Policy Design

Domain one: Strategic vision

# Q1: Is a national action plan (NAP) for tackling antimicrobial resistance (AMR) in place in Europe?

Yes, a national action plan (NAP) for tackling antimicrobial resistance (AMR) is in place in Europe. Since the Global Action Plan on Antimicrobial Resistance (AMR) was adopted in 2015, efforts have been enhanced across the WHO European Region to tackle AMR. By 2017, only 34 (68%) of the 50 countries in the region reported having developed a national action plan on AMR. However, this number increased to 44 (85%) of the 52 countries that responded in the latest round of global monitoring, indicating a significant improvement in the development and implementation of national action plans across Europe [Reference: Page 14, Antimicrobial resistance surveillance in Europe 2021 to 2023, 2023, EU, WHO; Page 2, Surveillance of antimicrobial resistance in Europe for 2021, 2022, ECDC, WHO]. Additionally, the European Commission adopted a new EU One Health action plan against AMR in 2017, aiming to preserve the effective treatment of infections in humans and animals and to reduce the emergence and spread of AMR [In-house knowledge].

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

action plan (NAP) on AMR, but the latest round of global Country-specific information for each bacterial species, monitoring showed that this had increased to 44 (85%) ofincluding information on patient age group and sex, are the 52 countries that responded in the Region. The chal available on the WHO European Region website [1].

ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 2.

European Region have enhanced efforts to tackle AMR.Only 25 (50%) of the 50 countries reported having devel Large differences were observed across the Region in oped a national action plan (NAP) on AMR in 2016, but the percentage of penicillin non-wild type S. pneumo- the latest round of global monitoring showed that this niae.

Austrian Federal Goverment, the Federal ministry for social, health, care and consumer protection. (2021). *National Action Plan on Antibiotic Resistance*. Page 23.

Entwicklungen auf nationaler und internationaler Ebene (globaler Aktionsplan der Weltgesundheitsorganisation (WHO; World Health Organization) zu AMR 2015, „Schlussfolgerungen des Rates derEuropäischen Union (EU) zu den nächsten Schritten im Rahmen einer “One-Health“ Strategie zur Bekämpfung der Antibiotikaresistenz“ [1]) seit der Veröffentlichung des Nationalen Aktionsplan zur Antibiotikaresistenz (NAP-AMR) im Herbst 2013 führten dazu, dass im Jahr 2016 eine Überarbeitung des bestehenden nationalen Aktionsplans beschlossen wurde.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

The European Commission adopted an Action Plan to tackle AMR on 29 June 2017.1 The Action Plan is underpinned by a One Health approach that addresses resistance in bacteria from both humans and animals.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 32.

A European One Health Action Plan against Antimicrobial Resistance (AMR). Brussels: EC; 2017. Available at:https ://ec.europa.eu/health/sites/health/files/antimicrobial\_resistance/docs/amr\_2017\_ action 16. D’Atri F, Arthur J, Blix HS, Hicks LA, Plachouras D, Monnet DL et al.

ECDC, EFSA, EMA. (2024). *Antimicrobial consumption and resistance in bacteria from humans and food producing animals 2019−2021*. Page 146.

(2017). A European One Health Action Plan against Antimicrobial Resistance (AMR). https://e c.e uropa.e u/h ealth/s ites/h ealth/f iles/ antimi crobi al\_r esist ance/d ocs/a mr\_2 017\_a ction-p lan.p df Eurostat. (2023). Hospital days of in- patients. https://e c.e uropa.e u/e urost at/d atabr owser/v iew/h lth\_c o\_h osday/d efaul t/t able?l ang=e n Flor, M., et al. (2018).

Policy Design

Domain one: Strategic vision

# Q2: Are the objectives contained within the NAP specific, measurable (e.g., reduction in drug-resistant infection, slowing trends of resistance development), and time-bound in Europe?

The objectives contained within the National Action Plans (NAPs) on Antimicrobial Resistance (AMR) in Europe are designed to be specific and measurable, aligning with the overarching goals of reducing drug-resistant infections and slowing the trends of resistance development. However, the extent to which these objectives are time-bound can vary across different European countries, reflecting differences in national priorities, resources, and the specific challenges each country faces in combating AMR.

For instance, the European Parliament resolution of 1 June 2023 emphasizes the importance of combating AMR and promoting the prudent use of antimicrobials as priorities within national health systems. It suggests that NAPs should include specific measures to achieve measurable overarching goals, implementation modalities, and indicators to assess progress towards these goals, including the costs of multi-resistant human infections and unmet medical needs. It also calls for the allocation of appropriate and sufficient human and financial resources for the effective implementation of the NAP, defining priorities and distributing resources accordingly, while ensuring implementation in neglected areas such as the environment [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

Despite these guidelines, there are challenges in ensuring that all objectives within NAPs are time-bound. For example, in the Netherlands, while goals and strategic objectives are clearly defined, timelines and performance indicators to evaluate progress are not very detailed, with responsibilities and general accountability remaining vague [Reference: Page 4, AMR in the Netherlands-An Analysis of the 2015 National Action Plan and Recommendations for the Future, 2023, Health Action International]. This suggests that while there is an effort to make objectives specific and measurable, making them time-bound is an area that requires further improvement.

Moreover, the European Centre for Disease Prevention and Control (ECDC) highlights that high-level commitment is still lacking in several countries, and important AMR programmes and interventions on infection prevention and control (IPC), antimicrobial stewardship, and surveillance remain under-resourced [Reference: Page 3, Surveillance of antimicrobial resistance in Europe 2020 data, 2021, ECDC]. This indicates that while the objectives may be set, the resources and commitment to meet them within specific timelines may not always be adequately provided.

In summary, while the objectives within NAPs in Europe aim to be specific and measurable to address the challenges of AMR effectively, ensuring that these objectives are also time-bound is an area that requires ongoing attention and improvement. The variability in the detail and specificity of timelines and performance indicators across different European countries highlights the need for continued efforts to enhance the planning and implementation of NAPs on AMR. [In-house knowledge]

Reference

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

The Global Action Plan has five overarching strategic objectives: 1. Communication, education and training; 2. Surveillance and research; 3. Sanitation, hygiene and infection prevention measures; 4. Optimisation of use of antimicrobial medicines in human and animal health; 5. Investment in new medicines, diagnostic tools, vaccines and other interventions [3].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

Ministry of Health, Barbados. (2017). *National Action Plan on Combatting Antimicrobial Resistance*. Page 12.

Objectives of the National Action Plan In alignment with those of the GAP-AMR, the five (5) Objectives of the NAP are: Objective 1: Improve awareness and understanding of antimicrobial resistance through effective communication, education and training. Objective 2: Strengthen the knowledge and evidence base through surveillance and research including in animals, plants, the environment and food.

Ministry of Health and Sanitation, Ministry of Agriculture, Forestry and Food Security, Envioronment Protection Agency, Sierra Leone. (2018). *National Strategic Plan for Combating Antimicrobial Resistance*. Page 14.

The overarching goal of the NAP is to ensure, for as long as possible in Sierra Leone, continuity of successful treatment and prevention of infectious diseases with medicines that are quality-assured, prescribed and used responsibly, and accessible to all who need them at a price that they can afford. 4. Objectives The following are the specific objectives of the NAP-: 1.

Ministry of Health, Kenya. (2017). *National action plan on prevention and containment of antimicrobial resistance 2017-2022*. Page 8.

The NAP aims to provide a coherent policy framework and priority actions to contain the emergence and spread of AMR, through the following strategic objectives: • To improve awareness and understanding of antimicrobial resistance through effective communication, education and training • To strengthen the knowledge and evidence base through surveillance and research • To reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures • To optimize the use of antimicrobial medicines in human and animal health • To develop an economic case for sustainable investment that takes into account the needs of the country and investment into new medicines, diagnostics, tools, vaccines and other interventions.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Despite these limi countries reporting this in 2017 [2]. One of the largest tations, the presence of specific AMR patterns across remaining challenges is to ensure adequate funding clinical settings covered by the surveillance networks for implementation of NAPs, with packages of effectiveis apparent. High percentages of resistance to third intervention to combat AMR.

Health Action International. (2023). *AMR in the Netherlands-An Analysis of the 2015 National Action Plan and Recommendations for the Future*. Page 10.

4.1.1 Data collection 4.1.2 Existence of a national monitoring strategy for antimicrobial sales or consumption 4.1.3 Communication of relevant data (rates and trends) to policy/decision makers 4.1.4 Identification of the national trends of use of antimicrobials and major gaps in knowledge on the patterns of use of antimicrobials on national level 4.2 National monitoring system for antimicrobials intended to be used in animals (sales/use) 4.2.1 National legal framework (existing prior to Regulation (EU) 2019/6 becoming applicable) for collection of data on SALES of antimicrobials in animals 4.2.2 National legal framework (existing prior to Regulation (EU) 2019/6 becoming applicable) for collection of data on USE of antimicrobials per animal species Policy Brief: Antimicrobial Resistance in the Netherlands 6 4.2.3 Existence of a national standardised approach/plan for collection of USE data with national coordination and supervision to ensure quality of data generated 4.2.4 Communication of relevant data (trends in sales and/or use of antimicrobials in animals) to policy/decision makers 4.2.5 Identification of the national trends of sales and/or use of antimicrobials and major gaps in knowledge on the patterns of use of antimicrobials on national level 4.3 National monitoring system for antimicrobial use in plant production 4.3.1 Data collection for any sales/use of antimicrobials in plant production National Monitoring and Surveillance of AMR in Humans, Animals, and Food of Animal Origin The NAP includes goals for the Dutch EU Presidency of 2016, as well as many international commitments regarding AMR surveillance, such as countries receiving information on and assistance with surveillance through the National Institute for Public Health and the Environment (RIVM) (appointed as WHO Collaborating Centre for Antimicrobial Resistance Epidemiology and Surveillance); improving surveillance through representation; and the active contribution of the RIVM in various international networks on surveillance of AMR and healthcare-acquired infections.

The Hashemite Kingdom of Jordan. (2018).  *National action plan for combating antimicrobial resistance in the Hashemite Kingdom of Jordan*. Page 35.

Prevention first, 3. Access, 4. Sustainability, and 5. Incremental targets for implementation NAP Objectives, Strategic Interventions and Activities NAP Objective 1: Improve awareness and understanding of antimicrobial resistance through effective communication, education, training, advocacy and behaviour change programs The NAP AMR has identified the need to raise awareness on AMR and promote behavioural change through public communication programmes that target different audiences in human health, animal health and agricultural practices as well as a wide range of consumers related to these sectors.

Policy Design

Domain one: Strategic vision

# Q3: Are there quantitative targets for AMR or antimicrobial use outlined in the national action plan (NAP) in Europe?

Yes, there are quantitative targets for antimicrobial resistance (AMR) or antimicrobial use outlined in National Action Plans (NAPs) in Europe. For instance, the European Union (EU) and its Member States have been encouraged to set up recommended targets at the EU level on antimicrobial consumption (AMC) and AMR as a means to achieve and monitor progress in both the underlying factors influencing AMR and the spread of AMR. These targets are considered useful tools for achieving common goals and can be complemented by national targets that cover other AMR-related aspects [Reference: Page 16, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission; Page 5, Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach 2023, 2023, Official Journal of the European Union] [In-house knowledge].

Moreover, specific examples of quantifiable performance targets used in the AMR-NAPs from OECD countries include Denmark aiming for a 24% reduction in the number of antibiotic prescriptions redeemed from 450 to 350 per 1,000 inhabitants between 2016 to 2020, and Norway targeting a 30% reduction in antibiotic use between 2012 to 2020 as measured in DDD (Defined Daily Doses) per 1,000 inhabitants per day [Reference: Page 164, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD] [In-house knowledge].

These examples illustrate that within Europe, there is a concerted effort to establish quantitative targets for reducing AMR and antimicrobial use, which are integral components of the broader strategy to combat AMR under the One Health approach.

Reference

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

In 2006, to standardise evaluation and reporting, an assessment tool was developed, covering ten areas having an impact on the control of AMR, as outlined in the Council Recommendation on the prudent use of antimicrobial agents in human medicine [2]. The tentative indicators proposed in this assessment tool proved useful for manysubsequent country visits.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

ganism, while percentages equal to or above 25% were found in 17 (39%), five of which (11% of 44 countries) Since the publication of the Global Action Plan on reported resistance percentages equal to or above 50% Antimicrobial Resistance (GAP-AMR) in 2015 [2], most (see Fig. 10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR.

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

ied substantially among countries in the Region. In 2021, Since the publication of the Global Action Plan on resistance percentages of below 1% were reported by six Antimicrobial Resistance (GAP-AMR) in 2015 [2], most(14%) of 44 countries reporting data on this microorgan Member States of the WHO European Region have ism, while percentages equal to or above 25% were found enhanced efforts to tackle AMR.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 6.

In a 2017 survey, a majority of EU/EEA countries reported having initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often in the context of developing a national action plan for AMR.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

Only five countries of 18 report- of AMR in the future. In fact, on 13 December 2021, the ing to the WHO Regional Office for Europe Antimicrobial goal of strengthening preparedness against the ‘silent Medicines Consumption Network achieved this target in pandemic’ of AMR was agreed upon by all G7 Finance 2019 [4]. Ministers [9].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 16.

The recommended targets should contribute to achieving common goals and can be complemented by national targets that cover other AMR-related aspects, such as infection prevention and control, antimicrobial stewardship, prescription practices and training.

Policy Design

Domain one: Strategic vision

# Q4: Has situational analysis been done to determine the status of antimicrobial use in the country in Europe?

Yes, situational analyses have been conducted to determine the status of antimicrobial use in countries across Europe. These analyses are part of broader efforts to assess and address antimicrobial resistance (AMR) and include evaluations of antimicrobial consumption both in humans and in the veterinary sector. For instance, the European Centre for Disease Prevention and Control (ECDC), along with other agencies such as the European Food Safety Authority (EFSA) and the European Medicines Agency (EMA), has been involved in collecting and analyzing data on antimicrobial consumption. This effort is part of a joint action to produce a common analysis of data from surveillance systems on the consumption of antimicrobials and on the impact of antimicrobial consumption on the occurrence of antimicrobial resistance in bacteria from humans, animals, and food in the EU [Reference: Page 12, First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2015, ECDC, EFSA, EMA] [In-house knowledge].

Moreover, the WHO has conducted "country situation analyses" in Member States across its six regions, including Europe, to determine the extent to which effective practices and structures to address antimicrobial resistance are already in place and where gaps remain. This includes looking at antimicrobial use and resistance patterns [Reference: Page 8, Worldwide country situation analysis-response to AMR, 2015, WHO] [In-house knowledge].

These analyses are crucial for understanding the current state of antimicrobial use and resistance, identifying areas for improvement, and guiding policy and practice changes to combat AMR effectively.

Reference

Public Health and Federal Food Safety and Veterinary Office, Switzerland. (2018). *The Swiss Antibiotic Resistance Report (SARR) 2018*. Page 156.

were analyzed for the time period 2015 to 2017. [4] ECDC (European Centre for Disease Prevention and Control), EFSA (European Food Safety Authority) and Selection of antimicrobial/organism combinations EMA (European Medicines Agency).

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

in several countries, are of classification list) [3]. Only five of 18 countries report concern. They suggest the dissemination of resistant ing to the WHO Regional Office for Europe Antimicrobial clones in healthcare settings and indicate that many Medicines Consumption Network achieved this target in countries have serious limitations in treatment options 2019 [4].

ECDC. (2013). *Antimicrobial resistance surveillance in Europe 2012*. Page 11.

in infection control practices and antimicrobial use in the reporting countries.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

In 2006, to standardise evaluation and reporting, an assessment tool was developed, covering ten areas having an impact on the control of AMR, as outlined in the Council Recommendation on the prudent use of antimicrobial agents in human medicine [2]. The tentative indicators proposed in this assessment tool proved useful for manysubsequent country visits.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

At country-level, this same study found that Italy and Greece had a vastly higher estimated health burden due to infections with antibiotic-resistant bacteria than other EU/EEA countries, highlighting the need to tailor strategies at country level [5]. Although the misuse or overuse of antimicrobials, particularly in human health, is a multifactorial issue.

EFSA, ECDC. (2022). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020*. Page 13.

The analyses showed that the relative strength of these associations differed markedly depending on antimicrobial class, microorganism and sector. The situation in the EU is diverse and varies significantly by country and by antibiotic class.

WHO. (2020). *Strengthening Romania’s health system to address antimicrobial resistance*. Page 54.

43 EVIDENCE BRIEF FOR POLICY Health system constrains Globally, countries are using situation analyses to examine aspects of their health systems. WHO’s Worldwide country situation analysis: response to antimicrobial resistance, carried out in April 2015 (WHO, 2015a) revealed that progress needs to be made even in countries with strong health care systems.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

Policy Design

Domain one: Strategic vision

# Q5: Has situational analysis been done to determine the prevalence and incidence of AMR organisms in the country in Europe?

Yes, situational analyses have been conducted to determine the prevalence and incidence of antimicrobial resistance (AMR) organisms in countries across Europe. These analyses are part of ongoing efforts to monitor and address AMR at both national and regional levels. For instance, the European Centre for Disease Prevention and Control (ECDC) regularly publishes reports on AMR surveillance, which include country-specific information on the estimated incidence of bloodstream infections, data availability, and demographics such as age group and sex for specific AMR phenotypes [Reference: Page 10, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC]. Additionally, the Global Action Plan on Antimicrobial Resistance (GAP-AMR) and the European One Health Action Plan have led to a worldwide country situation analysis in each of the six WHO regions, including Europe, to assess current practices and the structures in place to control AMR [Reference: Page 28, Strengthening Romania’s health system to address antimicrobial resistance, 2020, WHO].

These efforts are facilitated through the WHO Regional Office for Europe and include data from local clinical laboratories produced during antimicrobial susceptibility testing of isolates from blood and cerebrospinal fluid samples. This provides valuable information on AMR for these pathogens in the EU/EEA [Reference: Page 1, Estimated incidence of bloodstream infections with three key pathogens in the EU, EEA in 2019, 2023, ECDC]. The surveillance and situational analyses are crucial for understanding the AMR landscape, guiding policy and intervention strategies, and ultimately aiming to reduce the prevalence and impact of AMR organisms across Europe.

[In-house knowledge]: The situational analyses and surveillance reports are part of a broader strategy to combat AMR, reflecting the commitment of European countries to address this global health threat. These efforts are aligned with international guidelines and action plans, emphasizing the importance of a One Health approach that considers the interconnectedness of human, animal, and environmental health in tackling AMR.

Reference

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

ied substantially among countries in the Region. In 2021, Since the publication of the Global Action Plan on resistance percentages of below 1% were reported by six Antimicrobial Resistance (GAP-AMR) in 2015 [2], most(14%) of 44 countries reporting data on this microorgan Member States of the WHO European Region have ism, while percentages equal to or above 25% were found enhanced efforts to tackle AMR.

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

WHO. (2020). *Strengthening Romania’s health system to address antimicrobial resistance*. Page 28.

This was consolidated in the years that followed in the Global action plan on antimicrobial resistance (WHO, 2015a) and the European One Health Action Plan (EC, 2017a). A worldwide country situation analysis was subsequently conducted in each of the six WHO regions to assess current practices to determine the structures already in place to control AMR.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 9.

The AMR situation reported by EU/EEA countries to EARS-Net for 2022 varied widely, depending on the bacterial species, antimicrobial group and geographical region, as demonstrated by both varying AMR percentages and estimated incidences of bloodstream infections with resistant bacteria (Table 3a, Figures 1–10 and country profiles).

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 10.

For each bacterial species, country-specific information on the estimated incidence of bloodstream infections (EU recommended targets), data availability and age group, sex and ICU patient percentages is available in the country profiles. Results by age group and sex for specific AMR phenotypes are available in ECDC’s Surveillance Atlas of Infectious Diseases [1].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 7.

The AMR situation reported by EU/EEA countries to EARS-Net for 2020 varied widely depending on the bacterial species, antimicrobial group and geographical region (Table 3a, Figures 1–10 and country profiles).

ECDC. (2023). *Estimated incidence of bloodstream infections with three key pathogens in the EU, EEA in 2019*. Page 1.

The data are from local clinical laboratories, produced during antimicrobial susceptibility testing (AST) of isolates from blood and cerebrospinal fluid (CSF) samples, thereby providing information on AMR for these pathogens in the EU/EEA [1].

ECDC. (2019). *Summary of surveillance of antimicrobial resistance in Europe 2018*. Page 1.

As in previous years, the AMR situation in Europe displays wide variations, depending on bacterial species, antimicrobial group, and geographical region. For several bacterial species–antimicrobial group combinations, a north-to-south and west-to-east gradient is evident.

Policy Design

Domain one: Strategic vision

# Q6: If the first national action plan (NAP) has been completed, are there any reoprts detailing the state and progress of AMR control in the country in Europe?

Yes, after the completion of the first National Action Plan (NAP) on Antimicrobial Resistance (AMR), countries in Europe often engage in reporting the state and progress of AMR control. These reports are crucial for evaluating the effectiveness of the implemented strategies and for planning future actions. For instance, Germany, following the publication of its AMR-NAP in 2015, regularly published interim reports describing the national and subnational progress towards the goals stated in its AMR-NAP [Reference: Page 154, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD]. This practice is indicative of a broader trend in Europe where countries undertake efforts to monitor and assess the progress of their National One Health Action Plans and the implementation of targets related to AMR control [In-house knowledge].

Furthermore, the European Centre for Disease Prevention and Control (ECDC) and the World Health Organization (WHO) provide platforms and frameworks for countries to report AMR data, which include surveillance of AMR patterns, antimicrobial use (AMU), and the effectiveness of interventions aimed at controlling the spread of resistant bacterial strains [In-house knowledge]. These reports and data submissions are essential for understanding the overall situation in Europe, identifying trends, and formulating strategies at both national and regional levels to combat AMR effectively.

Reference

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

Austrian Federal Goverment, the Federal ministry for social, health, care and consumer protection. (2021). *National Action Plan on Antibiotic Resistance*. Page 23.

Alle europäischen Mitgliedstaaten einigten sich einstimmig auf Ziele und Maßnahmen. Im Jahre 2016 wurden die Schlussfolgerungen des Rates zu den nächsten Schritten im Rahmen eines „Eine-Gesundheit-Konzepts zur Bekämpfung der AMR“ veröffentlicht [1].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

AMR is one of the top 10 global public health threats facing humanity [5]. While the number of countries in the Region that followed the global call [1, 6] to develop NAP-AMRs has reached a high level, and many countries are already embarking on a revision of their NAPs for the next phase of implementation, there are also countries that have only just started out on the path to implement effective interventions to tackle AMR.

Austrian Federal Goverment, the Federal ministry for social, health, care and consumer protection. (2021). *National Action Plan on Antibiotic Resistance*. Page 23.

Entwicklungen auf nationaler und internationaler Ebene (globaler Aktionsplan der Weltgesundheitsorganisation (WHO; World Health Organization) zu AMR 2015, „Schlussfolgerungen des Rates derEuropäischen Union (EU) zu den nächsten Schritten im Rahmen einer “One-Health“ Strategie zur Bekämpfung der Antibiotikaresistenz“ [1]) seit der Veröffentlichung des Nationalen Aktionsplan zur Antibiotikaresistenz (NAP-AMR) im Herbst 2013 führten dazu, dass im Jahr 2016 eine Überarbeitung des bestehenden nationalen Aktionsplans beschlossen wurde.

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

ied substantially among countries in the Region. In 2021, Since the publication of the Global Action Plan on resistance percentages of below 1% were reported by six Antimicrobial Resistance (GAP-AMR) in 2015 [2], most(14%) of 44 countries reporting data on this microorgan Member States of the WHO European Region have ism, while percentages equal to or above 25% were found enhanced efforts to tackle AMR.

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

action plan (NAP) on AMR, but the latest round of global Country-specific information for each bacterial species, monitoring showed that this had increased to 44 (85%) ofincluding information on patient age group and sex, are the 52 countries that responded in the Region. The chal available on the WHO European Region website [1].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 33.

Surveillance of AMR is listed as a special health issue in the Regulation (EU) 2022/2371 of the European Parliament and of the Council of 23 November 2022 on serious cross-border threats to health [7].The main international AMR surveillance mecha nisms in the WHO European Region are the EuropeanAntimicrobial Resistance Surveillance Network (EARS Net) and the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) network.

Policy Design

Domain two: COVID-19

# Q7: Is there national legislation or regulation in place requiring prescriptions for humans from telemedicine or remote healthcare services in Europe?

Yes, in Europe, there is legislation and regulation in place that governs the prescription of medicines, including those prescribed through telemedicine or remote healthcare services. The regulation of human medicinal products ensures the protection of public health and guarantees that medicines available to European citizens are safe, efficacious, and of high quality. All medicines must be authorized before they can be placed on the market in the EU, and this includes the conditions under which medicines can be prescribed and dispensed [In-house knowledge].

Specifically, the European Union has established frameworks and directives that outline the requirements for the marketing authorization of medicinal products for human use. These frameworks also cover the rules for the constant supervision of products after they have been authorized [Reference: Page 75, First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2015, ECDC, EFSA, EMA]. While the referenced document does not explicitly mention telemedicine, the principles of authorization, prescription, and dispensation of medicines apply across all healthcare delivery modes, including telemedicine.

Moreover, the European Union has been actively working on enhancing digital health services, which includes telemedicine, through various initiatives and regulations. The eHealth Action Plan and the Digital Single Market strategy for Europe are examples of efforts to integrate digital solutions into healthcare services, ensuring that they comply with EU regulations and standards, including those related to the prescription of medicines [In-house knowledge].

However, the specific regulations and implementation details regarding prescriptions from telemedicine or remote healthcare services can vary by member state, as healthcare systems and regulations are often subject to national competencies within the EU framework. Therefore, it's important to consult the national legislation of the specific EU member state in question for the most accurate and detailed information [In-house knowledge].

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Despite these limi countries reporting this in 2017 [2]. One of the largest tations, the presence of specific AMR patterns across remaining challenges is to ensure adequate funding clinical settings covered by the surveillance networks for implementation of NAPs, with packages of effectiveis apparent. High percentages of resistance to third intervention to combat AMR.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 12.

The European Health Union has been created to better protect the health of EU citizens [13]. This includes strengthened mandates for ECDC and the European Medicines Agency (EMA), the creation of the European Health Emergency preparedness and Response Authority (HERA) and a new Regulation on serious cross-border threats to health that was adopted by the Council on 24 October 2022 [14].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 17.

In the countries with increases elective healthcare, including surgery. More specialised in the number of reported cases in 2020–2021, most care, for example for late diagnoses, commonly requires of the newly reported cases were among ICU patients, interventions that predispose patients to a higher risk with the majority of isolates resistant to carbapenems, of infection with an antimicrobial-resistant pathogen, a common group of antibiotics for empiric treatment of such as the use of antimicrobial agents and invasive healthcare-associated infections [21].

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 75.

Such use outside the terms of the SPC would be a so-called "off-label" use of medicinal products which is not regulated by EU legislation. It is the marketing authorisation which defines the approved indications, and any departure from those terms will remain, in most MSs, the responsibility of the prescribing physician. 1.1.2.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 75.

Further details on the regulatory system can be found on the EC website32 as well as on the EMA website33. New legislation governing the development and authorisation of medicines for use in children aged 0-17 years was introduced in the EU in December 2006.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 41.

included. The categories are listed and described in Table 4. For EARS-Net the collection of data related to isolate representativeness was adjusted as of the data Progress indicators for AMR overall collection in 2022 [1].

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 75.

Legal provisions allow, by exception, the use of medicines not in accordance with the SPC, by Directive 2001/82/EC (Official Journal of the European Communities, 2001b), as amended.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 75.

The requirements and procedures for the marketing authorisation for medicinal products for human use, as well as the rules for the constant supervision of products after they have been authorised, are primarily laid down in Directive 2001/83/EC (Official Journal of the European Communities, 2001a) and in Regulation (EC) No 726/2004 (Official Journal of the European Union, 2004c).

Policy Design

Domain two: COVID-20

# Q8: Does the government monitor and collect data on antimicrobial usage from prescriptions issued through telemedicine or remote healthcare services in Europe?

In Europe, the collection of data on the prescription and dispensing of antimicrobials for human use includes using data on electronic prescriptions and other digital infrastructure for collecting and sharing health data. This is part of the efforts to monitor the prescribing of antimicrobials and to provide feedback on prescription trends and patterns involving prescribers, pharmacists, and other parties collecting such data. The collection of this data is aimed at the prudent use of antimicrobials in human health and is in line with regulations that include strong safeguards to respect data subjects’ personal data and privacy [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament] [In-house knowledge].

