Expert Panel on Effective Ways of Investing in Health (EXPH)

Opinion on
managing antimicrobial resistance (AMR)
across the health system
Public hearing 20 June 2022

European Commission

SLIDO

Expert Panel on Investing in Health

The Expert Panel on effective ways of investing in health is an **interdisciplinary and independent group established by the European Commission to provide non-binding independent advice** on matters related to effective, accessible and resilient health systems. The Expert Panel aims to support DG Health and Food Safety in its efforts towards **evidence-based policy-making**, to inform national policy making in improving the quality and sustainability of health systems and to foster EU level cooperation to improve information, expertise and the exchange of best practices.

Expert Panel on Investing in Health

The Expert Panel consists of **15 experts** appointed in December 2019 for a period of 3 years. They were appointed following an open call for applications, evaluation and selection process ensuring a balanced representation of relevant areas of expertise as well as geographical and gender balance.

Appointed in a personal capacity, they are **well-established, independent scientists, with over 10 years' professional and multi-disciplinary experience in health area.**

Expert Panel members (2019-2022)

Prof. Jan De MAESENEER (Chair)
Dr Anna GARCIA-ALTES (Vice-Chair)
Prof. Damien GRUSON
Dr Dionne KRINGOS
Prof. Lasse LEHTONEN
Prof. Christos LIONIS
Prof. Martin McKEE
Dr Liubove MURAUSKIENE
Prof. Sabina NUTI
Prof. Pedro PITA BARROS
Dr Heather ROGERS
Prof. Luigi SICILIANI
Prof. Katarzyna WIECZOROWSKA-TOBIS
Dr Sergej ZACHAROV
Dr Jelka ZALETEL

Picture taken in pre-corona times

Mandate: Questions for the Expert Panel

1. Taking into account the **One Health dimension** of antimicrobial resistance (AMR), including the role of the environment and of veterinary medicine in the emergence and spread of AMR, what are **necessary systemic elements, conditions and interventions** of effective management of antimicrobial resistance (AMR) across, but also beyond, the health systems that could translate into effective policy interventions and National Action Plans (national and EU targets, core requirements for antimicrobial stewardship and infection prevention and control standards, etc.)?

2. How might **new technologies** (e.g. digital apps, in vitro diagnostics) help tackle AMR in health systems?

3. Taking also into account the existing studies (e.g. those by OECD and ECDC) on the burden of diseases, where are the **areas for most urgent investment** across health systems for maximum benefit to tackle AMR?

4. What **concrete strategies** can be recommended to Member States **to implement existing and planned policies** to tackle AMR?

DRAFTING GROUP

Chair: Prof. Jan DE MAESENEER

Rapporteurs: Prof. Damien GRUSON, Dr Heather ROGERS

Dr Anna GARCIA-ALTES

Prof. Lasse LEHTONEN

Prof. Martin MCKEE

Prof. Luigi SICILIANI

Dr Dionne KRINGOS

Prof. Christos LIONIS

Prof. Liubove MURAUSKIENE

Dr Jelka ZALETEL

We are grateful to Prof. An de Sutter and Prof. Dominique Monnet for their valuable contributions to this Opinion.

The views in this presentation are those of the independent scientists who are members of the Expert Panel and do not necessarily reflect the opinion of the European Commission nor its services.

1. Antimicrobial Resistance (AMR) and its impact

1.1 AMR

AMR

"Antimicrobial Resistance (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.

As a result of drug resistance, antibiotics and other antimicrobial medicines become ineffective and infections become increasingly difficult or impossible to treat"

AMR threatens the entire medical system as it exists today

WHO has identified AMR as one of the top 10 global public health threats facing humanity

AMR as a global problem

Quantifying this burden is complicated: data from many parts of the world, including many high-income countries, are missing or incomplete

Estimated that 4.95 million deaths were *associated* with bacterial AMR in 2019 and 1.27 million deaths were *attributable* to it

In 2019, six pathogens were each responsible for more than 250,000 deaths *associated* with AMR:
E coli, Staphylococcus aureus, K pneumoniae, S pneumoniae, Acinetobacter baumannii,* and *Pseudomonas aeruginosa

These six pathogens accounted for 929,000 of the 1.27 million deaths *attributable* to AMR and 3.57 million of the 4.95 million associated with AMR globally in 2019

AMR as a global problem

There are large geographical variations in the scale and nature of deaths and Disability Adjusted Life Years

High-Income region includes, alongside western Europe, Australia, New Zealand, the USA, Canada, and countries in the lower cone of South America and in East Asia. Central and Eastern Europe includes the post-2004 EU member states (except Malta and Cyprus).

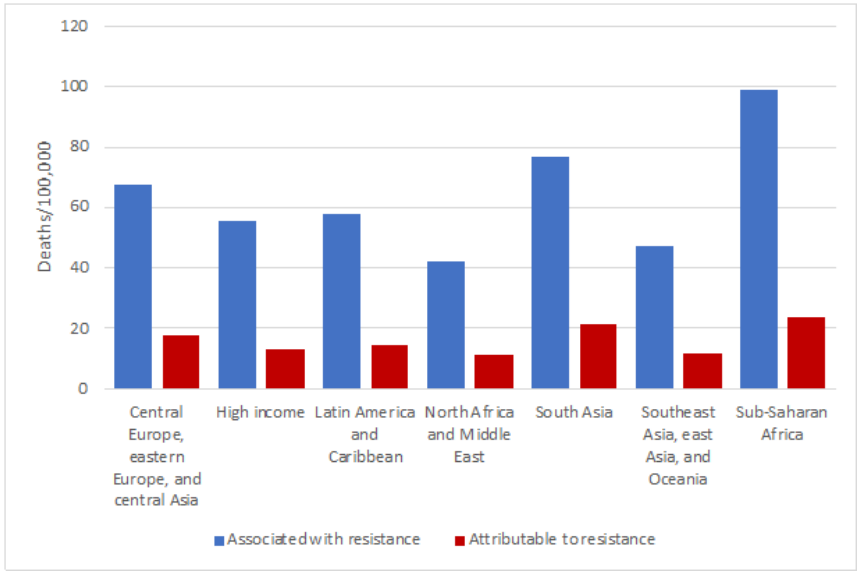


Figure 1 *All-age rate of deaths per 100,000 population associated with and attributable to bacterial antimicrobial resistance by region, 2019*

