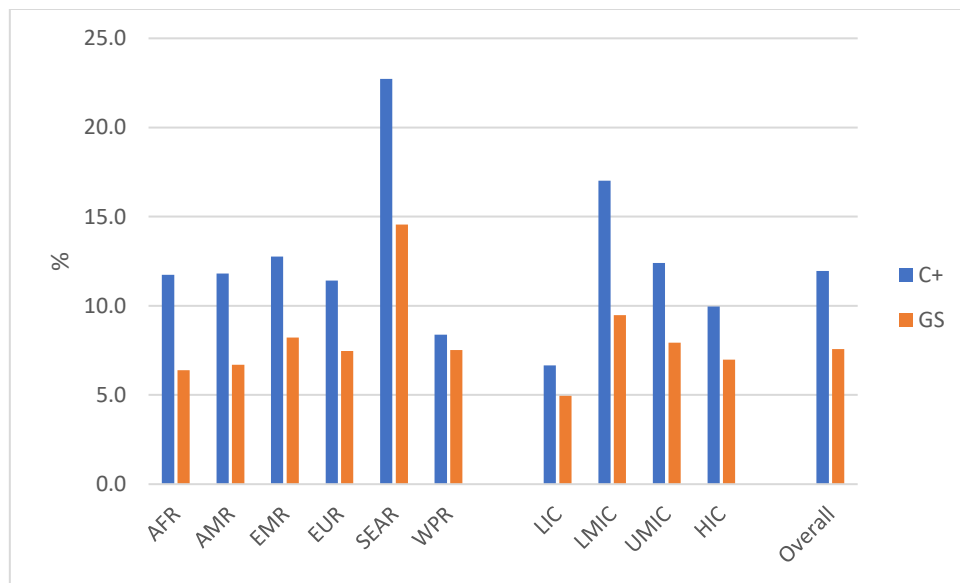
A6.71. Figure A6.18 shows the relationship between country income level and implementation score in a different way by plotting the mean implementation score (C+ method) against GNI per capita. This shows the same pattern, namely that mean implementation score increases as GNI per capita rises. This change is statistically significant ($p<.001$). However, there are some countries that achieve higher implementation scores than might be expected for their level of GNI per capita. Ten of these are within the red box in Figure A6.18 and further study of these might be beneficial to try to understand better their higher-than-expected levels of reported performance.[291]

Figure A6.18: Mean overall implementation score (C+ method) compared to GNI per capita

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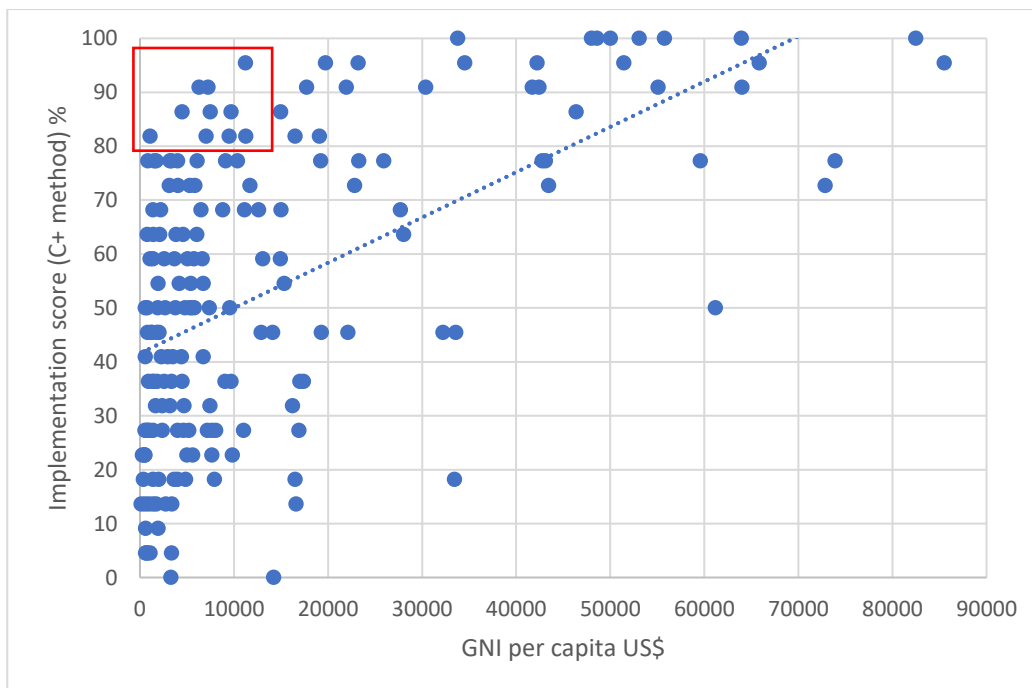
[291] The countries are Azerbaijan, Belarus, Cuba, Malaysia, Mexico, Russian Federation, Serbia, Tanzania, Thailand and Turkey.

A6.72.   Figure A6.19 shows a similar graph but this time it plots change in implementation score (C+ method) between baseline and performance data by GNI per capita. This shows that change in implementation score is largely independent of GNI per capita.[292] However, the countries with the highest increases (shown in Figure 9 within the red box)[293] all have GNI per capita below US$12,000. Again, further study of these might be beneficial to try to understand better their higher-than-expected levels of reported performance.

Figure A6.19: Change in implementation score (C+ method) between baseline and performance data by GNI per capita
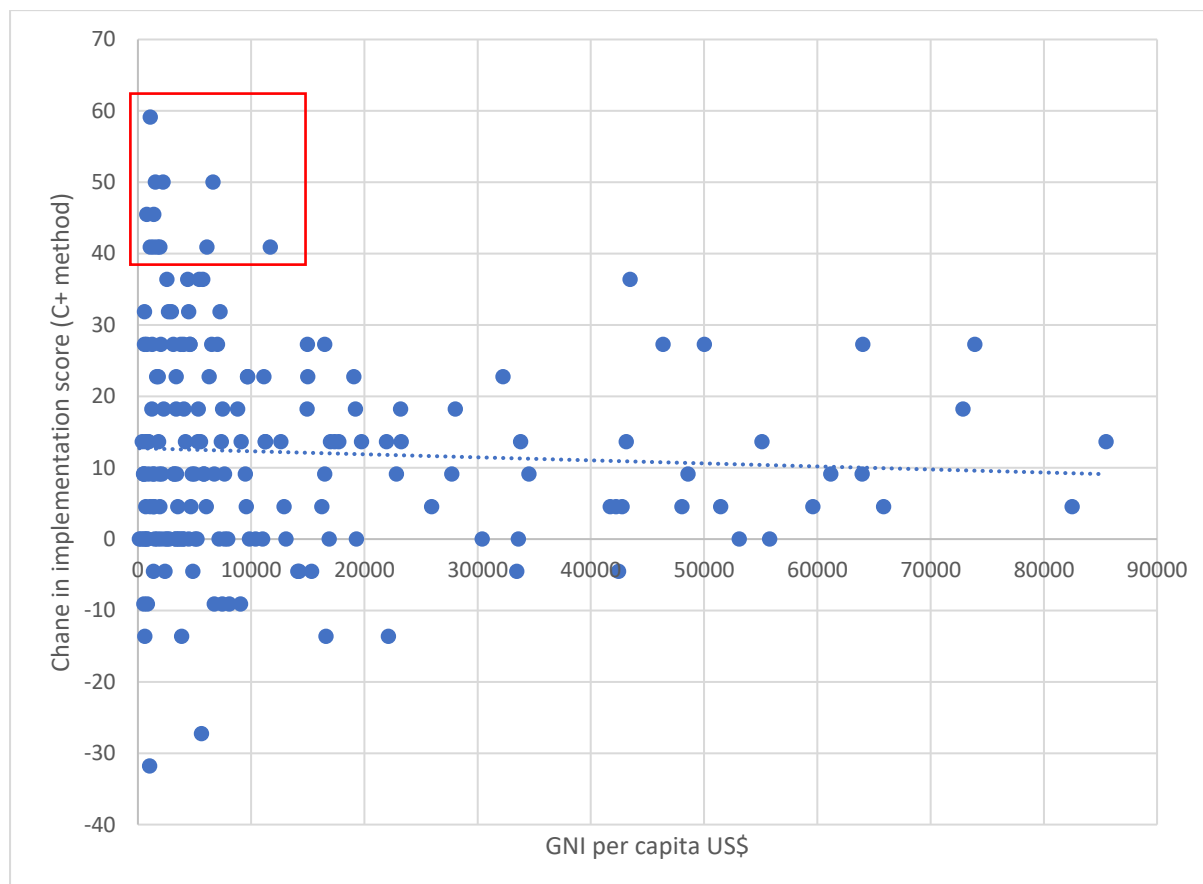
A6.73.   Figure A6.20 shows the mean implementation score across core indicators and indicators for four of the objectives of GAP AMR. The highest mean score is for objective 4 (C+ 62%; GS 57%) and for the core areas of multisectoral collaboration and national action plans (C+ 60%; GS 51%). Scores for the other three objectives are similar. Figure A6.21 shows the improvement in mean implementation score which has occurred between baseline and performance data. This shows that the increase is highest for core indicators, i.e. the main improvement that has occurred is the introduction of multisectoral coordination mechanisms and national action plans (C+ increase of 26 percentage points; GS increase of 19 percentage points), and lowest for objective 3 relating to infection prevention and control.

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[292] There is a slight negative association but this is not statistically significant (p=0.80).
[293] Bangladesh, Burkina Faso, Cambodia, Costa Rica, Ecuador, Ghana, Guyana, Kenya, Myanmar, Nepal, Tanzania and Zimbabwe.