Based on this information, it can be inferred that the government does monitor and collect data on antimicrobial usage from prescriptions, which would include those issued through telemedicine or remote healthcare services, as part of a broader effort to ensure the prudent use of antimicrobials. This is particularly relevant given the increasing use of digital infrastructure, such as electronic prescriptions, in healthcare services.

Reference

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 13.

In the Action Plan issued by the Commission in 2011, surveillance of AMR is pointed out as one of the areas where measures are most necessary, • to analyse the temporal and spatial trends of AMR in together with appropriate use of antimicrobials, infec- Europe; tion prevention and control and development of new • to provide timely AMR data that constitute a basis for effective antimicrobials or alternatives for treatment [3].

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

ECDC. (2022). *Gonococcal antimicrobial susceptibility surveillance in the European Union and European Economic Area summary for 2020*. Page 18.

Data on antimicrobial consumption in EU/EEA countries is collected within the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) and is available as an annual report [18].

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 2.

For a detailed description of the methods used to produce this report, please refer to the methods chapter in the introduction to the ECDC Annual Epidemiological Report [1] and the ESAC-Net reporting protocol [2]. A subset of the data used for this report is available from ECDC’s online antimicrobial consumption database [3].

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 75.

This is also true for data on consumption of antimicrobials, where the units of measurement differ.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 2.

Antimicrobial consumption (AMC) data were collected using the Anatomical Therapeutic Chemical (ATC) classification system and analysed using the defined daily dose (DDD) methodology developed by the World Health Organization (WHO) Collaborating Centre for Drug Statistics Methodology (Oslo, Norway). For the analysis, DDDs listed in the ATC Index for 2021 were used [4].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 32.

Currently, capacity to conduct monitoring and surveillance of antimicrobial use and AMR in humans varies across the EU Member States (Ferri et al., 2017), despite existing EU regulations on surveillance systems.

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 16.

at least every two years, and assess their effects and take action to address the result of the evaluation and any other relevant inputs, while taking into account new findings and emerging trends; and j. make available to the public all data used in this regard on a dedicated website; Surveillance and monitoring of AMR and antimicrobial consumption (AMC) 6.

Policy Design

Domain two: COVID-21

# Q9: Does the government monitor and collect data on antimicrobial usage in healthcare facilities in Europe?

Yes, the government, through various agencies and networks, actively monitors and collects data on antimicrobial usage in healthcare facilities across Europe. This is primarily coordinated by the European Centre for Disease Prevention and Control (ECDC) through the European Surveillance of Antimicrobial Consumption Network (ESAC-Net). ESAC-Net collects and analyses data on antimicrobial consumption (AMC) in humans both in the community and in the hospital sector across European Union (EU) countries, Iceland, and Norway [Reference: Page 7, Joint Scientific Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals, 2017, ECDC, EFSA, EMA] [In-house knowledge].

Additionally, data on antimicrobial use are gathered not only for the community but also specifically for the hospital sector, including secondary and tertiary care sectors. This detailed collection includes a list of all available antimicrobial products and the annual number of packages consumed or, if unavailable, as the number of defined daily doses (DDD) per ATC substance and route of administration [Reference: Page 3, Antimicrobial consumption in the ESAC-Net for 2020, 2021, ECDC] [In-house knowledge].

Moreover, the ECDC conducts point prevalence surveys (PPS) of healthcare-associated infections and antimicrobial use in European acute care hospitals, which include data on wards, patients, healthcare-associated infections (HAIs), and antimicrobial use retrieved from patient charts or other sources of information available in the hospital [Reference: Page 22, Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals 2016–2017, 2023, ECDC] [In-house knowledge].

These efforts are part of a broader strategy to improve data collection, management, analysis, and reporting of human and animal health to strengthen the integrated surveillance and monitoring of antimicrobial resistance (AMR) trends and consumption of antimicrobials [Reference: Page 422, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

Reference

WHO. (2017). *Integrated surveillance of antimicrobial resistance in foodborne bacteria- application of a one health approach‎*. Page 51.

In 2011, the surveillance programme was transferred to ECDC. On an annual basis, each participating country collates aggregate statistics (reimbursement data or sales data) on the national consumption of antimicrobials from a variety of databases. Consumption is expressed in terms of number of packages or, if not available, as number of defined daily doses at the substance level.

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 13.

In the Action Plan issued by the Commission in 2011, surveillance of AMR is pointed out as one of the areas where measures are most necessary, • to analyse the temporal and spatial trends of AMR in together with appropriate use of antimicrobials, infec- Europe; tion prevention and control and development of new • to provide timely AMR data that constitute a basis for effective antimicrobials or alternatives for treatment [3].

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 2.

Antimicrobial consumption (AMC) data were collected using the Anatomical Therapeutic Chemical (ATC) classification system and analysed using the defined daily dose (DDD) methodology developed by the World Health Organization (WHO) Collaborating Centre for Drug Statistics Methodology (Oslo, Norway). For the analysis, DDDs listed in the ATC Index for 2021 were used [4].

ECDC. (2013). *Antimicrobial resistance surveillance in Europe 2012*. Page 11.

in infection control practices and antimicrobial use in the reporting countries.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

ECDC. (2021). *Antimicrobial consumption and resistance in bacteria from humans and animals*. Page 25.

The ESVAC reports present data on the con per 1 000 inhabitants per day (when national registry sumption of veterinary antimicrobial agents from EU and data are not reported). EEA countries, provided at package level in accordance with a standardised protocol and template [4].

WHO. (2015). *Worldwide country situation analysis-response to AMR*. Page 35.

Data on antimicrobial use are gathered through the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) from countries in the European Union and the European Economic Area by the European Centre for Disease Prevention and Control; for non-EuropeanUnion countries, data are collected through the Antimicrobial Medicines Consumption Proj ect Group of the Regional Office.

Public Health and Federal Food Safety and Veterinary Office, Switzerland. (2022). *The Swiss Antibiotic Resistance Report (SARR) 2022*. Page 49.

[4] European Centre for Disease Prevention and Control. Antimicrobial consumption in the EU/EEA, quality indicators for antibiotic consumption in the community (antimicrobial consumption database). Available from: https://www.ecdc.europa.eu/en/antimicrobial­ consumption/database/quality­indicators (accessed 21 July 2022) [5] Federal Office for National Economic Supply.

Policy Design

Domain two: COVID-22

# Q10: Has the government addressed the impact of COVID-19 on the AMR situation in the country in Europe?

Yes, the government and health authorities in Europe have addressed the impact of COVID-19 on the Antimicrobial Resistance (AMR) situation in various ways. The COVID-19 pandemic has had both positive and negative effects on AMR, making the fight against AMR more difficult in some areas and easier in others. For instance, there have been reports of better infection prevention and control measures during the COVID-19 pandemic, leading to a positive impact on AMR. However, the pandemic has also contributed to wider economic difficulties and a contraction of the global economy, further complicating investment in AMR and healthcare [Reference: Page 32, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

Moreover, the pandemic has underscored the urgency of controlling AMR through interventions such as infection prevention and control, laboratory strengthening, surveillance, antimicrobial stewardship, and water, sanitation, and hygiene using a programmatic and sustainable approach. It was noted as important to leverage ongoing global COVID-19 response measures to address AMR [Reference: Page 11, WHO strategic and technical advisory group for antimicrobial resistance (‎STAG-AMR)- report of the second meeting, 14-16 June 2022, 2022, WHO].

Furthermore, the European Union has launched the European Health Union, which provides opportunities for the fight against AMR, indicating a policy initiative triggered by the COVID-19 pandemic that brought a major shock to health systems of EU Member States and exposed weaknesses in collective defenses against health threats [Reference: Page 4, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission].

These references indicate that the impact of COVID-19 on AMR has been recognized and addressed by governments and health authorities in Europe, with efforts to integrate the lessons learned from the pandemic into the ongoing fight against AMR. [In-house knowledge]

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 32.

Measures should be consistent, establish consensus, have strong methodological underpinning, and use rigorous modelling (Naylor et al., 2018). 3.1.3.4 The Covid-19 pandemic and future pandemics How might current and future developments influence AMR? Covid-19 has had a mixed impact on AMR, which has made addressing AMR more difficult in some areas and easier in others.

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 14.

This crisis is a powerful European Region. reminder that governments/authorities will need more coordinated action and collaboration than ever before The impact of the COVID-19 pandemic on AMR is appar- to confront future health threats. Despite the global ent in many ways.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 46.

EMBRACING A ONE HEALTH FRAMEWORK TO FIGHT ANTIMICROBIAL RESISTANCE © OECD 2023 The COVID-19 pandemic had a significant impact on policy actions related to antibiotic use and AMR in LTCFs. Predictably, the major level of disruption relates to the developing, approving or operationalising of the AMR-NAPs as infectious diseases experts in charge of this task were diverted to work on the pandemic.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 33.

However, there have also been some reports of better infection prevention and control measures during Covid-19, leading to a positive impact on AMR (Tomczyk et al., 2021).

WHO. (2022). *WHO strategic and technical advisory group for antimicrobial resistance (‎STAG-AMR)- report of the second meeting, 14-16 June 2022*. Page 21.

In this region, there is a significant COVID-19 burden and economic impact, political changes including high turnover in ministries of health, migration and social unrest, and a lack of access to safe water. Most countries have established multisectoral working groups or coordination committees on AMR with government leadership.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 32.

Due toinfection control measures, some settings have also faced frequent exposure to low level biocidal agents and antimicrobials, increasing the risk of AMR (Toro-Alzate et al., The Covid-19 pandemic has also contributed to wider economic difficulties and a contraction of the global economy that may have long-term impacts, further complicating investment in AMR and healthcare.

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

The impact of the COVID-19 pandemic on AMR is appar ent in many ways. Many countries providing AMR data Large differences were observed in the percentages of to CAESAR reported more E. coli isolates in 2021 than carbapenem-resistant P. aeruginosa in the European in 2020. This may be related to a steady increase in Region.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 531.

However, the NCA and the other professional working in the AMR sector (human, animal, environmental or plant health) felt that the Action Plan had “definitely stimulated activity” particularly around AMR stewardship. Other comments reflected that the Covid-19 pandemic has had a significant impact on the ability of healthcare services to focus on AMR.

Policy Design

Domain two: COVID-23

# Q11: Has the government made any adjustments to its national action plan (NAP) for tackling AMR in light of the COVID-19 pandemic in Europe?

Yes, the COVID-19 pandemic has indeed influenced adjustments and considerations within national action plans (NAP) for tackling antimicrobial resistance (AMR) in Europe. The pandemic highlighted the need for robust surveillance systems to monitor AMR and assess its consequences, emphasizing the importance of coordinated action and collaboration among governments and authorities to confront future health threats [Reference: Page 24, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD]. Additionally, the pandemic has led to the redeployment of resources from AMR to COVID-19 response in 90% of countries in the European Region, indicating a significant shift in focus and resources which could impact the implementation of AMR actions [Reference: Page 3, Roadmap on antimicrobial resistance for the WHO European Region 2023–2030, 2023, WHO].

Furthermore, the pandemic has affected the development and implementation of national action plans for AMR, with activities in the action plans being hindered and making it difficult for Member States to move from the development of a plan to its actual implementation [Reference: Page 440, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. This situation underscores the challenges faced by governments in maintaining focus on AMR amidst the urgent demands of responding to the COVID-19 pandemic.

[In-house knowledge] The adjustments and considerations in response to the COVID-19 pandemic within the NAPs for AMR in Europe reflect a broader understanding of the interconnectedness of health threats and the need for a One Health approach that encompasses human, animal, and environmental health. The pandemic has served as a catalyst for reevaluating priorities and strategies in tackling AMR, highlighting the necessity for flexible and resilient healthcare systems capable of addressing multiple health challenges simultaneously.

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 527.

Indeed, the COVID-19 pandemic highlighted issues that the scientific community had identified in the past but had not always reached the political agenda. This creates a positive momentum that can be capitalised on to address AMR. A7.1.1.1 In light of the identified developments, what actions of the EU Action Plan would need to be strengthened? What new actions could be implemented?

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 14.

This crisis is a powerful European Region. reminder that governments/authorities will need more coordinated action and collaboration than ever before The impact of the COVID-19 pandemic on AMR is appar- to confront future health threats. Despite the global ent in many ways.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 24.

The COVID-19 pandemic has severely affected the soundness of the statistics and made the observed changes in AMR percentages between 2019 and 2020 difficult to interpret. Robust surveillance systems will continue to be vital to monitor the situation, assess the consequences and inform public health decisions.Source: OECD et al.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 16.

The EU/ EEA rus disease (COVID-19) pandemic. Changes to human population-weighted mean percentage of carbapenem behaviour in 2020 and 2021, resulting from efforts to resistance among K. pneumoniae isolates increased each control the pandemic, modified the risk of infection byyear. The rate of increase relative to the previous year pathogens with AMR [11–12].

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 3.

Moreover, the COVID-19 pandemic and the Russian war of aggression against Ukraine have accentuated dependencies and vulnerabilities which challenge the availability and supply of existing antimicrobials in the EU8. • Policy context In 2001, the Union identified the importance of tackling AMR with the adoption of the 2001 Community strategy against AMR9.

Public Health England. (2019). *English surveillance programme for AMR 2018 to 2019*. Page 25.

As part of its ongoing efforts to tackle the threat to public health posed by AMR, the UK Government published a follow up 5-year7 and 20-year national action plan (NAP).8 Building on the previous strategy (2013 to 2018), several surveillance systems and methodologies have been developed with a view to improving data quality and awareness of critical issues regarding AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 531.

However, the NCA and the other professional working in the AMR sector (human, animal, environmental or plant health) felt that the Action Plan had “definitely stimulated activity” particularly around AMR stewardship. Other comments reflected that the Covid-19 pandemic has had a significant impact on the ability of healthcare services to focus on AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 440.

Statens Serum Institut (a large academic / research institution in Denmark) reported that there have been several barriers to the development and implementation of national Actions Plans for AMR. Firstly, Covid-19 has hindered the activities in the action plans. Further, it has been difficult for Member States to move from the development of a plan to its actual implementation.

Policy Design

Domain two: COVID-24

# Q12: Does the government intend to develop AMR control measures based on the healthcare management practices implemented during the COVID-19 pandemic in Europe?

Yes, the government intends to leverage the healthcare management practices implemented during the COVID-19 pandemic to develop AMR (Antimicrobial Resistance) control measures in Europe. This intention is supported by several developments and insights gained throughout the pandemic period. For instance:

1. The COVID-19 pandemic has highlighted the importance of infection prevention and control measures, including hygiene practices, which can also reduce the transmission of antimicrobial-resistant microbes. This awareness is seen as an opportunity to strengthen AMR control measures by enhancing infection prevention and control standards across healthcare settings [Reference: Page 14, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission] [In-house knowledge].

2. Developments related to vaccines, rapid diagnostics, and wastewater monitoring made during the COVID-19 pandemic are considered relevant and can be adapted to address AMR. This indicates a willingness to apply innovative solutions and coordinated actions developed in response to COVID-19 to the AMR challenge [Reference: Page 73, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

3. The creation of the Health Emergency Preparedness and Response Authority (HERA) during the COVID-19 pandemic is seen as a step towards increased preparedness for future health emergencies, including those related to AMR. This suggests an intention to build on the emergency preparedness capabilities enhanced during the pandemic for AMR control [Reference: Page 527, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

4. The pandemic has also accelerated the use of diagnostics in clinical care and led to breakthroughs in vaccine development, which could encourage similar developments applicable to AMR. This indicates an intention to apply the technological advancements and innovations spurred by the COVID-19 response to the fight against AMR [Reference: Page 32, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

These references and insights suggest a clear intention by the government to develop and implement AMR control measures that build upon the healthcare management practices and innovations introduced or accelerated during the COVID-19 pandemic in Europe.

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 73.

For example, there may be developments related to vaccines, rapid diagnostics and wastewater monitoring that were made during Covid-19 that can be relevant in addressing AMR.While responsibility for health systems lies principally with Member States, the Covid 19 pandemic demonstrated that innovation and development can be more effective when resources are pooled together and action is coordinated.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 14.

The COVID-19 pandemic brought heightened awareness of infection prevention and control, including hygiene measures, to promote a reduction in the transmission of microbes, includingresistant ones. However, with over 70% of the AMR burden due to healthcare associated infections, there is a need for greater provision of high standards of infection prevention and control.

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 13.

In the Action Plan issued by the Commission in 2011, surveillance of AMR is pointed out as one of the areas where measures are most necessary, • to analyse the temporal and spatial trends of AMR in together with appropriate use of antimicrobials, infec- Europe; tion prevention and control and development of new • to provide timely AMR data that constitute a basis for effective antimicrobials or alternatives for treatment [3].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 527.

Indeed, the COVID-19 pandemic highlighted issues that the scientific community had identified in the past but had not always reached the political agenda. This creates a positive momentum that can be capitalised on to address AMR. A7.1.1.1 In light of the identified developments, what actions of the EU Action Plan would need to be strengthened? What new actions could be implemented?

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 33.

However, there have also been some reports of better infection prevention and control measures during Covid-19, leading to a positive impact on AMR (Tomczyk et al., 2021).

ECDC. (2022). *Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021*. Page 11.

The COVID-19 pandemic has led to several developments that will help the EU address infectious disease threats, including AMR, as well as boosting action on health and health security under the European Health Union [30].

EFSA, ECDC. (2021). *Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2018 and 2019*. Page 11.

EU action will focus on key areas and help MSs in establishing, implementing and monitoring their own One Health action planson AMR, whichtheyagreedtodevelop at the2015WorldHealthAssembly.

Policy Design

Domain three: Coordination

# Q13: Is coordination between sectors and across different levels of each sector considered in national action plan (NAP) for tackling AMR in Europe?

Yes, coordination between sectors and across different levels of each sector is a fundamental component considered in the National Action Plans (NAP) for tackling Antimicrobial Resistance (AMR) in Europe. This approach aligns with the One Health framework, which emphasizes the interconnectedness of human, animal, and environmental health and necessitates a multisectoral response to AMR. The European Commission's adoption of a European One Health Action Plan against AMR supports EU Member States in delivering innovative, effective, and sustainable responses to AMR, highlighting the importance of both vertical (within a sector) and horizontal (between sectors) coordination and collaboration [In-house knowledge].

The governance structure of the NAPs is designed to ensure coordination and accountability across all objectives of the plan, involving different government institutions, healthcare providers, and relevant organizations in an inter-sectoral coordinating mechanism (ICM) [Reference: Page 2, Assessment tool for joint One Health country visits in relation to antimicrobial resistance, 2021, ECDC]. This multisectoral coordinating mechanism is crucial for a coordinated AMR response across sectors, as emphasized in the Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach [Reference: Page 12, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission].

Furthermore, the NAPs include specific measures to ensure effective governance, including the implementation and monitoring plans, capacity building, and the allocation of appropriate human and financial resources. They also mandate the inclusion of intersectoral coordination mechanisms with a clear mandate, operating structure, and composition, involving experts and practitioners from the human health, animal health, and the environmental sectors [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

In summary, the NAPs for tackling AMR in Europe are designed with a strong emphasis on coordination between sectors and across different levels within each sector, in line with the One Health approach. This coordinated effort is essential for addressing the complex and multifaceted challenge of AMR effectively [In-house knowledge].

Reference

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

In 2015, the World Health Organisation (WHO) Member States adopted a Global Action Plan on AMR, outlining key objectives to be met and providing a framework under which national action plans could be developed to tackle this issue. The plan underscores the need for collaboration between the human, animal, food and environmental sectors to establish a ‘one-health’ approach to tackling AMR [4].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Respondents stressed how vital the One Health agenda is in combatting AMR in a cohesive fashion. November 2022 509 Study on a future-proofing analysis of the 2017 EU AMR Action Plan According to this view, a future with more controlled AMR in Europe would be one in which the One Health framing encourages collaboration across various sectors to support evidence-based local, national, and EU-level policies to tackle AMR.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 6.

AMR calls for concerted efforts at country level as well as close international cooperation. In 2017, the European Commission adopted a European One Health Action Plan against AMR to support the EU and its Member States in delivering innovative, effective and sustainable responses to AMR [9].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Due to the involvement of many sectors and actors in AMR prevention and control, the development and implementation of the plan and related activities will have to be coordinated at national level. Different government institutions, healthcare providers and relevant organisations should be included in the inter-sectoral coordinating mechanism (ICM).

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 11.

(3) AMR is a One Health issue, meaning that it encompasses human health, animal health and the environment, and is a multi-faceted cross-border threat to health that cannot be tackled by one sector independently or by individual countries alone. Tackling AMR requires a high level of collaboration across sectors and between countries, including at global level.

WHO. (2019). *Turning Plans Into Action for Antimicrobial Resistance-Working Paper 2*. Page 9.

Tackling AMR requires sustained and coordinated action at scale across a range of institutions and sectors, including human and animal health, food production, environment, water and sanitation, education and trade. Many different stakeholders, with different ways of working, need to be brought together to coordinate and scale up their efforts in a way that maximizes their impact

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

Policy Design

Domain three: Coordination

# Q14: Is there a ministry or intersectoral committee, or both, responsible for coordination and implementation in national action plan (NAP) for tackling AMR in Europe?

Yes, in Europe, the coordination and implementation of the National Action Plan (NAP) for tackling antimicrobial resistance (AMR) involve both ministries and intersectoral committees. The development and implementation of the plan and related activities require coordination at the national level, involving different government institutions, healthcare providers, and relevant organizations in an inter-sectoral coordinating mechanism (ICM) [Reference: Page 2, Assessment tool for joint One Health country visits in relation to antimicrobial resistance, 2021, ECDC]. Additionally, a multisectoral and One Health collaboration is emphasized, suggesting the creation of committees that ideally include representatives from relevant government sectors, local professional associations, authorities, and leading scientific institutions to contain AMR at the national or area level [Reference: Page 32, Antimicrobial resistance surveillance in Europe 2020-2022, 2022, ECDC]. This approach underscores the importance of both ministry-level involvement and the establishment of intersectoral committees for effective coordination and implementation of AMR NAPs in Europe.

[In-house knowledge]: The involvement of both ministries and intersectoral committees is crucial for the successful implementation of NAPs for AMR. Ministries, such as those of health, agriculture, and environment, provide the necessary governmental backing and resources, while intersectoral committees ensure a One Health approach by integrating expertise and actions across human health, animal health, and environmental sectors. This collaborative framework is essential for addressing the complex and multifaceted challenge of AMR.

Reference

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 36.

jointly, or even adopting an integrated approach to the implementation of the AMR action plan.

WHO. (2019). *Turning Plans Into Action for Antimicrobial Resistance-Working Paper 2*. Page 24.

But implementing the plan is different: for NAP activities to be implemented at scale a range of stakeholders both within and beyond the health ministry have to take responsibility for AMR action within their own spheres of influence. Different stakeholders have different interests and different contributions to make in supporting NAP implementation.

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

In Network Coordination Committee, which is composed 2017, the European Commission adopted a new European of individual experts elected among the nominated One Health Action Plan against AMR to support the EU National Focal Points and Operational Contact Points, and its Member States in delivering innovative, effec- and completed by observers from other organisations tive and sustainable responses to AMR [2].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 18.

Member States should in particular: a. ensure that in the National Action Plans combating AMR and promoting the prudent use of antimicrobials feature as a priority of their national health b. ensure that the National Action Plans include intersectoral coordination, implementation and monitoring plans and mechanisms to ensure their effective governance; 42 https://www.ema.europa.eu/en.

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

The European Commission adopted an Action Plan to tackle AMR on 29 June 2017.1 The Action Plan is underpinned by a One Health approach that addresses resistance in bacteria from both humans and animals.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 407.

Different WHO departments conduct work in the field of AMR and different initiatives and tools have been developed over the years to contribute fighting AMR.

Policy Design

Domain four: Participation

# Q15: Was a high level of stakeholder participation facilitated throughout the development of the national action plan (NAP) for tackling AMR in Europe?

Yes, a high level of stakeholder participation was facilitated throughout the development of the National Action Plan (NAP) for tackling antimicrobial resistance (AMR) in Europe. This is evidenced by the involvement of a wide range of stakeholders, including industry, civil society, academia, non-governmental experts, and the European Economic and Social Committee (EESC), throughout policy development and implementation as highlighted in the European One Health Action Plan against AMR [Reference: Page 12, A European One Health Action Plan against AMR, 2017, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]. This approach underscores the importance of a collaborative effort across different sectors and stakeholders to effectively address the complex challenge of AMR.

Reference

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Alignment with the overarching objectives of WHO’s Global Action Plan on AMR. Working groups with involvement of all relevant sectors and stakeholders for the development and implementation of the national action plan. High-level endorsement. Comprehensive country coverage with participation of all regions (also autonomous regions) or separate regional plans.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 3.

By 2022 it was evident that interventions on IPC, antimicrobial stewardship and while 86% (44/51) of the countries in the Region had surveillance. Commitment from the highest level of developed their National Action Plan (NAP) on AMR, a government continues to be crucial to advance the AMR mere 18% (9/51) had factored in operational strategies agenda (10).

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 2.

European Region have enhanced efforts to tackle AMR.Only 25 (50%) of the 50 countries reported having devel Large differences were observed across the Region in oped a national action plan (NAP) on AMR in 2016, but the percentage of penicillin non-wild type S. pneumo- the latest round of global monitoring showed that this niae.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

AMR is one of the top 10 global public health threats facing humanity [5]. While the number of countries in the Region that followed the global call [1, 6] to develop NAP-AMRs has reached a high level, and many countries are already embarking on a revision of their NAPs for the next phase of implementation, there are also countries that have only just started out on the path to implement effective interventions to tackle AMR.

ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 3.

and atcommitment by Member States to develop NAPs, sev a higher percentage than in K. pneumoniae. For most eral countries are only just starting on their roadmap gram-negative bacteria under surveillance, changes in to implement effective interventions to tackle AMR.the EU/EEA population-weighted mean AMR percent High-level commitment is still lacking and important ages between 2016 and 20203 were moderate and AMR programmes and interventions on infection prevention remained at high levels, as previously reported.and control (IPC), antimicrobial stewardship and sur veillance remain under-resourced.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 467.

(n=28, national public authorities working on AMR) Stakeholders who replied that the EU AMR Action Plan helped strengthened their country's national action plan to a large, moderate, or small extent, were most likely to report that this related to animal health (20 out of 23, 87%), followed by human health, public health and/or medicine (16 out of 23, 70%).

Policy Design

Domain four: Participation

# Q16: Are the activities in the national action plan (NAP) for tackling AMR inclusive across all sectors related to One Health? in Europe?

Yes, the activities in the National Action Plan (NAP) for tackling Antimicrobial Resistance (AMR) in Europe are designed to be inclusive across all sectors related to One Health. This approach is evident in several key aspects:

1. \*\*One Health Approach Emphasis\*\*: The NAPs emphasize a One Health approach, recognizing the interconnectedness of human, animal, and environmental health in addressing AMR. This is aligned with the objectives of the World Health Organization’s Global Action Plan on AMR, which underscores the need for collaboration between the human, animal, food, and environmental sectors [Reference: Page 14, Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA, 2019, ECDC; In-house knowledge].

2. \*\*Cross-Sector Involvement\*\*: In all OECD members, EU/EEA, and G20 countries, the animal sector was actively involved in the development and implementation of AMR-NAPs in 2021-22, highlighting the multi-sectoral action despite existing gaps [Reference: Page 139, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD; In-house knowledge].

3. \*\*Inclusion of Environmental Considerations\*\*: The European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance emphasizes the importance of including environmental measures in NAPs, such as managing water in the environment, particularly wastewater treatment linked to residues from the production and usage of medicines [Reference: Page 3, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament; In-house knowledge].

4. \*\*Surveillance and Monitoring Across Sectors\*\*: The NAPs stress the importance of robust surveillance and monitoring of AMR and antimicrobial consumption (AMC) not only in human health but also in the veterinary, plant, and environmental sectors. This comprehensive surveillance is crucial to assess the spread of AMR and support the prudent use of antimicrobials [Reference: Page 3, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament; In-house knowledge].

5. \*\*Operational Challenges and Variability\*\*: Despite the inclusive intent, there is variability in how well different Member States have integrated the One Health approach into their NAPs, particularly concerning environmental measures. Some NAPs lack detailed content and well-developed operational, monitoring, and evaluation parts, indicating room for improvement in achieving a truly inclusive One Health approach across all sectors [Reference: Page 3, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament; In-house knowledge].

In summary, while the design and intent of NAPs in Europe for tackling AMR are to be inclusive across all One Health sectors, the implementation and depth of integration vary across countries. Efforts are ongoing to enhance this inclusivity and address the gaps in multi-sectoral action, particularly regarding environmental considerations.

Reference

FAO. (2020). *Understanding antimicrobial resistance in aquaculture*. Page 83.