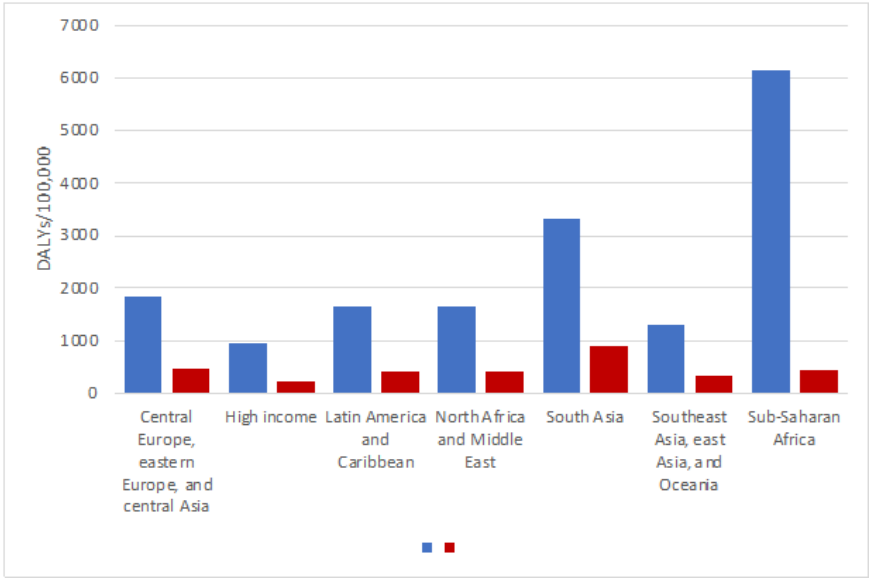


Figure 2 *All-age rate of disability-adjusted life years (DALYs) per 100,000 population associated with and attributable to bacterial antimicrobial resistance by GBD region, 2019*

AMR in Europe

Most reported bacterial species–antimicrobial combinations showed either a significantly decreasing trend or no significant trend in population-weighted mean AMR percentage during 2016–2020.

The exceptions were carbapenem resistance in *Escherichia coli* and Klebsiella pneumoniae **and vancomycin resistance in *Escherichia faecium*, which saw a significant increase during this period**

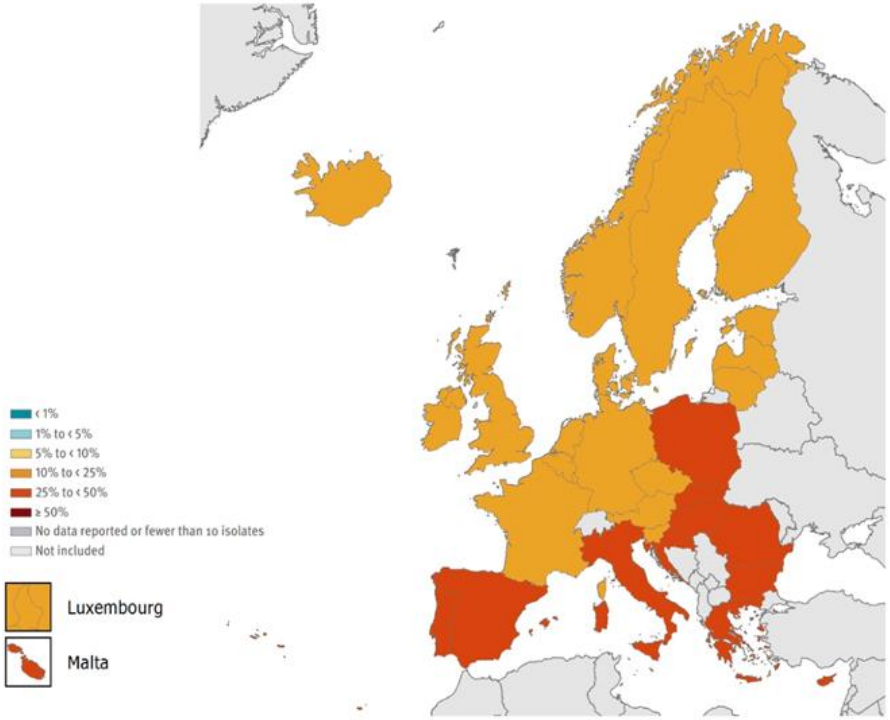
Reduction in the percentage of *Methicillin-Resistant Staphylococcus aureus (MRSA)* during 2016–2020

but MRSA remains of concern, with high percentages in several countries including Spain, Portugal, Italy, Austria, and Romania, and combined resistance to another antimicrobial group is common.

The gradient was more pronounced for fluoroquinolone resistance in *E. coli*, (**Figure 3**), third-generation cephalosporin and carbapenem resistance in *K. pneumoniae* and carbapenem resistance in *Acinetobacter* species.

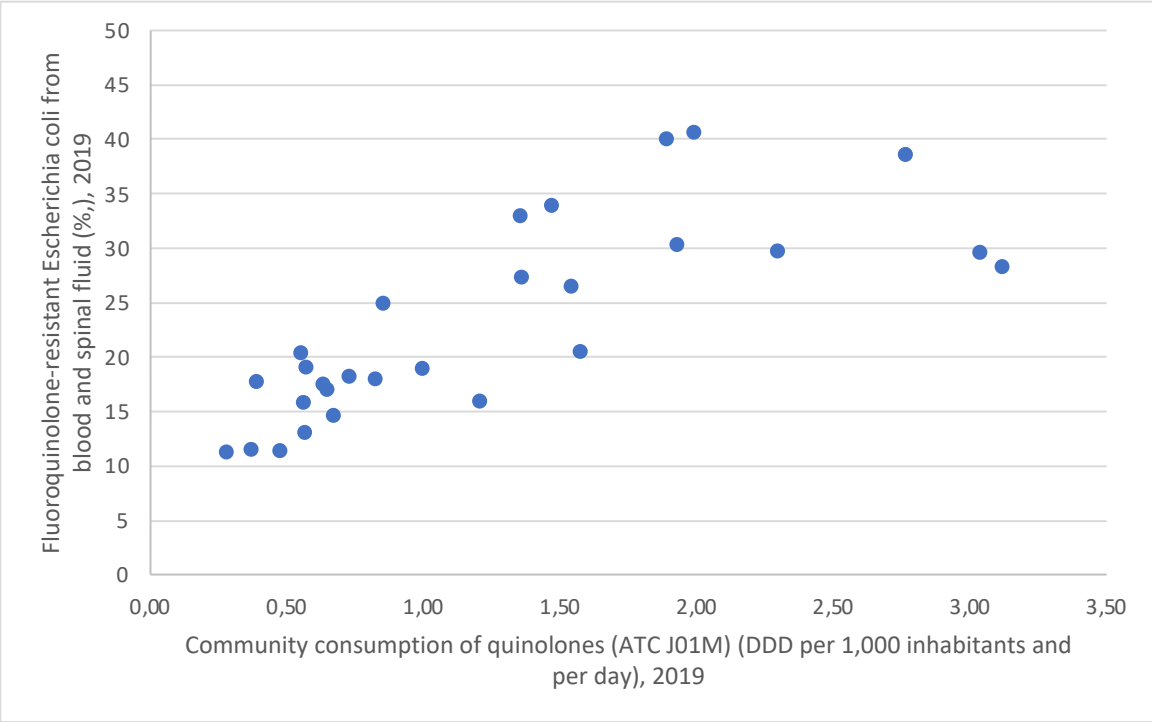
European Commission

AMR in Europe



Percentage of invasive E. coli isolates resistant to fluoroquinolones (ciprofloxacin or/and levofloxacin or/and ofloxacin), by country, EU/EEA, 2019

AMR in Europe



Association between use of and resistance to fluroquinolones in the EU28 (2019)

Antibiotic consumption in Europe

- In 2018, in 29 EU/EEA countries, 4,264 tonnes of antibiotics were used in humans corresponding to a mean antibiotic consumption of 133 mg of active substance per kg estimated biomass, whereas 6,358 tonnes of antibiotics were used in food-producing animals corresponding to a lower mean antibiotic consumption of 105 mg per kg estimated biomass

- Recognition of the need to reduce, as far as possible, the use of antibiotics.