Figure A6.20: Mean implementation score (both methods) across core indicators and indicators for four objectives of GAP AMR
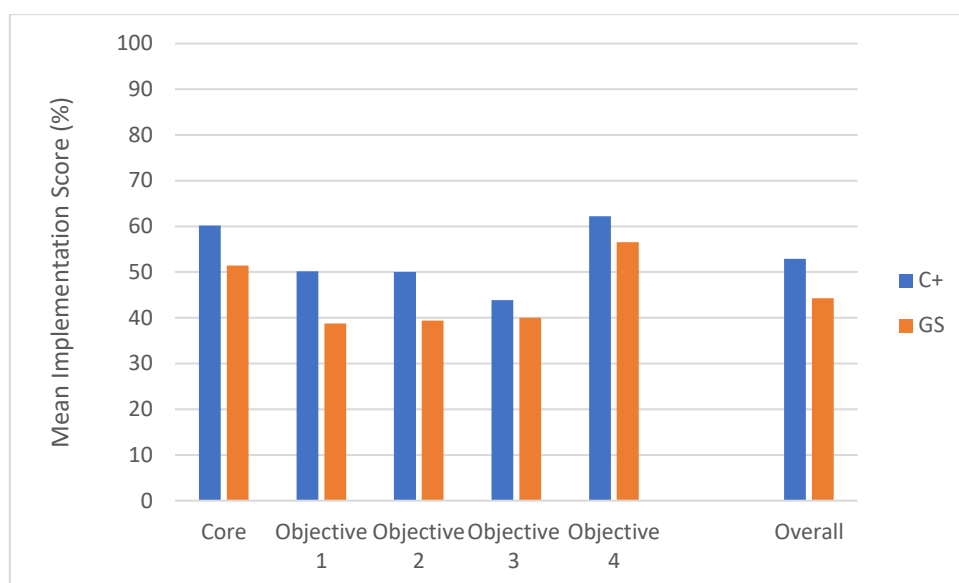
Figure A6.21: Change in mean implementation score (both methods) between baseline and performance data across core indicators and indicators for four objectives of GAP AMR
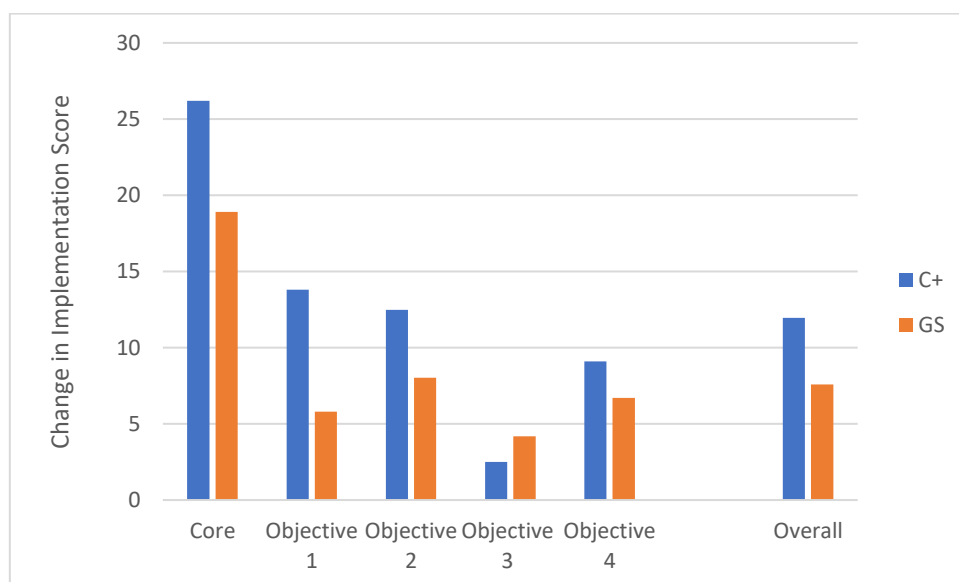
A6.74. This could perhaps be viewed negatively, i.e. that the main changes that have occurred in countries following the adoption of the GAP AMR have been in relation to multisectoral coordination and national action plans. However, Figure A6.22 shows that there is a positive association between having a multisectoral coordination mechanism in place and overall modified[294] implementation score. This association is statistically significant ($p<.001$ for both methods). There is also a statistically significant positive association ($p=.01$ for C+ method and $<.001$ for GS method) between improvement in multisectoral coordination mechanism between baseline and performance data and improvement in modified implementation score (see Figure A6.23). It should be noted that the numbers of countries at the extreme ends of this graph are small (see Figure A6.24) and this may explain the somewhat anomalous findings in those groups. Almost all countries (90%) fall in the range of 0 to 3. Only eight countries (4%) recorded negative changes.

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[294] The modification is that the score for the particular indicator being considered is deducted from the implementation score

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Figure A6.22: Is there an association between the grade a country gives for its multisectoral coordination mechanism and mean modified implementation score
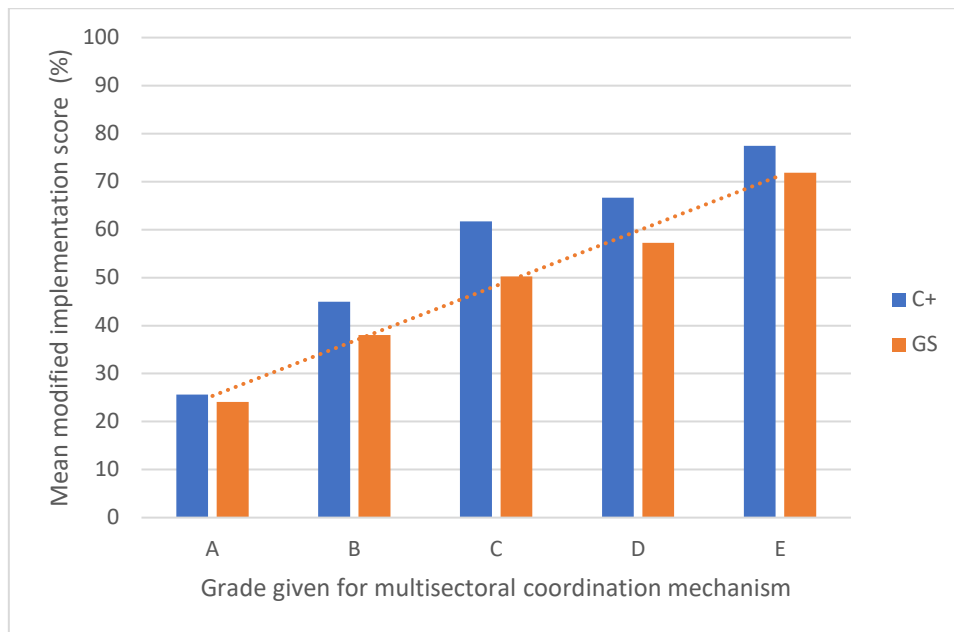
Figure A6.23: Is there an association between change in the grade a country gives for its multisectoral coordination mechanism between baseline and performance data and change in mean modified implementation score
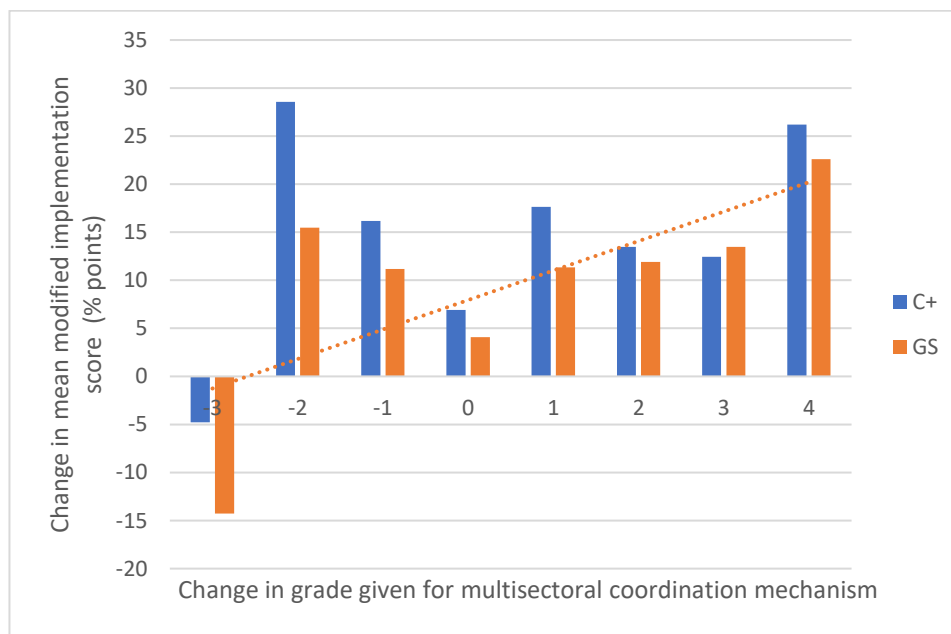
Figure A6.24: Percentage of Member States that recorded different levels of changes in scores for multisectoral coordination commissions between baseline and performance data

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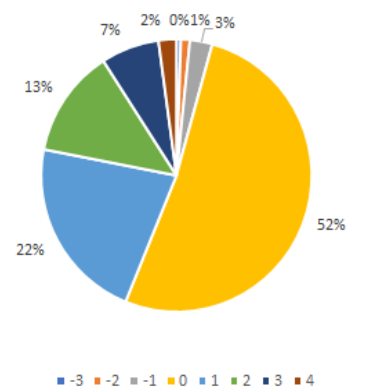
A6.75.   Figure A6.25 also shows that there is a positive association between having a national action plan in place and overall modified[295] implementation score. This association is statistically significant ($p<.001$ for both methods). There is also a statistically significant positive association ($p<.001$ for both methods) between improvement in national action plans between baseline and performance data and improvement in modified implementation score (see Figure A6.26).