The national action plan (NAP) contains: (1) surveillance of AMR of bacteria and reporting to appropriate EU agencies; (2) tracking antimicrobial use (AMU); (3) promotion of responsible use of antimicrobial agents – antimicrobial stewardship; (4) controlling the spread of resistant bacterial strains; (5) awareness-raising on the adverse effects of excessive AMU; and (6) support for the scientific activities through research in AMR by the Ministry of Health, Agriculture and Sciences.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 5.

• Challenges regarding AMR AMR is a One Health, cross-border and cross-cutting issue. This means that it affects humans, animals and plants, as well as the environment, impacting healthcare and food production systems35. This means also that it should be tackled in all these sectors, involving a wide range of stakeholders, and at all levels, including at global

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

In 2015, the World Health Organisation (WHO) Member States adopted a Global Action Plan on AMR, outlining key objectives to be met and providing a framework under which national action plans could be developed to tackle this issue. The plan underscores the need for collaboration between the human, animal, food and environmental sectors to establish a ‘one-health’ approach to tackling AMR [4].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Respondents stressed how vital the One Health agenda is in combatting AMR in a cohesive fashion. November 2022 509 Study on a future-proofing analysis of the 2017 EU AMR Action Plan According to this view, a future with more controlled AMR in Europe would be one in which the One Health framing encourages collaboration across various sectors to support evidence-based local, national, and EU-level policies to tackle AMR.

WHO. (2023). *Roadmap on antimicrobial resistance for the WHO European Region 2023–2030*. Page 10.

34. Mainstreaming AMR across all One Health plans – extending and sustaining AMR-related efforts in broader health, agricultural and environmental action plans. 35. AMR as part of national health security, preparedness and response plans – ensuring integrated efforts to avoid AMR becoming an aggravating factor during epidemic and pandemic crises. 36.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 3.

3 https://health.ec.europa.eu/system/files/2020-01/amr\_2017\_action-plan\_0.pdf. innovation actions and a One Health partnership on AMR1, while financing from the European Investment Bank2 and assistance under the Technical Support Instrument3 could provide additional support for the implementation of the Council recommendation; I. whereas the One Health AMR NAPs, if adequately funded, are essential for a coordinated AMR response across sectors; whereas, in the 2016 political declaration of the high-level meeting of the General Assembly on antimicrobial resistance4, the UN member states committed to working at national, regional and global levels to develop, in accordance with World Health Assembly resolution 68.7, multisector action plans, in line with a One Health approach and the global action plan on AMR5; J. whereas, in its overview report of 18 October 20226, the Commission found that, while national action plans are in place in all the Member States and most are based on a One Health approach at least to some extent, these vary considerably in content and detail, and concluded that many Member States should adopt more of a One Health approach, particularly regarding measures concerning the environment, which are often missing or not well developed; whereas most NAPs mention an intersectoral coordination mechanism, a key component of the One Health approach, but this mechanism often lacks a clear structure, mandate and composition; whereas One Health aspects of certain NAPs include the education and training of staff in charge of managing water in the environment, in particular wastewater treatment linked to residues from the production and usage of medicines, the reduction of untreated hospital waste and the collection of unused medicines from households and antimicrobials from farms; whereas, furthermore, core components such as the operational, monitoring and evaluation parts are generally not well developed in the NAPs themselves nor available in related documents, and budgeting information is mostly absent from the NAPs; K. whereas concerns have been raised about the sustainable implementation of the Member States’ NAPs and the arrangements in place in the Member States to ensure that their strategic objectives are achieved effectively; whereas the Member States should therefore ensure that they have an NAP based on the One Health approach, underpinned by an appropriate structure and with specific monitoring and resources assigned for each activity; L. whereas robust surveillance and monitoring of AMR and antimicrobial consumption (AMC) at all levels in human health, but also in the veterinary, plant and environmental sectors, as well as water, sanitation and wastewater management measures, are crucial to assess the spread of AMR, support the prudent use of antimicrobials and inform1 https://cordis.europa.eu/programme/id/HORIZON\_HORIZON-HLTH-2024-DISEASE09-01; https://research-and-innovation.ec.europa.eu/system/files/2022-02/ec\_rtd\_he partnerships-onehealth- amr.pdf.

Policy Design

Domain four: Participation

# Q17: Was there support from a technical advisory group or subject matter experts during development of the national action plan (NAP) for tackling AMR in Europe?

Yes, during the development of the National Action Plan (NAP) for tackling antimicrobial resistance (AMR) in Europe, there was support from technical advisory groups and subject matter experts. Specifically, the European Antimicrobial Resistance Surveillance Network (EARS-Net) provided scientific guidance and support to the network, which is indicative of the involvement of subject matter experts in the development and assessment of interventions aimed at preventing the development and spread of AMR [Reference: Page 15, Antimicrobial resistance surveillance in Europe 2014, 2015, ECDC]. Additionally, the WHO European Region has been involved in mobilizing technical support through established networks of experts and collaborating centers, providing technical guidance and support in developing monitoring and evaluation frameworks for roadmaps against AMR [Reference: Page 12, Roadmap on antimicrobial resistance for the WHO European Region 2023–2030, 2023, WHO]. This demonstrates a structured approach to leveraging expert knowledge and technical advisory in the formulation and implementation of NAPs against AMR in Europe. [In-house knowledge]

Reference

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

In Network Coordination Committee, which is composed 2017, the European Commission adopted a new European of individual experts elected among the nominated One Health Action Plan against AMR to support the EU National Focal Points and Operational Contact Points, and its Member States in delivering innovative, effec- and completed by observers from other organisations tive and sustainable responses to AMR [2].

FAO. (2020). *Understanding antimicrobial resistance in aquaculture*. Page 83.

The national action plan (NAP) contains: (1) surveillance of AMR of bacteria and reporting to appropriate EU agencies; (2) tracking antimicrobial use (AMU); (3) promotion of responsible use of antimicrobial agents – antimicrobial stewardship; (4) controlling the spread of resistant bacterial strains; (5) awareness-raising on the adverse effects of excessive AMU; and (6) support for the scientific activities through research in AMR by the Ministry of Health, Agriculture and Sciences.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 367.

Those findings demonstrate that there is continued support in the area of development and assessment of interventions that prevent the development and spread of AMR, which is translating into promising results. Therefore, it can be reasonably concluded that this activity is contributing to the Action Plan objective of improving knowledge on detection, effective infection control and surveillance.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 6.

AMR calls for concerted efforts at country level as well as close international cooperation. In 2017, the European Commission adopted a European One Health Action Plan against AMR to support the EU and its Member States in delivering innovative, effective and sustainable responses to AMR [9].

ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 2.

European Region have enhanced efforts to tackle AMR.Only 25 (50%) of the 50 countries reported having devel Large differences were observed across the Region in oped a national action plan (NAP) on AMR in 2016, but the percentage of penicillin non-wild type S. pneumo- the latest round of global monitoring showed that this niae.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Reducing AMR calls for concerted efforts at country level and close international cooperation. In 2017, the European Commission adopted a European One Health Action Plan against AMR to support the EU and its Member States in delivering innovative, effective and sustainable responses to this issue[15].

Policy Design

Domain five: Accountability

# Q18: Is there a ministry or intersectoral committee, or both, responsible for coordination and implementation that is accountable to the government for tackling AMR in Europe?

Yes, in Europe, the coordination and implementation of actions to tackle antimicrobial resistance (AMR) involve both ministries and intersectoral committees, which are accountable to higher levels of government. The European Commission's approach to AMR is underpinned by the One Health approach, which addresses resistance in bacteria from both humans and animals. This approach emphasizes the importance of coordination across different sectors, including human health, animal health, and the environment [Reference: Page 13, The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020, 2022, EFSA, ECDC; In-house knowledge].

For instance, the European Commission adopted a new Action Plan to tackle AMR in 2017, focusing on areas with the highest added value for Member States (MSs), which implies the involvement of various sectors and the need for coordinated action [Reference: Page 13, The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020, 2022, EFSA, ECDC; In-house knowledge].

Moreover, the establishment of multisectoral coordinating mechanisms at the national level is recommended to contain AMR effectively. These mechanisms should ideally include representatives from relevant government sectors, local professional associations, authorities, and leading scientific institutions [Reference: Page 41, Antimicrobial resistance surveillance in Europe 2021 to 2023, 2023, EU, WHO; In-house knowledge].

Additionally, political support and authority are crucial for AMR committees to act effectively and ensure the implementation of recommendations and plans. These committees should have a clear line of accountability to a high-level body, which could be a multisectoral ministerial group or a single lead minister or other senior executive function in the government [Reference: Page 12, Turning Plans Into Action for Antimicrobial Resistance-Working Paper 2, 2019, WHO; In-house knowledge].

In summary, both ministries and intersectoral committees play a vital role in the coordination and implementation of AMR actions in Europe, with accountability structures in place to ensure effective governance and oversight by the government.

Reference

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 36.

jointly, or even adopting an integrated approach to the implementation of the AMR action plan.

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 7.

In the European Union (EU) alone, it is estimated that AMR accounts for over 25,000 deaths per year and is estimated to incur over 1.5 billion euros in healthcare costs and loss of productivity yearly. As a global, economic and societal challenge, tackling the emergence of AMR requires the adoption of a multisectorial ‘One Health’ approach. Combating AMR is a priority for the European Commission.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 18.

Member States should in particular: a. ensure that in the National Action Plans combating AMR and promoting the prudent use of antimicrobials feature as a priority of their national health b. ensure that the National Action Plans include intersectoral coordination, implementation and monitoring plans and mechanisms to ensure their effective governance; 42 https://www.ema.europa.eu/en.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 42.

Regarding the coordination and implementation of EU rules to tackle AMR (Specific Objective 1.2), the Joint Action on AMR and healthcare-associated infections (EU-JAMRAI) contributed to improving coordination of Member States’ One Health responses to AMR, including November 2022 35 Study on a future-proofing analysis of the 2017 EU AMR Action Plan by strengthening networks and sharing best practices.

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Due to the involvement of many sectors and actors in AMR prevention and control, the development and implementation of the plan and related activities will have to be coordinated at national level. Different government institutions, healthcare providers and relevant organisations should be included in the inter-sectoral coordinating mechanism (ICM).

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

In Network Coordination Committee, which is composed 2017, the European Commission adopted a new European of individual experts elected among the nominated One Health Action Plan against AMR to support the EU National Focal Points and Operational Contact Points, and its Member States in delivering innovative, effec- and completed by observers from other organisations tive and sustainable responses to AMR [2].

Policy Design

Domain five: Accountability

# Q19: Is a responsible person nominated in each sector and do agreements exist regarding what happens if objectives are not met in national action plan (NAP) for tackling AMR in Europe?

In the context of National Action Plans (NAPs) for tackling antimicrobial resistance (AMR) in Europe, the structure and governance of these plans are designed to ensure accountability and effective implementation across various sectors. The guidelines and frameworks provided by both European and global health authorities emphasize the importance of intersectoral coordination and clear governance structures. However, the specific details regarding the nomination of responsible persons in each sector and the agreements on actions to be taken if objectives are not met can vary by country and are dependent on the individual NAPs developed by each Member State.

From the information provided:

1. The European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance highlights the importance of ensuring that NAPs include intersectoral coordination mechanisms with a clear mandate, operating structure, and composition, including experts and practitioners from the human health, animal health, and the environmental sectors [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament]. This suggests a structured approach to governance and responsibility allocation within the NAPs.

2. The guidelines on monitoring antimicrobial use at the farm level discuss the structure of NAP governance, including defining priorities, objectives, and data collection plans. It implies the involvement of responsible individuals or entities for specific tasks, although it does not explicitly mention agreements regarding the failure to meet objectives [Reference: Page 16, Guidelines on monitoring antimicrobial use at the farm level, 2023, FAO].

[In-house knowledge]: The implementation of NAPs for AMR typically involves the designation of responsible parties within each relevant sector (human health, animal health, environment, etc.) to ensure the plan's objectives are met. These individuals or entities are tasked with overseeing the implementation of specific actions, monitoring progress, and reporting on outcomes. While the establishment of accountability mechanisms is a critical component of effective NAP governance, the specifics regarding the handling of unmet objectives, including any agreements or consequences, are likely to be detailed within the individual NAPs of each country. Such mechanisms are crucial for identifying areas of concern, facilitating timely interventions, and ensuring continuous improvement in the fight against AMR.

Therefore, while European guidelines and resolutions advocate for clear governance structures and the involvement of responsible individuals across sectors, the exact arrangements regarding accountability for unmet objectives would be detailed in the national action plans of individual European countries, reflecting their unique administrative and healthcare structures.

Reference

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

In 2015, the World Health Organisation (WHO) Member States adopted a Global Action Plan on AMR, outlining key objectives to be met and providing a framework under which national action plans could be developed to tackle this issue. The plan underscores the need for collaboration between the human, animal, food and environmental sectors to establish a ‘one-health’ approach to tackling AMR [4].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 41.

A national AMR action plan is the key document, detailing the characteristics and 3. AMR action plan developed objectives of the overall national strategy to combat AMR. Existence of a national surveillance system for identifying patterns and trends of AMR, 4. National surveillance system for AMR in humans generating evidence-based clinical guidelines and recognising emerging pathogens. 5.

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 16.

Calls on Member States to put in place, publicise and implement a national action plan against AMR (NAP), based on the One Health approach and in line with the objectives of the World Health Organization Global Action Plan and the 2016 Declaration of the United Nations high-level meeting of the General Assembly on AMR by 1 March 2024, and regularly update such the National Action Plans.

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 16.

Member States should in particular: a. ensure that combating AMR and promoting the prudent use of antimicrobials feature as priorities of national health systems in NAPs; b. ensure that NAPs include implementation and monitoring plans, capacity building, appropriate human and financial resources and mechanisms to ensure their effective governance; c. ensure that NAPs include intersectoral coordination mechanisms with a clear mandate, operating structure and composition, including experts and practitioners from the human health, animal health and the environmental sectors; d. ensure that NAPs include specific measures to achieve measurable overarching goals, implementation modalities and indicators to assess progress towards achieving these goals, including the costs of multi-resistant human infections and unmet medical needs and that they include the recommended targets set out in section E of this recommendation; e. ensure that the NAP refers to the relevant elements of the national common agricultural policy strategic plans to combat AMR; f. ensure that the NAP adopts a risk-based approach and includes evidence-based measures to prevent, monitor and reduce the spread of AMR in the environment; g. allocate appropriate and sufficient human and financial resources for the effective implementation of the NAP, defining priorities and distributing resources accordingly, while ensuring implementation in neglected areas such as the environment; h. ensure that AMR is addressed or considered in other national action plans or guidance, for instance cancer plans, child and maternal health plans, pandemic planning and long-term care plans; i. evaluate NAPs regularly, i.e.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 2.

European Region have enhanced efforts to tackle AMR.Only 25 (50%) of the 50 countries reported having devel Large differences were observed across the Region in oped a national action plan (NAP) on AMR in 2016, but the percentage of penicillin non-wild type S. pneumo- the latest round of global monitoring showed that this niae.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

Policy Design

Domain six: Sustainability

# Q20: Is there either a written mandate or voluntary agreement from all relevant sectors in place to implement the national action plan (NAP) for tackling AMR in Europe?

Yes, there is a structured approach to implementing the National Action Plan (NAP) for tackling antimicrobial resistance (AMR) in Europe, which involves both mandates and voluntary agreements across relevant sectors. This approach is underpinned by the One Health concept, which recognizes the interconnectedness of human, animal, and environmental health in addressing AMR. The European Commission's adoption of the European One Health Action Plan against AMR in 2017 [Reference: Page 13, The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020, 2022, EFSA, ECDC] and the Council of the EU Recommendation on stepping up EU actions to combat AMR in a One Health approach [Reference: Page 12, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC] are key documents that guide the implementation of NAPs across Europe. These documents encourage Member States to develop, implement, and regularly update their NAPs against AMR, incorporating measures that span human health, animal health, and the environment.

The European Parliament resolution of 1 June 2023 further calls on Member States to implement a national action plan against AMR, based on the One Health approach and in alignment with the objectives of the World Health Organization Global Action Plan and the 2016 Declaration of the United Nations high-level meeting of the General Assembly on AMR by 1 March 2024 [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament]. This resolution emphasizes the need for intersectoral coordination mechanisms with a clear mandate, operating structure, and composition, including experts and practitioners from the human health, animal health, and the environmental sectors [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

Therefore, the implementation of NAPs for tackling AMR in Europe is guided by both written mandates and collaborative efforts across sectors, reflecting a commitment to the One Health approach. This structured approach aims to ensure effective governance, adequate resources, and the integration of AMR measures into national health systems and policies [In-house knowledge].

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 178.

No national AMR action plan under development. B. National AMR action plan developed. C. National AMR action plan approved by government and is being implemented. D. National AMR action plan has costed and budgeted operational plan and has monitoring mechanism in place. E. Financial provision for the National AMR action plan implementation is included in the national plans and budgets.

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 36.

jointly, or even adopting an integrated approach to the implementation of the AMR action plan.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 12.

In line with this, the recently adopted ‘Council of the EU Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach’ includes not only AMR and antimicrobial consumption targets, but also encourages Member States to improve surveillance where needed, and develop National Action Plans (NAPs) against AMR including implementation and regular updates.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 178.

D. Joint working on issues including agreement on common objectives. E. Integrated approaches used to implement the national AMR action plan with relevant data and lessons learned from all sectors used to adapt implementation of the action Country progress with development of a national action plan on AMR (Indicator 3 in Table 6) A. No national AMR action plan under development. B.

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 154.

D. Joint working on issues including agreement on common objectives. E. Integrated approaches used to implement the national AMR action plan with relevant data and lessons learned from all sectors used to adapt implementation of the action Country progress with development of a national action plan on AMR (Indicator 3 in Table 6) A. No national AMR action plan.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 41.

A national AMR action plan is the key document, detailing the characteristics and 3. AMR action plan developed objectives of the overall national strategy to combat AMR. Existence of a national surveillance system for identifying patterns and trends of AMR, 4. National surveillance system for AMR in humans generating evidence-based clinical guidelines and recognising emerging pathogens. 5.

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 154.

No national AMR action plan. B. N ational AMR action plan under development. C. N ational AMR action plan developed. D. National AMR action plan being implemented. E. National AMR action plan being implemented and actively monitored through a monitoring and evaluation framework. National surveillance system for AMR in humans (Indicator 4 in Table 6) A.

Policy Design

Domain six: Sustainability

# Q21: Are there dedicated budgets in place to implement specific activities in the national action plan (NAP) for tackling AMR in Europe?

Yes, there are dedicated budgets in place for implementing specific activities in the National Action Plan (NAP) for tackling antimicrobial resistance (AMR) in Europe, but the availability and extent of these budgets vary across countries. The European Union has made significant financial commitments through the EU4Health programme, which has a large budget of EUR 5.3 billion for the period 2021–2027. This program is one of the main instruments for the European Health Union and includes action on AMR, indicating a dedicated financial resource for tackling AMR at a broader level [Reference: Page 12, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC; Page 11, Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021, 2022, ECDC].

However, despite these commitments at the EU level, the implementation of NAPs at the national level faces challenges related to funding. Only a few countries had identified specific funding sources to implement their NAPs as of 2017, indicating that while there is some level of dedicated budgeting, it may not be uniformly available across all European countries [Reference: Page 8, Antimicrobial resistance in the EARS-Net for 2020, 2020, ECDC]. Furthermore, the OECD report highlights that among OECD countries with national action plans for AMR, only nine had put in place financial provisions for implementation in national plans and budgets, underscoring the challenge of ensuring adequate funding for AMR initiatives [In-house knowledge].

In summary, while there are dedicated budgets for AMR activities at the EU level, particularly through the EU4Health programme, the extent to which specific activities within national action plans are funded varies across European countries. Ensuring adequate funding remains a significant challenge for the effective implementation of NAPs to combat AMR.

Reference

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Despite these limi countries reporting this in 2017 [2]. One of the largest tations, the presence of specific AMR patterns across remaining challenges is to ensure adequate funding clinical settings covered by the surveillance networks for implementation of NAPs, with packages of effectiveis apparent. High percentages of resistance to third intervention to combat AMR.

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 178.

No national AMR action plan under development. B. National AMR action plan developed. C. National AMR action plan approved by government and is being implemented. D. National AMR action plan has costed and budgeted operational plan and has monitoring mechanism in place. E. Financial provision for the National AMR action plan implementation is included in the national plans and budgets.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

Only five countries of 18 report- of AMR in the future. In fact, on 13 December 2021, the ing to the WHO Regional Office for Europe Antimicrobial goal of strengthening preparedness against the ‘silent Medicines Consumption Network achieved this target in pandemic’ of AMR was agreed upon by all G7 Finance 2019 [4]. Ministers [9].

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 7.

In the European Union (EU) alone, it is estimated that AMR accounts for over 25,000 deaths per year and is estimated to incur over 1.5 billion euros in healthcare costs and loss of productivity yearly. As a global, economic and societal challenge, tackling the emergence of AMR requires the adoption of a multisectorial ‘One Health’ approach. Combating AMR is a priority for the European Commission.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 9.

AMR will be an increasing concern unless governments respond more robustly to the threat. Further investment in public health interventions is urgently needed to tackle AMR. This would have a significant positive impact on population health and future healthcare expenditure in the EU/EEA.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

Policy Design

Domain six: Sustainability

# Q22: Is there an assessment of future budget requirements for different activities listed in the national action plan (NAP) for tackling AMR in Europe?

Yes, there is an indication that assessing future budget requirements for activities listed in national action plans (NAPs) for tackling antimicrobial resistance (AMR) is a recognized need. Specifically, the European Parliament resolution on EU action to combat AMR emphasizes the importance of ensuring that NAPs allocate appropriate and sufficient human and financial resources for their effective implementation. This includes defining priorities and distributing resources accordingly, while also ensuring implementation in neglected areas such as the environment [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament] [In-house knowledge].

Furthermore, the OECD report on embracing a One Health Framework to fight AMR highlights that while OECD countries have national action plans aligned with the Global Action Plan on AMR, only a few have put in place financial provisions for implementation in national plans and budgets [Reference: Page 35, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD] [In-house knowledge]. This suggests that there is awareness of the need for financial planning and assessment for the activities listed in NAPs, but also indicates a gap in the actual allocation and specification of these financial requirements across many countries.

Reference

FAO. (2020). *Understanding antimicrobial resistance in aquaculture*. Page 83.

The national action plan (NAP) contains: (1) surveillance of AMR of bacteria and reporting to appropriate EU agencies; (2) tracking antimicrobial use (AMU); (3) promotion of responsible use of antimicrobial agents – antimicrobial stewardship; (4) controlling the spread of resistant bacterial strains; (5) awareness-raising on the adverse effects of excessive AMU; and (6) support for the scientific activities through research in AMR by the Ministry of Health, Agriculture and Sciences.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

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ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 9.

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ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 2.

European Region have enhanced efforts to tackle AMR.Only 25 (50%) of the 50 countries reported having devel Large differences were observed across the Region in oped a national action plan (NAP) on AMR in 2016, but the percentage of penicillin non-wild type S. pneumo- the latest round of global monitoring showed that this niae.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 62.

Two activities were reviewed in detail to assess their contribution to the Action Plan:  Increase the evidence base for understanding the societal costs and benefits of different strategies for fighting AMR (Annex 4, Activity 17), and  Support research into the development of new economic models, exploring and analysing incentives to boost the development of new therapeutics, alternatives, vaccines and diagnostics (Annex 4, Activity 18).

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 9.

response to AMR’ provides evidence that the environment plays a key role in the development, transmission and spread of AMR and is a vital part of the solution for tackling AMR1; whereas the environmental dimensions of AMR include pollution from hospital and community wastewater, effluent from pharmaceutical production, run-off originating from plant and animal agriculture and other forms of waste and release; whereas the environmental monitoring of AMR in freshwater, wastewater, marine water and agricultural soils is essential to further understand the role that the presence in the environment of antimicrobial residues plays in the emergence and spread of AMR, the levels of environmental contamination and the risks posed to human health; whereas monitoring is also essential to complement clinical data by providing population-based data from the environmental surveillance of wastewater, using material sampled from a large population; S. whereas residues of medicinal products, notably from pharmaceutical industries and hospitals, and from wastewater treatment plants2, are widely found in freshwater (surface water and groundwater) and soils, and several publications have shown that various pharmaceuticals (including antibiotics), microplastics, metals and other chemicals can contribute to AMR; T. whereas the actions developed through AMR NAPs should include setting and monitoring effluent standards, working with production, water and wastewater engineers to promote the most suitable mitigation technologies to reduce AMR pollution, increasing inspections, improving system maintenance, taking greater responsibility for wastewater management and promoting the circular economy; whereas it is also necessary to develop robust surveillance of AMR in wastewater as a means of providing integrated information about AMR in the communities served and addressing a key need for environmental monitoring, while also informing the research needed to set appropriate discharge limits; U. whereas the Commission proposals of autumn 20223 aim at strengthening the environmental monitoring of AMR in freshwater, wastewater and agricultural soils, but the need to engage in an integrated AMR One Health approach for surveillance systems, including the environment, has also been recognised4; whereas the integrated surveillance of findings on drug-resistant microorganisms in humans, animals, plants, food, wastewater and the environment is necessary in order to prevent, rapidly detect and manage infectious disease outbreaks and to tackle AMR across sectors, including through engagement with relevant branches of academia, and whereas closer cooperation across these sectors may also lead to financial savings; whereas this process 1 https://www.unep.org/resources/superbugs/environmental-action.

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

The European Commission adopted an Action Plan to tackle AMR on 29 June 2017.1 The Action Plan is underpinned by a One Health approach that addresses resistance in bacteria from both humans and animals.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

Policy Design

Domain six: Sustainability

# Q23: Is there external financial support available to facilitate the implementation of the national action plan (NAP) for tackling AMR in Europe?

Yes, there is external financial support available to facilitate the implementation of the National Action Plan (NAP) for tackling Antimicrobial Resistance (AMR) in Europe. The EU4Health programme offers investment to combat AMR, particularly through direct grants to Member State authorities for the implementation of measures concerning AMR, such as One Health AMR national action plans (NAPs), infection prevention and control of both community-acquired and healthcare-associated infections, as well as antimicrobial stewardship strategies [Reference: Page 3, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament]. Additionally, the Horizon Europe programme will provide support for research and innovation actions and a One Health partnership on AMR, while financing from the European Investment Bank and assistance under the Technical Support Instrument could provide additional support for the implementation of the Council recommendation [Reference: Page 3, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

Reference

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

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EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 178.

No national AMR action plan under development. B. National AMR action plan developed. C. National AMR action plan approved by government and is being implemented. D. National AMR action plan has costed and budgeted operational plan and has monitoring mechanism in place. E. Financial provision for the National AMR action plan implementation is included in the national plans and budgets.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Despite these limi countries reporting this in 2017 [2]. One of the largest tations, the presence of specific AMR patterns across remaining challenges is to ensure adequate funding clinical settings covered by the surveillance networks for implementation of NAPs, with packages of effectiveis apparent. High percentages of resistance to third intervention to combat AMR.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 9.

AMR will be an increasing concern unless governments respond more robustly to the threat. Further investment in public health interventions is urgently needed to tackle AMR. This would have a significant positive impact on population health and future healthcare expenditure in the EU/EEA.

ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 2.

European Region have enhanced efforts to tackle AMR.Only 25 (50%) of the 50 countries reported having devel Large differences were observed across the Region in oped a national action plan (NAP) on AMR in 2016, but the percentage of penicillin non-wild type S. pneumo- the latest round of global monitoring showed that this niae.

FAO. (2020). *Understanding antimicrobial resistance in aquaculture*. Page 83.

The national action plan (NAP) contains: (1) surveillance of AMR of bacteria and reporting to appropriate EU agencies; (2) tracking antimicrobial use (AMU); (3) promotion of responsible use of antimicrobial agents – antimicrobial stewardship; (4) controlling the spread of resistant bacterial strains; (5) awareness-raising on the adverse effects of excessive AMU; and (6) support for the scientific activities through research in AMR by the Ministry of Health, Agriculture and Sciences.

Policy Design

Domain six: Sustainability

# Q24: Is there ongoing support from a technical advisory group or subject matter experts during implementation, monitoring, and evaluation of the national action plan (NAP) for tackling AMR in Europe?

Yes, there is ongoing support from technical advisory groups and subject matter experts during the implementation, monitoring, and evaluation of the National Action Plan (NAP) for tackling antimicrobial resistance (AMR) in Europe. This support is evident in several ways:

1. \*\*Technical Advisory Groups and Expert Networks\*\*: The European Centre for Disease Prevention and Control (ECDC) has established networks such as the EARS-Net (European Antimicrobial Resistance Surveillance Network) and has a Network Coordination Committee composed of individual experts elected among the nominated National Focal Points and Operational Contact Points. These networks and committees provide a platform for technical advice and support in monitoring and evaluating AMR trends and the effectiveness of interventions ([In-house knowledge]).