- During the period 2011–2019, a decreasing trend in total antibiotic consumption was apparent in the EU/EEA overall, with large reductions in some countries

Antibiotic consumption in Europe

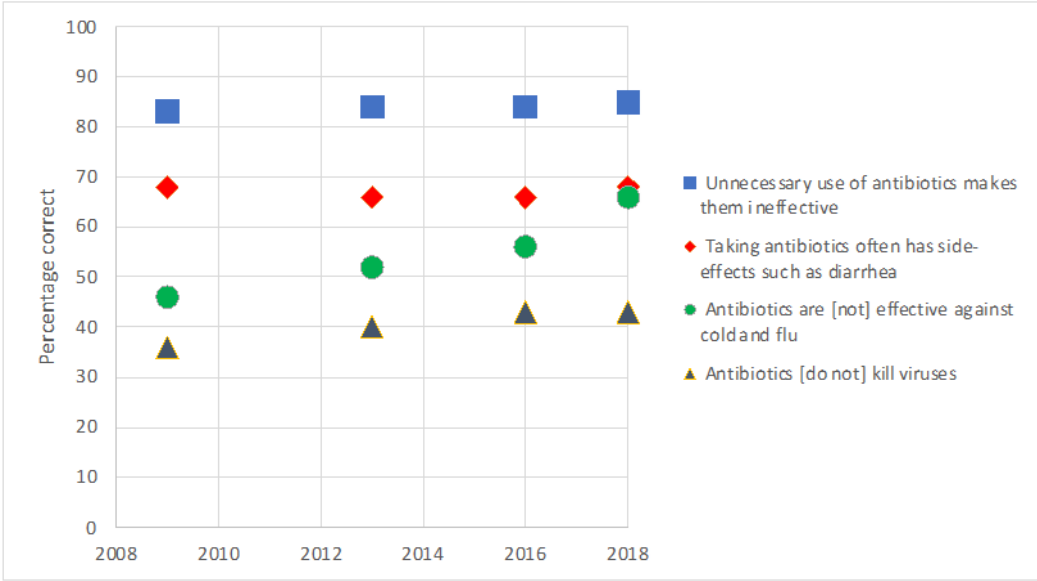
- In 2019, the mean total (community and hospital sector combined) consumption of antibacterials for systemic use in humans in the EU/EEA was 19.9 defined daily doses (DDD) per 1,000 inhabitants per day

- Most (approximately 90%) antibiotic consumption in humans takes place in the community, although the proportion of patients receiving an antibiotic on a given day is much higher in acute care hospitals than in the community

Knowledge, attitudes, and beliefs about antibiotics in Europe

Responses to European surveys:

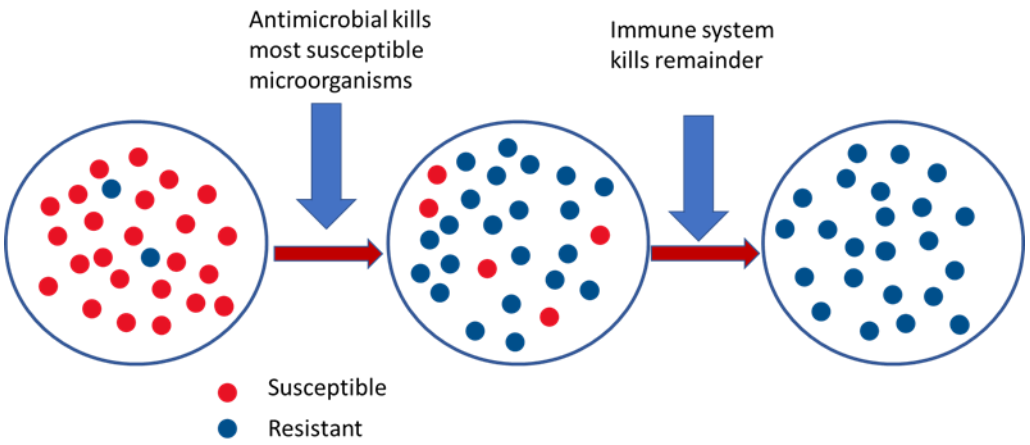
The vast majority of respondents had received their last course of antibiotics from a healthcare professional (93%), either based on a prescription dispensed at a pharmacy (72%) or directly from a medical practitioner (21%), while 7% of antibiotic courses were obtained without a prescription, a figure that was unchanged since 2016.



1.2 What contributes to the spread of AMR?

A One Health approach (within and beyond health systems) - the role of humans, animals, and the environment

The spread of AMR and the One Health approach



The development of AMR

Niegowska and Wögerbauer have identified five broad categories within which there are factors that contribute to the spread of AMR:

- Animal farming
- Environment
- Community
- Healthcare facilities
- Travel

Measures to tackle AMR

Reduce infections

Reduce antimicrobials

Rapid diagnosis for appropriate use

New antimicrobials

A taxonomy of approaches

1.2 What contributes to the spread of AMR?

Understanding context, culture, and behaviours

Understanding context, culture, and behaviours

Policy and strategic planning

1. Promote improved awareness and understanding of AMR, based on effective communication, education and training.
2. Strengthen knowledge and be evidence-based through surveillance and research.
3. Reduce the incidence of infection through effective sanitation, hygiene, and infection prevention
4. Include measures to optimise antimicrobials in human and animal health.