Figure A6.25: Is there an association between the grade a country gives for its national action plan and mean modified implementation score
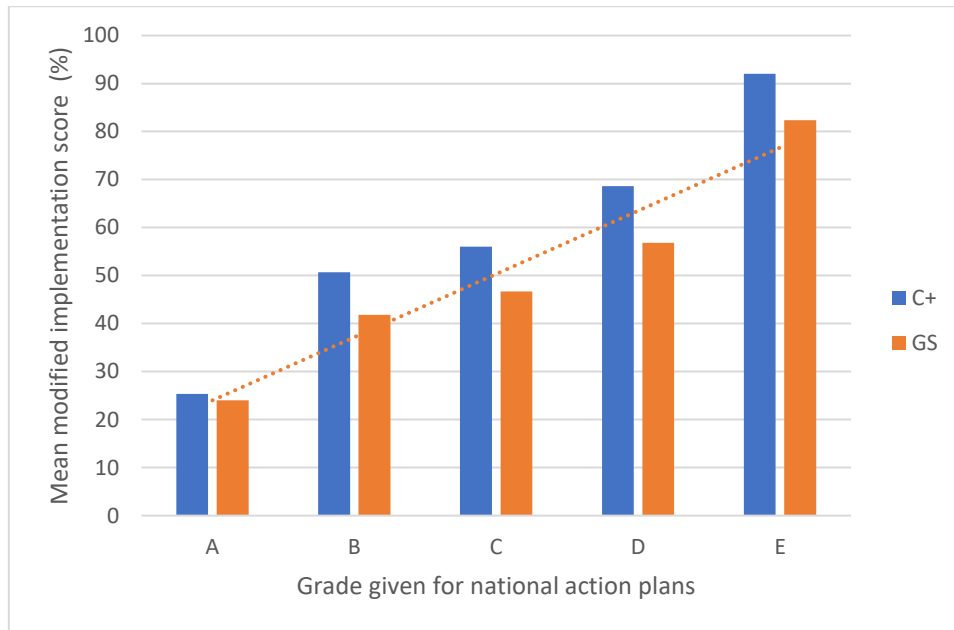
Figure A6.26: Is there an association between change in the grade a country gives for its national action plan between baseline and performance data and change in mean modified implementation score
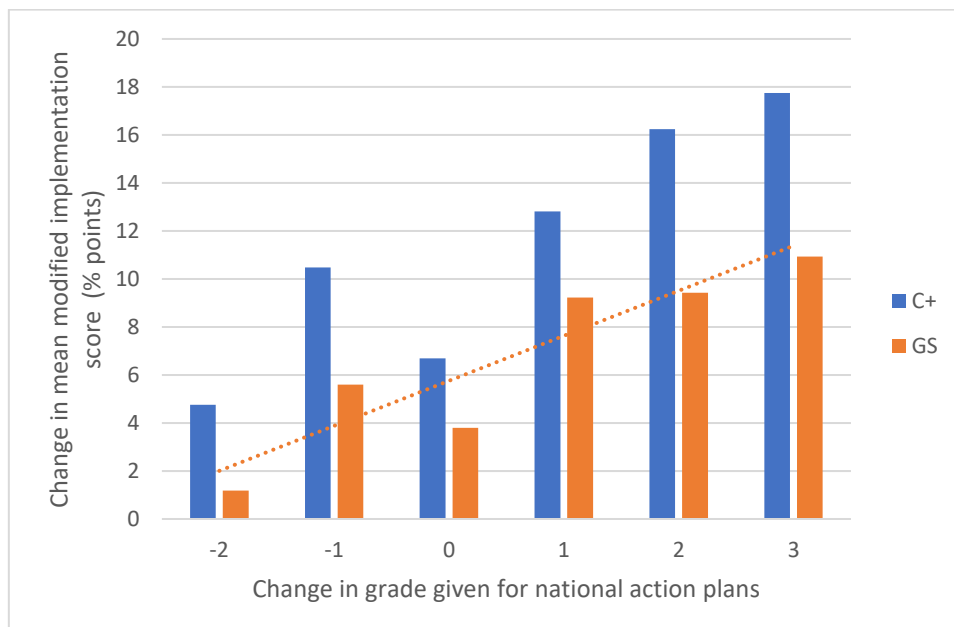
A6.76.   Finally in this section, Figure A6.27 shows that the mean implementation scores are higher for indicators of human health (C+ 68%; GS 54%) than for other areas (C+ 44%; GS 38%).

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[295] The modification is that the score for the particular indicator being considered is deducted from the implementation score

Figure A6.28 shows similar levels of change in indicators of human health and other areas. The gap is not narrowing and, if anything, is potentially widening.

Figure A6.27: Mean implementation scores for core indicators, indicators related to human health and other indicators
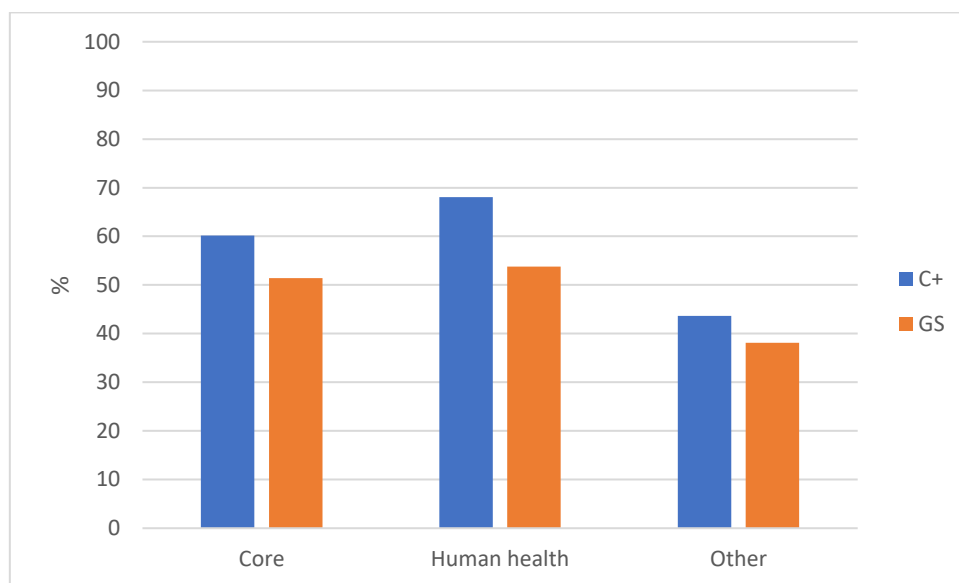
Figure A6.28: Change in mean implementation scores for core indicators, indicators related to human health and other indicators between baseline and performance data
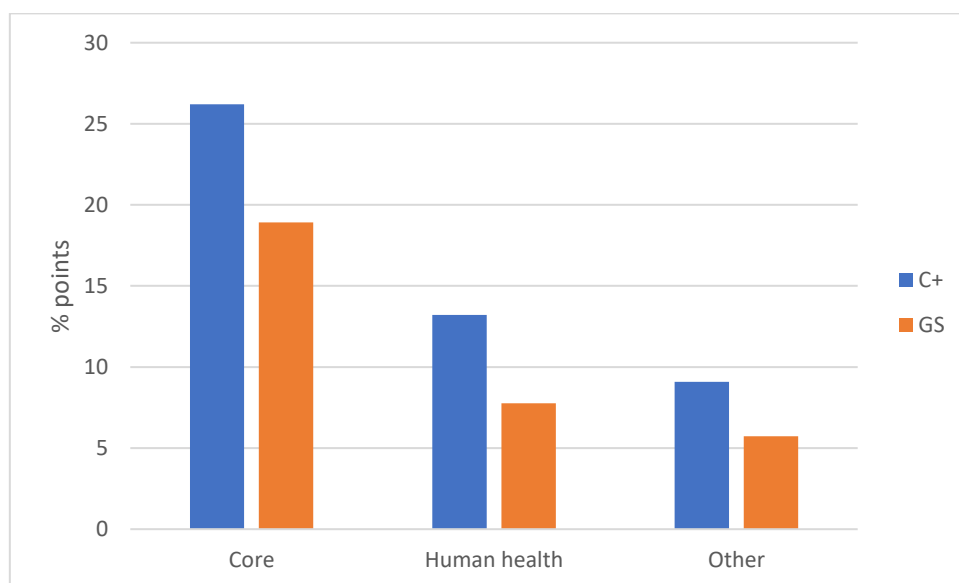
A6.77. Figure A6.29 compares improvements on implementation scores related to human health indicators and indicators in other areas. There is a statistically significant positive association ($p<.001$). In the figure, those countries above the red line have improved in other areas more than might be expected based on their improvement in areas of human health and these could merit further study.[296]

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[296] Cambodia, Colombia, Guyana, India, Iraq, Malaysia, Mongolia and Tanzania

Figure A6.29: Change in mean implementation scores for indicators of human health compared to change in mean implementation scores for indicators in other areas
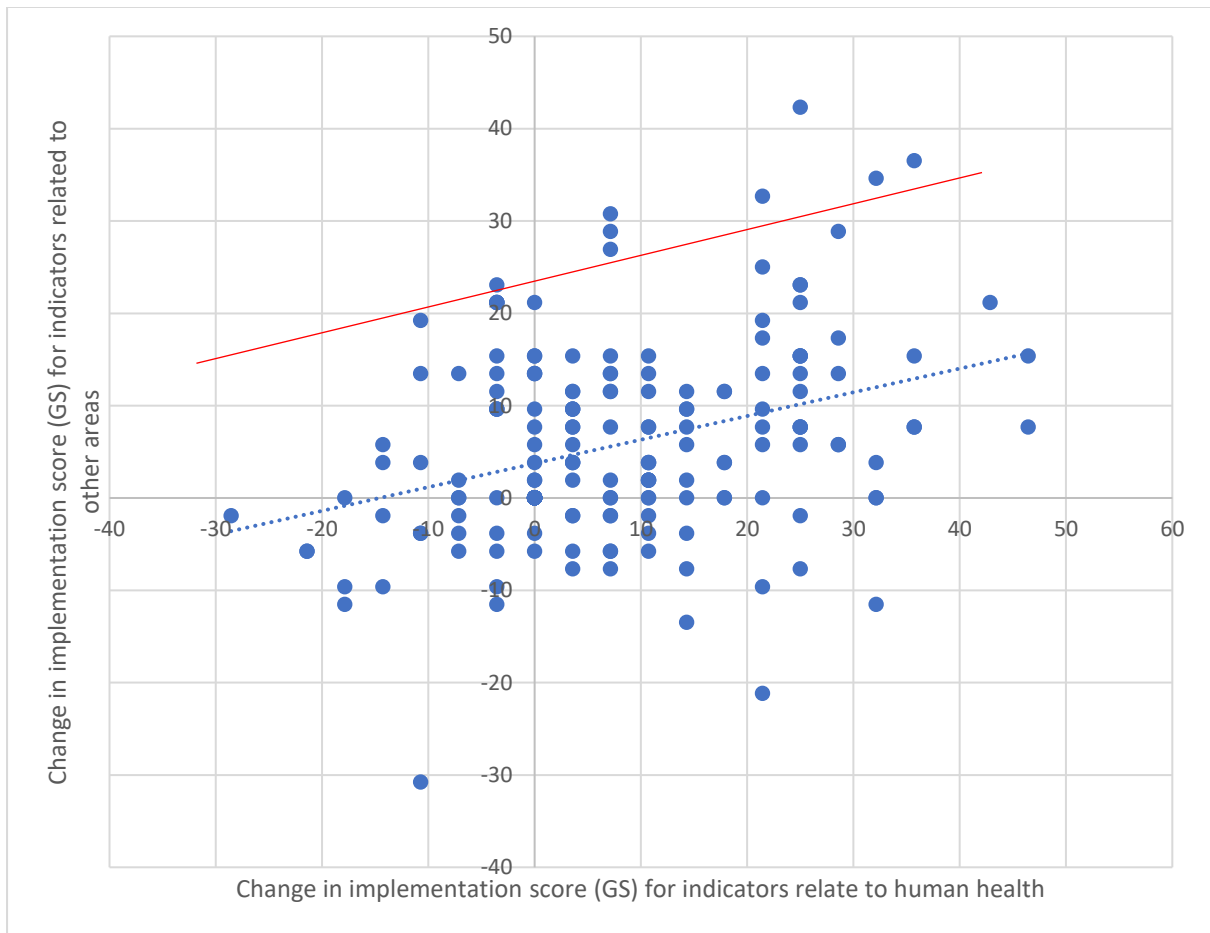
Section 9: Progress by GAP AMR objective

<u>Objective 1: Improve awareness and understanding of antimicrobial resistance through effective communication, education and training</u>

A6.78.   This objective in the GAP AMR is reflected in the results chain in the M&E framework as outcome 1 – improved awareness of AMR and behaviour change among policy-makers, farmers, veterinary and health workers, food industry and the general public. Although a baseline survey of public awareness of AMR was carried out in 12 countries before adoption of GAP AMR, it is unclear how awareness of the general public and/or other stakeholders is to be monitored as the indicator for this outcome is not yet fully developed (see Appendix 1). This is needed as the indicators at the output level are really about whether activities are taking place not really about whether levels of awareness and understanding have changed or not.