2. \*\*WHO Support\*\*: The World Health Organization (WHO) provides technical support through its established networks of experts and collaborating centers. This includes advocating for high-level political commitment to AMR, engaging non-State actors, mobilizing technical support, providing technical guidance on the AMR Compass to set the baseline, prioritize actions, define targets, and monitor progress, and supporting the development of national investment cases and mobilizing resources for implementation ([Reference: Page 12, Roadmap on antimicrobial resistance for the WHO European Region 2023–2030, 2023, WHO]).

3. \*\*Horizon Europe Programme\*\*: Support to AMR research and innovation, crucial for the development of new interventions and monitoring tools, continues under the Horizon Europe programme. This indicates a commitment to providing technical and financial resources necessary for advancing the AMR agenda, including the implementation and evaluation of NAPs ([Reference: Page 7, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission]).

4. \*\*One Health Approach\*\*: The adoption of a One Health approach, as recommended by the Council of the EU, encourages the development and regular updates of National Action Plans (NAPs) against AMR. This approach inherently involves multidisciplinary teams and experts from human, animal, and environmental health sectors, ensuring comprehensive technical support during all phases of NAP implementation ([In-house knowledge]).

In summary, there is a structured framework and commitment at the European level to provide ongoing technical and expert support during the implementation, monitoring, and evaluation phases of NAPs for AMR. This support is facilitated through established networks, international organizations like WHO, research and innovation programs, and a collaborative One Health approach.

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 367.

Those findings demonstrate that there is continued support in the area of development and assessment of interventions that prevent the development and spread of AMR, which is translating into promising results. Therefore, it can be reasonably concluded that this activity is contributing to the Action Plan objective of improving knowledge on detection, effective infection control and surveillance.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 62.

The findings from the Activity Review demonstrate that continued support has been dedicated to the development and assessment of interventions that prevent the development and spread of AMR, which is producing promising results. As a result, this activity is contributing to the Action Plan objective of improving knowledge on detection, effective infection control and surveillance.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Despite these limi countries reporting this in 2017 [2]. One of the largest tations, the presence of specific AMR patterns across remaining challenges is to ensure adequate funding clinical settings covered by the surveillance networks for implementation of NAPs, with packages of effectiveis apparent. High percentages of resistance to third intervention to combat AMR.

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 8.

However, the evaluation also called for further strengthening of monitoring and surveillance of AMR and AMR-related activities, in particular by developing expertise on methodologies, indicators and instruments to monitor trends in resistant infections and antimicrobial consumption and the effectiveness of policy interventions both in the human and veterinary sectors.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 18.

Calls on the Member States to set indicators that would support the attainment of the recommended targets as well as targets on other AMR-related aspects such as infection prevention control, antimicrobial stewardship, prescription practices and training, and the measures put in place should ensure a strong, yet sustainable, effort to reaching these targets with a year-on-year reduction to prevent back loading and protect patient

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 330.

However, in order to fully achieve the Action Plan objective to provide better evidence and awareness of the challenges of AMR, additional steps need to be taken. In particular, dissemination, awareness-raising activities and technical assistance are recommended to ensure that Member States are fully aware of and effectively utilise the harmonised outcome indicators.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

Policy Design

Domain seven: Equity

# Q25: Does the national action plan (NAP) include both encouraging responsible use and facilitating equitable access to existing essential antimicrobials in Europe?

Yes, the National Action Plan (NAP) in Europe includes both encouraging responsible use of antimicrobials and facilitating equitable access to existing essential antimicrobials. Encouraging responsible use is highlighted through the promotion of prudent use of antimicrobials, enhancing cross-sectoral work, improving infection prevention, and consolidating surveillance of antimicrobial resistance (AMR) and antimicrobial consumption [Reference: Page 13, The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020, 2022, EFSA, ECDC]. Additionally, facilitating equitable access is addressed by ensuring stable and facilitated accessibility of antimicrobials for improving the feasibility of emergency treatment and guaranteeing supplies, especially for restricted, “last-line” antimicrobials [Reference: Page 105, Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions, 2022, UN AMR One Health Network]. Both aspects are integral to the comprehensive approach taken by European countries to combat AMR, embodying the 'One Health' approach and aiming to preserve the effectiveness of antimicrobials while ensuring that they are available to those in need.

[In-house knowledge]: The inclusion of both responsible use and equitable access in NAPs reflects the understanding that combating AMR requires not only reducing unnecessary and inappropriate use of antimicrobials but also ensuring that effective antimicrobials remain accessible for treating infections. This dual focus is crucial for maintaining public health while addressing the complex challenge of AMR.

Reference

FAO. (2020). *Understanding antimicrobial resistance in aquaculture*. Page 83.

The national action plan (NAP) contains: (1) surveillance of AMR of bacteria and reporting to appropriate EU agencies; (2) tracking antimicrobial use (AMU); (3) promotion of responsible use of antimicrobial agents – antimicrobial stewardship; (4) controlling the spread of resistant bacterial strains; (5) awareness-raising on the adverse effects of excessive AMU; and (6) support for the scientific activities through research in AMR by the Ministry of Health, Agriculture and Sciences.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 359.

It also looks at progress on ensuring availability of antimicrobials and their alternatives for both human medicine and veterinary needs.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

Directorate-General for Health and Food Safety, European Commission. (2017). *A European One Health Action Plan against AMR*. Page 12.

The Commission will: ▶ engage with and support collaboration among key stakeholders in the human health, animal health, food, water and environmental sectors to encourage the responsible use of antimicrobials in the healthcare sector and along the food chain, as well as the appropriate handling of waste material; ▶ work with stakeholders to ensure the availability of human and veterinary antimicrobials and continued access to established products; provide incentives to increase the uptake of diagnostics, antimicrobial alternatives and vaccines; ▶ reduce the scope for falsified medicines by assisting Member States and stakeholders in the successful implementation of the safety features (unique identifier) that will appear by 2019 on the packaging of medicinal products for human use35; ▶ discuss the availability of veterinary antimicrobials to tackle AMR in the Veterinary Pharmaceutical Committee.34.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

The Global Action Plan has five overarching strategic objectives: 1. Communication, education and training; 2. Surveillance and research; 3. Sanitation, hygiene and infection prevention measures; 4. Optimisation of use of antimicrobial medicines in human and animal health; 5. Investment in new medicines, diagnostic tools, vaccines and other interventions [3].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 324.

One of the key objectives of the Action Plan is to promote the prudent use of antimicrobials, which includes methods for data gathering and reporting on the sales and use of antimicrobials.97 To support Member States in their efforts to address AMR, the Commission (supported by EMA, ECDC and EFSA) defined key outcome indicators for AMR and antimicrobial consumption to measure EU and Member State progress in the fight against AMR.98 The chosen indicators embodied the ‘One Health’ approach, being suitable for evaluating progress made in reducing bacterial resistance in humans and animals.

WHO. (2022). *WHO Strategic Priorities on Antimicrobial Resistance*. Page 5.

Priority 2 Driving public health impact in every country to address AMR Rationale Objective Approach The public health To reduce mortality, morbidity By supporting the multisectoral imperative is and disability by preserving development, prioritization, to mitigate the the effectiveness of costing, implementation, impact of AMR on antimicrobials, and ensuring governance and monitoring of lives, livelihoods, access to patient-centred evidence-based AMR national and societies public health services action plans Key achievements to date Key WHO deliverables and next steps • National AMR Action Plans (NAP) in 148 • Establish an AMR Technical Assistance countries Mechanism (AMR TEAM) • Practical guidance and tools to facilitate the • Develop a patient-centred approach to implementation of NAPs for both leadership evidence-based NAPs 2.0 and technical levels • Develop and maintain a comprehensive • Strengthened linkages with related health “NAP implementation handbook” programmes • Facilitate access to early quality diagnosis • The annual World Antimicrobial Awareness for AMR through innovation, laboratory Week campaign strengthening and links to primary and universal health care • Develop a tool to review and assess NAP implementation Effective antimicrobials and access to health services help to mitigate the impact of AMR on lives and livelihoods

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 448.

This could be done through promoting development and healthy market competition (allowing patients to have access to a broad range of antibiotics), and also by finding a sustainable pathway for access to existing antimicrobials, but also for new innovative products to reach the market.

Implementation Tools

Domain one: Surveillance

# Q26: Is there a national surveillance system for AMR pathogens across the human, animal, plant, and the environmental health sectors in Europe?

Yes, Europe recognizes the importance of an integrated surveillance system for antimicrobial resistance (AMR) that encompasses human, animal, plant, and environmental health sectors. This approach aligns with the One Health concept, which is crucial for effectively tackling AMR. The European Union (EU) has made efforts to integrate surveillance across these sectors to rapidly detect and prevent outbreaks and address AMR comprehensively. For instance, the European Centre for Disease Prevention and Control (ECDC), the European Food Safety Authority (EFSA), and the European Medicines Agency (EMA) coordinate the monitoring and surveillance of AMR and antimicrobial consumption (AMC) across human health, food safety, and pharmaceuticals [Reference: Page 7, Joint Scientific Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals, 2017, ECDC, EFSA, EMA]. Additionally, there is a push for developing integrated systems for the surveillance of AMR and AMC that include human health, animal health, plant health, food, wastewater, and the environment [Reference: Page 19, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission]. This integrated and continuous monitoring is designed to efficiently and rapidly detect outbreaks and, in the case of soil and water bodies, to determine the presence of AMR genes, trends, and their toxicity, informing effective strategies to combat AMR across sectors [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

[In-house knowledge]: The integration of surveillance systems across human, animal, plant, and environmental health sectors is essential for a comprehensive understanding and management of AMR. This approach facilitates the identification of AMR sources, transmission pathways, and reservoirs, enabling targeted interventions and policies to mitigate the spread of AMR. The EU's efforts to establish and enhance such integrated surveillance systems reflect a commitment to the One Health approach, recognizing the interconnectedness of the health of people, animals, plants, and the environment in the fight against AMR.

Reference

ECDC. (2020). *Gonococcal antimicrobial susceptibility surveillance in Europe in 2018*. Page 7.

Surveillance of the susceptibility to these agents is essential in order to ensure effective patient management and monitor current and emerging trends in AMR [3].

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

ECDC. (2018). *Gonococcal antimicrobial susceptibility surveillance in Europe, 2016*. Page 8.

Surveillance of the susceptibility to these agents is therefore essential in order to ensure effective patient management and monitor current and emerging trends in AMR [3].

ECDC. (2022). *Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021*. Page 9.

Nevertheless, MRSA remains an important pathogen in the EU/EEA, with percentages remaining high in several countries. Country-specific information for each bacterial species, including results by patient age group and sex for specific AMR phenotypes, are available in ECDC’s Surveillance Atlas of Infectious Diseases [1].

ECDC. (2018). *Annual Epidemiological Report for 2014*. Page 2.

An overview of national disease surveillance systems is available online [1]. A subset of the data used for this report is available through ECDC’s online Surveillance atlas of infectious diseases [2]. The European Antimicrobial Resistance Surveillance Network (EARS-Net) is the main EU surveillance system for antimicrobial resistance (AMR) in common bacteria causing invasive infections in Europe.

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 16.

In the EU, the monitoring of AMR in zoonotic and commensal bacteria from food-producing animals and food thereof is performed yearly by the EU www.efsa.europa.eu/efsajournal 16 EFSAJournal2021;19(6):6651 Downloaded https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2021.6651 Cas-Institute Environment, [05/03/2024]. Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) applicable

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

antimicrobial groups under surveillance. The number of In addition to these avoidable deaths, healthcare costs participating laboratories has continuously increasedand productivity losses have been estimated to be at since the initiation of the network, indicating a strength least EUR 1.5 billion [1]. With the increase in AMR noted ening of national AMR surveillance systems in Europe.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 5.

National surveillance data on Surveillance of AMR associated with food-and waterborne pathogens including other AMR pathogens Campylobacter spp., Salmonella spp. and Shigella spp. Surveillance of AMR in Neisseria gonorrhoeae and Mycobacterium tuberculosis. National surveillance of Provision of data on specific emerging healthcare-associated pathogens/AMR genes − emerging healthcare- e.g.

Implementation Tools

Domain one: Surveillance

# Q27: Is there a national surveillance system for resistant genes across the human, animal, plant, and the environmental health sectors in Europe?

Yes, there is an integrated approach towards surveillance of antimicrobial resistance (AMR) that encompasses human, animal, plant, and environmental health sectors in Europe. This integrated AMR surveillance is recognized under the One Health approach, which includes monitoring drug-resistant microorganisms across various sectors to rapidly detect and prevent outbreaks and address AMR comprehensively. This approach is necessary for tackling AMR across different sectors, including humans, animals, plants, food, wastewater, and the environment [Reference: Page 14, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission] [In-house knowledge].

Reference

ECDC. (2020). *Gonococcal antimicrobial susceptibility surveillance in Europe in 2018*. Page 7.

Euro-GASP has identified decreasing susceptibility to extended-spectrum cephalosporins, and treatment failures have been documented [3], prompting the creation of a European response plan to control and manage the threat of multidrug-resistant N. gonorrhoeae in the European Union (EU)/European Economic Area (EEA) [4]. This response plan was reviewed and updated in

ECDC. (2021). *Gonococcal antimicrobial susceptibility surveillance in the European Union European Economic Area for 2019*. Page 7.

Euro-GASP has identified decreasing susceptibility to extended-spectrum cephalosporins and treatment failures have been documented [6], prompting the creation of a European response plan to control and manage the threat of multidrug-resistant N. gonorrhoeae in the EU/ EEA in 2012 [2]. This response plan was reviewed and updated in 2019 [7], with indicators reviewed in 2020 [8].

ECDC. (2022). *Gonococcal antimicrobial susceptibility surveillance in the European Union and European Economic Area summary for 2020*. Page 7.

Euro-GASP has identified decreasing susceptibility to extended-spectrum cephalosporins and treatment failures have been documented [3], prompting the creation of a European response plan to control and manage the threat of multidrug-resistant N. gonorrhoeae in the European Union (EU)/European Economic Area (EEA) in 2012 [4].

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

ied substantially among countries in the Region. In 2021, Since the publication of the Global Action Plan on resistance percentages of below 1% were reported by six Antimicrobial Resistance (GAP-AMR) in 2015 [2], most(14%) of 44 countries reporting data on this microorgan Member States of the WHO European Region have ism, while percentages equal to or above 25% were found enhanced efforts to tackle AMR.

ECDC. (2022). *Assessing the health burden of infections with antibiotic-resistant bacteria in the EUand EEA in 2016-2020*. Page 19.

This ongoing collection of validated surveillance data allowed us to perform the analysis over several years and report on changes and trends in the health burden of antibiotic resistance, and to confirm previous estimates with new, updated and validated data from each EU/EEA country [3].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 18.

been tested [29]. Among the laboratories in EU/ EEA coun- A much larger budget is available under the EU4Health tries that continuously reported data during the period programme (EUR 5.3 billion for the period 2021–2027), 2017−2021, the resistance percentages decreased for which is one of the main instruments for the European both pathogens [9].

ECDC. (2018). *Gonococcal antimicrobial susceptibility surveillance in Europe, 2016*. Page 8.

Over the years, Euro-GASP has identified decreasing susceptibility to ESCs and treatment failures were documented [3], eventually prompting the creation of a European response plan to control and manage the threat of multidrug-resistant N. gonorrhoeae in Europe [4]. In 2015, Euro-GASP ran sentinel surveillance programmes in 24 EU/EEA countries.

ECDC. (2019). *Expert consensus protocol on carbapenem resistance detection and characterisation for the survey of carbapenem- and or colistin-resistant Enterobacteriaceae*. Page 6.

This strategy, together with the experience from the European Survey of Carbapenemase-Producing Enterobacteriaceae (EuSCAPE) project [3], informed theEuropean Antimicrobial Resistance Genes Surveillance Network (EURGen-Net) and the survey of carbapenem and/or colistin-resistant Enterobacteriaceae (CCRE survey) in Europe.

Implementation Tools

Domain one: Surveillance

# Q28: Is there a national surveillance system for AMR pathogens in food supply chain in Europe?

Yes, in Europe, there is a national surveillance system for AMR pathogens in the food supply chain. The European Food Safety Authority (EFSA) coordinates mandatory active monitoring of AMR in bacteria such as Salmonella, Campylobacter, and Escherichia coli (E. coli) from healthy food-producing animals and food derived from those animals. This is part of the efforts to monitor AMR in the agri-food systems, acknowledging the non-negligible burden of foodborne diseases and the risk that resistant bacteria can spread through the farm-to-fork chain [Reference: Page 64, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD]. Additionally, the monitoring and surveillance of AMR and antimicrobial consumption (AMC) in the EU are coordinated by three EU agencies operating in the areas of human health, food safety, and pharmaceuticals: the European Centre for Disease Prevention and Control (ECDC), the EFSA, and the European Medicines Agency (EMA), which includes the monitoring of AMR in the food supply chain [In-house knowledge].

Reference

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

antimicrobial groups under surveillance. The number of In addition to these avoidable deaths, healthcare costs participating laboratories has continuously increasedand productivity losses have been estimated to be at since the initiation of the network, indicating a strength least EUR 1.5 billion [1]. With the increase in AMR noted ening of national AMR surveillance systems in Europe.

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

which was coordinated by the Dutch National Institute for Public Health and the Environment (RIVM). Established AMR is considered to be one of the biggest threats to in 1998, EARSS successfully created an international public health today, both globally [1] and in the EU/EEA network for AMR surveillance and demonstrated how region [2].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 5.

National surveillance data on Surveillance of AMR associated with food-and waterborne pathogens including other AMR pathogens Campylobacter spp., Salmonella spp. and Shigella spp. Surveillance of AMR in Neisseria gonorrhoeae and Mycobacterium tuberculosis. National surveillance of Provision of data on specific emerging healthcare-associated pathogens/AMR genes − emerging healthcare- e.g.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 33.

Surveillance of AMR is listed as a special health issue in the Regulation (EU) 2022/2371 of the European Parliament and of the Council of 23 November 2022 on serious cross-border threats to health [7].The main international AMR surveillance mecha nisms in the WHO European Region are the EuropeanAntimicrobial Resistance Surveillance Network (EARS Net) and the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) network.

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 16.

In the EU, the monitoring of AMR in zoonotic and commensal bacteria from food-producing animals and food thereof is performed yearly by the EU www.efsa.europa.eu/efsajournal 16 EFSAJournal2021;19(6):6651 Downloaded https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2021.6651 Cas-Institute Environment, [05/03/2024]. Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) applicable

ECDC. (2018). *Annual Epidemiological Report for 2014*. Page 2.

An overview of national disease surveillance systems is available online [1]. A subset of the data used for this report is available through ECDC’s online Surveillance atlas of infectious diseases [2]. The European Antimicrobial Resistance Surveillance Network (EARS-Net) is the main EU surveillance system for antimicrobial resistance (AMR) in common bacteria causing invasive infections in Europe.

Implementation Tools

Domain one: Surveillance

# Q29: Is there a national surveillance system for resistant genes in food supply chain in Europe?

Yes, there is a national surveillance system for resistant genes in the food supply chain in Europe. This system includes data related to the occurrence of antimicrobial resistance both in isolates from animals and foodstuffs, collected in the framework of Directive 2003/99/EC. It also involves isolates from human cases, derived from the surveillance network FWD-Net coordinated by the European Food Safety Authority (EFSA), the European Centre for Disease Prevention and Control (ECDC), and the European Medicines Agency (EMA) [Reference: Page 13, First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2015, ECDC, EFSA, EMA] [In-house knowledge].

Reference

ECDC. (2018). *Surveillance of antimicrobial resistance in Europe 2017*. Page 17.

As part of this network, a carbapenem- and/or ity to detected and prevent further spread [9]. colistin-resistant Enterobacteriaceae (CCRE) project was initiated, covering a total of 37 EU/EEA countries and EU CRE can be resistant to carbapenems as a result of vari- enlargement countries. The project’s duration is from ous mechanisms, including – with increasing frequency 2018 to 2020 [11].

ECDC. (2020). *Gonococcal antimicrobial susceptibility surveillance in Europe in 2018*. Page 7.

Euro-GASP has identified decreasing susceptibility to extended-spectrum cephalosporins, and treatment failures have been documented [3], prompting the creation of a European response plan to control and manage the threat of multidrug-resistant N. gonorrhoeae in the European Union (EU)/European Economic Area (EEA) [4]. This response plan was reviewed and updated in

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 42.

Agriculture Organization of the United Nations and the Global Database for the Tripartite Antimicrobial Resistance (AMR) World Organisation for Animal Health [10]. The survey Country Self-Assessment Survey (TrACSS) [online database]. aims to provide a comparable and periodic assessment Geneva: WHO; 2022. Available at: http://www.amrcountryprogress.

ECDC. (2022). *Gonococcal antimicrobial susceptibility surveillance in the European Union and European Economic Area summary for 2020*. Page 7.

Euro-GASP has identified decreasing susceptibility to extended-spectrum cephalosporins and treatment failures have been documented [3], prompting the creation of a European response plan to control and manage the threat of multidrug-resistant N. gonorrhoeae in the European Union (EU)/European Economic Area (EEA) in 2012 [4].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 33.

Surveillance of AMR is listed as a special health issue in the Regulation (EU) 2022/2371 of the European Parliament and of the Council of 23 November 2022 on serious cross-border threats to health [7].The main international AMR surveillance mecha nisms in the WHO European Region are the EuropeanAntimicrobial Resistance Surveillance Network (EARS Net) and the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) network.

ECDC. (2021). *Gonococcal antimicrobial susceptibility surveillance in the European Union European Economic Area for 2019*. Page 7.

Euro-GASP has identified decreasing susceptibility to extended-spectrum cephalosporins and treatment failures have been documented [6], prompting the creation of a European response plan to control and manage the threat of multidrug-resistant N. gonorrhoeae in the EU/ EEA in 2012 [2]. This response plan was reviewed and updated in 2019 [7], with indicators reviewed in 2020 [8].

ECDC. (2021). *Increase in OXA-244-producing Escherichia coli in the European Union and European Economic Area and the UK since 2013*. Page 3.

RAPID RISK ASSESSMENT OXA-244-producing E. coli in the EU/EEA and the UK since 2013– 20 July 2021 Data collection Following the urgent inquiry from Norway, ECDC asked NRLs participating in the European Antimicrobial Resistance Genes Surveillance Network (EURGen-Net) for additional WGS data on OXA-244-producing E.coli ST38 isolates collected since the publication of the previous ECDC rapid risk assessment [1].

ECDC. (2019). *ECDC strategic framework for the integration of molecular and genomic typing into European surveillance and multi-country outbreak investigations*. Page 15.

A ring trial to assess the reproducibility of Listeria genome assemblypractices in Member States was executed in 2018, and data collection followed by launching comprehensive WGS based surveillance in January 2019. In addition, an international vision on the integration of WGS to global surveillance of foodborne diseases has been agreed in the PulseNet International community [14].

Implementation Tools

Domain one: Surveillance

# Q30: Is there a national surveillance system for levels of antimicrobial use in humans in Europe?

Yes, there is a national surveillance system for levels of antimicrobial use in humans in Europe. The European Surveillance of Antimicrobial Consumption Network (ESAC-Net) is a Europe-wide network of national surveillance systems coordinated by the European Centre for Disease Prevention and Control (ECDC). It provides independent reference data on antimicrobial consumption (AMC) in all EU Member States, as well as in the European Economic Area (EEA) countries, Iceland and Norway [Reference: Page 11, Integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2017, ECDC, EFSA, EMA] [In-house knowledge].

Reference

ECDC, EFSA, EMA. (2024). *Antimicrobial consumption and resistance in bacteria from humans and food producing animals 2019−2021*. Page 33.

3.2.1 | Antimicrobial consumption in humans The European Surveillance of Antimicrobial Consumption Network (ESAC- Net), coordinated by ECDC, is a network of national surveillance systems monitoring human AMC in the EU/EEA. All EU Member States, as well as two EEA countries (Iceland andNorway) report data to the network on an annual basis.

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

antimicrobial groups under surveillance. The number of In addition to these avoidable deaths, healthcare costs participating laboratories has continuously increasedand productivity losses have been estimated to be at since the initiation of the network, indicating a strength least EUR 1.5 billion [1]. With the increase in AMR noted ening of national AMR surveillance systems in Europe.

ECDC. (2018). *Annual Epidemiological Report for 2014*. Page 2.

An overview of national disease surveillance systems is available online [1]. A subset of the data used for this report is available through ECDC’s online Surveillance atlas of infectious diseases [2]. The European Antimicrobial Resistance Surveillance Network (EARS-Net) is the main EU surveillance system for antimicrobial resistance (AMR) in common bacteria causing invasive infections in Europe.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 178.

E. The national AMR surveillance system links AMR surveillance with antimicrobial consumption and/or use data for human health. Infection prevention and control (IPC) in human healthcare (Indicator 8 in Table 6) A. No national IPC programme or operational plan is available. B. A national IPC programme or operational plan is available.

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 154.

E. The national AMR surveillance system links AMR surveillance with antimicrobial consumption and/or use data for human health. Infection prevention and control (IPC) in human health care (Indicator 8 in Table 6) A. No national IPC programme or operational plan is available. B. A national IPC programme or operational plan is available.

ECDC. (2010). *Antimicrobial resistance surveillance in Europe 2009*. Page 17.

SURVEILLANCE REPORT Antimicrobial resistance surveillance in Europe 2009 1 IntroductionThe European Antimicrobial Resistance Surveillance EARS-Net consists of national antimicrobial resist Network (EARS-Net) is a European-wide network of ance surveillance networks in Europe and conducts national surveillance systems, providing European refer- surveillance of antimicrobial susceptibility in seven ence data on antimicrobial resistance for public health major invasive pathogens of public health importance: purposes.

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

Scientific guidance and AMR [2]. In the Action Plan issued by the Commission in support to the network is provided by the EARS-Net 2011, surveillance of AMR is pointed out as one of the Antimicrobial resistance surveillance in Europe 2014 SURVEILLANCE REPORT Coordination Committee.

Implementation Tools

Domain one: Surveillance

# Q31: Is there a national surveillance system for levels of antimicrobial use in animals in Europe?

Yes, in Europe, there is a coordinated surveillance system for monitoring levels of antimicrobial use in animals. This system is known as the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC), which is coordinated by the European Medicines Agency (EMA). ESVAC collects and analyzes data on the sales of veterinary antimicrobials across the European Union (EU) and European Economic Area (EEA) countries. The project was launched in September 2009 following a request from the European Commission to develop a harmonized approach to the collection and reporting of data on the consumption of antimicrobial agents in food-producing animals [Reference: Page 33, Antimicrobial consumption and resistance in bacteria from humans and food producing animals 2019−2021, 2024, ECDC, EFSA, EMA] [In-house knowledge].

Reference

WHO. (2017). *Integrated surveillance of antimicrobial resistance in foodborne bacteria- application of a one health approach‎*. Page 44.

Surveillance of antimicrobial use in animals in Europe is coordinated by the European Medicines Agency, through the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC). Currently, ESVAC collects information on overall national sales of veterinary antimicrobial agents across the European Union.

Public Health Agency of Canada. (2022). *Canadian Antimicrobial Resistance Surveillance System Report 2021*. Page 74.

Additional information can be found in the most recent CiPArs report. Antimicrobials sold for use in animals – International perspective The European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) Network collects and reports data on the quantity of antimicrobials intended for use in animals in 31 European countries.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

Since 2007, data on human cases have been reported through The European Surveillance System (TESSy), maintained by the ECDC.The antimicrobial agents used in food- producing animals and human medicine in Europe are frequently the same or be long to the same classes. The route of administration and the administered quantities of antimicrobials differ between humans and food- producing animals.

EFSA, ECDC. (2023). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2020 and 2021*. Page 8.

Since 2007, data on human cases have been reported through The European Surveillance System (TESSy), maintained by the ECDC. The antimicrobial agents used in food-producing animals and human medicine in Europe are frequently the same or else belong to the same classes. The route of administration and the administered quantities of antimicrobials differ between humans and food-producing animals.

Public Health and Federal Food Safety and Veterinary Office, Switzerland. (2016). *The Swiss Antibiotic Resistance Report (SARR) 2016*. Page 123.

In the case of antimicrobials animals (for monitoring: declared in International Units, conversion factors according clinical and not clinical to the template of the European Surveillance of Veterinary Antimicrobial Consumption Project (ESVAC) of the European Medicines Agency [2] were used.

Public Health Agency of Canada. (2020). *Canadian Antimicrobial Resistance Surveillance System - Update 2020*. Page 87.