Medicines management and prescribing systems

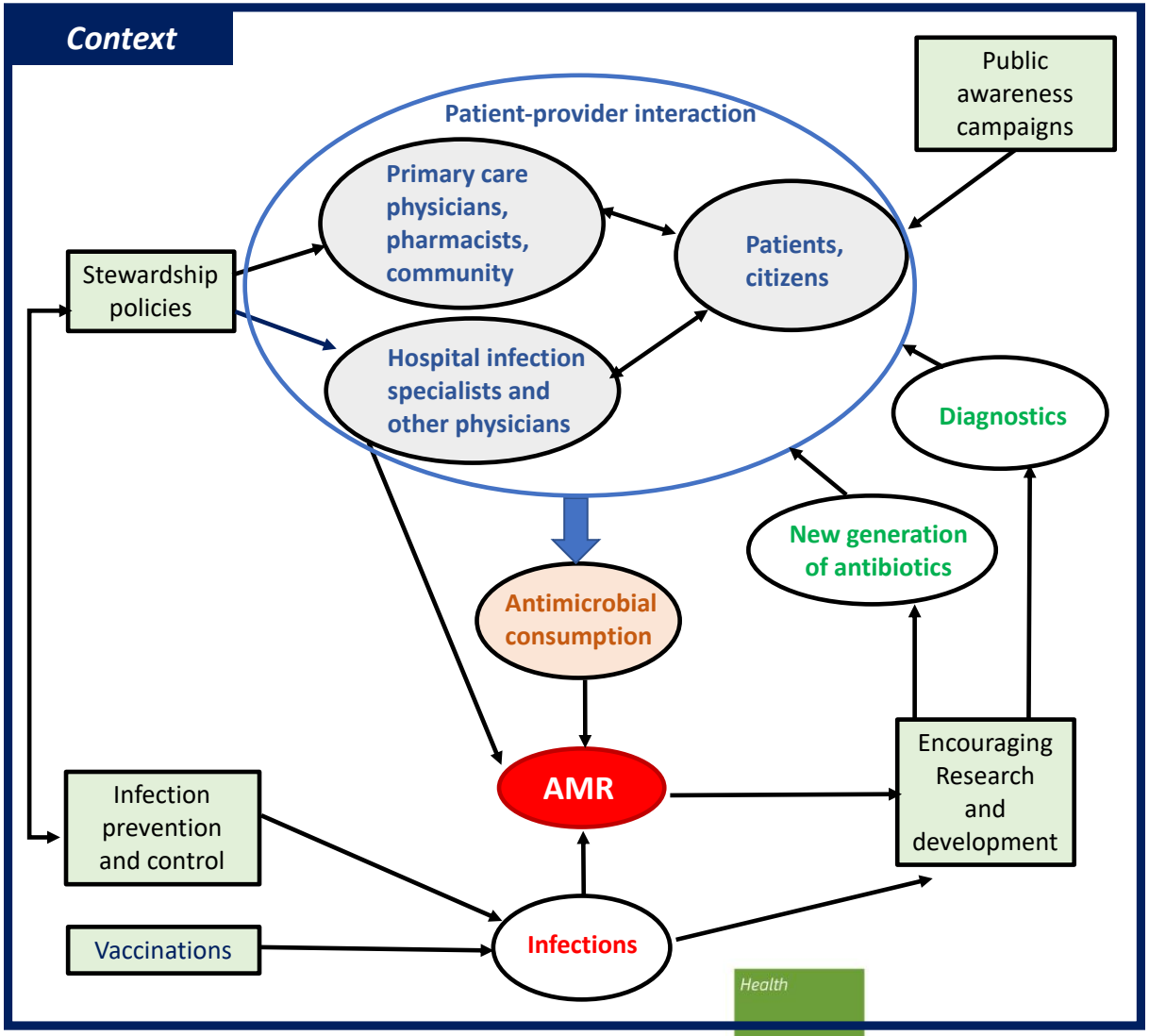
Antimicrobial stewardship (AMS) and multimodal strategies

Research, innovation and technological approaches

Revitalization of the antimicrobials pipeline is essential

1.2 What contributes to the spread of AMR?

A Framework for AMR Tackling AMR at the health system level



Framework for AMR policy interventions at the health system level

1.3 What is the evidence on the determinants of AMR in the health system?

Overview of Evidence on Determinants of AMR

Determinants of AMR are multiple with various factors related to:

the prescriber (e.g. socio-demographic factors, attitudes and beliefs),
the patient (e.g. knowledge and behaviour),
the health care system (e.g. reimbursement system)
the overall environmental and cultural scheme

Heterogeneity in the prescribing style and variation within GPs has been attributed to the personal psychological/behavioural attitudes towards uncertainty and risk at the GP-level

Non-prescription antibiotic use and inappropriate prescriptions are common in all WHO regions according to a recently published mixed methods systematic review and meta-analysis.

The use of antibiotics without prescription represents also a non-prudent use of antibiotics because of its lack of medical guidance

1.4 What are the innovations and emerging technologies available to improve the fight against AMR, and how to support their development?

Strategies to reduce infections

Vaccination and alternative approaches

- Haemophilus influenzae type B as well as Streptococcus pneumoniae conjugate vaccines have impressive track records in not only preventing life threatening diseases caused by these bacteria, but also reducing antibiotic use and AMR.

- Different vaccines are also under development with the examples of Clostridioides difficile, Escherichia coli, Staphylococcus aureus, Neisseria gonorrhoeae, Pseudomonas aeruginosa or Klebsiella pneumoniae.

- Development of **next generation vaccines** is also part of the strategy against AMR pathogens.

- **Alternative strategies:** therapeutic monoclonal antibodies, microbiota-based interventions, or use of bacteriophages

Strategies for stewardship and reduction of the use of antimicrobials

Education of prescribers

Seminars, online e-learning modules, social media platforms, educational video games and problem-based learning modules

Integral component of other interventions of AMS

Public Awareness Campaigns

Subsequent review of studies from Italy, the United Kingdom and the United States concluded that mass media campaigns could decrease antibiotic consumption by 6.5%.

Innovative reimbursement strategies

Reimbursement strategies for stewardship purpose is an option

Approaches to tackling AMR through reimbursement strategies for incentivising innovation

29

Strategies for rapid diagnosis based on emerging technologies and digital interventions

Telemedicine

- Support AMS and connect healthcare providers with infectious disease specialists, clinical microbiologists, and/or pharmacists
- Remote infectious disease consultancy program

Biomarker-based antibiotic stewardship

Phase	1 Start of treatment	2 During treatment	3 End of treatment
Action	Select drug and dose	Adjust drug and dose	De-escalation
Tools	Pathogen identification Pharmacokinetic biomarkers Susceptibility testing Pharmacogenomics	Efficacy biomarkers Toxicity biomarkers Therapeutic drug monitoring Pharmacokinetic related biomarkers	Clinical symptoms Efficacy biomarkers Microbial cultures

Electronic clinical decision support systems (eCDDS)

1) Passive decision support through electronic access to guidelines and mobile applications;
2) Electronic antimicrobial approval systems;
3) Electronic infection prevention surveillance systems;
4) Electronic prescribing (e-prescribing) and electronic medication management;
5) Advanced decision support.