A6.79.   Table A6.14 summarizes the implementation scores for six output indicators under outcome 1. The strongest performance is seen in relation to the two indicators pertaining to human health and the biggest improvement is seen in one of these – awareness and understanding of AMR risks and response (human health). The weakest performance and least improvement is seen in relation to the indicator on training and professional education on AMR in farming sector, food production, food safety and the environment.

Table A6.14: Implementation scores for output indicators within outcome 1

Indicator	Baseline		Performance		Change	
	GS	C+	GS	C+	GS	C+
Awareness and understanding of AMR risks and response (human health)	1.73	49	2.20	78	0.48	28
Awareness and understanding of AMR risks and response (animal health, plant health, food production, food safety and environment)	1.15	29	1.25	47	0.10	17
Training and professional education on AMR in the human health sector	1.73	60	1.92	71	0.19	11
Training and professional education on AMR in the veterinary sector	1.28	33	1.55	50	0.27	17
Training and professional education on AMR in farming sector, food production, food safety and the environment	0.68	16	0.74	19	0.06	3
Progress with strengthening veterinary services	1.36	39	1.65	52	0.29	13

A6.80.   By way of example, Figure A6.30 shows data (using the GS method) for awareness and understanding of AMR risks and response (human health). This shows that average score varies by country income group and by region. Improvements have occurred in all country income groups and across all regions, particularly SEAR. Figure A6.31 shows that while human health remained the main focus of AMR awareness raising in many countries from 2018 to 2020, the number of countries making animal health a main focus rose as did the number of countries focusing on other areas including plant health, food production and food safety (but not environment).

Figure A6.30: Implementation scores (using GS method) for awareness and understanding of AMR risks and response (human health)

Figure A6.31: Percentage of countries reporting different levels of focus on a particular sector in AMR awareness raising activities: 2018/19-2019/20
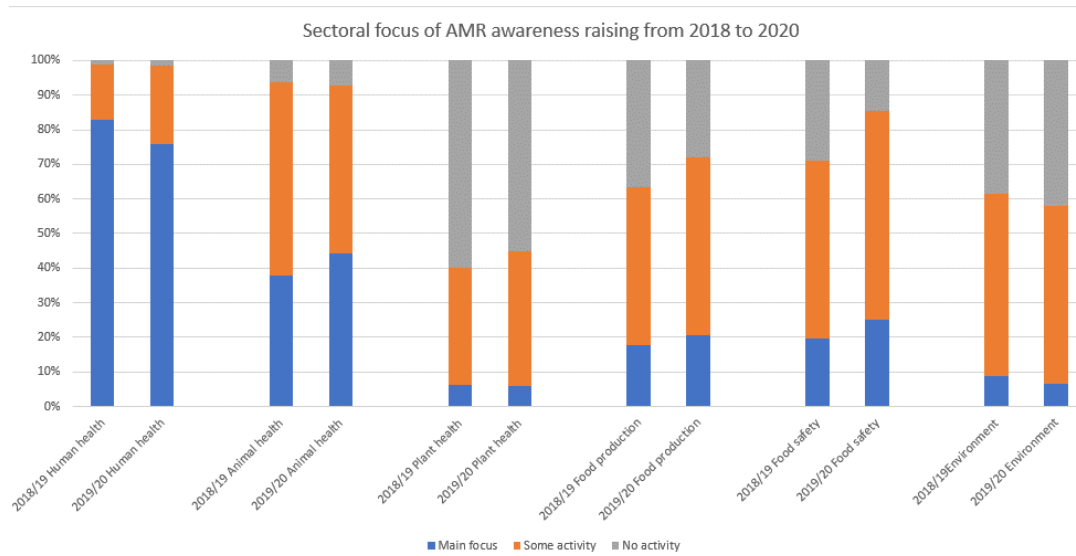
Objective 2: Strengthen the knowledge and evidence base through surveillance and research

A6.81.   This objective in the GAP AMR is reflected in the results chain in the M&E framework as outcome 2 – strengthened knowledge and evidence base used for policy and practical decisions. There are no specific outcome indicators for this objective rather reference is made to indicators at the goal level related to reduced levels and slower development of resistance. It is clear that surveillance systems, such as GLASS, will be critical sources of data to measure progress towards GAP AMR expected outcomes.

A6.82.   Table A6.15 summarizes the implementation scores for six output indicators under outcome 2. The strongest performance is seen in relation to national surveillance systems for AMR in humans but achievement of a national monitoring system for consumption and rational use of antimicrobials in human health is lagging behind this and the gap is not closing. The weakest performing area relates to national monitoring system for antimicrobial use in plant production but this are improved more than some other areas including national monitoring systems for consumption and rational use of antimicrobials in human health and national surveillance systems for AMR in food (animal and plant origin).

Table A6.15: Implementation scores for output indicators within outcome 2

Indicator	Baseline		Performance		Change	
	GS	C+	GS	C+	GS	C+
National monitoring system for consumption and rational use of antimicrobials in human health	1.36	41	1.63	47	0.27	6
National monitoring system for antimicrobials intended to be used in animals	1.16	33	1.54	51	0.39	18
National monitoring system for antimicrobial use in plant production	0.50	18	0.86	33	0.36	15
National surveillance system for AMR in humans	1.74	53	2.10	67	0.36	14
National surveillance system for AMR in animals	1.31	38	1.73	55	0.42	18
National surveillance system for AMR in food (animal and plant origin)	1.47	53	1.60	60	0.13	7

A6.83.   By way of example, Figure A6.32 shows data (using the GS method) for national monitoring system for consumption and rational use of antimicrobials in human health. This shows that average score varies by country income group and by region, with performance levels highest in EUR and lowest in AFR. Improvements have occurred in all country income groups and across all regions, particularly EMR and SEAR.

Figure A6.31: Implementation scores (using GS method) for national monitoring system for consumption and rational use of antimicrobials in human health

Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

A6.84. This objective in the GAP AMR is reflected in the results chain in the M&E framework as outcome 3 – reduced incidence of infection in health facilities, farms and communities as well as reduced environmental contamination, due to effective prevention. There are a number of outcome indicators[297] for this objective relating to surgical site infections, immunization, access to safe water and sanitation and environmental standards. Some of these are SDG indicators and it is these indicators which seem to have data available (See Appendix 1).

A6.85. Table A6.16 summarizes the implementation scores for three output indicators under outcome 3. The strongest performance is seen in relation to infection prevention control in human health but there has been little improvement in this indicator, or other indicators under this outcome, since the GAP AMR was adopted.

Table A6.16: Implementation scores for output indicators within outcome 3

Indicator	Baseline		Performance		Change	
	GS	C+	GS	C+	GS	C+
Infection prevention control in human health care	1.89	61	1.96	61	0.07	0
Good health, management and hygiene practices to reduce the use of antimicrobials and minimize development and transmission of AMR in animal production	1.14	31	1.40	33	0.25	2
Good management and hygiene practices to reduce the development and transmission of AMR in food processing	1.26	38	1.44	44	0.18	6

A6.86. By way of example, Figure A6.33 shows data (using the GS method) for infection prevention control in human health care. This shows that average score varies by country income group and by region, with performance levels highest in high-income countries and in EUR. Change has been mixed with setbacks in some country income groups and regions, such as AMR, EMR and particularly SEAR.

Figure A6.33: Implementation scores (using GS method) for infection prevention control in human health care

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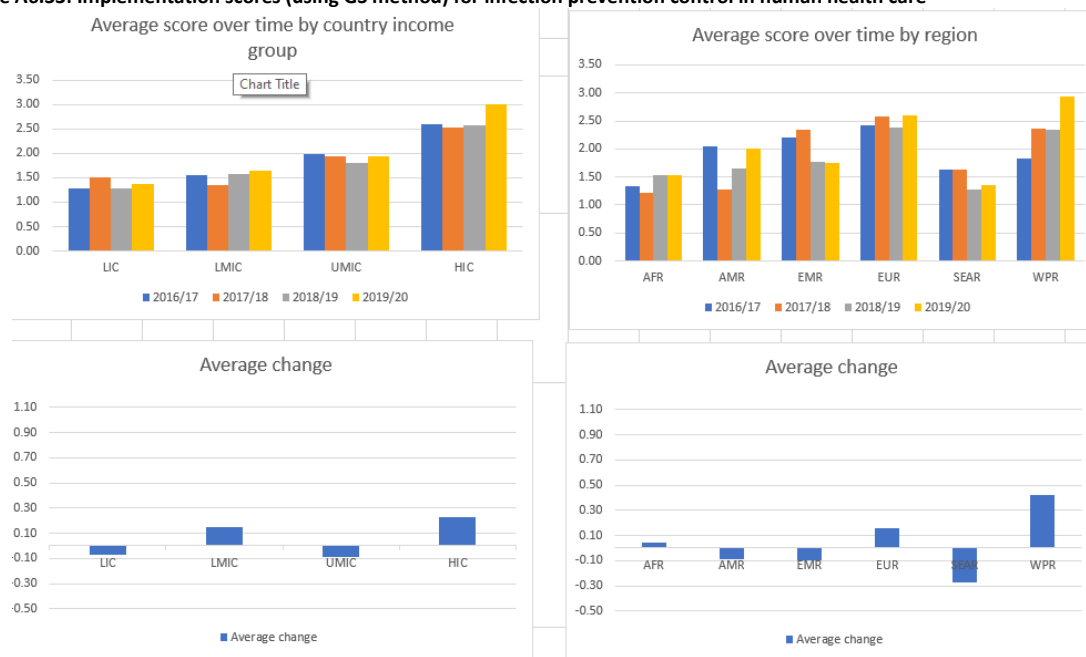
[297] Five or nine depending on whether sub-indicators are counted or not.