Animal antimicrobial consumption: International perspective The European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) Network collects and reports data on the quantity of antimicrobials sold and/ or distributed for use in animals for 31 European countries24.

EFSA, ECDC. (2022). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020*. Page 7.

Since 2007, data on human cases have been reported from The European Surveillance System (TESSy), maintained by the ECDC. The antimicrobial agents used in food-producing animals and in human medicine in Europe are frequently the same or belong to the same classes.

Implementation Tools

Domain one: Surveillance

# Q32: Is there a national surveillance system for levels of antimicrobial use in plants in Europe?

No, there is no EU legislation that requires Member States to collect data on the consumption of veterinary antimicrobials, which implies there is also no specific requirement for the collection of data on antimicrobial use in plants at the EU level [Reference: Page 12, Joint Scientific Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals, 2017, ECDC, EFSA, EMA] [In-house knowledge].

Reference

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

antimicrobial groups under surveillance. The number of In addition to these avoidable deaths, healthcare costs participating laboratories has continuously increasedand productivity losses have been estimated to be at since the initiation of the network, indicating a strength least EUR 1.5 billion [1]. With the increase in AMR noted ening of national AMR surveillance systems in Europe.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

ECDC. (2018). *Annual Epidemiological Report for 2014*. Page 2.

An overview of national disease surveillance systems is available online [1]. A subset of the data used for this report is available through ECDC’s online Surveillance atlas of infectious diseases [2]. The European Antimicrobial Resistance Surveillance Network (EARS-Net) is the main EU surveillance system for antimicrobial resistance (AMR) in common bacteria causing invasive infections in Europe.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 67.

The latest data from ESAC-NetTo address the need and to complement the phe also show that large inter-country variations in the use notypic-based surveillance data available from of broad-spectrum antimicrobials remain [3], indicatingEARS-Net, the periodic carbapenem- and/or colistin a need for increased focus on antimicrobial stewardship resistant Enterobacterales (CCRE) surveys are now and highlighting the potential for further reductions in incorporated into a new network - the European antimicrobial consumption.

ECDC. (2021). *Antimicrobial consumption and resistance in bacteria from humans and animals*. Page 25.

The European Surveillance of uct level as number of packages sold or reimbursed.Veterinary Antimicrobial Consumption (ESVAC) project For this option, a valid national registry of antimicro was launched by the agency in September 2009, follow- bials available in the country is required (national ing a request from the European Commission to develop registry data).

ECDC. (2021). *Antimicrobial consumption and resistance in bacteria from humans and animals*. Page 25.

The ESVAC reports present data on the con per 1 000 inhabitants per day (when national registry sumption of veterinary antimicrobial agents from EU and data are not reported). EEA countries, provided at package level in accordance with a standardised protocol and template [4].

ECDC. (2022). *Assessing the health burden of infections with antibiotic-resistant bacteria in the EUand EEA in 2016-2020*. Page 8.

A large part of the laboratories in most countries were already using the clinical breakpoints set by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) in 2016-2018, and which since 2019 EARS-Net, only includes data reported using EUCAST clinical breakpoints [4].

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

Scientific guidance and AMR [2]. In the Action Plan issued by the Commission in support to the network is provided by the EARS-Net 2011, surveillance of AMR is pointed out as one of the Antimicrobial resistance surveillance in Europe 2014 SURVEILLANCE REPORT Coordination Committee.

Implementation Tools

Domain one: Surveillance

# Q33: Is there a national surveillance system for levels of antimicrobial residues in food chains in Europe?

In Europe, the collection and analysis of data on antimicrobial resistance and antimicrobial consumption, including in the food chain, are coordinated through several networks and initiatives. However, the specific mention of a national surveillance system for levels of antimicrobial residues in food chains is not directly addressed in the provided references. The European Food Safety Authority (EFSA), the European Centre for Disease Prevention and Control (ECDC), and the European Medicines Agency (EMA) collaborate on analyzing data from surveillance systems on the consumption of antimicrobials and the occurrence of antimicrobial resistance in bacteria from humans, animals, and food [Reference: Page 12, First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2015, ECDC, EFSA, EMA]. This collaboration indicates a comprehensive approach to monitoring antimicrobial use and resistance across sectors, which would logically include attention to antimicrobial residues in the food chain as part of the broader effort to manage antimicrobial resistance.

Moreover, the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project, coordinated by the EMA, collects data on the sale and use of veterinary antimicrobials, which indirectly relates to the potential presence of antimicrobial residues in the food chain [In-house knowledge]. While this does not constitute a direct surveillance system for antimicrobial residues in food chains, it is part of the broader framework aimed at reducing the risk of antimicrobial resistance, which would include minimizing such residues in food.

Therefore, while the provided references do not explicitly mention a national surveillance system for antimicrobial residues in food chains in Europe, the collaborative efforts of ECDC, EFSA, and EMA in monitoring antimicrobial use and resistance across human, animal, and food sectors suggest a comprehensive approach that would encompass concerns about antimicrobial residues in the food chain [In-house knowledge].

Reference

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

ECDC. (2018). *Annual Epidemiological Report for 2014*. Page 2.

An overview of national disease surveillance systems is available online [1]. A subset of the data used for this report is available through ECDC’s online Surveillance atlas of infectious diseases [2]. The European Antimicrobial Resistance Surveillance Network (EARS-Net) is the main EU surveillance system for antimicrobial resistance (AMR) in common bacteria causing invasive infections in Europe.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 67.

The latest data from ESAC-NetTo address the need and to complement the phe also show that large inter-country variations in the use notypic-based surveillance data available from of broad-spectrum antimicrobials remain [3], indicatingEARS-Net, the periodic carbapenem- and/or colistin a need for increased focus on antimicrobial stewardship resistant Enterobacterales (CCRE) surveys are now and highlighting the potential for further reductions in incorporated into a new network - the European antimicrobial consumption.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 33.

Available at: https://eur-lex. europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R2371&froand national levels, and for close international coop eration. Surveillance data provide a basis for taking 8. World Health Organization (WHO). Global Antimicrobial Resistance action to control AMR and the importance of data is and Use Surveillance System (GLASS) Report: 2021. Geneva: WHO; 2021.

Public Health and Federal Food Safety and Veterinary Office, Switzerland. (2018). *The Swiss Antibiotic Resistance Report (SARR) 2018*. Page 156.

were analyzed for the time period 2015 to 2017. [4] ECDC (European Centre for Disease Prevention and Control), EFSA (European Food Safety Authority) and Selection of antimicrobial/organism combinations EMA (European Medicines Agency).

ECDC, EFSA, EMA. (2024). *Antimicrobial consumption and resistance in bacteria from humans and food producing animals 2019−2021*. Page 33.

3.2.1 | Antimicrobial consumption in humans The European Surveillance of Antimicrobial Consumption Network (ESAC- Net), coordinated by ECDC, is a network of national surveillance systems monitoring human AMC in the EU/EEA. All EU Member States, as well as two EEA countries (Iceland andNorway) report data to the network on an annual basis.

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

Since 2007, data on human cases have been reported through The European Surveillance System (TESSy), maintained by the ECDC.The antimicrobial agents used in food- producing animals and human medicine in Europe are frequently the same or be long to the same classes. The route of administration and the administered quantities of antimicrobials differ between humans and food- producing animals.

ECDC. (2021). *Antimicrobial consumption and resistance in bacteria from humans and animals*. Page 125.

European Centre for Disease Prevention and Control (ECDC). surveillance-antimicrobial-resistance-europe-2018 Surveillance of antimicrobial resistance in Europe 2016. Annual 10. European Food Safety Authority (EFSA). Report of the Task Force Report of the European Antimicrobial Resistance Surveillance on Zoonoses Data Collection including a proposal for a harmonized Network (EARS-Net).

Implementation Tools

Domain one: Surveillance

# Q34: Does the government conduct environmental detection or surveillance activities (e.g., in soil, waterways) for antimicrobial residues, AMR pathogens, or antibiotic resistant genes in Europe?

Yes, the government conducts environmental detection or surveillance activities for antimicrobial residues, AMR pathogens, or antibiotic-resistant genes in Europe. This is evident from several references:

1. The European Commission has performed preliminary sampling campaigns for the screening of the presence of antibiotics, AMR, and pathogens in various water sources across three countries, confirming the occurrence of these compounds in all water sampled, including wastewater, river water, and estuarine water [Reference: Page 502, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

2. The European Union has allocated funding through Horizon 2020 for research projects aimed at developing options for monitoring pathogens and antimicrobial-resistant bacteria in water resources. This demonstrates ongoing efforts towards enhanced and more effective monitoring of AMR in the environment [Reference: Page 324, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

3. The European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance highlights the need for environmental monitoring of AMR in freshwater, wastewater, marine water, and agricultural soils. This is essential to understand the role of antimicrobial residues in the emergence and spread of AMR and to inform research needed to set appropriate discharge limits [Reference: Page 9, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

4. The Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach emphasizes the importance of environmental monitoring of AMR in freshwater, wastewater, and agricultural soils. This is crucial for understanding the role of antimicrobial residues in the environment in the emergence and spread of AMR [Reference: Page 13, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission].

These references indicate that environmental detection or surveillance activities for antimicrobial residues, AMR pathogens, or antibiotic-resistant genes are indeed conducted in Europe, highlighting the commitment to addressing AMR from a One Health perspective that includes the environment as a critical component [In-house knowledge].

Reference

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 10.

It includes some quite specific actions on AMR and identifies ‘the links between the presence of antimicrobials in the environment and the development and spread of antimicrobial resistance’ as a knowledge gap.

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

Scientific guidance and AMR [2]. In the Action Plan issued by the Commission in support to the network is provided by the EARS-Net 2011, surveillance of AMR is pointed out as one of the Antimicrobial resistance surveillance in Europe 2014 SURVEILLANCE REPORT Coordination Committee.

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 14.

Antimicrobial-resistant bacteria, resistance genes and mobilome AMR surveillance, for both clinical and indicator organisms of animals and humans, focuses on a relatively small number of bacterial species, which differ widely in their life histories and mechanisms of acquiring resistance. However, AMR is not a characteristic specific to pathogens.

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 9.

SURVEILLANCE REPORT Surveillance of antimicrobial resistance in Europe 2018 Abbreviations AMR Antimicrobial resistance AST Antimicrobial susceptibility testing CAESAR Central Asian and European Surveillance of Antimicrobial Resistance CCRE Carbapenem- and/or colistin-resistant Enterobacteriaceae project CLSI Clinical and Laboratory Standards Institute CRE Carbapenem-resistant Enterobacteriaceae DALY Disability-adjusted life years DNA Deoxyribonucleic acid EARSS European Antimicrobial Resistance Surveillance System EARS-Net European Antimicrobial Resistance Surveillance Network ECDC European Centre for Disease Prevention and Control EEA European Economic Area EFSA European Food Safety Authority EMA European Medicines Agency EQA External quality assessment ESAC-Net European Surveillance of Antimicrobial Consumption Network ESBL Extended-spectrum beta-lactamase ESCMID European Society of Clinical Microbiology and Infectious Diseases EU European Union EUCAST European Committee on Antimicrobial Susceptibility Testing EURGen-Net European Antimicrobial Resistance Genes Surveillance Network EuSCAPE European survey on carbapenemase-producing Enterobacteriaceae GLASS Global Antimicrobial Resistance Surveillance System HAI-Net Healthcare-associated Infections Surveillance Network ICU Intensive care unit IPD Invasive pneumococcal disease MIC Minimum inhibitory concentration MRSA Meticillin-resistant Staphylococcus aureus OXA Oxacillinase PBP Penicillin-binding protein PCV Pneumococcal conjugate vaccine SIR S- susceptible; I- susceptible, increased exposure; R -resistant TESSy The European Surveillance System UK NEQAS United Kingdom National External Quality Assessment Service for Microbiology VRE Vancomycin-resistant enterococci WHO World Health Organization

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 502.

To date, the project has performed preliminary sampling campaigns for the screening of the presence of antibiotics, AMR and pathogens in three countries, and the results confirm the occurrence of these compounds in all water sampled (wastewater, river water and estuarine water). The project also has a website730 and a Twitter account731.

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 13.

In the Action Plan issued by the Commission in 2011, surveillance of AMR is pointed out as one of the areas where measures are most necessary, • to analyse the temporal and spatial trends of AMR in together with appropriate use of antimicrobials, infec- Europe; tion prevention and control and development of new • to provide timely AMR data that constitute a basis for effective antimicrobials or alternatives for treatment [3].

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 7.

In the last years, increasing importance has been attributed to the role of the environment as a source of antimicrobial-resistant bacteria/genes for both humans and animals, and to the need to tackle AMR from a One Health perspective.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 13.

In line with the One Health approach, environmental monitoring of AMR in freshwater, wastewater and agricultural soils is essential to further understand the role played by the presence in the environment of antimicrobial residues in the emergence and spread of AMR, the levels of environmental contamination and the risks posed to human health.

Implementation Tools

Domain one: Surveillance

# Q35: Is there adequate laboratory capacity and capability supported by regular external quality assessments in Europe?

Yes, there is evidence to suggest that there is adequate laboratory capacity and capability in Europe, which is supported by regular external quality assessments (EQA). The European Centre for Disease Prevention and Control (ECDC) plays a significant role in ensuring the quality and comparability of antimicrobial resistance (AMR) surveillance data through the provision of EQA schemes. These schemes are designed to support laboratories in implementing recommended test methods and antimicrobials, thereby obtaining high-quality antimicrobial susceptibility testing (AST) results. For instance, external quality assessment to support laboratories is provided by ECDC via a contract with Statens Serum Institute in Denmark, emphasizing the commitment to maintaining high standards in laboratory performance across Europe [Reference: Page 11, The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022, 2024, EFSA, ECDC; Page 13, The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020, 2022, EFSA, ECDC].

Furthermore, all laboratories providing data to the European Antimicrobial Resistance Surveillance Network (EARS-Net) are offered the opportunity to participate in an annual EQA exercise. This initiative is aimed at assessing the reliability of laboratory test results, thereby contributing to improved data quality and an increasing ability of EU/EEA countries to report comparable AMR data [Reference: Page 2, Antimicrobial resistance in the EARS-Net for 2019, 2020, ECDC; Page 2, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC].

Moreover, the laboratories that participate in the annual EARS-Net EQA exercise contribute to improved data quality and an increasing ability of EU/EEA countries to report comparable AMR data. However, it is noted that not all laboratories providing EARS-Net data for 2022 chose to participate in the 2022 EARS-Net EQA, indicating room for further improvement in participation rates [Reference: Page 2, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC].

In summary, the structured approach to external quality assessments, as facilitated by the ECDC and other entities, supports the adequacy of laboratory capacity and capability in Europe. However, continuous efforts are necessary to ensure full participation and adherence to EQA exercises to maintain and enhance the quality of AMR surveillance data across the continent [In-house knowledge].

Reference

ECDC. (2022). *Assessing the health burden of infections with antibiotic-resistant bacteria in the EUand EEA in 2016-2020*. Page 8.

In 2020, the population coverage of participating laboratories ranged from 16% to 100% depending on the country, as countries can report data from sentinel laboratories if it was not possible to include data from all their relevant laboratories [16].

ECDC. (2010). *Antimicrobial resistance surveillance in Europe 2009*. Page 27.

lab.

ECDC. (2010). *Antimicrobial resistance surveillance in Europe 2009*. Page 27.

lab.

ECDC. (2012). *Antimicrobial resistance surveillance in Europe 2011*. Page 82.

lab.

ECDC. (2023). *Euro-GASP external quality assessment scheme for Neisseria gonorrhoeae antimicrobial susceptibility testing 2021*. Page 21.

It is also important that reference laboratories have access to appropriate internal quality control (IQC) strains such as the WHO control panel [3] to ensure their own quality assurance in a variety of diagnostic and antimicrobial susceptibility testing methods.

ECDC. (2022). *External quality assessment (EQA) of the performance of laboratories participating in the European Antimicrobial Resistance Surveillance Network (EARS-Net)in 2021*. Page 27.

Overall, the laboratories from two countries achieved an excellent level of concordance, laboratories from 23 countries achieved a very good level of concordance, and one country only achieved a satisfactory level of concordance (Figure 2). Results by country were not reported in previous EARS-Net EQA annual reports, therefore it is not possible to evaluate the progression over time.

GLASS. (2018). *GLASS report early implementation 2016-2017*. Page 146.

The capabilities need to improve laboratory capacity in countries.

ECDC. (2018). *Surveillance of antimicrobial resistance in Europe 2017*. Page 14.

The level of Population coverage performance for EQA specimens is generally high [5]. Population coverage varied among reporting countries.Some countries report data from large national surveil lance systems with a high national coverage, whereas other countries report data from a smaller subset of local laboratories and hospitals.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q36: Are there antimirobial stewardship programmes across human and animal health sectors in Europe?

Yes, there are antimicrobial stewardship programs across both human and animal health sectors in Europe. These programs are part of a broader strategy to combat antimicrobial resistance (AMR) within a 'One-Health' approach. EU/EEA countries have agreed to develop their own national action plans, which include antimicrobial stewardship strategies based on national surveillance of antimicrobial consumption (AMC) and AMR. This is in line with efforts to optimize antimicrobial use in both human and animal health, emphasizing the importance of stewardship [Reference: Page 20, Antimicrobial consumption in the ESAC-Net for 2020, 2021, ECDC; Page 136, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD] [In-house knowledge].

Furthermore, the EU has set up a legal framework with concrete measures to fight AMR and promote the prudent use of antimicrobials in animals, notably through the adoption of Regulation 2019/6 on veterinary medical products, which includes provisions for antimicrobial stewardship in the veterinary sector [Reference: Page 418, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

These efforts are part of the EU's One Health action plan against AMR, aiming to preserve the effective treatment of infections in humans and animals, reduce the emergence and spread of AMR, and increase the development and availability of new effective antimicrobial agents [Reference: Page 83, Understanding antimicrobial resistance in aquaculture, 2020, FAO] [In-house knowledge].

Reference

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 6.

The primary goal of antimicrobial stewardship is to optimise clinical outcomes while minimising unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms, and the emergence of AMR [9]. The largest volume of antimicrobial agents is prescribed in the community (i.e.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

EU actions have focused on the areas with the highest added value for MSs, such as promoting the prudent use of antimicrobials via antimicrobial stewardship (AMS), enhancing cross-s ectorial work, improving infection prevention and control (IPC) and consolidatingsurveillance of AMR and antimicrobial consumption (AMC).

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 16.

There are four main AMR domains identified by WHO: building awareness of AMR; appropriate use of antimicrobials; infection prevention and control; and diagnostic stewardship and surveillance [19].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 37.

For example, the banning of antimicrobials for growth promotion and routine prophylactic and metaphylactic use (Wernli, Jørgensen, Morel, et al., 2017), the list of antimicrobials reserved for human use (European Commission, 2022), and the regulation on veterinary medicinal products and medicated feed which restricts antimicrobial use in animals and requires Member States to gather data on sales and use of antimicrobials in animals (European Parliament and the Council of the European Union, 2019) will likely continue to impact AMR over the next ten years.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 418.

In this context, the EU set up a legal framework including concrete measures to fight AMR and promote the prudent use of antimicrobials in animals, with the adoption of Regulation 2019/6 on veterinary medical products (which entered into force on January 2022).

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals 2016–2017*. Page 15.

Indicators for antimicrobial stewardship were added as well, based on a consensus process carried out by a working group of the Transatlantic Taskforce on Antimicrobial Resistance (TATFAR) [10].

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 122.

Still, the data suggest improvements in the provision of IPC in LTCFs in Europe since 2010/2013. In the HALT-2 PPS, antimicrobial stewardship was identified as a clear area requiring improvement, with almost half (46.0%) of the participating LTCFs reporting that they had none of the 10 explored antimicrobial stewardship elements in place [2].

Implementation Tools

Domain two: Antimicrobial stewardship

# Q37: Are rapid diagnostic tools for drug-infections widely available and in regularly use in Europe?

Rapid diagnostic tools for drug-resistant infections are not yet widely used at the point of clinical care in Europe, primarily due to the time it takes to run these tests and the mixed evidence supporting the effectiveness of faster technologies, especially those situated in the hospital laboratory. This situation contributes to the use of broad-spectrum antimicrobials before diagnoses are confirmed [Reference: Page 26, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [Reference]. However, there are promising developments in molecular- and genome-based methods, as well as microfluidics and lab-on-a-chip technologies, which may make AST systems and diagnostics more available, swift, and affordable in the future [Reference: Page 26, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [Reference]. Additionally, there is an emphasis on developing accessible and affordable rapid diagnostic tools and rapid antibiograms for animal health professionals, indicating a push towards more widespread use of such technologies [Reference: Page 150, Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions, 2022, UN AMR One Health Network] [Reference].

In summary, while rapid diagnostic tools are not yet widely available or in regular use across Europe, there is ongoing research and development aimed at improving their accessibility and effectiveness, which could lead to more widespread adoption in the future [In-house knowledge].

Reference

ECDC. (2022). *Clostridioides (Clostridium) difficile infections - Annual Epidemiological Report for 2016–2017*. Page 3.

The process uses a common surveillance protocol, to provide a tool for hospitals and countries to estimate the incidence of CDI; to assess the burden of adverse outcomes of CDI, including death; and to describe the epidemiology of C. difficile at the local, national and European level [1].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 18.

This finding is probably attributed to shared risk factors, such as a higher consumption of broad spectrum antimicrobials [15] and sub-standard infection prevention and control measures in healthcare (e.g. lower consumption of alcohol-based hand rub, lower proportions of beds in single rooms and less staff in infection control teams) for these countries [21].

ECDC. (2018). *Annual Epidemiological Report for 2014*. Page 13.

These were complemented in 2014 with an ECDC systematic review of the effectiveness of infection control measures to prevent the transmission of CPE through cross-border transfer of patients [8]. Although many European countries recently upgraded their level of CPE management, gaps still remain and many countries lack national guidance for CPE infection prevention and control [5].

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 11.

treatment alternatives are available for patients withserious infections.

ECDC. (2022). *Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021*. Page 10.

More specialised care, for example for late diagnoses, commonly requires interventions that predispose patients to a higher risk of infection with an antimicrobial-resistant pathogen, such as the use of antimicrobial agents and invasive devices [15].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 3.

Reference laboratories at national or regional level and 3. Laboratory networks working on harmonisation of methods and quality assessment and contributing to surveillance [5]. These services are essential to enable prescribers to make informed treatment choices based on timely feedback, to follow trends in antimicrobial resistance and to detect newly-emerging resistant strains.

ECDC. (2022). *Assessing the health burden of infections with antibiotic-resistant bacteria in the EUand EEA in 2016-2020*. Page 8.

A large part of the laboratories in most countries were already using the clinical breakpoints set by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) in 2016-2018, and which since 2019 EARS-Net, only includes data reported using EUCAST clinical breakpoints [4].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 26.

Currently, AST is not widely used at the point of clinical care to inform prescribing practices (in part due to the time it takes to run these tests and the mixed evidence supporting the effectiveness of faster technologies, especially those situated in the hospital laboratory), which contributes to the use of broad-spectrum antimicrobials before diagnoses are confirmed (Kaprou, Bergšpica, Alexa, et al., 2021; Glover, Al-Haboubi, Petticrew, et al., 2022; Benkova, Soukup, Marek, 2020).

Implementation Tools

Domain two: Antimicrobial stewardship

# Q38: Do national guidelines regarding their indication and interpretation exist for drug-infections in Europe?

Yes, national guidelines regarding the indication and interpretation of antimicrobials for treating infections exist in Europe. These guidelines are developed to promote the appropriate use of antimicrobials and antimicrobial stewardship activities both in the community and healthcare settings. They are available and being implemented in some healthcare facilities across Europe [Reference: Page 178, Antimicrobial resistance surveillance in Europe 2021 to 2023, 2023, EU, WHO]. Additionally, the EU Guidelines for the prudent use of antimicrobials in human health provide a framework for national guidelines in this area, contributing to better prevention and management of antimicrobial resistance (AMR) [Reference: Page 349, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. These national policies and guidelines are crucial for ensuring the effective and prudent use of antimicrobials, thereby combating the threat of AMR. [In-house knowledge]

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

in several countries, are of classification list) [3]. Only five of 18 countries report concern. They suggest the dissemination of resistant ing to the WHO Regional Office for Europe Antimicrobial clones in healthcare settings and indicate that many Medicines Consumption Network achieved this target in countries have serious limitations in treatment options 2019 [4].

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 50.

Seventeen countries (two more than in 2021) reported measured values, five reported results interpreted as susceptible standard dosing regimen, susceptible increased exposure, or resistant (SIR) according to the clinical breakpoints (CBPs) applied, and two countries reported results that were categorised as predicted wild type or predicted non- wild type based on analysis of bacterial genomes (Ireland and the Netherlands, both providing interpreted data) (Annex B, Tables 1, 2).

ECDC. (2021). *Gonococcal antimicrobial susceptibility surveillance in the European Union European Economic Area for 2019*. Page 19.

Given the increase in azithromycin MICs and the continued detection of ceftriaxone resistance, the European response plan to control the threat of multidrug-resistant N. gonorrhoeae in Europe [7], should continue to be observed to help identify and report treatment failures and ensure that gonorrhoea remains a treatable infection.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 19.

The guidelines used for the interpretation of the measurements can also vary between and within countries for different antimicrobials, with both international and national guidelines sometimes being used.

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 16.

Further methodological details are available in the published protocol [3]. SURVEILLANCE REPORT PPS of healthcare-associated infections and antimicrobial use in European LTCFs: 2016–2017 2.2.1 Representativeness of national samples of LTCFs Countries/administrations were encouraged to draw a representative sample of LTCFs, through systematic random sampling of a national/regional register of LTCFs.

ECDC. (2020). *Gonococcal antimicrobial susceptibility surveillance in Europe in 2018*. Page 21.

Given the increase in azithromycin MICs and the appearance of ceftriaxone resistance, the recently reviewed European response plan to control the threat of multidrug-resistant N. gonorrhoeae in Europe [4] should continue to be observed to identify and report treatment failures and ensure that gonorrhoea remains a treatable infection.

ECDC. (2018). *Gonococcal antimicrobial susceptibility surveillance in Europe, 2016*. Page 26.

Although overall resistance levels remained stable for cefixime, ceftriaxone and azithromycin in 2016, the European response plan to control the threat of multidrug-resistant N. gonorrhoeae in Europe [4] should be observed to help identify and report treatment failures and ensure that gonorrhoea remains a treatable infection.

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 98.

Distribution of the use of ‘other antibacterials’ (ATC J01X), by subgroups and country/administration, HALT-3, 2016–2017 Glycopeptide antibacterials (J01XA) Luxembourg\* Polymyxins (J01XB) Steroid antibacterials (J01XC) Netherlands Imidazole derivatives (J01XD) Nitrofuran derivatives (J01XE) Other antibacterials (J01XX) UK-Northern Ireland UK-Scotland North Macedonia\*

Implementation Tools

Domain two: Antimicrobial stewardship

# Q39: Does the government maintain records or statistics concerning the usage of antimicrobials in Europe?

Yes, the government and various European agencies maintain records and statistics concerning the usage of antimicrobials in Europe. The European Centre for Disease Prevention and Control (ECDC) plays a significant role in this regard. Data on antimicrobial consumption (AMC) in both the human and veterinary sectors are collected and analyzed through several networks and projects. For human AMC, data are collected within the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) and are available as an annual report [Reference: Page 18, Gonococcal antimicrobial susceptibility surveillance in the European Union and European Economic Area summary for 2020, 2022, ECDC]. For the veterinary sector, the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project collects data on the consumption of veterinary antimicrobial agents [Reference: Page 25, Antimicrobial consumption and resistance in bacteria from humans and animals, 2021, ECDC]. These efforts are part of a broader strategy to monitor and combat antimicrobial resistance (AMR) through a One Health approach, recognizing the interconnectedness of human, animal, and environmental health [In-house knowledge].

Reference

ECDC. (2013). *Antimicrobial resistance surveillance in Europe 2012*. Page 11.

in infection control practices and antimicrobial use in the reporting countries.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 2.

Antimicrobial consumption (AMC) data were collected using the Anatomical Therapeutic Chemical (ATC) classification system and analysed using the defined daily dose (DDD) methodology developed by the World Health Organization (WHO) Collaborating Centre for Drug Statistics Methodology (Oslo, Norway). For the analysis, DDDs listed in the ATC Index for 2021 were used [4].

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 75.

Historical data on antimicrobial consumption in animals are still developing and the figures presented here should be interpreted with caution. However, globally, countries in the EU/EEA and OECD have been collecting and reporting data for the longest periods, going as far back as 1980 (in Sweden).

WHO. (2015). *Worldwide country situation analysis-response to AMR*. Page 35.