Point-of-care testing (POCT)

Strategies for rapid diagnosis based on emerging technologies and digital interventions

Omics technologies to detect antibiotic resistance genes in the environment

- Genomics, transcriptomics, proteomics, and metabolomics
- Provide new insights into our comprehension of antimicrobial resistance/susceptibility

Multi-omics approaches for screening

Collection of extensive standardized freshwater dataset from hundreds of European lakes, which can be used as a comprehensive resistome dataset to facilitate and monitor changes in the development of AMR

Metagenomics and network medicine

Analyse untreated sewage to characterize the bacterial resistome

2. Policy analysis

2.1 A One Health Approach to tackling AMR

World Health Organization Global Action Plan (WHO GAP)

5 strategic objectives endorsed in May 2015:

1) To improve **awareness** and understanding of AMR through effective communication, education and training;
2) To strengthen knowledge through **surveillance** and research;
3) To reduce the incidence of infection through effective sanitation, hygiene and **infection prevention** measures;
4) To **optimize the use of antimicrobial agents** in human and animal health; and
5) To **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

WHO GAP Recommendations

1) **Awareness:** Communication programmes, AMR as a core component of professional education, training, and certification, and inclusion of antimicrobial use and resistance in school curricula

2) **Surveillance:** Development of a national surveillance system for AMR that includes a national reference centre able to systematically collect, analyse, and report data and at least one reference laboratory capable of susceptibility testing using standardized tests and operating under agreed quality standards to fulfil the core data requirements.

WHO GAP Recommendations

3) **Infection prevention and control:** Training and education in hygiene and infection prevention and control component of professional education, training, and certification, developing/strengthening policies and standards while monitoring implementation and adherence, and incorporation of collecting and reporting of data on antimicrobial susceptibility of microorganisms causing health care-associated infections.

4) **Optimization of antimicrobial use:** Developing/implementing enforceable regulatory frameworks for marketing, distribution, prescriptions, dispensing, and reimbursements, as well as provision of stewardship programs and modification of economic incentives to encourage appropriate use of antimicrobial agents.

WHO GAP Recommendations

5) **Development of the economic case:** Assessing and financing national action plans and participating in research to support the development of new medicines, diagnostic tools, and vaccines

Tripartite Annual Country Self-Assessment Survey (TrACSS)

- First assessment in 2016
- Conducted by national authorities
- Multi-sectoral progress with one official response
- Responses structured by WHO GAP objectives
- Rate national capacity and progress on a five-point scale (A to E), representing both content and implementation
- Now conducted annually
- Results feed the April 2022 Strategic Framework

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The Quadripartite Strategic Framework (April 2022)

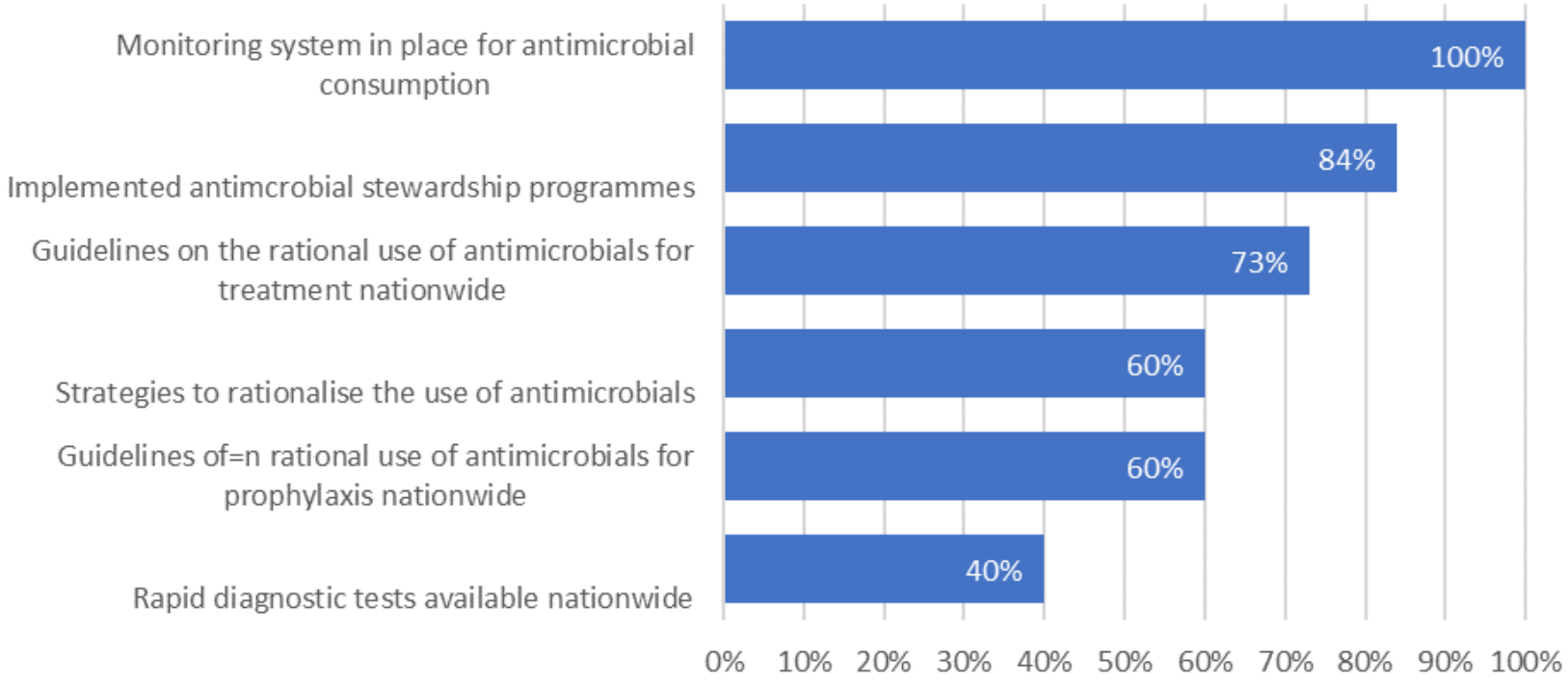
- Documents goals, objectives, impact, outcomes, and related functions/outputs at 1) country level and 2) global/regional levels.
- Goal: To preserve antimicrobial efficacy and ensure sustainable and equitable access to antimicrobials for responsible and prudent use in human, animal, and plant health, contributing to achieving the SDGs.
- Objectives are:
  1. To optimize the production and use of antimicrobials along the whole life cycle from research and development to disposal;
  2. To decrease the incidence of infection in humans, animals, and plants to reduce the development and spread of AMR.

TrACSS Results

- Differences in the progress with respect to capacity, resources and context.
- Most countries have developed a national action plan, however:
  - Few have the necessary approved and budgeted operational plan to implement it
  - Many lack of capacity to coordinate, monitor, and adapt responses to AMR.
- Less than half have nationwide implementation of infection prevention and control in human health facilities aligned with WHO guidelines.
- Multi-sectoral working groups are functional in only half of countries surveyed
- Only a third balance representation across human, animal, and plant health and the environment.