Objective 4: Optimize the use of antimicrobial medicines in human and animal health

A6.87. This objective in the GAP AMR is reflected in the results chain in the M&E framework as outcome 4 – optimized use of antimicrobials in human and animal health; phased out animal use for growth promotion. There are a number of outcome indicators[298] for this objective relating to use of antimicrobials in humans (including the relative use of antibiotics categorized as "*Access*"), access to antibiotics, appropriate use of antimicrobials in surgery, use in growth promotion, levels and trends in sales/imports/use of antimicrobials in food producing animals, levels and trends in sales/use of pesticides for the purpose of controlling bacterial or fungal disease in plant production and optimized AMU and regulation (although this indicator may fit better at output level). In general, there may be a problem of availability of data for outcome indicators under this objective (see Appendix 1).

A6.88. Table A6.17 summarizes the implementation scores for five output indicators under outcome 4. It should be noted that the last three indicators under this output are measured on a different basis from the others.[299] In general, the indicators under this outcome score relatively strongly. However, there has been relatively little progress between baseline and performance data with the exception of optimizing antimicrobial use in human health.

Table A6.17: Implementation scores for output indicators within outcome 4

Indicator	Baseline		Performance		Change	
	GS	C+	GS	C+	GS	C+
Optimizing antimicrobial use in human health	1.36	44	1.80	67	0.44	24
Optimizing antimicrobial use in animal health (terrestrial and aquatic)	1.46	44	1.49	44	0.03	0
Laws or regulations on prescription and sale of antimicrobials for human use	3.08	77	3.44	86	0.36	9
Laws or regulations on prescription and sale of antimicrobials for animal use	2.44	61	2.59	65	0.15	4
Laws or regulations that prohibit the use of antibiotics for growth promotion	1.63	41	1.99	50	0.36	9

A6.89. By way of example, Figure A6.34 shows data (using the GS method) for optimizing antimicrobial use in animal health (terrestrial and aquatic). This shows that average score varies by country income group and by region, with performance levels highest in high-income countries and in EUR. Change has however been very mixed with setbacks in UMIC and HIC and in EUR.

Figure A6.34: Implementation scores (using GS method) for optimizing antimicrobial use in animal health (terrestrial and aquatic)

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[298] Seven or 12 depending on whether sub-indicators are counted or not.
[299] In that they are based on Yes/No responses rather than grading from A to E.

Objective 5: Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

A6.90.   This objective in the GAP AMR is reflected in the results chain in the M&E framework as outcome 5 – increased research and development on new medicines, diagnostics, vaccines and other interventions related to priority pathogens. There are a number of outcome indicators[300] for this objective relating to the global research and development pipeline. It appears that data is more available for products related to human health than in other areas and in relation to treatments and (to some extent) vaccines rather than therapeutics. However, there may be some issues with the correctness of some of the data (see Appendix 1).

A6.91.   There are two output indicators for this outcome and they relate to incentivizing and funding research and development. The metadata for these indicators is not particularly well-developed but it does contain some links. These include:

- WHO's Global Health Observatory on Health Research and Development and funding flows for neglected diseases[301].
- The Global Antibiotic Research and Development Partnership[302]

A6.92.   However, based on information provided by key informants in early interviews, it appears that there may be better sources of data, particularly on funding for research and development. These sources include:

- The Global AMR Research and Development Hub[303]. This includes a dynamic dashboard with:
    − Details of investments in AMR research and development which provides an overview of funding in the area with more detail of funding distributors and how funding is allocated across particular sectors (see Figure A6.35).
    − Antibacterials in clinical development (see Appendix 1).
    − Incentives for antibacterial research and development which is based around a diagram of the steps needed to develop new antibiotics. For each step, the dashboard provides details of organizations, partnerships, mechanisms and funds working in that area (see Figure A6.36).

- The Joint Programming Initiative on Antimicrobial Research (JPIAMR) conducted systematic analysis of funding on research on AMR in 2014 and 2017. In 2014, the analysis focused on research on antibacterial resistance while, in 2017, the exercise was expanded to also include anti-fungal and anti-parasitic research. Reports and core data (in Excel) are available.[304]

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[300] One or three depending on whether sub-indicators are counted or not.
[301] See https://www.who.int/research-observatory/monitoring/inputs/neglected_diseases/en/ (accessed 3 May 2021)
[302] See https://www.gardp.org/ (accessed 3 May 2021)
[303] See https://globalamrhub.org/ (accessed 3 May 2021)
[304] See https://www.jpiamr.eu/resources/amr-knowledge-hub/research-funding-datahub/ (accessed 4 May 2021)

Figure A6.35: Screenshot of the Global AMR Research and Development Hub Dynamic Dashboard: Incentives in AMR Research and Development
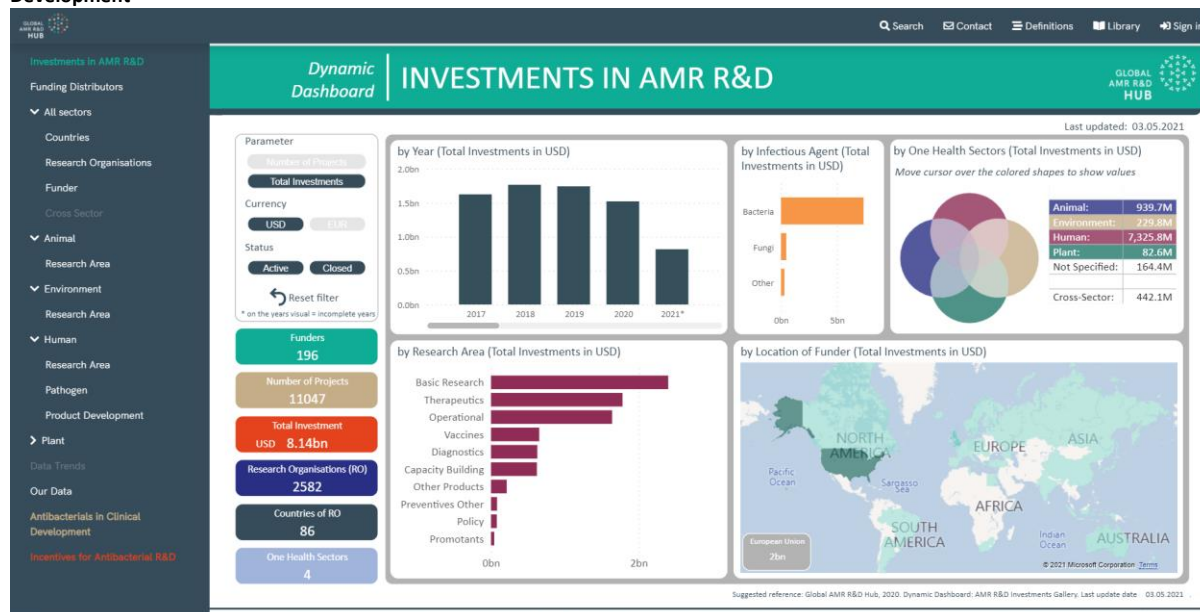
Figure A6.36: Screenshot of the Global AMR Research and Development Hub Dynamic Dashboard: Incentives for Antibacterial Research and Development
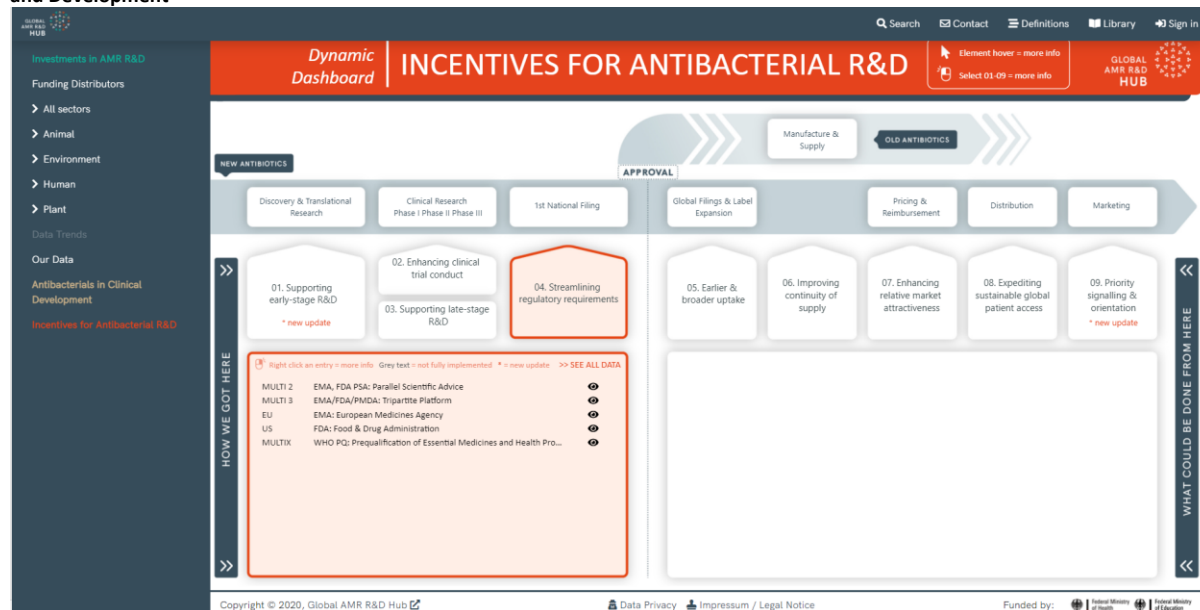
Section 10: Conclusions and Implications for Implementation Phase

C1. In terms of the monitoring and evaluation framework, the review may wish to explore:

- If there is appetite to reduce the number of indicators and how this might be done.
- If there is appetite to update the framework and particularly metadata where it is incomplete – including a specific category for data source.
- If more could be done to use the M&E framework to actively track GAP AMR implementation progress including whether there is capacity to do this.
- How might the results chain be strengthened including where is there evidence for causal links and what are the underlying assumptions.
- Whether indicators concerning national action plans and multisectoral coordination mechanisms should be included in the framework, given the centrality of those to TrACSS and work carried out on GAP AMR.
- Whether there could be clearer linkages between the GAP AMR M&E framework and relevant parts of the GPW13 results framework.
- Whether more could be done to track progress made by actors other than Member States, e.g. the WHO Secretariat and national and international partners.