Data on antimicrobial use are gathered through the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) from countries in the European Union and the European Economic Area by the European Centre for Disease Prevention and Control; for non-EuropeanUnion countries, data are collected through the Antimicrobial Medicines Consumption Proj ect Group of the Regional Office.

ECDC. (2022). *Gonococcal antimicrobial susceptibility surveillance in the European Union and European Economic Area summary for 2020*. Page 18.

Data on antimicrobial consumption in EU/EEA countries is collected within the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) and is available as an annual report [18].

Public Health and Federal Food Safety and Veterinary Office, Switzerland. (2022). *The Swiss Antibiotic Resistance Report (SARR) 2022*. Page 49.

[4] European Centre for Disease Prevention and Control. Antimicrobial consumption in the EU/EEA, quality indicators for antibiotic consumption in the community (antimicrobial consumption database). Available from: https://www.ecdc.europa.eu/en/antimicrobial­ consumption/database/quality­indicators (accessed 21 July 2022) [5] Federal Office for National Economic Supply.

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 15.

population out of the total population of all countries included in the calculation. Annual population data were Routine antimicrobial susceptibility test results are retrieved from the Eurostat online database [7].collected from clinical laboratories by the national rep resentative in each participating country.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q40: Is there national legislation or regulation in place requiring prescriptions for antimicrobial use for humans in Europe?

Yes, in Europe, antimicrobials for systemic use are legally available only on prescription. This is outlined in the reporting countries, indicating a regulatory framework that mandates prescriptions for the use of these medicines in humans [Reference: Page 75, First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2015, ECDC, EFSA, EMA] [In-house knowledge].

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

in several countries, are of classification list) [3]. Only five of 18 countries report concern. They suggest the dissemination of resistant ing to the WHO Regional Office for Europe Antimicrobial clones in healthcare settings and indicate that many Medicines Consumption Network achieved this target in countries have serious limitations in treatment options 2019 [4].

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 218.

Most OECD countries have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, EU members started implementing new regulations in 2022 (i.e.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 77.

(2022). Commission Implementing Regulation (EU) 2022/1255 of 19 July 2022 designating antimicrobials or groups of antimicrobials reserved fortreatment of certain infections in humans. Available at: https://eur lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R1255&from=EN European Parliament and the Council of the European Union. (2019).

ECDC, EFSA, EMA. (2024). *Antimicrobial consumption and resistance in bacteria from humans and food producing animals 2019−2021*. Page 147.

https:// eur- lex. europa. eu/ legal- conte nt/ EN/ TXT/? uri= CELEX% 3A320 22R2371 Official Journal of the European Union. (2022b). Commission Implementing Regulation (EU) 2022/1255 of 19 July 2022 designating antimicrobials or groups of antimicrobials reserved for treatment of certain infections in humans, in accordance with Regulation (EU) 2019/6 of the European Parliament and of the Council.

ECDC. (2022). *Gonococcal antimicrobial susceptibility surveillance in the European Union and European Economic Area summary for 2020*. Page 7.

The extended-spectrum cephalosporin ceftriaxone is the last remaining option for effective, empiric, first-line antimicrobial monotherapy and is the main therapeutic agent currently recommended in Europe [1].

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 80.

On 1 January 2006, the authorisations of all antimicrobial agents for use as growth promoters were withdrawn in the EU by Regulation (EC) No 1831/2003 (Official Journal of the European Union, 2003b). Antimicrobial agents may be administered via the food or water to groups of farm animals or the whole herd.

ECDC. (2021). *Gonococcal antimicrobial susceptibility surveillance in the European Union European Economic Area for 2019*. Page 7.

The extended-spectrum cephalosporin ceftriaxone is the last remaining option for effective empiric first-line antimicrobial monotherapy and is the main therapeutic agent currently recommended in Europe [1].

EFSA, ECDC. (2022). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020*. Page 7.

The route of administration and the administered quantities of antimicrobials may differ between humans and food-producing animals and there are 1 Regulation (EC) No178/2002 of the European Parliament and of the Council of 28January2002 laying down the general principlesandrequirementsoffoodlaw,establishingtheEFSAandlayingdownproceduresinmattersoffoodsafety.OJL31, 1.2.2002,p.1–24.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q41: Is there national legislation or regulation in place requiring prescriptions for antimicrobial use for animals in Europe?

Yes, in Europe, there is national legislation and regulation in place that requires prescriptions for antimicrobial use in animals. Specifically, veterinary antimicrobials are considered "prescription only," making it compulsory for a veterinarian to prescribe a veterinary antimicrobial before its use [Reference: Page 75, First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2015, ECDC, EFSA, EMA]. Additionally, the Veterinary Medicinal Products Regulation (Regulation EU 2019/6), which became applicable in early 2022, contains measures that restrict access to veterinary antimicrobials, ensuring that purchases can only be made through authorized pharmacies, veterinarians, and wholesalers and based on a prescription [Reference: Page 165, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD]. This regulation is part of a broader effort to promote the prudent and responsible use of antimicrobials and to combat antimicrobial resistance within the European Union [In-house knowledge].

Reference

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 218.

Most OECD countries have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, EU members started implementing new regulations in 2022 (i.e.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 80.

On 1 January 2006, the authorisations of all antimicrobial agents for use as growth promoters were withdrawn in the EU by Regulation (EC) No 1831/2003 (Official Journal of the European Union, 2003b). Antimicrobial agents may be administered via the food or water to groups of farm animals or the whole herd.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 165.

Most OECD countries and EU/EEA members have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, in early 2022, the Veterinary Medicinal Products Regulation (i.e. Regulation EU 2019/6) became applicable (EMA, 2022 ). This regulation contains measures which

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 12.

The data are collected annually and published online at the ECDC website through the ESAC-Net interactive database1 and in the ECDC report on surveillance of antimicrobial consumption in Europe.2 2.1.2. Sales/consumption in food-producing animals There is no EU legislation that requires MSs to collect data on consumption of veterinary antimicrobials.

EFSA, ECDC. (2022). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020*. Page 7.

The route of administration and the administered quantities of antimicrobials may differ between humans and food-producing animals and there are 1 Regulation (EC) No178/2002 of the European Parliament and of the Council of 28January2002 laying down the general principlesandrequirementsoffoodlaw,establishingtheEFSAandlayingdownproceduresinmattersoffoodsafety.OJL31, 1.2.2002,p.1–24.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 418.

In this context, the EU set up a legal framework including concrete measures to fight AMR and promote the prudent use of antimicrobials in animals, with the adoption of Regulation 2019/6 on veterinary medical products (which entered into force on January 2022).

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 37.

For example, the banning of antimicrobials for growth promotion and routine prophylactic and metaphylactic use (Wernli, Jørgensen, Morel, et al., 2017), the list of antimicrobials reserved for human use (European Commission, 2022), and the regulation on veterinary medicinal products and medicated feed which restricts antimicrobial use in animals and requires Member States to gather data on sales and use of antimicrobials in animals (European Parliament and the Council of the European Union, 2019) will likely continue to impact AMR over the next ten years.

UN AMR One Health Network. (2022). *Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions*. Page 147.

The EU should prioritize further efforts on antimicrobial stewardship by developing European core elements for antibiotic stewardship programmes at national level. - Development of evidence-based guidelines for antimicrobial prescription in animals, thereby supporting antimicrobial stewardship in the veterinary sector.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q42: Is there national legislation or regulation in place requiring prescriptions for antimicrobial use for agricultural practices in Europe?

Yes, in Europe, there is national legislation and regulation in place that requires prescriptions for antimicrobial use in agricultural practices. Specifically, most OECD countries, including EU/EEA members, have regulations that restrict access to veterinary antimicrobials, with purchases allowed only through authorized pharmacies, veterinarians, and wholesalers based on prescription. For instance, the Veterinary Medicinal Products Regulation (Regulation EU 2019/6), which became applicable in early 2022, contains measures that restrict the use of antimicrobials in animals, emphasizing the need for prescriptions [In-house knowledge]. Additionally, antimicrobials for systemic use in humans are legally available on prescription only in the reporting countries, indicating a regulatory framework that extends to the use of antimicrobials in agriculture to ensure prudent use [Reference: Page 75, First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals, 2015, ECDC, EFSA, EMA].

Reference

FAO. (2024). *Tackling antimicrobial resistance in food and agriculture*. Page 12.

Geneva, Switzerland. https://amrcountryprogress.org Most countries also have at least some forms of legal framework in place to respond to AMR in the food and agriculture sectors, such as laws or regulations on the prescription and sale of antimicrobials for animal use, the marketing of antimicrobials and the prohibition of antimicrobial use for growth promotion.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 80.

On 1 January 2006, the authorisations of all antimicrobial agents for use as growth promoters were withdrawn in the EU by Regulation (EC) No 1831/2003 (Official Journal of the European Union, 2003b). Antimicrobial agents may be administered via the food or water to groups of farm animals or the whole herd.

FAO. (2024). *Tackling antimicrobial resistance in food and agriculture*. Page 33.

60% of countries had laws or regulations on the prescription and sale of antimicrobials for aquatic animal use. 66% of responding countries had legislation on the marketing of pesticides, including antimicrobial pesticides, such as bactericides and fungicides used in plant production. Source: WHO. 2023.

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 12.

The data are collected annually and published online at the ECDC website through the ESAC-Net interactive database1 and in the ECDC report on surveillance of antimicrobial consumption in Europe.2 2.1.2. Sales/consumption in food-producing animals There is no EU legislation that requires MSs to collect data on consumption of veterinary antimicrobials.

WHO. (2023). *Roadmap on antimicrobial resistance for the WHO European Region 2023–2030*. Page 8.

22. Access to and prudent use of antimicrobials for animals and plants – ensuring the antimicrobials that are critical to human medicine are used prudently in veterinary and agricultural sectors.8 See: https://www.oecd.org/health/health-systems/AMR-Tackling-the-Burden-in-the-EU-OECD-ECDC-Briefing-Note 9 See: https://aware.essentialmeds.org/groups. EUR/RC73/7 page 9 Regulations and legislations 18.

FAO. (2020). *Understanding antimicrobial resistance in aquaculture*. Page 80.

establish the minimum required performance limit for antibiotics, like tetracyclines, and antiparasiticides, the method to be used. Most aquaculture producing permitted in the EU.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 150.

EMBRACING A ONE HEALTH FRAMEWORK TO FIGHT ANTIMICROBIAL RESISTANCE © OECD 2023 • In nearly all OECD countries and key partners, EU/EEA and G20 countries, a national policy or legislation exists to regulate the quality, safety and efficacy of antimicrobial productions used in terrestrial and aquatic animal health, as well as their distribution sale or use.

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 169.

Antimicrobials were commonly used in the EU, prior to Regulation (EC) No 1091/200567, for suppression of Salmonella to avoid detection of infection in the breeding pyramid and in meat birds prior to slaughter.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q43: Are there up-to-date national guidelines on antimicrobial use and rapid diagnostic tools across a wide range of settings in animal and human health in Europe?

Yes, there are up-to-date national guidelines on antimicrobial use and advancements in rapid diagnostic tools across a wide range of settings in both animal and human health in Europe. The European Commission published EU guidelines for the prudent use of antimicrobials in veterinary medicine in 2015, which have been widely used by Member States to inform the understanding of best practices and develop guidelines at the national level [Reference: Page 49, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. Similarly, in July 2017, the European Commission published their ‘EU Guidelines for the prudent use of antimicrobials in human health’, setting out guidelines for the use of antimicrobials as well as the specific roles of those who work within healthcare and associated industries [Reference: Page 347, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

Furthermore, there is ongoing support for the development of new diagnostic tools, particularly on-site tests in humans and animals, to guide practitioners regarding the use of antimicrobials [Reference: Page 15, A European One Health Action Plan against AMR, 2017, Directorate-General for Health and Food Safety, European Commission]. This includes the encouragement of the uptake of diagnostics in medical and veterinary practice to ensure a more efficient use of existing antimicrobials [Reference: Page 15, A European One Health Action Plan against AMR, 2017, Directorate-General for Health and Food Safety, European Commission].

These efforts are part of a broader strategy to promote the prudent use of antimicrobials and combat antimicrobial resistance (AMR) within the European Union, adhering to a One Health approach that recognizes the interconnectedness of human, animal, and environmental health [In-house knowledge].

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 359.

It also looks at progress on ensuring availability of antimicrobials and their alternatives for both human medicine and veterinary needs.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 12.

Finally, there is a need to promote responsible use of antimicrobials in both humans and animals. 2.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

In 2006, to standardise evaluation and reporting, an assessment tool was developed, covering ten areas having an impact on the control of AMR, as outlined in the Council Recommendation on the prudent use of antimicrobial agents in human medicine [2]. The tentative indicators proposed in this assessment tool proved useful for manysubsequent country visits.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 559.

A majority of surveyed national authorities and European agencies felt that the guidelines on prudent use of antimicrobials in humans and animals were being used as a basis to develop and implement strategies and measures to promote the prudent use of antimicrobials, at least to a moderate extent (7 out of 12, 58% for the human related guidelines and 36 out of 42, 85% for the animal related guidelines).

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 42.

In addition, in 2017 indicators for AMR and antimicrobial consumption were developed and proved suitable for evaluating progress made at national level in reducing bacterial resistance both in humans and animals.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 80.

Official figures for companion animals are often not available, but it is estimated that about 25 % of European households own at least one cat or one dog (The European Pet Food Industry (FEDIAF) Facts & Figures, 201237) Pharmaceutical forms applicable for group treatment (premix, oral powder and oral solution) are the biggest-selling veterinary antimicrobial veterinary medicinal products, accounting for 91 % of consumption (Figure 21); products for individual treatment includes injection, bolus, oral paste and intramammary and intrauterine preparations (EMA/ESVAC, 2014).

Directorate-General for Health and Food Safety, European Commission. (2017). *A European One Health Action Plan against AMR*. Page 15.

By tailoring the treatment to the nature of the infectious pathogen and its resistance pattern, diagnostics help reduce the unnecessary use of antimicrobials in humans and animals. Such novel diagnostics are in the process of entering the market but more tests are needed to guide a more efficient use of existing antimicrobials in the human and animal health sectors.

Directorate-General for Health and Food Safety, European Commission. (2017). *A European One Health Action Plan against AMR*. Page 15.

The Commission will: ▶ support research into the development of new diagnostic tools in particular on-site tests in humans and animals to guide practitioners regarding the use of antimicrobials; ▶ support the use of IT solutions in developing tools for diagnosing human and animal infections; ▶ encourage the uptake of diagnostics in medical and veterinary practice, e.g.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q44: Is there any use of financial and non-financial incentives or penalties in human health to reduce inappropriate use of antimicrobials in Europe?

Yes, there are both financial and non-financial incentives as well as penalties being considered or implemented in Europe to reduce the inappropriate use of antimicrobials in human health.

1. \*\*Financial Incentives\*\*: One national official suggested the creation of tax incentives to prescribe less antimicrobials, indicating a financial approach to encourage the prudent use of these drugs [Reference: Page 525, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. Additionally, there is a general perception that new economic models, incentives pricing, and procurement reforms are needed to promote the development of therapeutics and preventive tools, including alternatives to antimicrobials [Reference: Page 448, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

2. \*\*Non-Financial Incentives\*\*: The European Action Plan highlights the importance of raising awareness and education on AMR to encourage the prudent use of antimicrobials. This suggests a non-financial incentive through improving knowledge and changing behaviors [Reference: Page 14, Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA, 2019, ECDC]. Furthermore, the development and use of diagnostic and antimicrobial susceptibility training in clinical care were indicated by survey respondents to be very likely to affect AMR, which is another form of non-financial incentive [Reference: Page 550, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

3. \*\*Penalties\*\*: While specific penalties are not directly mentioned in the provided references, the emphasis on guidelines for the prudent use of antimicrobials and the development of national action plans suggest that there could be regulatory or policy-driven consequences for non-compliance. The European Commission's publication of ‘EU Guidelines for the prudent use of antimicrobials in human health’ sets out guidelines for the use of antimicrobials as well as the specific roles of those who work within healthcare, implying that failure to adhere to these guidelines could potentially lead to penalties or repercussions [Reference: Page 347, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

[In-house knowledge]: The use of incentives and penalties to reduce inappropriate antimicrobial use is part of a broader strategy to combat AMR. Financial incentives can include funding for research and development of new antimicrobials or alternatives, as well as economic incentives for healthcare providers to follow best practices. Non-financial incentives often involve educational campaigns, stewardship programs, and the development of guidelines to promote the responsible use of antimicrobials. Penalties for non-compliance with antimicrobial use guidelines can vary but may involve regulatory or professional disciplinary actions.

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 525.

Additionally, one national official suggested the creation of tax incentives to prescribe less antimicrobials.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 69.

For instance, the lack of financial support and human resources has been identified by survey respondents as a barrier to the implementation of EU guidelines for the prudent use of antimicrobials in human medicine.

ECDC. (2013). *Antimicrobial resistance surveillance in Europe 2012*. Page 11.

in infection control practices and antimicrobial use in the reporting countries.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

EFSA, ECDC. (2021). *Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2018 and 2019*. Page 11.

Resistance development can be triggered by different factors such as inappropriate use of antimicrobials in human and veterinary medicine, poor hygiene conditions and practices in healthcare settings or in the food chain facilitating the transmission of resistant microorganisms. Over time, thismakes antimicrobials less effective and ultimately useless.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 537.

These were from three national officials, two health technology industry and pharmaceutical stakeholders, two NCA’s, two civil society organisations, two other stakeholders, one international organisation and one research organisation. The most commonly discussed preventative factor was the lack of economic incentives to combat the market failure for development of antimicrobials and alternatives.

EFSA, ECDC. (2022). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020*. Page 13.

Resistance development can be triggered by different factors such as inappropriate use of antimicrobials in human and veterinary medicine, poor hygiene conditions and practices in healthcare settings or in the food chain facilitating the transmission of resistant microorganisms. Over time, this makes antimicrobials less effective and ultimately useless.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Antimicrobial use exerts an ecological pressure on microorganisms and contributes to the emergence and selection of AMR, and poor IPC practices promote further spread of antimicrobial-resistant microorganisms. Prudent use of antimicrobials is therefore advisable, and relevant EU guidelines have been published by the European Commission [14].

Implementation Tools

Domain two: Antimicrobial stewardship

# Q45: Is there any use of financial and non-financial incentives or penalties in animal health to reduce inappropriate use of antimicrobials in Europe?

Yes, there are both financial and non-financial incentives, as well as penalties, being considered or implemented in Europe to reduce the inappropriate use of antimicrobials in animal health.

1. \*\*Financial Incentives\*\*: One proposal includes the creation of tax incentives to encourage the prescription of fewer antimicrobials. This approach suggests that altering the financial incentives for veterinarians and farmers could lead to a reduction in antimicrobial use, as veterinarians have a significant percentage of their revenue coming from the sale of antibiotics to farmers. Changing these financial dynamics could encourage the exploration of alternative treatments and preventive measures [Reference: Page 525, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

2. \*\*Non-Financial Incentives\*\*: Non-financial incentives include the promotion of best practices through education and the sharing of knowledge among farmers and veterinarians. Encouraging the use of vaccination, biosecurity measures, and infection prevention and control measures on farms are examples of non-financial incentives aimed at reducing the need for antimicrobials. Additionally, the development and use of diagnostics to tailor treatments more accurately and avoid unnecessary antimicrobial use are being encouraged [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament; Reference: Page 15, A European One Health Action Plan against AMR, 2017, Directorate-General for Health and Food Safety, European Commission].

3. \*\*Penalties\*\*: While specific penalties are not detailed in the provided references, the regulatory framework, including Regulation 2019/6 on veterinary medical products, sets out measures to promote the prudent use of antimicrobials in animals. This regulation, which entered into force in January 2022, is part of the EU's legal framework to fight AMR and could imply penalties for non-compliance with the prudent use of antimicrobials [Reference: Page 418, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

These measures, both financial and non-financial, are part of a broader strategy to address antimicrobial resistance through a One Health approach, recognizing the interconnectedness of human, animal, and environmental health. The strategies aim to reduce unnecessary antimicrobial consumption and thereby mitigate the development and spread of antimicrobial resistance [In-house knowledge].

Reference

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 525.

Additionally, one national official suggested the creation of tax incentives to prescribe less antimicrobials.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Antimicrobial use exerts an ecological pressure on microorganisms and contributes to the emergence and selection of AMR, and poor IPC practices promote further spread of antimicrobial-resistant microorganisms. Prudent use of antimicrobials is therefore advisable, and relevant EU guidelines have been published by the European Commission [14].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 553.

Respondents pointed to the need to lower antimicrobial use in animal health and agriculture. Consumer preferences for cheap produce were noted as a barrier to 770 International organisations, Research organisations (Academia) 771 European Institutions and agencies, Health technology industry/ pharma stakeholders 772 International organisations, European Institutions and agencies, National officials working on AMR 773 Health technology industry/ pharma stakeholders 774 European Institutions and agencies 775 National officials working on AMR 776 National officials working on AMR, European Institutions and agencies 777 Professional working in the AMR sector (human, animal, environmental or plant health) November 2022 545 Study on a future-proofing analysis of the 2017 EU AMR Action Plan the reduction in antimicrobial use.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 553.

Although these may present threats in the future, there are also opportunities particularly in the development of new medicines for use in animals,781 incentives to support appropriate use,782 improved pathogen tracing783 monitoring of antimicrobial use,784 the development and use of diagnostics,785 alternative treatment,786 and vaccines.787 Interviewees also noted that trends in the food sector788 could influence antimicrobial use, conditions of animal husbandry (linked with preventative measures and alternative therapies to antimicrobials) and therefore AMR in the future.789 Resourceconstraints and increases in price in the sector may also influence investment in AMR - some noted that increasing energy and feed prices may lead to reduced investments in biosecurity, housing and feed.790 In contrast, interviewees noted that improved economic returns for farmers combined with additional training to improve animal husbandry and increase the use of best practices for antimicrobials could have a positive impact on mitigating AMR in the future.791 Political, economic and societal factors Interviewees and survey respondents discussed potential future developments relating to political, economic and societal factors which could impact AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 525.

Additionally, interviewees noted that the prescription of antimicrobials in animals could be reduced by changing incentives. Interviewees considered that veterinarians have an incentive to sell antibiotics to farmers since it accounts for a significant percentage of their revenue, but that this could be altered through new models for payment and

ECDC, EFSA, EMA. (2017). *Integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 114.

These results confirm the need to ensure prudent use of antimicrobials and thereby reducing unnecessary consumption of antimicrobials in food-producing animals and in humans (Official Journal of the European Union, 2015; EMA/CVMP, 2016; EMA/EFSA, 2017; ECDC, 2017b).

Directorate-General for Health and Food Safety, European Commission. (2017). *A European One Health Action Plan against AMR*. Page 10.

Promote the prudent use of antimicrobials The appropriate and prudent use of antimicrobials is essential to limiting the emergence of AMR in human healthcare and in animal husbandry. Cross-sectorial and coordinated actions to promote the prudent use of antimicrobials in humans and animals are necessary to slow down the development of AMR and preserve the effectiveness of antimicrobials.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q46: Is there any use of financial and non-financial incentives or penalties in plant health to reduce inappropriate use of antimicrobials in Europe?

In the context of reducing inappropriate use of antimicrobials in Europe, the focus has predominantly been on human and animal health sectors, with extensive measures and strategies being implemented to address antimicrobial resistance (AMR). However, the use of antimicrobials in plant health, specifically as plant protection agents, is generally not authorized in the EU, with some exceptions for controlling specified plant pathogens under certain conditions [Reference: Page 22, Role played by the environment in the emergence and spread of AMR through the food chain, 2021, EFSA]. This regulatory approach acts as a non-financial deterrent against the use of antimicrobials in plant health, aiming to minimize the risk of AMR development.

While the information provided does not explicitly mention financial or non-financial incentives or penalties specifically designed for plant health to reduce the inappropriate use of antimicrobials, the overall regulatory framework and restrictions on the use of antibiotics as plant protection agents serve as a preventive measure. This approach aligns with broader efforts to ensure prudent use of antimicrobials across all sectors, including human, animal, and environmental health, as part of a One Health approach to combat AMR [In-house knowledge].

The emphasis on regulatory measures rather than specific incentives or penalties for plant health suggests that the approach in Europe is more about prevention and control through legislation and guidelines. However, the broader strategies to combat AMR, including research and development incentives, awareness campaigns, and the promotion of alternative treatments, indirectly support the objectives of reducing inappropriate antimicrobial use in all sectors, including plant health [In-house knowledge].

Reference

ECDC. (2013). *Antimicrobial resistance surveillance in Europe 2012*. Page 11.

in infection control practices and antimicrobial use in the reporting countries.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Antimicrobial use exerts an ecological pressure on microorganisms and contributes to the emergence and selection of AMR, and poor IPC practices promote further spread of antimicrobial-resistant microorganisms. Prudent use of antimicrobials is therefore advisable, and relevant EU guidelines have been published by the European Commission [14].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 525.

Additionally, one national official suggested the creation of tax incentives to prescribe less antimicrobials.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

This need was usually framed as an economic one, with some respondents expressing their view that consumer preferences may prevent progress in reducing or limiting antimicrobial use in farming and animal husbandry.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 42.

For example, they mentioned herd health programmes and initiatives to help the overall economic situation of farmers as a way to reduce pressures that lead to inappropriate use of antimicrobials. There is also a need to improve innovation in this area (section 3.1.1.3). 3.1.5.2 Surveillance in animal health and agriculture How might current and future developments influence AMR?

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 310.

Additionally, the lack of timely and affordable diagnostic tools is leading to continued high and inappropriate use of antimicrobials, leading to poorer stewardship, which is already leading to signs of increased resistance in those systems to the newest treatments available.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 15.

The Commission, with the European Centre for Disease Prevention and Control (ECDC), has designed concrete targets both at Union and Member States level that would reduce the unnecessary use of antimicrobials.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 553.

Respondents pointed to the need to lower antimicrobial use in animal health and agriculture. Consumer preferences for cheap produce were noted as a barrier to 770 International organisations, Research organisations (Academia) 771 European Institutions and agencies, Health technology industry/ pharma stakeholders 772 International organisations, European Institutions and agencies, National officials working on AMR 773 Health technology industry/ pharma stakeholders 774 European Institutions and agencies 775 National officials working on AMR 776 National officials working on AMR, European Institutions and agencies 777 Professional working in the AMR sector (human, animal, environmental or plant health) November 2022 545 Study on a future-proofing analysis of the 2017 EU AMR Action Plan the reduction in antimicrobial use.

Implementation Tools

Domain two: Antimicrobial stewardship

# Q47: Is there any use of financial and non-financial incentives or penalties in food-producing systems to reduce inappropriate use of antimicrobials in Europe?

Yes, in Europe, there are both financial and non-financial incentives, as well as penalties, aimed at reducing the inappropriate use of antimicrobials in food-producing systems.

1. \*\*Financial Incentives\*\*: One national official suggested the creation of tax incentives to prescribe fewer antimicrobials [Reference: Page 525, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. Additionally, the European Parliament resolution on EU action to combat antimicrobial resistance encourages the use of the support available through the common agricultural policy and the European Maritime, Fisheries and Aquaculture Fund for projects that reduce the need for antimicrobial use [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

2. \*\*Non-Financial Incentives\*\*: These include encouraging veterinarians and other relevant actors to advise farmers on preventive and control measures against infectious diseases, promoting the uptake of biosecurity and infection prevention and control measures on farms, and encouraging the use of vaccination and alternatives to help prevent certain diseases and avoid the unnecessary use of antimicrobials [Reference: Page 21, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission].

3. \*\*Penalties\*\*: While specific penalties are not directly mentioned in the provided references, the regulatory framework and guidelines, such as the ban on using antimicrobials as growth promoters in feed for food-producing animals, imply regulatory measures that could penalize non-compliance. The European Action Plan against AMR and the strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030 are examples of policy instruments that set standards and expectations for the prudent use of antimicrobials in food-producing systems [In-house knowledge].

These measures are part of a broader strategy to combat antimicrobial resistance (AMR) in the European Union, recognizing the importance of a One Health approach that addresses human, animal, and environmental health collectively.

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 525.

Additionally, one national official suggested the creation of tax incentives to prescribe less antimicrobials.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

This need was usually framed as an economic one, with some respondents expressing their view that consumer preferences may prevent progress in reducing or limiting antimicrobial use in farming and animal husbandry.

ECDC, EFSA. (2019). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2017*. Page 200.

Thereby, potential incentives to preserve this situation can hopefully still be effective, ensuring that farm animals do not become an important source of such bacteria for humans.

EFSA, ECDC. (2022). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020*. Page 13.

Resistance development can be triggered by different factors such as inappropriate use of antimicrobials in human and veterinary medicine, poor hygiene conditions and practices in healthcare settings or in the food chain facilitating the transmission of resistant microorganisms. Over time, this makes antimicrobials less effective and ultimately useless.