Policies Promoting Rational Use of Antimicrobials

- Proportion of 29 OECD countries implementing specific policies to promote the rational use of antimicrobials:



2.2 AMR Policy in the EU

EU One Health AMR Action Plan: Pillars

- Published in 2017
- High-level objectives based on 3 main pillars:

1. Making the EU a best practice region via better evidence, better coordination and surveillance, and better control measures.
2. Boosting research, development and innovation by closing current knowledge gaps, providing novel solutions and tools to prevent and treat infectious diseases, and improving diagnosis in order to control the spread of AMR;
3. Intensifying EU efforts worldwide to shape the global agenda on AMR and the related risks in an increasingly interconnected world.

EU One Health AMR Action Plan: Actions

- EU Actions, also relevant for Member States, include:

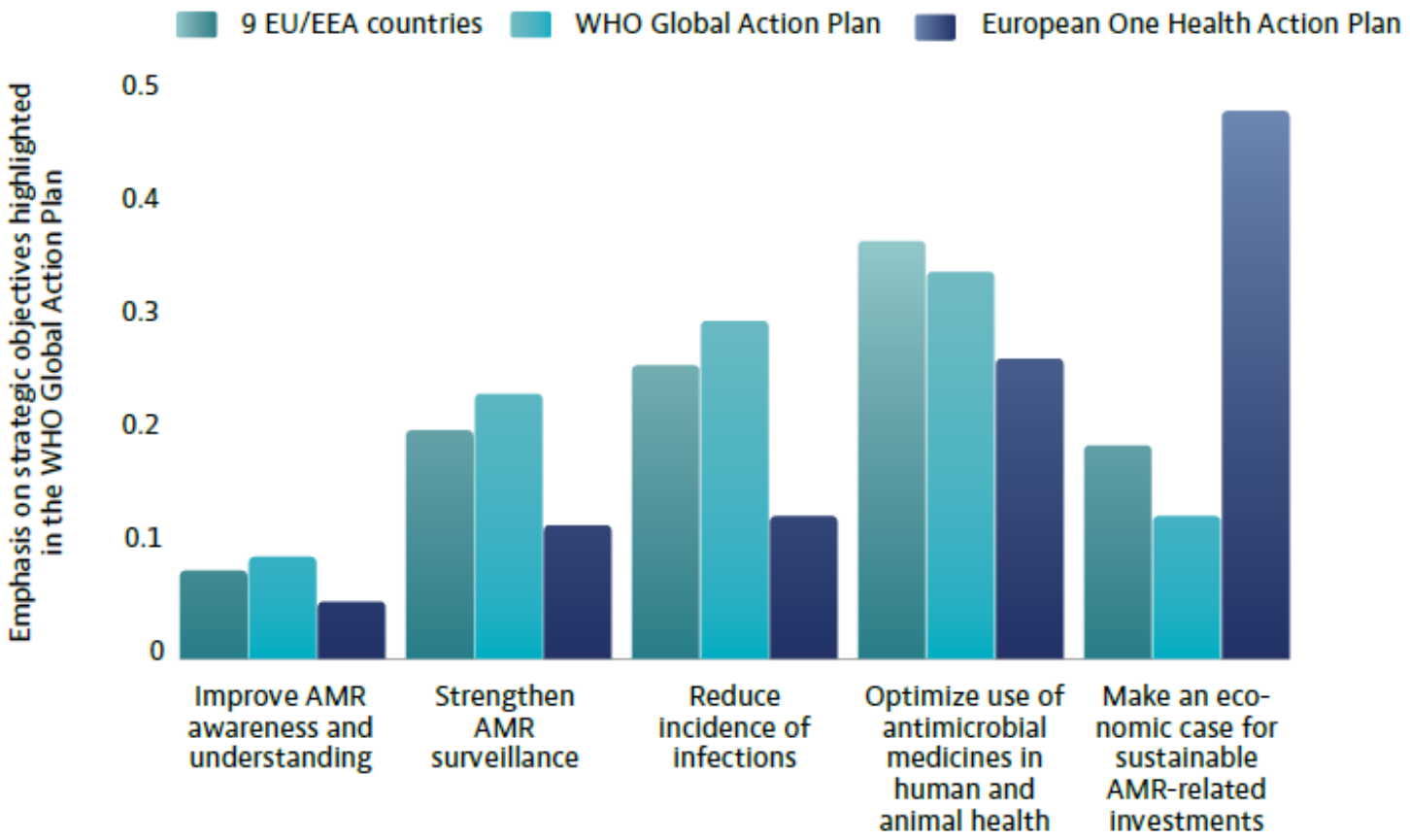
1. Review EU implementing legislation
2. Develop harmonised rules for surveillance, where appropriate
3. Support for networking collaboration and reference laboratory activities
4. Provide evidence-based data
5. Define key outcome indicators and economic models
6. Support public awareness through Eurobarometer surveys and European Antibiotic Awareness Day
7. Coordinate and support the AMR One Health Network, joint actions, joint Commission and the ECDC visits to MSs upon request, and collaboration with EU and international agencies
8. Support IPC activities and sharing of best practices, and vaccines
9. Develop new EU guidelines to promote the prudent use of antimicrobials, where appropriate

2.3 National AMR Policies / Action Plans

TrACSS Findings as Reported by Member States

- As of May 2021, 25 out of 29 EU/EEA countries had developed an action plan to tackle AMR.
  - **No national AMR Action Plan**: Poland
  - **National AMR Action Plan under development**: Bulgaria, Estonia, Lithuania
  - **National AMR Action Plan developed**: Belgium, Czech Republic, Slovenia, Hungary, Greece, Portugal, Romania, Cyprus
  - **National AMR Action Plan being implemented**: Finland, Ireland, Croatia, Austria, Germany, Denmark, Netherlands, Latvia, Sweden
  - **National AMR action plan being implemented and actively monitored through a monitoring and evaluation framework**: Slovakia, France, Italy.

OECD Analysis of Content of 9 EU/EEA Action Plans from 2020-2021 TrACSS Report (published in March 2022)



AMR One Health Network May 2022 Update

- With respect to One Health content, 26 of the EU-27 countries have a One Health National AMR Action Plan.
  - 12 countries have valid and approved plans.
  - 10 countries have plans that lapse in 2022.
  - Cyprus has a plan approved prior to the adoption of WHO GAP Objectives.
  - 4 countries do not have valid and approved plans:
    - Hungary has a two-sectoral plan
    - Estonia and Romania have a one-sector plan
    - Poland does not have a National One Health AMR Plan

2.4 Evidence regarding the Effectiveness of Existing AMR policies to Tackle AMR

2019 Policy Brief on Averting the AMR Crisis: Evidence

1. **Awareness:** Public health campaigns are effective in some countries. Training on AMR, AMS, and IPC is important. Despite WHO guidance, quality and coverage vary within and across countries.
2. **Surveillance**: Used to inform NAPs and as feedback on implementation effectiveness. Span human, animal, plant, and environmental health. National systems linking into international ones, which require certain standards (adequate laboratories, equipment and technical expertise, along with regular external quality assessment). Both structures and processes must be in place for successful data collection.
3. **IPC:** Horizontal (applied generally across a whole institution) or vertical (address specific problems, such as a type of infection) measures are available, but not clear which is more effective. OECD modelling suggests cost-effectiveness of improved hand hygiene.