C2. In terms of TrACSS the review may wish to explore:

- Whether the A-E system can be retained/restored for all questions, e.g. Q7.3.
- Whether questions can now be kept stable over time.
- Whether questions that are not analysed can be reduced.
- Whether the response system (A-E) can be linked to how the data is analysed. If the data is dichotomized, why not simply ask if countries meet the standards set in C? If the A-E system is retained, a graduated scoring system makes more sense and will better distinguish progress in performance beyond level C.
- Whether more use can be made of TrACSS data with more analysis.

C3. In general, the review needs to understand GLASS better and speaking to Carmem Pessoa is a priority. Topics to explore include:

- How GLASS will contribute to providing data on GPW12 indicators – particularly rates of AMR and antibiotic consumption.
- Why enrolment in GLASS is low in AMR.
- How GLASS relates to AMR Division and AMR M&E team.
- Nature of GLASS modules.
- Apparent reluctance to publish country-by-country AMR data.
- Availability of core data including on surveillance system status.
- Plans to collect and report AMC data.

C4. In terms of progress reporting:

- Why has reporting to WHA been every two years?
- Could WHA reports be tied more to the M&E framework?
- Could there be an annual progress report?
- Could this use a system for assessing overall progress on GAP AMR, e.g. some form of implementation score? Is there a reason why the implementation score proposed in the TrACSS report 2018/19 was not continued?

C5. With respect to CCS, the interviews (particularly with country offices) will explore the perceived value of CCSs and how the association between having a CCS which mentions AMR and country performance on AMR might be understood.

C6. With respect to JEEs, the apparent validation of TrACSS data by JEEs will be explored, again particularly with country offices. The relative advantages and disadvantages of TrACSS and JEEs will be explored.

C7. With respect to baseline data:

- Is it possible to use the baseline data collected from the multi-country awareness survey? To determine this, the review needs to better understand what plans there are, if any, to monitor awareness (as an outcome to objective 1) in the future.
- The review really needs the source data for the worldwide country situation analysis and this is something to follow up with Peter Beyer.
- The review may wish to get feedback from key informants on the approach we are taking to baseline data.

C8. While the M&E framework includes many outcome indicators, data availability is a big challenge and the review may decide at this point not to pursue this issue further. An alternative may be to focus on the two outcome indicators in the GPW13 results framework. But, the issues with these include data availability particularly for more than one year and the review also needs to explore GLASS perspectives on AMR country data. The review did run some preliminary comparisons of AMR data (from the SDG database) with overall GAP IMR implementation scores and there is a correlation but country income group is a major confounder as both these variables are associated with country income group. If the review could get data for multiple years, it may be possible to compare improvement scores as these are not associated with country income group.

C9. Concerning overall implementation scores, the review may wish to discuss the idea in general with key informants and the pros and cons of the different methods. Similarly, the review may wish to sense check the findings that most improvement has occurred in the core indicators related to multisectoral coordination and national action plans and little improvement has occurred in relation to infection prevention and control.

C10. The review may wish to consider whether country case studies of countries that have performed better than might be expected would add value to the review. If so, the countries in Table A6.18 might be considered. The review may also explore this issue with key informants.

C11. Under the respective objectives, the review may wish to explore the following issues:

- Objective 1 – how this objective will be assessed at the outcome level and relative performance of different indicators
- Objective 2 – better understanding of surveillance systems and GLASS
- Objective 3 – why is performance on IPC not improving
- Objective 4 – measuring AMC and whether there are issues concerning use of antimicrobials for growth promotion
- Objective 5 – the review needs a focused enquiry on this including discussion with key informants from Global Health Observatory on Health Research and Development, the Global Antibiotic Research and Development Partnership, the Global AMR Research and

Development Hub and the Joint Programming Initiative on AMR – and better understanding of data on funding and pipelines.

Table A6.18: Possible countries for case study based on higher performance than might be expected

	Region	Country income group	Higher implementation score than might be expected based on GNI	Greater improvement in implementation score in countries with lower GNI	Greater improvement on indicators in other areas, e.g. animal health
Azerbaijan	EUR	UMIC	✓		
Bangladesh	SEAR	LMIC		✓	
Belarus	EUR	UMIC	✓		
Burkina Faso	AFR	LIC		✓	
Cambodia	WPR	LMIC		✓	✓
Colombia	AMR	UMIC			✓
Costa Rica	AMR	UMIC		✓	
Cuba	AMR	UMIC	✓		
Ecuador	AMR	UMIC		✓	
Ghana	AFR	LMIC		✓	
Guyana	AMR	UMIC		✓	✓
India	SEAR	LMIC			✓
Iraq	EMR	UMIC			✓
Kenya	AFR	LMIC		✓	
Malaysia	WPR	UMIC	✓		
Mexico	AMR	UMIC	✓		
Mongolia	WPR	LMIC			✓
Myanmar	SEAR	LMIC		✓	
Nepal	SEAR	LMIC		✓	
Russian Federation	EUR	UMIC	✓		
Serbia	EUR	UMIC	✓		
Tanzania	AFR	LMIC	✓	✓	✓
Thailand	SEAR	UMIC	✓		
Turkey	EUR	UMIC	✓		
Zimbabwe	AFR	LMIC		✓	
AFR	5	1	LIC		
AMR	6	10	LMIC		
EMR	1	14	UMIC		
EUR	5	0	HIC		
SEAR	5				
WPR	3				

Appendix 1: Outcome indicators identified in GAP AMR M&E framework and assessment of data availability (*colour coding is based on the following grading system – A red = metadata not fully defined; B amber = data collection process not yet operational; C yellow = some data available but insufficient for purposes of analysis; D light green = performance data fully available by country; E dark green = performance and baseline data fully available by country*)

Indicator	Rating	Data availability	SDG	GPW13
Overarching goal				
Global burden of disease (key bacterial infections plus HIV, TB and malaria)	C	Data on the Global Burden of Disease (GBD) is available from the Institute for Health Metrics and Evaluation (IHME).[305] However, the form it is presented in combines figures for communicable diseases with maternal and child health and nutritional disorders. It should be possible to get the data needed but WHO have not yet done this.		
Goals				
Prevalence of bloodstream infections caused by Methicillin-resistance Staphylococcus aureus	C	Data is collected through GLASS but the last GLASS report (2020) stated that "*the data collected by GLASS-AMR are not yet of sufficient representativeness to allow comparisons of trends in AMR among countries, territories and areas and regions*". Some country data is available from the GLASS website[306] and from the SDG indicator database.[307]	✓	✓
Prevalence of bloodstream infections caused by ESBL in E Coli - third generation cephalosporin resistance as a proxy	C		✓	✓
Resistance in commensal E coli from key food producing animals - percentage of E coli isolates showing resistance to third-generation cephalosporins (i.e. presumptive ESBL-producing E coli)	B	While there is metadata for these indicators, this states that the FAO platform is to be confirmed.		
Resistance in commensal E coli from key food producing animals - patterns of resistance in E coli to a defined panel of antimicrobials	B			
Percentage of new bacteriologically confirmed pulmonary TB cases associated with rifampicin-resistant or multidrug-resistant Mycobacterium tuberculosis	E	According to the latest GLASS report, WHO collects national data on the burden of drug-resistant infections and reviews the quality of data for 164 countries and territories for multi-drug resistant TB. Data to 2019 is available on the WHO Global Health Observatory[308] for 194 Member States. A data sheet entitled MDR_RR_TB-burden_estimates_2021 is downloadable from https://www.who.int/teams/global-tuberculosis-programme/data which can be accessed from the indicator metadata. This presents data for 215 countries and territories.		
Percentage of malaria patients displaying treatment failure after antimalarial treatment during surveillance in selected sentinel sites	C	According to the latest GLASS report, WHO collects national data on the burden of drug-resistant infections and reviews the quality of data for 64 countries for drugs to treat malaria. The indicator metadata links to a webpage[309] which provides data on different types of malaria including Plasmodium falciparum. Data is available in a PDF table or a range of visualizations but it does not seem possible to access the data in analyzable format.		
Percentage of individuals tested positive for HIV starting antiretroviral therapy with detected HIV antiretroviral drug resistance (prevalence of pretreatment HIV drug resistance)	C	According to the latest GLASS report, WHO collects national data on the burden of drug-resistant infections and reviews the quality of data for 49 countries for resistance to drugs for HIV infection. Although it does seem possible to access a report on this topic from the indicator metadata, the raw data sets do not appear to be available.		
Percentage of individuals tested positive for HIV on antiretroviral therapy with virological failure and detected HIV antiretroviral drug	C	According to the latest GLASS report, WHO collects national data on the burden of drug-resistant infections and reviews the quality of data for 49 countries for resistance to drugs for HIV infection. Although it does seem possible to access a		

[305] See http://www.healthdata.org/gbd/2019 (accessed 2 May 2021).
[306] See https://drive.google.com/file/d/1lqcx6WnO4pul4kre6tqehtRN0ULtUMdU/view, https://drive.google.com/file/d/1DQDV_7nJebDP8CtN448EDNDtzW0PCdCg/view and https://docs.google.com/spreadsheets/d/157mAK90huHMSevY6zpqxsNSw2BNHqTlfPNq9CYKQsw4/edit#gid=1631684533 (all accessed 2 May 2021).
[307] See https://unstats.un.org/sdgs/indicators/database/ (accessed 2 May 2021). This data is for 2018 only. The data source is given as AMR Surveillance National Coordinating Center for country data and WHO GLASS for regional data.
[308] See https://apps.who.int/gho/data/node.main.MDRTB?lang=en (accessed 2 May 2021)
[309] See https://www.who.int/malaria/areas/drug_resistance/drug_efficacy_database/en/ (accessed 2 May 2021)