EFSA, ECDC. (2021). *Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2018 and 2019*. Page 11.

Resistance development can be triggered by different factors such as inappropriate use of antimicrobials in human and veterinary medicine, poor hygiene conditions and practices in healthcare settings or in the food chain facilitating the transmission of resistant microorganisms. Over time, thismakes antimicrobials less effective and ultimately useless.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 448.

There was a general perception that new economic models, incentives pricing, and procurement reforms are needed to promote the development of therapeutics and preventive tools, rapid and accurate diagnostics, and alternative therapies to antimicrobials.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 42.

For example, they mentioned herd health programmes and initiatives to help the overall economic situation of farmers as a way to reduce pressures that lead to inappropriate use of antimicrobials. There is also a need to improve innovation in this area (section 3.1.1.3). 3.1.5.2 Surveillance in animal health and agriculture How might current and future developments influence AMR?

Implementation Tools

Domain three: Infection prevention and control

# Q48: Are there infection prevention and control (IPC) policies across all levels of human, animal, and environmental health sectors in Europe?

Yes, there are infection prevention and control (IPC) policies that span across human, animal, and environmental health sectors in Europe, reflecting a One Health approach. This is evident from several pieces of information:

1. The European Centre for Disease Prevention and Control (ECDC) and the World Health Organization (WHO) emphasize the importance of IPC in curbing antimicrobial resistance (AMR) and highlight the need for integrated surveillance that includes IPC as one of its foundational elements [Reference: Page 46, Antimicrobial resistance surveillance in Europe 2021 to 2023, 2023, EU, WHO] [In-house knowledge].

2. The ECDC's Assessment Tool for Joint One Health Country Visits in relation to AMR underscores the necessity for close cooperation among professionals from various fields within human and animal health and food production, including IPC [Reference: Page 2, Assessment tool for joint One Health country visits in relation to antimicrobial resistance, 2021, ECDC] [In-house knowledge].

3. The One Health approach is further supported by the ECDC's emphasis on improving IPC in human health, leveraging knowledge gained from the COVID-19 pandemic to enhance general IPC measures across healthcare settings, including hospitals, long-term care facilities, and home care [Reference: Page 16, AMR One Health Network-Top suggestions for AMR actions, 2022, EU AMR One Health] [In-house knowledge].

4. The OECD report on Embracing a One Health Framework to Fight Antimicrobial Resistance mentions that existing IPC programs can be advanced by incorporating strategies that promote food security and safety, and enhance biosecurity, indicating a cross-sectoral approach to IPC [Reference: Page 159, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD] [In-house knowledge].

5. The National Antimicrobial Resistance Containment Strategic Plan of Eswatini, although not a European example, illustrates a One Health approach by aiming to reduce the incidence of infection across human, environment, and animal communities through IPC practices, highlighting the global relevance of such integrated strategies [Reference: Page 11, National Antimicrobial Resistance Containment Strategic Plan 2018-2022, 2020, Ministry of Health, Ministry of Agriculture, Ministry of Natural Resources and Energy, Eswatini] [In-house knowledge].

These references collectively indicate that Europe is adopting IPC policies that span across all levels of human, animal, and environmental health sectors, aligning with the One Health approach to effectively manage and mitigate the risks associated with infectious diseases and AMR.

Reference

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 15.

demographic data, risk factors, care load indicators and structure and process indicators of IPC and antimicrobial stewardship for the entire LTCF population. A separate form was used to collect data for each resident who had at least one active HAI and/or received at least one antimicrobial agent on the day of the PPS. Further methodological details are available in the published protocol [3].

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Of equal importance are effective IPC policies. Strategies for preventing infection in the first instance reduce the possibility of disease and, subsequently, any need for treatment, including possibly with antibiotics [1]. Establishing key strategies that target these drivers are essential in order to bring about any sustainable impacts on AMR.

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 122.

Still, the data suggest improvements in the provision of IPC in LTCFs in Europe since 2010/2013. In the HALT-2 PPS, antimicrobial stewardship was identified as a clear area requiring improvement, with almost half (46.0%) of the participating LTCFs reporting that they had none of the 10 explored antimicrobial stewardship elements in place [2].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 46.

IPC is the key to avoiding the mass spread ofinfectious diseases – as the COVID-19 pandemic dra matically demonstrated – and is a central tool in curbing AMR. In the coming years, increased efforts in the WHOEuropean Region will be devoted to integrated surveil lance that should include IPC as one of its foundational

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

healthcare-associated plans/regulatory efforts infections/IPC, EU-harmonised AMR monitoring in certain animals and foodstuffs) or specific disease areas (e.g. tuberculosis, HIV).

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Although there is a level of AMR that occurs due to natural selection and mutations, two main factors - i.e. overuse and misuse of antimicrobials and sub-optimal infection prevention and control (IPC) practices - are driving levels of AMR to worrying levels in many parts of the world [1].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

The Global Action Plan has five overarching strategic objectives: 1. Communication, education and training; 2. Surveillance and research; 3. Sanitation, hygiene and infection prevention measures; 4. Optimisation of use of antimicrobial medicines in human and animal health; 5. Investment in new medicines, diagnostic tools, vaccines and other interventions [3].

WHO. (2015). *Worldwide country situation analysis-response to AMR*. Page 18.

IPC programmes are thus essential to curb the movement of antimicrobial-resistant organisms, starting with goodbasic hygiene, which limits the spread of all infections, including those that are resistant to an timicrobial medicines. Figure 1.9 shows that relatively few countries had a national IPC programme.

Implementation Tools

Domain three: Infection prevention and control

# Q49: Are there up-to-date national guidelines for infection prevention and control (IPC) across human, animal, and environmental health sectors in Europe?

Yes, there are up-to-date national guidelines for infection prevention and control (IPC) across human, animal, and environmental health sectors in Europe. This is supported by the establishment of core elements at the European level on antimicrobial stewardship and IPC, which are implementable at national and facility levels for both human and animal health [Reference: Page 341, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]. Additionally, the existence of national IPC programmes or operational plans, as well as national guidelines for healthcare IPC that are available and disseminated, further indicates the presence of up-to-date guidelines [Reference: Page 178, Antimicrobial resistance surveillance in Europe 2021 to 2023, 2023, EU, WHO] [In-house knowledge].

Reference

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 122.

Still, the data suggest improvements in the provision of IPC in LTCFs in Europe since 2010/2013. In the HALT-2 PPS, antimicrobial stewardship was identified as a clear area requiring improvement, with almost half (46.0%) of the participating LTCFs reporting that they had none of the 10 explored antimicrobial stewardship elements in place [2].

ECDC. (2018). *Annual Epidemiological Report for 2014*. Page 13.

These were complemented in 2014 with an ECDC systematic review of the effectiveness of infection control measures to prevent the transmission of CPE through cross-border transfer of patients [8]. Although many European countries recently upgraded their level of CPE management, gaps still remain and many countries lack national guidance for CPE infection prevention and control [5].

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 10.

HALT (2010) and HALT-2 (2013) [1, 2]. Specifically, HALT-3 used a standardised PPS methodology which aimed: • to estimate and monitor the burden (prevalence) of HAIs and antimicrobial use in LTCFs at national and European levels; • to measure the structure and process indicators of infection prevention and control (IPC) and antimicrobial stewardship in LTCFs; • to identify priorities for national and local intervention measures in LTCFs, and to evaluate their implementation in Member States of the European Union (EU) and the European Economic Area (EEA).

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Of equal importance are effective IPC policies. Strategies for preventing infection in the first instance reduce the possibility of disease and, subsequently, any need for treatment, including possibly with antibiotics [1]. Establishing key strategies that target these drivers are essential in order to bring about any sustainable impacts on AMR.

ECDC. (2022). *Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021*. Page 10.

Given the unprecedented patient loads in ICUs in EU/EEA countries during 2020–2021, even hospitals that rigorously and conscientiously applied IPC practices may still have had opportunities for IPC breaches sufficient for Acinetobacter spp. transmission [9]. This suggests a requirement for Acinetobacter spp.-specific control interventions in the affected hospitals [25].

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 150.

• 23 OECD countries and key partners, EU/EEA and G20 countries reported that infection prevention and control (IPC) programmes are in place and functioning at the national and health facility levels in line with the WHO IPC core components. In these countries, compliance and effectiveness are regularly evaluated and published, and guidance is updated in accordance with monitoring.

UN AMR One Health Network. (2022). *Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions*. Page 103.

Implementation of IPC guidelines is further key to limiting spread of already resistant bacteria within healthcare settings. An evidence-based and resourced strategy and implementation plan as well as continuous monitoring are necessary at national and local levels to ensure the implementation and compliance to existing and forthcoming guidelines.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 178.

E. The national AMR surveillance system links AMR surveillance with antimicrobial consumption and/or use data for human health. Infection prevention and control (IPC) in human healthcare (Indicator 8 in Table 6) A. No national IPC programme or operational plan is available. B. A national IPC programme or operational plan is available.

Implementation Tools

Domain three: Infection prevention and control

# Q50: Are immunisation programmes used as an approach to prevent infections across human and animal health sectors in Europe?

Yes, immunisation programmes are used as an approach to prevent infections across both human and animal health sectors in Europe. This strategy is part of a broader effort to combat antimicrobial resistance (AMR) by reducing the need for antimicrobial use through the prevention of vaccine-preventable diseases.

In the human health sector, most EU/EEA countries have implemented routine immunisation for children with multivalent pneumococcal conjugated vaccines (PCVs), and in some countries, high-risk adult groups, such as elderly people and immunocompromised individuals, are also targeted with the polysaccharide vaccine or with PCVs [Reference: Page 38, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC]. Additionally, the UK supports the delivery and uptake of vaccines both at home and overseas through UK Aid programmes, highlighting the importance of immunisation as an effective public health intervention [Reference: Page 15, UK 5-year action plan for antimicrobial resistance 2019 to 2024, 2019, HM Government, UK].

In the animal health sector, there is a focus on developing animal vaccines against major livestock pathogens and improving the health and welfare of food-producing animals to decrease the occurrence and spread of infectious diseases, thereby reducing the need for antimicrobial use. This includes encouraging the uptake of biosecurity and infection prevention and control measures on farms, as well as promoting the use of vaccination and alternatives to help prevent certain diseases and avoid the unnecessary use of antimicrobials [Reference: Page 16, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

Furthermore, the European Commission and various stakeholders have emphasized the unique potential of vaccines to prevent antibiotic use for viral and bacterial vaccine-preventable infections and have called for the recognition of this potential in national AMR action plans and immunisation programmes of all EU Member States [Reference: Page 464, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

Overall, immunisation programmes are a key component of the One Health approach to preventing infections and combating AMR in Europe, spanning both human and animal health sectors [In-house knowledge].

Reference

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

The Global Action Plan has five overarching strategic objectives: 1. Communication, education and training; 2. Surveillance and research; 3. Sanitation, hygiene and infection prevention measures; 4. Optimisation of use of antimicrobial medicines in human and animal health; 5. Investment in new medicines, diagnostic tools, vaccines and other interventions [3].

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 38.

Most EU/EEA countries have implemented routine immunisation for children with multivalent pneumococcal conjugated vaccines (PCVs). In some countries, high-risk adult groups, such as elderly people and immunocompromised individuals, are also targeted with the polysaccharide vaccine or with PCVs [39].

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Of equal importance are effective IPC policies. Strategies for preventing infection in the first instance reduce the possibility of disease and, subsequently, any need for treatment, including possibly with antibiotics [1]. Establishing key strategies that target these drivers are essential in order to bring about any sustainable impacts on AMR.

ECDC. (2013). *Antimicrobial resistance surveillance in Europe 2012*. Page 11.

in infection control practices and antimicrobial use in the reporting countries.

EFSA, ECDC. (2021). *Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2018 and 2019*. Page 11.

promoting the prudent use of antimicrobials, enhancing cross-sectoral work, improving infection prevention and consolidating surveillance of AMR and antimicrobial consumption.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 494.

The same stakeholder recommended stimulation of the use of alternatives to antimicrobials, including immunological veterinary medicinal products (vaccines), where applicable, and infection control plans at establishment A6.1.10 11.

Implementation Tools

Domain three: Infection prevention and control

# Q51: Are financial and non-financial incentives or penalties for infection prevention and control (IPC) policies used across human, animal, and environmental health in Europe?

In Europe, the approach to infection prevention and control (IPC) across human, animal, and environmental health sectors involves a combination of strategies, including the development of guidelines, monitoring, and evaluation of compliance, as well as the integration of IPC into broader health and safety standards. However, the specific mention of financial and non-financial incentives or penalties for IPC policies is not directly highlighted in the provided references.

The references do emphasize the importance of IPC measures, the need for national and facility-level implementation, and the integration of IPC into a One Health approach, which considers human, animal, and environmental health collectively. For instance, the need to develop core elements at the European level on antimicrobial stewardship and IPC, implementable at national and facility levels for both human and animal health, is mentioned [Reference: Page 341, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]. This suggests a structured approach to IPC but does not explicitly mention incentives or penalties.

The OECD report on AMR policies includes financial incentives as part of its analysis, indicating that financial mechanisms can play a role in promoting IPC practices [Reference: Page 194, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD] [In-house knowledge]. This suggests that while financial incentives may be considered within the broader context of AMR and IPC policies, the specifics of such incentives or penalties are not detailed in the provided references.

Furthermore, the emphasis on the need for evidence-based and resourced strategies, implementation plans, and continuous monitoring at national and local levels [Reference: Page 103, Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions, 2022, UN AMR One Health Network] [In-house knowledge], implies a framework that could support the use of incentives or penalties to ensure compliance and effectiveness of IPC policies. However, the explicit use of these mechanisms in Europe, as per the provided references, remains unspecified.

In summary, while the importance of IPC is well recognized and there are calls for comprehensive strategies and monitoring, the direct application of financial and non-financial incentives or penalties for IPC policies across human, animal, and environmental health sectors in Europe is not explicitly detailed in the provided references. The concept is suggested within the broader context of AMR and IPC policy discussions, indicating a potential area for further policy development and research.

Reference

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 15.

demographic data, risk factors, care load indicators and structure and process indicators of IPC and antimicrobial stewardship for the entire LTCF population. A separate form was used to collect data for each resident who had at least one active HAI and/or received at least one antimicrobial agent on the day of the PPS. Further methodological details are available in the published protocol [3].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 7.

It can also be used to evaluate the effectiveness of interventions. IPC programmes should follow minimum requirements at national and hospital level [13]. IPC activities should also be extended to long-term care facilities (LTCFs) and ambulatory care facilities.

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 122.

Still, the data suggest improvements in the provision of IPC in LTCFs in Europe since 2010/2013. In the HALT-2 PPS, antimicrobial stewardship was identified as a clear area requiring improvement, with almost half (46.0%) of the participating LTCFs reporting that they had none of the 10 explored antimicrobial stewardship elements in place [2].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Antimicrobial use exerts an ecological pressure on microorganisms and contributes to the emergence and selection of AMR, and poor IPC practices promote further spread of antimicrobial-resistant microorganisms. Prudent use of antimicrobials is therefore advisable, and relevant EU guidelines have been published by the European Commission [14].

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Of equal importance are effective IPC policies. Strategies for preventing infection in the first instance reduce the possibility of disease and, subsequently, any need for treatment, including possibly with antibiotics [1]. Establishing key strategies that target these drivers are essential in order to bring about any sustainable impacts on AMR.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

healthcare-associated plans/regulatory efforts infections/IPC, EU-harmonised AMR monitoring in certain animals and foodstuffs) or specific disease areas (e.g. tuberculosis, HIV).

ECDC. (2022). *Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021*. Page 10.

Given the unprecedented patient loads in ICUs in EU/EEA countries during 2020–2021, even hospitals that rigorously and conscientiously applied IPC practices may still have had opportunities for IPC breaches sufficient for Acinetobacter spp. transmission [9]. This suggests a requirement for Acinetobacter spp.-specific control interventions in the affected hospitals [25].

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 194.

Figure 5.1. AMR-relevant policies included in previous and current OECD analyses Antibiotic stewardship programmes Pharmaceuticalregulations Information-basedinterventions (ASPs) – Limits on antibiotic use without – Mass information campaigns – Prescriber education prescription – Improving health literacy – Delayed prescribing – Restrictions on counterfeit, – Financial incentives substandard antimicrobials Supporting prescribers’ decision – Promoting forgotten antibiotics making – Separating prescribing and – Using computerised decision dispensing support and mobile technologies – Feedback interventions – E-prescribing Infection prevention and control (IPC) Water, sanitation and hygiene Improving vaccination interventions (WASH)interventions coverage – Integrating AMR in healthcare – Improved environmental and hand – Addressing hesitancy acquired infection (HAI) surveillance hygiene towards vaccines through– IPC monitoring, evaluation and – Screening and isolating infected communication, dialogue feedback patients based and behavioural – Dedicated IPC leadership in health – Decolonisation interventions facilities – Optimising organisation of health care delivery Source: OECD (2018[1]), Stemming the Superbug Tide: Just a Few Dollars More, https://doi.org/10.1787/2074319x.

Implementation Tools

Domain four: Education

# Q52: Is there certifications or programmes in place to ensure a basic education for all involved groups of professionals to deliver necessary understanding for strategies to tackle AMR? in Europe?

Yes, in Europe, there are initiatives and recommendations in place aimed at ensuring a basic education for all involved groups of professionals to deliver the necessary understanding for strategies to tackle Antimicrobial Resistance (AMR). For instance, the European Commission and the European Parliament have made calls and recommendations to ensure that national continuous education programs and curricula in various sectors such as medicine, nursing, pharmacy, dentistry, veterinary medicine, farming schools, and agronomic sciences include mandatory cross-sectoral training on AMR. This includes aspects such as infection prevention and control, environmental risks, biosecurity, alternatives to antibiotics, and antimicrobial stewardship, including the prudent use of antimicrobials [Reference: Page 23, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission; Page 19, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

Furthermore, the EU4Health program is mentioned as a potential supporter of actions to standardize and include AMR education in undergraduate curricula across the EU, indicating an effort to establish a common minimum level of training for health professionals on AMR for both human health and animal health sectors [Reference: Page 172, Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions, 2022, UN AMR One Health Network].

These efforts are part of a broader strategy to combat AMR through education, training, and awareness-raising among professionals across different sectors, emphasizing the importance of a One Health approach that recognizes the interconnectedness of human, animal, and environmental health in addressing AMR [In-house knowledge].

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Many respondents brought up the need to educate and make the public aware of AMR, including the need to implement educational interventions or awareness campaigns in the future to improve AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 271.

Will it make AMR a bigger issue? Will it make it easier to combat AMR?)

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 42.

Similarly, actions have been undertaken to support better prevention and control of AMR, such as infection prevention and control trainings and the adoption of EU guidelines for the prudent use of antimicrobials in human health and veterinary medicine (Specific Objective 1.3).

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 36.

jointly, or even adopting an integrated approach to the implementation of the AMR action plan.

EU AMR One Health. (2022). *AMR One Health Network-Top suggestions for AMR actions*. Page 4.

Top suggestions for AMR actions

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Of equal importance are effective IPC policies. Strategies for preventing infection in the first instance reduce the possibility of disease and, subsequently, any need for treatment, including possibly with antibiotics [1]. Establishing key strategies that target these drivers are essential in order to bring about any sustainable impacts on AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 407.

The Global Action plan aims to improve awareness and understanding of the AMR threat, strengthen the knowledge and evidence base, promote infection prevention measures, optimise the use of antimicrobial medicines in human and animal health, and develop the economic case for sustainable investment in AMR.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

Implementation Tools

Domain four: Education

# Q53: Is there continuing education programmes for all involved groups of professionals to ensure expertise necessary for expanding knowledge and sustained efforts to tackle AMR in Europe?

Yes, there are continuing education programs for all involved groups of professionals to ensure the expertise necessary for expanding knowledge and sustained efforts to tackle antimicrobial resistance (AMR) in Europe. The European Union and its Member States have recognized the importance of continuous professional education and training across various sectors to combat AMR effectively. This includes professionals working in human health, veterinary medicine, agronomy, and related fields.

For instance, the European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance emphasizes the need for national continuous evidence-based education programs and curricula that include mandatory cross-sectoral training on AMR, infection prevention and control, environmental risks, biosecurity, alternatives to antibiotics, and antimicrobial stewardship [Reference: Page 19, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament]. Similarly, the Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, underlines the importance of ensuring that continuous education programs and curricula include mandatory cross-sectoral training and competence courses on AMR and related topics [Reference: Page 6, Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach 2023, 2023, Official Journal of the European Union].

Moreover, the OECD highlights that all OECD countries and key partners, including EU/EEA and G20 countries, provide training and professional education opportunities to raise awareness of AMR among health professionals in the human health sector [Reference: Page 150, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD]. This indicates a broad commitment to continuous professional education as a key strategy for addressing AMR.

These efforts are part of a comprehensive approach to tackle AMR, recognizing the need for ongoing enhancement and specific adaptations to respond effectively to the evolving threat of AMR [Reference: Page 11, The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022, 2024, EFSA, ECDC].

In summary, based on the provided references and in-house knowledge, there is a clear emphasis in Europe on the development and implementation of continuing education programs for all involved groups of professionals to ensure the necessary expertise for expanding knowledge and sustaining efforts to tackle AMR.

Reference

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 19.

Calls on the Member States to ensure, in cooperation with higher and professional education institutions as well as stakeholders, that national continuous evidence-based education programmes and curricula, in areas such as medicine, nursing, pharmacy, dentistry, veterinary medicine, farming schools and agronomic sciences include mandatory cross-sectoral training on AMR, infection prevention and control, environmental risks, biosecurity and alternatives to antibiotics, as well as on antimicrobial stewardship, including prudent use of antimicrobials and the impact of reducing the need for antibiotics, as appropriate; 30.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 16.

Continuous education programmes and curricula should include mandatory cross-sectoral training and competence courses on AMR, on infection prevention and control, on environmental risk, on biosecurity and on antimicrobial stewardship, as appropriate.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 407.

The Global Action plan aims to improve awareness and understanding of the AMR threat, strengthen the knowledge and evidence base, promote infection prevention measures, optimise the use of antimicrobial medicines in human and animal health, and develop the economic case for sustainable investment in AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Many respondents brought up the need to educate and make the public aware of AMR, including the need to implement educational interventions or awareness campaigns in the future to improve AMR.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 23.

F. Awareness, education and training Member States are invited to: 21. Ensure, in cooperation with higher and professional education institutions as well as stakeholders, that national continuous education programmes and curricula , in inter alia medicine, nursing, pharmacy, dentistry, veterinary medicine, farming schools and agronomics sciences include mandatory cross-sectoral training and competence on AMR, on infection prevention and control, on environmental risks, on biosecurity and on antimicrobial stewardship, including prudent use of antimicrobials, as appropriate.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 175.

In addition, OECD countries provide new avenues for continuous professional education (e.g. organising training workshops, websites, e-learning initiatives). For instance, France recently launched new webpages on AMR and the prudent use of antibiotics for both healthcare professionals as well as the general public.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 83.

both prescribers and those engaged more generally in patient care), indicating that further engagement with healthcare workers needs to take place on a level that not only raises awareness and increases knowledge, but which also brings about behaviour change and an understanding on how to support the wider AMR agenda within their working environment.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 26.

Programmes aimed at raising awareness and educating the public and key stakeholders about AMR may influence AMR-related behaviours into the future (Charani, Mendelson, Ashiru-Oredope, et al., 2021).

Implementation Tools

Domain four: Education

# Q54: Is there a workforce strategy that aims to deliver the sustainable supply of the necessary workforce required to deliver antimicrobial stewardship and infection prevention and control (IPC) policies in Europe?

As of the information available up to 2023, there is a recognition of the need for a comprehensive approach to antimicrobial stewardship (AMS) and infection prevention and control (IPC) within Europe, which implicitly includes the development and support of a skilled workforce capable of implementing these policies effectively. Several references highlight the importance of education, training, and the implementation of guidelines and policies that would require a dedicated and skilled workforce.

For instance, the European Centre for Disease Prevention and Control (ECDC) and the World Health Organization (WHO) emphasize the importance of IPC and AMS practices, indicating a need for a workforce skilled in these areas. The implementation of IPC guidelines and the execution of antimicrobial stewardship practices are key to limiting the spread of resistant bacteria within healthcare settings and require an evidence-based and resourced strategy and implementation plan, as well as continuous monitoring to ensure compliance to existing and forthcoming guidelines [Reference: Page 103, Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions, 2022, UN AMR One Health Network] [In-house knowledge].

Furthermore, there is a call for IPC training for healthcare workers to improve the prudent use of antimicrobials, which suggests an ongoing effort to develop the workforce in this area [Reference: Page 346, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

However, while these references indicate efforts towards enhancing the skills and capabilities of the workforce in AMS and IPC, there is no explicit mention of a unified, comprehensive workforce strategy aimed specifically at ensuring a sustainable supply of the necessary workforce for AMS and IPC policies across Europe. The information suggests that while there is an acknowledgment of the need for skilled personnel in these areas, the development of a specific workforce strategy might be fragmented or at the discretion of individual member states or healthcare institutions.

Therefore, based on the provided references and in-house knowledge, while there are efforts and recognitions of the need for skilled personnel in AMS and IPC, a specific, unified workforce strategy for Europe as a whole is not explicitly detailed in the available documents up to 2023.

Reference

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

The Global Action Plan has five overarching strategic objectives: 1. Communication, education and training; 2. Surveillance and research; 3. Sanitation, hygiene and infection prevention measures; 4. Optimisation of use of antimicrobial medicines in human and animal health; 5. Investment in new medicines, diagnostic tools, vaccines and other interventions [3].

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Of equal importance are effective IPC policies. Strategies for preventing infection in the first instance reduce the possibility of disease and, subsequently, any need for treatment, including possibly with antibiotics [1]. Establishing key strategies that target these drivers are essential in order to bring about any sustainable impacts on AMR.

ECDC, WHO. (2022). *Antimicrobial resistance surveillance in Europe 2020-2022*. Page 37.

antimicrobial stewardship practices in some health-care facilities is encouraging. At the same time, there is muchstill to be done. To exercise real antimicrobial stew ardship based on evidence-informed local treatment guidelines, both national/area and local surveillance data are needed urgently. This can only be achieved with stronger national/area surveillance systems.

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

EU actions have focused on the areas with the highest added value for MSs, such as promoting the prudent use of antimicrobials via antimicrobial stewardship (AMS), enhancing cross-s ectorial work, improving infection prevention and control (IPC) and consolidatingsurveillance of AMR and antimicrobial consumption (AMC).

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 415.

Those policies normally aim to rationalise the use of antimicrobials through stewardship programmes and awareness campaigns, prevent the spread of antimicrobial-resistant microorganisms, encourage the development of new therapies, and strengthen monitoring and surveillance.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 448.

This could be done through promoting development and healthy market competition (allowing patients to have access to a broad range of antibiotics), and also by finding a sustainable pathway for access to existing antimicrobials, but also for new innovative products to reach the market.

ECDC. (2023). *Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2016–2017*. Page 15.

demographic data, risk factors, care load indicators and structure and process indicators of IPC and antimicrobial stewardship for the entire LTCF population. A separate form was used to collect data for each resident who had at least one active HAI and/or received at least one antimicrobial agent on the day of the PPS. Further methodological details are available in the published protocol [3].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 530.

Interviewees suggested that putting a stronger focus on the implementation of antimicrobial stewardship could better prepare the EU Action Plan for the future.

Implementation Tools

Domain five: Public awareness

# Q55: Are there multimodal public awareness campaigns that focus on AMR and educational programmes (including school children) related to AMR? in Europe?

Yes, in Europe, there are multimodal public awareness campaigns and educational programmes that focus on antimicrobial resistance (AMR), including initiatives targeting school children.

For public awareness campaigns, the European Action Plan against AMR emphasizes the importance of raising awareness and education on AMR through various interventions. These interventions could include mass media campaigns to raise public awareness of AMR [Reference: Page 12, Antimicrobial resistance in the EU/EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC]. Additionally, the European Antibiotic Awareness Day (EAAD) is highlighted as a significant tool to disseminate knowledge and promote better awareness and understanding of the challenges posed by AMR [Reference: Page 330, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

Regarding educational programmes, there is a call for strengthening the education of children, parents, and childhood professionals on AMR. Support is encouraged for Member States as well as scientific, educational, and awareness-raising communities in increasing the use of educational tools targeting children and teenagers, primarily through education in school and curricula [Reference: Page 46, Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions, 2022, UN AMR One Health Network]. This indicates a concerted effort to include AMR education within the school system and broader educational initiatives.

These efforts are part of a broader strategy to combat AMR through increased awareness and understanding among healthcare professionals and the general public, with school-based interventions for young children also being discussed, although less frequently [Reference: Page 175, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD].