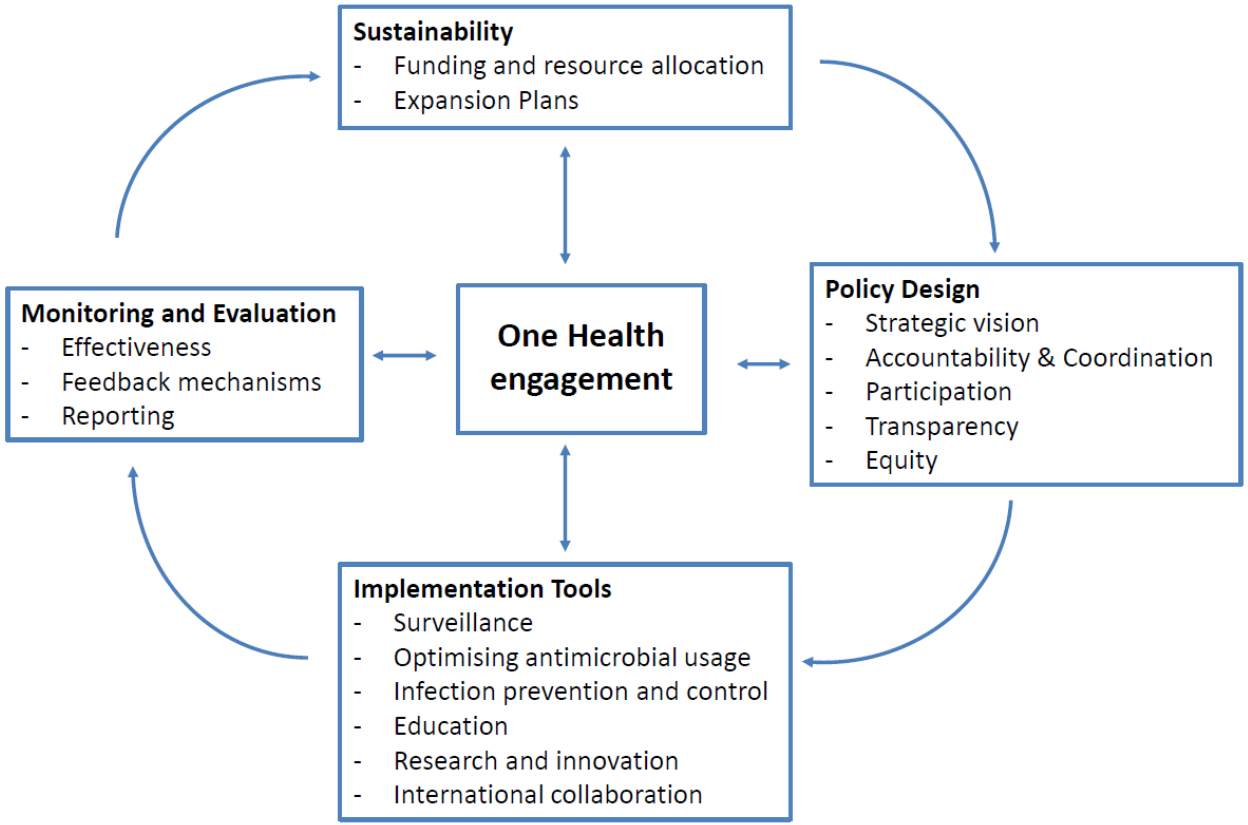
2019 Policy Brief on Averting the AMR Crisis: Evidence

4. **Optimisation of antimicrobial agent use:** In primary care, effective interventions to change the prescribing behaviour of clinicians:
   - Guidelines, outreach visits, clinical audit, and/or computerized reminders. Financial incentives under specific circumstances.
   - Shared decision-making is highly effective.
   - Rapid, affordable and easy-to-use diagnostic tools, including point-of-care tests, can be effective but are not widely available.

5. **Economic case development**: OECD modelling suggests that effective implementation of AMS programmes could result in a 51% reduction of deaths from AMR and €2.3 billion saved. The OECD Strategic Public Health Planning for AMR (SPHeP-AMR) model results are pending.

2.5 Effective Implementation of National Action Plans (NAPs)

Framework for Continuous Improvement and Adaptation (Andersen et al., 2019)



Available Tools for Implementation of NAPs

- WHO Implementation Guidebook
  - Sample terms of reference for suggested coordination mechanisms
  - A generic template for a national action plan (NAP)
  - A sample monitoring and evaluation plan
  - A checklist produced by WHO, FAO, OIE
- AMR guidelines for European countries from Joint Action EUJamrai
- AMR Policy Analysis Coding Tool (Ogyu et al., 2020) to guide indicators and identify policy gaps
- WHO Implementation Handbook for NAPs specific to the human health sector (February 2022)
  - Details structures, processes, and capacity-building required

Implementation Strategies for Successful Deployment

- Of POCTs (Bukve et al., 2016) draws on Quality Improvement (QI) systems:
  - Measurements from high-quality, calibrated instruments
  - Regular external quality assurance (QA) checks and weekly internal quality control (QC) checks
  - Minimum numbers (10 or more) tests weekly
  - Laboratory-qualified personnel performing the tests
- Take context into account using Implementation Science Frameworks:
  - Consolidated Framework for Implementation Research (CFIR), Promoting Action on Research Implementation in Health Services (PARIHS), and Logic models / Programme Theory Evaluation (Brousselle & Champagne, 2011)
- Leverage Expert Recommendations for Implementing Change (ERIC) strategies according to identified barriers to implementation

3. Recommendations

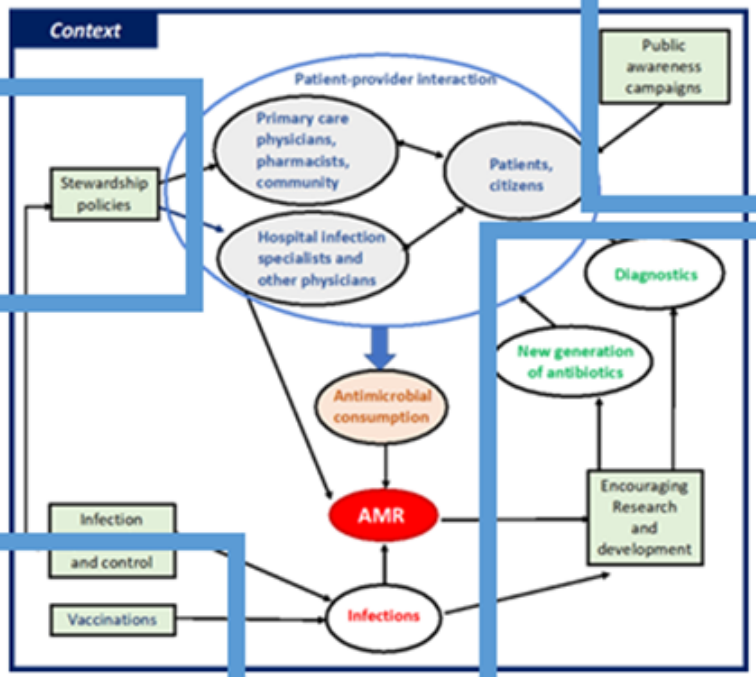
for the EU and Member States

European Commission

Strategic approach is needed, building on best practices.