Indicator	Rating	Data availability	SDG	GPW13
resistance (prevalence of acquired HIV drug resistance)	*(yellow)*	report on this topic from the indicator metadata, the raw data sets do not appear to be available.		
Outcome 1				
Percentage of stakeholders (e.g. human and animal health workers, prescribers, farmers, food processing workers) who have knowledge of AMR and the implications for AMU and infection prevention (metrics to be developed)	A *(red)*	Indicator metadata is not fully developed despite the fact that a baseline survey in 12 countries was conducted in 2015 (see paragraph A6.78).		
Outcome 2 – the framework does not identify specific indicators for outcome 2 but references the goal indicators related to reduced levels and slower development of resistance				
Outcome 3				
Incidence of surgical site infections – inpatient surgical procedures	B *(orange)*	Most of the links in the metadata seem to be for guidance and protocols. Is there data somewhere?		
Percentage of the target population that has received the last recommended dose of the basic series for each of the following vaccines: i) pneumococcal conjugate vaccine	B *(orange)*	While the indicator metadata does provide a link to data, this site[310] was on a maintenance break when the review team tried to access it.		
Percentage of the target population that has received the last recommended dose of the basic series for each of the following vaccines: ii) rotavirus vaccine	B *(orange)*			
Percentage of the target population that has received the last recommended dose of the basic series for each of the following vaccines: iii) measles-containing vaccine, either alone, or in a measles–rubella or measles–mumps–rubella combination	B *(orange)*			
Percentage of the target population that has received the last recommended dose of the basic series for each of the following vaccines: iv) Haemophilus influenzae type b containing vaccine (Hib)	B *(orange)*			
Proportion of population using safely managed drinking-water services	E *(green)*	The indicators' metadata links to available data sets[311] and data is also available from the SDGindicators website.[312]	✓	
Proportion of population using safely managed sanitation services	E *(green)*		✓	
Number of state parties to international multilateral environmental agreements on hazardous waste and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement	E *(green)*	The link from the indicator metadata links to metadata but not to data. However, as an SDG indicator, some data is available from the SDGindicators website.[313]	✓	
Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment	A *(red)*	The metadata for this indicator has not been fully developed. This is an SDG indicator but, according to the SDGindicators website[314], this indicator is broken down into 18 sub-indicators and there may be need to identify which, if any, of these will be tracked for monitoring GAP AMR progress.	✓	
Outcome 4				
Total human consumption of antibiotics for systemic use (Anatomical Therapeutic Chemical classification code J01) in Defined Daily Doses per 1000 population (or inhabitants) per day	B *(orange)*	According to the metadata, this data will be collected through GLASS but this is a work in progress and data has yet to be reported.		

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[310] See http://www.who.int/immunization/monitoring_surveillance/routine/coverage/en/index4.html

[311] See http://www.washdata.org (accessed 2 May 2021)

[312] See https://unstats.un.org/sdgs/indicators/database/ (accessed 2 May 2021)

[313] See https://unstats.un.org/sdgs/indicators/database/ (accessed 2 May 2021)

[314] See https://unstats.un.org/sdgs/indicators/database/ (accessed 2 May 2021)

Indicator	Rating	Data availability	SDG	GPW13
Proportion of Access antibiotics for systemic use, relative to total antibiotic consumption in Defined Daily Doses	B	It is not completely clear how this data will be collected. Reference is made in the M&E framework to a cross-sectional point prevalence survey		✓[315]
Relative proportion of AWaRe (Access, WAtch and REserve) antibiotics for paediatric formulations	B	It is not completely clear how this data will be collected. Reference is made in the M&E framework to a cross-sectional point prevalence survey		
Percentage of adult and paediatric hospital patients receiving an antibiotic according to AWaRe categories	B	It is not completely clear how this data will be collected. Reference is made in the M&E framework to a cross-sectional point prevalence survey		
Percentage of health facilities that have a core set of relevant antibiotics available and affordable on a sustainable basis	B	Reference is made in the metadata to a disaggregation of SDG data but is such data available?	?	
Percentage of inpatient surgical procedures with appropriate timing and duration of surgical antibiotic prophylaxis	B	Reference is made in the metadata to point prevalence surveys but is any data available? The link in the metadata appears to be to guidelines.		
Percentage of veterinary AMs authorized /used for non-veterinary medical use (e.g. for growth promotion).	A	Although the indicator metadata refers to TrACSS as a possible data source (alongside the OIE AMU database), no details are provided as to exactly how this data will be derived from TrACSS.		
Total volume of sales/imports (or use), in mg/kg biomass, in food producing animals	B	Reference is made to the OIE AMU database but is this publicly available and is there data?		
Percentage of total sales/imports (or use) classified as WHO Highest Priority Critically Important Antimicrobial agents	B	Reference is made to the OIE AMU database but is this publicly available and is there data?		
Total amount of pesticide (active substance) intended to repel, destroy or control bacterial or fungal disease (tonnes) and % of the above total composed of each the following antimicrobial classes: aminoglycosides tetracyclines triazoles oxolinic acid	B	Confirmation is needed as to whether data is available from FAOSTAT.		
Legislation or regulation that requires antimicrobials for human use to be dispensed only with a prescription from an authorized health worker		This is monitored through TrACSS and there is data but is there a reason why legislation or regulation for human use is considered an outcome while other regulatory frameworks are considered outputs?		
Outcome 5				
Number of new medicines in the R&D pipeline targeting products on the WHO global priority pathogens list	C	There are a number of places that track antibacterials in clinical development. These include the Global AMR Research and Development Hub[316] which provides details of products addressing priority pathogens, products addressing tuberculosis, products addressing clostridioides and the stage of their development. Raw data is not available for download and the figures in the dashboard do not seem to add up. Other data sources include Pew's antibiotic pipeline[317], Pew's non-traditional products for bacterial infections pipeline[318] and WHO pipeline.[319] WHO has a vaccine pipeline tracker covering a broad range of diseases.[320]		
Number of new diagnostic products in the R&D pipeline responding to the essential diagnostics list (forthcoming)	B	None of the links provided in the metadata seem to relate to diagnostics.		
Number of new Vaccines registered according to prioritisation (OIE reports on prioritisation of diseases for which vaccines could reduce antimicrobial use	B	The metadata does not provide links to data.		

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[315] Is this indicator the one in the results framework for GPW13?

[316] See https://dashboard.globalamrhub.org/reports/pipelines/pipelines (accessed 3 May 2021)

[317] See https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2019/five-year-analysis-shows-continued-deficiencies-in-antibiotic-development (accessed 3 May 2021)

[318] See https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2017/nontraditional-products-for-bacterial-infections-in-clinical-development (accessed 3 May 2021)

[319] See https://www.who.int/research-observatory/monitoring/processes/antibacterial_products/en/ (accessed 3 May 2021).

[320] See https://www.who.int/immunization/research/vaccine_pipeline_tracker_spreadsheet/en/ (accessed 3 May 2021)

Indicator	Rating	Data availability	SDG	GPW13
in pig, poultry and fish, 2015, and in cattle, sheep, and goats, 2018)				

Appendix 2: Global AMR Research and Development Hub Dashboard[321]

The figure below is a screenshot from the Global AMR Research and Development Hub Dashboard.
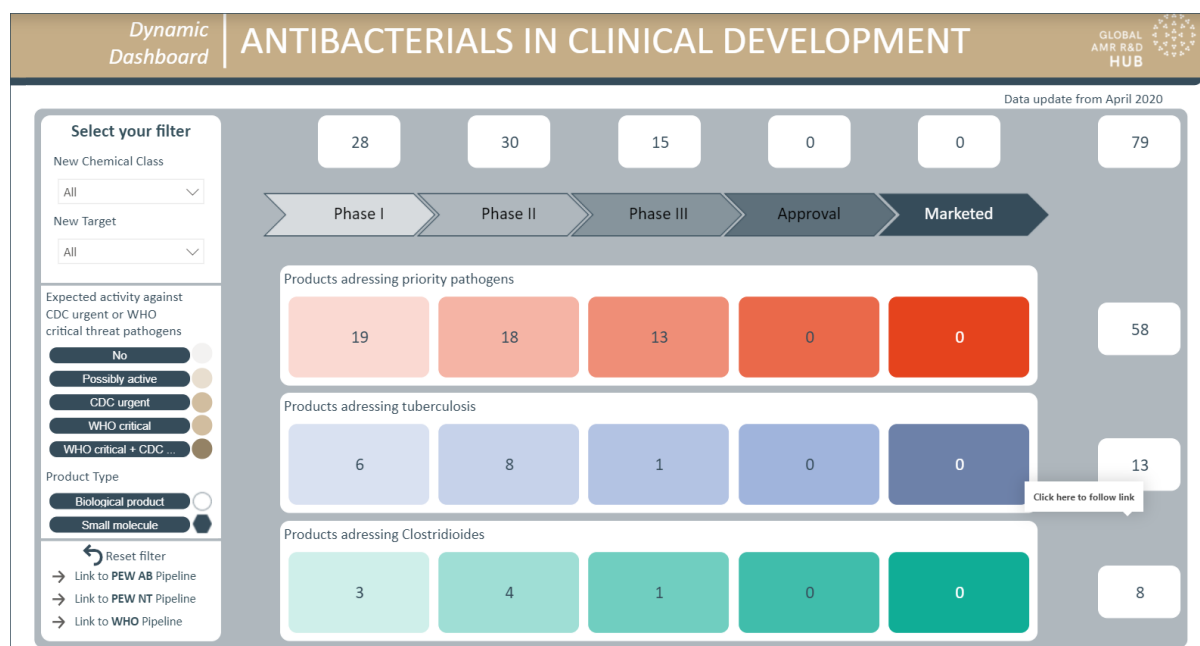
It is unclear why the figures in the far-right column do not seem to total correctly. The discrepancy in the tuberculosis row is because Macozinone/PBTZ-169 is included in both phase I and phase II, and SQ-109 is shown in both phase II and phase III. These extra inclusions seem to be counted in totalling the columns but not the rows.

In the row for products addressing priority pathogens, it is not clear where the additional eight products come from.