Values and belief systems of population determine the level of potential misuse of antibiotics

AMR has to be addressed by complex multimodal interventions



Steering of research and development should be based on foresight exercise (or similar analyses for the potential future) and rapidly integrated and adopted within regulatory and legal framworks.

Whenever possible, infections should be prevented and/or controlled.

Surveillance, monitoring and evaluation including transparency of harmonized data shown should be in place at all levels

Recommendation 1: Each Member State should strengthen their systems for convening all AMR stakeholders and improve national assessment quality

- This requires a strategic approach on the part of **Member States** with support mechanisms in place.
- Comprehensive national assessments of the quality of the plan content should continue, with emphasis on the effectiveness of plan implementation.
- In addition to outcome indicators, process indicators need to be incorporated into AMR plan monitoring and evaluating.
- AMR initiatives have to be seen as essential parts of quality and safety actions in healthcare.
- MSs are holding the accountability for the results and the adaptations of the actions, and committed to report them regularly (every second year) at EU level.

Recommendation 1: Each Member State should strengthen their systems for convening all AMR stakeholders and improve national assessment quality

To support this recommendation, the **European Commission** should:

- Establish an annual system, that would involve a collaborative effort by those Directorate Generals and Agencies most directly involved, to report progress on the measures set and in the European One Health Action Plan against Antimicrobial Resistance that would be published and presented to the Council and the Parliament.

Recommendation 1: Each Member State should strengthen their systems for convening all AMR stakeholders and improve national assessment quality

To support this recommendation, the **EU** should:

- Support exchange of evidence from research and experience of good practice among member states on surveillance of AMR
- Ensuring the closest possible coordination of organizations responsible for both human and animal health and the environment
- With a focus on generating information that can inform timely and effective policy responses, as well as governance structures at all levels of health systems that increase the effectiveness of such responses.

Recommendation 2: Complete the process of developing indicators for the surveillance, monitoring, and evaluation of AMR

- The **Member States** and the **EU** should improve One Health surveillance through the collection and reporting of harmonized data on AMR and antibiotic consumption.
- The **EU** can continue to facilitate transparent surveillance, monitoring and evaluation across all sectors.
- AMR data collection for animals should be expanded to human health.

Recommendation 3: Each Member State should ensure that there are stewardship systems in place throughout their health systems.

- This requires **Member States** to address determinants of antibiotic prescribing based on evidence of what works, including education and training in shared-decision making between physicians and patients and in inter-professional collaboration among physicians, laboratory staff, and pharmacists.
- A combination of complementary and mutually reinforcing measures within a robust system of governance is needed that can ensure that those designated as responsible for the system have the appropriate levers to make it work.
- Implementation strategies like computerized reminders, outreach visits and clinical audits have demonstrated effectiveness.
- Such stewardship systems should be designed at Member State level, considering the gaps identified and the respective context.
- Multimodal interventions appear necessary to address appropriate antimicrobial prescription at the time of pandemics.

Recommendation 3: Each Member State should ensure that there are stewardship systems in place throughout their health systems.

To support this recommendation, the **EU** should:

- Support exchange of evidence from research and experience of good practice in methods to reduce the incidence of nosocomial infections, drawing on a wide range of disciplines including, but not limited to, research on building design, clinical methods, epidemiology, and behavioural sciences.
- Support undertaking a review of potential innovative financing systems that provide the pharmaceutical industry with adequate incentives to develop new products while ensuring that both the risks and the benefits are shared by the public and private sectors.

Recommendation 3: Each Member State should ensure that there are stewardship systems in place throughout their health systems.

To support this recommendation, the **EU** and **Member States** should:

- Continue to support exchange of evidence of good practice in creating, implementing, and monitoring clinical governance systems that encourage appropriate use of antimicrobials (including timely surveillance of prescribing data), thereby implementing provisions of the 2017 EU Guidelines for the prudent use of antimicrobials in human health and supporting research on ways of implementing these systems in different contexts.

Recommendation 4: Steering of research and development based on foresight exercises, rapidly integrated and adopted within regulatory and legal frameworks

To support this recommendation, the **EU** should:

- Support undertaking a foresight exercise to identify the opportunities offered by advances in vaccine science, in particular those offered by mRNA vaccines, to reduce the burden of infections requiring treatment by antimicrobials and use the findings to inform a programme of research.

The **EU**, in collaboration with **Member States**, should:

- Go beyond the Pharmaceutical Strategy for Europe and provide a clear strategic direction and goal-setting for pharmaceutical research and development of new antibiotics and emerging technologies.
- Support initiatives that provide incentives through funding or other ways to stimulate the development of new antibiotics and testing.

Recommendation 4: Steering of research and development based on foresight exercises, rapidly integrated and adopted within regulatory and legal frameworks

- There is scope for **Member States** to improve the regulatory and legal frameworks to facilitate the rapid integration and adoption of appropriate new technologies.
- The **EU** could stimulate and facilitate harmonization of these standards and criteria across Member States.
- **EU** and **Member States** should be supporting research on diagnostic tools that can identify the agents causing infections and their susceptibility to antimicrobials and encouraging exchange of evidence of good practice in their use, including how best they can be incorporated into routine clinical practice.

Recommendation 5: Leverage the knowledge that value and belief systems of population determine the level of potential misuse of antibiotics

- There is scope for **Member States** to introduce targeted, well-designed and effective AMR public awareness campaigns.

To support this recommendation, the **EU** can:

- Play a role in facilitating the sharing of best practices supported by demonstrated evidence through learning communities.
- Support exchange of evidence of good practice in public engagement on the appropriate use of antimicrobials, drawing on insights from cognitive and behavioural sciences, with an emphasis on equity (given the risks that disadvantaged groups may be excluded) and on co-creation of messages and means of dissemination.

Discussion

Thank You !

Comments, Questions & Answers

Additional comments

SANTE-EXPERT-PANEL@ec.europa.eu

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