[321] See https://dashboard.globalamrhub.org/reports/pipelines/pipelines (accessed 3 May 2021)

Appendix 3: Indicators used to calculate implementation scores

Question No.[322]	Topic area	Included in 2018 TrACSS report implementation score?	Core	Objective 1	Objective 2	Objective 3	Objective 4	Human health	Other
4.1	Multi-sector and one health working arrangements	✓	✓					n/a	n/a
5.1	National action plan	✓	✓					n/a	n/a
6.1	Awareness and understanding of AMR risks and response (human health)	✓		✓				✓	
6.2[323]	Awareness and understanding of AMR risks and response (animal health, plant health, food production, food safety and environment)	✓		✓					✓
6.2	Training and professional education on AMR in the human health sector	✓		✓				✓	
6.3	Training and professional education on AMR in the veterinary sector	✓		✓					✓
6.4	Training and professional education on AMR in farming sector, food production, food safety and the environment	✓		✓					✓
6.5	Progress with strengthening veterinary services	✓		✓					✓
7.1	National monitoring system for consumption and rational use of antimicrobials in human health	✓			✓			✓	
7.2	National monitoring system for antimicrobials intended to be used in animals	✓			✓				✓
7.3	National monitoring system for antimicrobial use in plant production	✓			✓				✓

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[322] In most cases, these numbers are based on the TrACSS questionnaire 2019/20
[323] In this case, the question number relates to the TrACSS questionnaire 2017/18

Question No.[322]	Topic area	Included in 2018 TrACSS report implementation score?	Core	Objective 1	Objective 2	Objective 3	Objective 4	Human health	Other
7.4	National surveillance system for AMR in humans	✓			✓			✓	
7.5a	National surveillance system for AMR in animals				✓				✓
7.5c	National surveillance system for AMR in food (animal and plant origin)	✓			✓				✓
8.1	Infection prevention control in human health care	✓				✓		✓	
8.2	Good health, management and hygiene practices to reduce the use of antimicrobials and minimize development and transmission of AMR in animal production	✓				✓			✓
8.3	Good management and hygiene practices to reduce the development and transmission of AMR in food processing					✓			✓
9.1	Optimizing antimicrobial use in human health	✓					✓	✓	
9.2	Optimizing antimicrobial use in animal health (terrestrial and aquatic)	✓					✓		✓
5.4	Laws or regulations on prescription and sale of antimicrobials for human use						✓	✓	
5.4	Laws or regulations on prescription and sale of antimicrobials for animal use						✓		✓
5.4	Laws or regulations that prohibit the use of antibiotics for growth promotion						✓		✓
Total	22	**18[324]**	**2**	**6**	**6**	**3**	**5**	**7**	**13**

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[324] The indicator from Q9.3 (Legislation and/or regulations to prevent contamination of the environment with antimicrobials) was also included in this score but this question was not asked in subsequent rounds.

Appendix 4: Average scores on different category areas of Joint External Evaluations

(Colour coding - <2 – red; 2-3 amber; 3-4 yellow; >4 green)

		Template 1		Template 2	
National legislation policy and financing	P.1.1 Legislation, laws, regulations, administrative requirements, policies or other	2.75	P1.1 The State has assessed, adjusted and aligned its domestic legislation, policies and administrative arrangements in all relevant sectors to enable compliance with the IHR	2.44
	P.1.2 The State can demonstrate that it has adjusted and aligned its domestic legislation, policies and administrative arrangements to enable compliance with IHR (2005)	2.74	P1.2 Financing is available for the implementation of IHR capacities	2.13
			P1.3 A financing mechanism and funds are available for timely response to public health emergencies	2.06
IHR coordination, communication and advocacy	P.2.1 A functional mechanism is established for the coordination and integration of relevant sectors in the implementation of IHR	2.81	P2.1 A functional mechanism established for the coordination and integration of relevant sectors in the implementation of IHR	2.25
Antimicrobial resistance	P.3.1 Antimicrobial resistance detection	2.17	P3.1 Effective multisectoral coordination on AMR	2.50
	P.3.2 Surveillance of infections caused by antimicrobial-resistant pathogens	2.05	P3.2 Surveillance of AMR	1.94
	P.3.3 Health care-associated infection (HCAI) prevention and control programmes	2.46	P3.3 Infection prevention and control	1.81
	P.3.4 Antimicrobial stewardship activities	1.74	P3.4 Optimize use of antimicrobial medicines in human and animal health and agriculture	1.63
Zoonotic diseases	P.4.1 Surveillance systems in place for priority zoonotic diseases/pathogens	3.19	P4.1 Coordinated surveillance systems in place in the animal health and public health sectors for zoonotic diseases/ pathogens identified as joint priorities	2.19
	P.4.2 Veterinary or animal health workforce	3.17		
	P.4.3 Mechanisms for responding to infectious and potential zoonotic diseases are established and functional	2.67	P4.2 Mechanisms for responding to infectious and potential zoonotic diseases established and functional	1.94
Food safety	P.5.1 Mechanisms for multisectoral collaboration are established to ensure rapid response to food safety emergencies and outbreaks of foodborne diseases	2.78	P5.1 Surveillance systems in place for the detection and monitoring of foodborne diseases and food contamination	2.19
			P5.2 Mechanisms are established and functioning for the response and management of food safety emergencies	1.94
Biosafety and biosecurity	P.6.1 Whole-of-government biosafety and biosecurity system is in place for human, animal and agriculture facilities	2.25	P6.1 Whole-of-government biosafety and biosecurity system in place for all sectors (including human, animal and agriculture facilities)	1.81
	P.6.2 Biosafety and biosecurity training and practices	2.25	P6.2 Biosafety and biosecurity training and practices in all relevant sectors (including human, animal and agriculture)	2.00
Immunization	P.7.1 Vaccine coverage (measles) as part of national programme	3.68	P7.1 Vaccine coverage (measles) as part of national programme	3.25
	P.7.2 National vaccine access and delivery	4.10	P7.2 National vaccine access and delivery	3.88
National laboratory system	D.1.1 Laboratory testing for detection of priority diseases	3.83	D1.1 Laboratory testing for detection of priority diseases	2.75
	D.1.2 Specimen referral and transport system	3.19	D1.2 Specimen referral and transport system	2.56

	Template 1		Template 2	
	D.1.3 Effective modern point-of-care and laboratory-based diagnostics	3.06	D1.3 Effective national diagnostic network	2.56
	D.1.4 Laboratory quality system	2.64	D1.4 Laboratory quality system	2.44
Surveillance	D.2.1 Indicator- and event-based surveillance systems	3.53	D2.1 Surveillance systems	2.63
Surveillance	D.2.2 Interoperable, interconnected, electronic real-time reporting system	2.53	D2.2 Use of electronic tools	2.38
Surveillance	D.2.3 Integration and analysis of surveillance data	3.52	D2.3 Analysis of surveillance data	3.13
Surveillance	D.2.4 Syndromic surveillance systems	3.74		
Reporting	D.3.1 System for efficient reporting to FAO, OIE and WHO	3.10	D3.1 System for efficient reporting to FAO, OIE and WHO	3.06
Reporting	D.3.2 Reporting network and protocols in country	2.73	D3.2 Reporting network and protocols in country	2.75
Workforce development			D4.1 An up-to-date multisectoral workforce strategy is in place	2.13
Workforce development	D.4.1 Human resources available to implement IHR core capacity requirements	2.93	D4.2 Human resources are available to effectively implement IHR	2.63
Workforce development	D.4.2 FETP1 or other applied epidemiology training programme in place	3.33	D4.3 In-service trainings are available	2.25
Workforce development	D.4.3 Workforce strategy	2.59	D4.4 FETP or other applied epidemiology training programme in place	2.81
Emergency preparedness	R.1.1 National multi-hazard public health emergency preparedness and response plan is developed and implemented	2.46	R1.1 Strategic emergency risk assessments conducted and emergency resources identified and mapped	2.00
Emergency preparedness	R.1.2 Priority public health risks and resources are mapped and utilized	2.17	R1.2 National multisectoral multi-hazard emergency preparedness measures, including emergency response plans, are developed, implemented and tested	1.94
Emergency response operations	R.2.1 Capacity to activate emergency operations	2.60	R2.1 Emergency response coordination	2.81
Emergency response operations	R.2.2 EOC operating procedures and plans	2.40	R2.2 Emergency Operations Centre (EOC) capacities, procedures and plans	2.31
Emergency response operations	R.2.3 Emergency operations programme	2.83	R2.3 Emergency Exercise Management Programme	2.63
Emergency response operations	R.2.4 Case management procedures implemented for IHR relevant hazards	2.75	R2.4 Case management procedures applied for IHR hazards[325]	2.00
Linking public health and security authorities	R.3.1 Public health and security authorities (e.g. law enforcement, border control, customs) are linked during a suspect or confirmed biological event	2.91	R3.1 Public health and security authorities (e.g. law enforcement, border control, customs) linked during a suspect or confirmed biological, chemical or radiological event	2.31
Medical countermeasures and personnel deployment	R.4.1 System in place for sending and receiving medical countermeasures during a public health emergency	2.59	R4.1 System in place for activating and coordinating medical countermeasures during a public health emergency	2.00
Medical countermeasures and personnel deployment	R.4.2 System in place for sending and receiving health personnel during a public health emergency	2.42	R4.2 System in place for activating and coordinating health personnel during a public health emergency	1.81
Medical countermeasures and personnel deployment			R4.3 Case management procedures implemented for IHR relevant hazards	2.13
Risk communication	R.5.1 Risk communication systems (plans, mechanisms, etc.)	2.23	R5.1 Risk communication systems for unusual/ unexpected events and emergencies	1.94
Risk communication	R.5.2 Internal and partner communication and coordination	3.07	R5.2 Internal and partner coordination for emergency risk communication	2.50
Risk communication	R.5.3 Public communication	3.16	R5.3 Public communication for emergencies	2.63
Risk communication	R.5.4 Communication engagement with affected communities	2.68	R5.4 Communication engagement with affected communities	2.13

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[325] Central African Republic only

	Template 1		Template 2	
	R.5.5 Dynamic listening and rumour management	2.83	R5.5 Addressing perceptions, risky behaviours and misinformation	2.13
Points of entry	PoE.1 Routine capacities established at points of entry	2.58	PoE1 Routine capacities established at points of entry	2.25
	PoE.2 Effective public health response at points of entry	2.19	PoE2 Effective public health response at points of entry	2.06
Chemical events	CE.1 Mechanisms established and functioning for detecting and responding to chemical events or emergencies	2.21	CE1 Mechanisms established and functioning for detecting and responding to chemical events or emergencies	2.00
	CE.2 Enabling environment in place for management of chemical events	2.35	CE2 Enabling environment in place for management of chemical events	2.00
Radiation emergencies	RE.1 Mechanisms established and functioning for detecting and responding to radiological and nuclear emergencies	2.32	RE1 Mechanisms established and functioning for detecting and responding to radiological and nuclear emergencies	2.00
	RE.2 Enabling environment in place for management of radiation emergencies	2.42	RE2 Enabling environment in place for management of radiological and nuclear emergencies	2.06