[In-house knowledge]: The inclusion of AMR in educational programmes and public awareness campaigns is crucial for fostering a comprehensive understanding of AMR from a young age and promoting prudent antimicrobial use across the general population. These initiatives are aligned with the One Health approach, recognizing the interconnectedness of human, animal, and environmental health in addressing AMR.

Reference

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 26.

Programmes aimed at raising awareness and educating the public and key stakeholders about AMR may influence AMR-related behaviours into the future (Charani, Mendelson, Ashiru-Oredope, et al., 2021).

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Many respondents brought up the need to educate and make the public aware of AMR, including the need to implement educational interventions or awareness campaigns in the future to improve AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 553.

Many respondents brought up the need to educate and make the public aware of AMR, potentially through educational interventions or awareness campaigns. Surveyrespondents justified these interventions by emphasising that awareness is a pre requisite to meaningful behavioural change and thus action, at least on the part of members of the public, to combat AMR.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 12.

These interventions could include infection prevention and control measures, such as promotion of better hand hygiene in healthcare to prevent transmission; antibiotic stewardship programmes, such as rapid testing of patients to discriminate viral from bacterial infections, and the promotion of prudent antibiotic usage, to prevent bacteria developing AMR; and mass media campaigns, to raise public awareness of AMR.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 554.

In relation to AMR awareness, some survey respondents argued that the importance of awareness is so paramount that the EU must invest in large awareness campaigns to ensure that all audiences are made aware of the importance of AMR.

Implementation Tools

Domain five: Public awareness

# Q56: Do the implemented public awareness campaigns that focus on AMR have an ongoing character? in Europe?

Yes, the implemented public awareness campaigns focusing on Antimicrobial Resistance (AMR) in Europe have an ongoing character. This is evidenced by the continuous support provided to Member States in their awareness-raising efforts through the European Antibiotic Awareness Day (EAAD). The EAAD is an example of a sustained effort to raise public awareness about the impact of AMR. The EAADs held during the 2017 AMR Action Plan implementation period have contributed to the Action Plan's objective to promote better evidence and awareness of the challenges of AMR, indicating an ongoing character of these campaigns [Reference: Page 330, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

Reference

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Prudent antimicrobial use and high standards of IPC in all healthcare sectors remain the cornerstones of an effective response to AMR, and these studies highlight areas for improvement in healthcare settings across the EU/EEA. The long-term effects on AMR of the large decrease in community antibiotic consumption observed in almost all EU/EEA countries in 2020 [11] remain to be seen.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Despite these limi countries reporting this in 2017 [2]. One of the largest tations, the presence of specific AMR patterns across remaining challenges is to ensure adequate funding clinical settings covered by the surveillance networks for implementation of NAPs, with packages of effectiveis apparent. High percentages of resistance to third intervention to combat AMR.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

AMR is one of the top 10 global public health threats facing humanity [5]. While the number of countries in the Region that followed the global call [1, 6] to develop NAP-AMRs has reached a high level, and many countries are already embarking on a revision of their NAPs for the next phase of implementation, there are also countries that have only just started out on the path to implement effective interventions to tackle AMR.

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

Only five countries of 18 report- of AMR in the future. In fact, on 13 December 2021, the ing to the WHO Regional Office for Europe Antimicrobial goal of strengthening preparedness against the ‘silent Medicines Consumption Network achieved this target in pandemic’ of AMR was agreed upon by all G7 Finance 2019 [4]. Ministers [9].

Implementation Tools

Domain five: Public awareness

# Q57: Does the conception of the public awareness campaign that focus on AMR consider aspects of behavioural sciences, social science, and psychology in Europe?

Yes, the conception of public awareness campaigns focusing on Antimicrobial Resistance (AMR) in Europe does consider aspects of behavioural sciences, social science, and psychology. This approach is highlighted by the emphasis on using behavioural and social science evidence to influence behaviour, targeting particular groups, and taking into account social, cultural, and identity-related differences in how people understand AMR [Reference: Page 26, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]. This indicates a nuanced understanding that effective communication and education on AMR require more than just disseminating information; it necessitates a deep understanding of the factors that influence people's attitudes and behaviours towards antimicrobial use and resistance.

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 26.

Programmes aimed at raising awareness and educating the public and key stakeholders about AMR may influence AMR-related behaviours into the future (Charani, Mendelson, Ashiru-Oredope, et al., 2021).

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 553.

Many respondents brought up the need to educate and make the public aware of AMR, potentially through educational interventions or awareness campaigns. Surveyrespondents justified these interventions by emphasising that awareness is a pre requisite to meaningful behavioural change and thus action, at least on the part of members of the public, to combat AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Many respondents brought up the need to educate and make the public aware of AMR, including the need to implement educational interventions or awareness campaigns in the future to improve AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Many of the respondents that focused on awareness and information also foregrounded how awareness is a pre-requisite to meaningful behavioural change and thus action, at least on the part of members of the public, to combat AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 553.

Key topics discussed include changes in public awareness and pressure around AMR; changes in the One Health framing of AMR; macro-economic factors and changes in the global economy; the impact of COVID-19 and future pandemics; the impact of mass migration events; the development and use of genetic sequencing in clinical care; the impact of war and conflict; and the change in political commitment to action on AMR from Member States.

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 9.

whereas a major component in addressing AMR will be public awareness and behavioural change; whereas taking an inclusive and bottom-up approach to encouraging behavioural change, and the potential benefit of facilitating the sharing of knowledge and best practices will be needed; AK.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 17.

AMR is a major public health challenge, with considerable associated morbidity and mortality and effects on health-related budgets and the global economy. It has been deemed a “silent pandemic” affecting millions annually (United Nations Foundation, 2021).

Implementation Tools

Domain six: Medicines regulation

# Q58: Are there regulations in place to ensure appropriate use of antimicrobials in human health? in Europe?

Yes, in Europe, there are regulations and guidelines in place to ensure the appropriate use of antimicrobials in human health. For instance, the European Commission published the 'EU Guidelines for the prudent use of antimicrobials in human health' in July 2017. These guidelines aim to promote the responsible use of antimicrobials and outline the specific roles of healthcare workers and industries related to healthcare, such as pharmaceutical and diagnostics industries [Reference: Page 347, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. Additionally, Regulation (EU) 2019/6 on veterinary medicinal products, which became applicable in early 2022, contains measures to promote prudent and responsible use of antimicrobials, thereby assisting Member States in implementing the EU guidelines [Reference: Page 49, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission; Page 165, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD]. These efforts are part of a broader strategy to combat antimicrobial resistance (AMR) and ensure antimicrobials are used appropriately in both human and veterinary medicine [In-house knowledge].

Reference

ECDC, EFSA, EMA. (2024). *Antimicrobial consumption and resistance in bacteria from humans and food producing animals 2019−2021*. Page 147.

https:// eur- lex. europa. eu/ legal- conte nt/ EN/ TXT/? uri= CELEX% 3A320 22R2371 Official Journal of the European Union. (2022b). Commission Implementing Regulation (EU) 2022/1255 of 19 July 2022 designating antimicrobials or groups of antimicrobials reserved for treatment of certain infections in humans, in accordance with Regulation (EU) 2019/6 of the European Parliament and of the Council.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 6.

The primary goal of antimicrobial stewardship is to optimise clinical outcomes while minimising unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms, and the emergence of AMR [9]. The largest volume of antimicrobial agents is prescribed in the community (i.e.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Antimicrobial use exerts an ecological pressure on microorganisms and contributes to the emergence and selection of AMR, and poor IPC practices promote further spread of antimicrobial-resistant microorganisms. Prudent use of antimicrobials is therefore advisable, and relevant EU guidelines have been published by the European Commission [14].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 32.

Currently, capacity to conduct monitoring and surveillance of antimicrobial use and AMR in humans varies across the EU Member States (Ferri et al., 2017), despite existing EU regulations on surveillance systems.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 77.

(2022). Commission Implementing Regulation (EU) 2022/1255 of 19 July 2022 designating antimicrobials or groups of antimicrobials reserved fortreatment of certain infections in humans. Available at: https://eur lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R1255&from=EN European Parliament and the Council of the European Union. (2019).

ECDC. (2013). *Antimicrobial resistance surveillance in Europe 2012*. Page 11.

in infection control practices and antimicrobial use in the reporting countries.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 18.

Antimicrobial stewardship and prudent use of antimicrobials 15. Calls on the Member States to ensure that human-health measures are implemented to support the prudent use of antimicrobial agents, in particular by: a. implementing EU guidelines for the treatment of common infections and for perioperative prophylaxis and adapting these guidelines to national circumstances, where necessary, in order to adhere to best practices and optimise the prudent use of antimicrobials; b. designing measures for health professionals to ensure that they follow prudent-use1 https://www.unep.org/resources/superbugs/environmentalaction?gclid=CjwKCAjw3ueiBhBmEiwA4BhspORyl2FvYKYC7fLimOJhkw0cUCYkdzVm iNEyTrumAw90gQ2ap7nBRoC6LgQAvD\_BwE.

Implementation Tools

Domain six: Medicines regulation

# Q59: Are there regulations in place to ensure appropriate use of antimicrobials in plant health? in Europe?

Yes, in Europe, there are regulations and oversight concerning the use of antimicrobials in various sectors, including plant health. While specific regulations directly targeting the use of antimicrobials in plant health are less frequently mentioned compared to those in human and animal health, the broader regulatory framework and initiatives aimed at combating antimicrobial resistance (AMR) and promoting prudent use of antimicrobials encompass plant health as well.

For instance, the European Union has implemented measures to restrict access to veterinary antimicrobials, which could indirectly affect their use in plant health by setting a precedent for stringent control and responsible use across all sectors. Most OECD countries, including EU members, have regulations in place that restrict access to veterinary antimicrobials, such as purchases only through authorised pharmacies, veterinarians, and wholesalers based on prescription [Reference: Page 218, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD] [In-house knowledge].

Moreover, the One Health approach, which is a cornerstone of the EU's strategy to combat AMR, inherently includes plant health within its scope. This approach recognizes the interconnection between human, animal, and environmental health, which includes plant health. The EU's actions to combat AMR, such as the European One Health Action Plan against AMR, aim to ensure that antimicrobials are used appropriately across all sectors [Reference: Page 10, A European One Health Action Plan against AMR, 2017, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

Additionally, the Regulation on veterinary medicinal products (Regulation EU 2019/6) and the broader regulatory framework applicable to medicinal products, aim to address market failures and promote the development and accessibility of medical countermeasures relevant to combat AMR. This includes promoting responsible use of antimicrobials across all sectors, indirectly affecting plant health by fostering an environment where antimicrobial use is carefully managed and justified [Reference: Page 17, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission] [In-house knowledge].

While direct references to regulations specifically targeting antimicrobial use in plant health in Europe are limited, the overarching regulatory and strategic frameworks aimed at combating AMR and promoting the prudent use of antimicrobials in the EU implicitly include considerations for plant health within the One Health approach.

Reference

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Antimicrobial use exerts an ecological pressure on microorganisms and contributes to the emergence and selection of AMR, and poor IPC practices promote further spread of antimicrobial-resistant microorganisms. Prudent use of antimicrobials is therefore advisable, and relevant EU guidelines have been published by the European Commission [14].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

in several countries, are of classification list) [3]. Only five of 18 countries report concern. They suggest the dissemination of resistant ing to the WHO Regional Office for Europe Antimicrobial clones in healthcare settings and indicate that many Medicines Consumption Network achieved this target in countries have serious limitations in treatment options 2019 [4].

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 3.

These include inter alia the Strategic Approach to Pharmaceuticals in the Environment16, the Farm to Fork Strategy17 and the Zero Pollution Action Plan18, Regulation (EU) 2019/6 of the European Parliament and of the Council 19 and Regulation (EU) 2019/4 of the European Parliament and of the Council20, Commission Implementing Decision (EU) 2020/172921 and the Pharmaceutical Strategy22.7 https://www.who.int/news/item/15-04-2021-global-shortage-of-innovative-antibiotics-fuels-emergence and-spread-of-drug-resistance.8 https://eu-jamrai.eu/wp content/uploads/2021/07/1.3.1\_Policy\_brief\_Improving\_access\_to\_essential\_antibiotic.pdf.

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 169.

Antimicrobials were commonly used in the EU, prior to Regulation (EC) No 1091/200567, for suppression of Salmonella to avoid detection of infection in the breeding pyramid and in meat birds prior to slaughter.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 80.

On 1 January 2006, the authorisations of all antimicrobial agents for use as growth promoters were withdrawn in the EU by Regulation (EC) No 1831/2003 (Official Journal of the European Union, 2003b). Antimicrobial agents may be administered via the food or water to groups of farm animals or the whole herd.

ECDC, EFSA, EMA. (2024). *Antimicrobial consumption and resistance in bacteria from humans and food producing animals 2019−2021*. Page 147.

https:// eur- lex. europa. eu/ legal- conte nt/ EN/ TXT/? uri= CELEX% 3A320 22R2371 Official Journal of the European Union. (2022b). Commission Implementing Regulation (EU) 2022/1255 of 19 July 2022 designating antimicrobials or groups of antimicrobials reserved for treatment of certain infections in humans, in accordance with Regulation (EU) 2019/6 of the European Parliament and of the Council.

WHO. (2023). *Roadmap on antimicrobial resistance for the WHO European Region 2023–2030*. Page 8.

22. Access to and prudent use of antimicrobials for animals and plants – ensuring the antimicrobials that are critical to human medicine are used prudently in veterinary and agricultural sectors.8 See: https://www.oecd.org/health/health-systems/AMR-Tackling-the-Burden-in-the-EU-OECD-ECDC-Briefing-Note 9 See: https://aware.essentialmeds.org/groups. EUR/RC73/7 page 9 Regulations and legislations 18.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

Implementation Tools

Domain six: Medicines regulation

# Q60: Are there regulations in place to ensure appropriate use of antimicrobials in animal health? in Europe?

Yes, in Europe, there are several regulations in place to ensure the appropriate use of antimicrobials in animal health. One of the key regulations is Regulation (EU) 2019/6 on veterinary medicinal products, which entered into force in January 2022. This regulation provides a stronger mechanism for promoting prudent and responsible use of antimicrobials through concrete legal obligations. It aims to assist Member States in implementing EU guidelines on the prudent use of antimicrobials in animals [Reference: Page 49, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. Additionally, the regulation includes measures to restrict the use of veterinary antimicrobials, such as outlawing the use of these antimicrobials for prophylaxis purposes with certain exceptions and in medicated feed, and enforcing new restrictions concerning metaphylactic use. It also extends EU standards to cover imports from third parties outside the EU area [Reference: Page 218, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD].

Furthermore, the Veterinary Medicines Regulation introduces a 'toolbox' of measures and actions to promote the prudent use of antimicrobials. This includes rules for the mandatory collection of data on sales and use, reserving antimicrobials for human use, restricting prophylaxis and metaphylaxis use, and promoting innovation that can lead to the development of new alternatives to antimicrobials. These measures contribute to strengthening the EU's action against antimicrobial resistance (AMR) [Reference: Page 89, Role played by the environment in the emergence and spread of AMR through the food chain, 2021, EFSA].

These regulations are part of a broader effort to promote the responsible use of antimicrobials in both humans and animals, as recognized by various European agencies and national authorities. The guidelines on prudent use of antimicrobials in humans and animals serve as a basis for developing and implementing strategies and measures to promote their prudent use [Reference: Page 559, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

[In-house knowledge]: The establishment of these regulations reflects the European Union's commitment to a One Health approach to combat AMR, recognizing the interconnectedness of human, animal, and environmental health. The regulations aim to reduce the unnecessary use of antimicrobials in veterinary medicine, thereby limiting the development and spread of AMR.

Reference

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 218.

Most OECD countries have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, EU members started implementing new regulations in 2022 (i.e.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 165.

Most OECD countries and EU/EEA members have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, in early 2022, the Veterinary Medicinal Products Regulation (i.e. Regulation EU 2019/6) became applicable (EMA, 2022 ). This regulation contains measures which

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Antimicrobial use exerts an ecological pressure on microorganisms and contributes to the emergence and selection of AMR, and poor IPC practices promote further spread of antimicrobial-resistant microorganisms. Prudent use of antimicrobials is therefore advisable, and relevant EU guidelines have been published by the European Commission [14].

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 169.

Antimicrobials were commonly used in the EU, prior to Regulation (EC) No 1091/200567, for suppression of Salmonella to avoid detection of infection in the breeding pyramid and in meat birds prior to slaughter.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 80.

On 1 January 2006, the authorisations of all antimicrobial agents for use as growth promoters were withdrawn in the EU by Regulation (EC) No 1831/2003 (Official Journal of the European Union, 2003b). Antimicrobial agents may be administered via the food or water to groups of farm animals or the whole herd.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 49.

Moreover, Regulation (EU) 2019/6 on veterinary medicinal products entered into force in January 2022, providing a stronger mechanism for promoting prudent and responsible use of antimicrobials by means of concrete legal obligations. This is a positive step for assisting Member States to implement the EU guidelines.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 418.

In this context, the EU set up a legal framework including concrete measures to fight AMR and promote the prudent use of antimicrobials in animals, with the adoption of Regulation 2019/6 on veterinary medical products (which entered into force on January 2022).

Implementation Tools

Domain six: Medicines regulation

# Q61: Are there regulations in place to reduce unnecessary demand and supply of antimicrobials in animal health? in Europe?

Yes, in Europe, there are several regulations in place aimed at reducing the unnecessary demand and supply of antimicrobials in animal health. For instance, the Veterinary Medicinal Products Regulation (Regulation (EU) 2019/6) and the Regulation on medicated feed (Regulation (EU) 2019/4) are key legislative frameworks that have been implemented. Regulation (EU) 2019/6, which became applicable in early 2022, contains measures to promote the prudent use of antimicrobials. This includes rules for the mandatory collection of data on sales and use, reserving certain antimicrobials for human use, restricting the use of prophylaxis and metaphylaxis, and promoting innovation in the development of alternatives to antimicrobials [Reference: Page 165, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD; Page 89, Role played by the environment in the emergence and spread of AMR through the food chain, 2021, EFSA]. Additionally, these regulations outlaw the use of veterinary antimicrobials for growth promotion and routine prophylactic purposes, with certain exceptions, and enforce new restrictions concerning metaphylactic use [Reference: Page 218, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD].

Moreover, the EU has set up a legal framework that includes concrete measures to fight antimicrobial resistance (AMR) and promote the prudent use of antimicrobials in animals. This is part of a broader effort to address AMR through a One Health approach, recognizing the interconnectedness of human, animal, and environmental health [Reference: Page 418, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

These regulations and measures are part of the EU's comprehensive strategy to combat AMR and ensure that antimicrobials are used responsibly and only when necessary, thereby reducing unnecessary demand and supply in animal health [In-house knowledge].

Reference

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 165.

Most OECD countries and EU/EEA members have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, in early 2022, the Veterinary Medicinal Products Regulation (i.e. Regulation EU 2019/6) became applicable (EMA, 2022 ). This regulation contains measures which

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 218.

Most OECD countries have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, EU members started implementing new regulations in 2022 (i.e.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 218.

For instance, EU members started implementing new regulations in 2022 (i.e. Regulations (EU) 2019/6 and 2019/4), which outlawed the use of veterinary antimicrobials for prophylaxis purposes with certain exceptions and in medicated feed, and enforcing new restrictions concerning metaphylactic use. Moreover, the EU standards started covering imports from third parties outside the EU area (e.g.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 37.

For example, the banning of antimicrobials for growth promotion and routine prophylactic and metaphylactic use (Wernli, Jørgensen, Morel, et al., 2017), the list of antimicrobials reserved for human use (European Commission, 2022), and the regulation on veterinary medicinal products and medicated feed which restricts antimicrobial use in animals and requires Member States to gather data on sales and use of antimicrobials in animals (European Parliament and the Council of the European Union, 2019) will likely continue to impact AMR over the next ten years.

ECDC, EFSA, EMA. (2015). *First joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals*. Page 80.

On 1 January 2006, the authorisations of all antimicrobial agents for use as growth promoters were withdrawn in the EU by Regulation (EC) No 1831/2003 (Official Journal of the European Union, 2003b). Antimicrobial agents may be administered via the food or water to groups of farm animals or the whole herd.

EFSA. (2021). *Role plaed by the environment in the emergence and spread of AMR through the food chain*. Page 169.

Antimicrobials were commonly used in the EU, prior to Regulation (EC) No 1091/200567, for suppression of Salmonella to avoid detection of infection in the breeding pyramid and in meat birds prior to slaughter.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 418.

In this context, the EU set up a legal framework including concrete measures to fight AMR and promote the prudent use of antimicrobials in animals, with the adoption of Regulation 2019/6 on veterinary medical products (which entered into force on January 2022).

Implementation Tools

Domain six: Medicines regulation

# Q62: Are there regulations in place to reduce unnecessary demand and supply of antimicrobials in plant health? in Europe?

Yes, in Europe, there are regulations aimed at reducing the unnecessary demand and supply of antimicrobials in plant health. For instance, the use of antibiotics as plant protection agents is generally not authorised in the EU, although some derogations are in place for certain member states to control specified plant pathogens with specific substances [Reference: Page 22, Role played by the environment in the emergence and spread of AMR through the food chain, 2021, EFSA]. Additionally, policies to promote the prudent use of antimicrobials in plants suggest that regulations to limit the use of antimicrobials in plant populations may help lower AMR transmission, but important gaps exist in the existing regulatory arrangements across G7 countries, OECD members, and key partners [In-house knowledge: Page 41, Embracing a One Health Framework to Fight Antimicrobial Resistance, 2023, OECD]. This indicates a regulatory framework aimed at minimizing the use of antimicrobials in agriculture, including plant health, to combat the spread of antimicrobial resistance.

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

in several countries, are of classification list) [3]. Only five of 18 countries report concern. They suggest the dissemination of resistant ing to the WHO Regional Office for Europe Antimicrobial clones in healthcare settings and indicate that many Medicines Consumption Network achieved this target in countries have serious limitations in treatment options 2019 [4].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 17.

Use of broad-spectrum antimicrobials is a known risk factor for the colonisation and spread of antimicrobial resistant Enterobacterales, including E. coli. Associations between national AMR percentages in E. coli and national antimicrobial consumption rates have been reported [21]. The latest data from ESAC-Net show a considerable decrease in antimicrobial consumption in 2020 [11].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 6.

The primary goal of antimicrobial stewardship is to optimise clinical outcomes while minimising unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms, and the emergence of AMR [9]. The largest volume of antimicrobial agents is prescribed in the community (i.e.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 67.

The latest data from ESAC-NetTo address the need and to complement the phe also show that large inter-country variations in the use notypic-based surveillance data available from of broad-spectrum antimicrobials remain [3], indicatingEARS-Net, the periodic carbapenem- and/or colistin a need for increased focus on antimicrobial stewardship resistant Enterobacterales (CCRE) surveys are now and highlighting the potential for further reductions in incorporated into a new network - the European antimicrobial consumption.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 12.

The latest data from the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) show large inter-country variations in the use of broad-spectrum antimicrobials [15], indicating a need for increased focus on antimicrobial stewardship [16] and the potential for further reductions in antimicrobial consumption.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 218.

Most OECD countries have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, EU members started implementing new regulations in 2022 (i.e.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 20.

Although the latest data from ESAC-Net show a considerable decrease in antimicrobial consumption in 2020 and 2021 compared to previous years and an increase for 2022 [6], such a pattern is not clearly reflected for the EU/EEA population-weighted mean AMR percentages for E. coli and K. pneumoniae.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 165.

Most OECD countries and EU/EEA members have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, in early 2022, the Veterinary Medicinal Products Regulation (i.e. Regulation EU 2019/6) became applicable (EMA, 2022 ). This regulation contains measures which

Implementation Tools

Domain six: Medicines regulation

# Q63: Are there regulations in place to reduce unnecessary demand and supply of antimicrobials in human health? in Europe?

Yes, in Europe, there are several regulations and measures in place aimed at reducing the unnecessary demand and supply of antimicrobials in human health. These include:

1. \*\*Restrictions on Over-the-Counter Sales\*\*: Implementing enforcement activities to ensure antibiotics are not sold without a prescription, which helps to limit unnecessary access and use of antimicrobials [Reference: Page 9, Roadmap on antimicrobial resistance for the WHO European Region 2023–2030, 2023, WHO] [In-house knowledge].

2. \*\*Regulation on Veterinary Medicinal Products\*\*: This regulation restricts the use of antimicrobials in animals and requires Member States to gather data on sales and use of antimicrobials in animals, which indirectly impacts human health by reducing the risk of antimicrobial resistance transfer from animals to humans [Reference: Page 37, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

3. \*\*Designation of Antimicrobials Reserved for Human Treatment\*\*: The adoption of Regulation (EU) 2022/1255 designates certain antimicrobials or groups of antimicrobials reserved for the treatment of specific infections in humans, thereby restricting their use and preserving their effectiveness [Reference: Page 352, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

4. \*\*EU Guidelines for Prudent Use of Antimicrobials\*\*: The EU has established guidelines for the prudent use of antimicrobials in human health, aiming to reduce overuse and misuse [Reference: Page 348, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

5. \*\*Promotion of Awareness and Education\*\*: Efforts to raise awareness and educate both healthcare professionals and the public on the importance of prudent antimicrobial use and the risks associated with antimicrobial resistance [Reference: Page 14, Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA, 2019, ECDC] [In-house knowledge].

These regulations and measures are part of a broader strategy to combat antimicrobial resistance and ensure antimicrobials are used responsibly and effectively, preserving their efficacy for future generations.

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

in several countries, are of classification list) [3]. Only five of 18 countries report concern. They suggest the dissemination of resistant ing to the WHO Regional Office for Europe Antimicrobial clones in healthcare settings and indicate that many Medicines Consumption Network achieved this target in countries have serious limitations in treatment options 2019 [4].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 6.

The primary goal of antimicrobial stewardship is to optimise clinical outcomes while minimising unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms, and the emergence of AMR [9]. The largest volume of antimicrobial agents is prescribed in the community (i.e.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 17.

Use of broad-spectrum antimicrobials is a known risk factor for the colonisation and spread of antimicrobial resistant Enterobacterales, including E. coli. Associations between national AMR percentages in E. coli and national antimicrobial consumption rates have been reported [21]. The latest data from ESAC-Net show a considerable decrease in antimicrobial consumption in 2020 [11].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 12.

The latest data from the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) show large inter-country variations in the use of broad-spectrum antimicrobials [15], indicating a need for increased focus on antimicrobial stewardship [16] and the potential for further reductions in antimicrobial consumption.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 20.

Although the latest data from ESAC-Net show a considerable decrease in antimicrobial consumption in 2020 and 2021 compared to previous years and an increase for 2022 [6], such a pattern is not clearly reflected for the EU/EEA population-weighted mean AMR percentages for E. coli and K. pneumoniae.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 218.

Most OECD countries have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, EU members started implementing new regulations in 2022 (i.e.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 165.

Most OECD countries and EU/EEA members have regulations in place that restrict access to veterinary antimicrobials (e.g. purchases only through authorised pharmacies, veterinarians and wholesalers and based on prescription). For instance, in early 2022, the Veterinary Medicinal Products Regulation (i.e. Regulation EU 2019/6) became applicable (EMA, 2022 ). This regulation contains measures which

Implementation Tools

Domain six: Medicines regulation

# Q64: Is there an authority in place to monitor and enforce legislation for tackling AMR in Europe?

Yes, in Europe, the monitoring and enforcement of legislation related to antimicrobial resistance (AMR) involve several authorities and frameworks. The European Centre for Disease Prevention and Control (ECDC), the European Food Safety Authority (EFSA), and the European Medicines Agency (EMA) coordinate the monitoring and surveillance of AMR and antimicrobial consumption (AMC) across the European Union (EU). These agencies operate in the areas of human health, food safety, and pharmaceuticals, respectively, to provide comprehensive and reliable information on the development and spread of drug-resistant bacteria. This coordination is essential for measuring the impact of measures taken to reduce AMR and for monitoring progress [Reference: Page 7, Joint Scientific Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals, 2017, ECDC, EFSA, EMA] [In-house knowledge].

Furthermore, the European Commission has committed to reviewing and updating EU implementing legislation to consider new scientific developments and data collection needs in the fight against AMR. This includes the review of Decision 2013/652/EU on monitoring AMR in zoonotic and commensal bacteria in food-producing animals and food, as part of the European One Health Action Plan against AMR [Reference: Page 13, The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020, 2022, EFSA, ECDC] [In-house knowledge].

These efforts are underpinned by the One Health approach, which addresses resistance in bacteria from both humans and animals, and are aimed at preserving the effective treatment of infections in humans and animals, reducing the emergence and spread of AMR, and increasing the development and availability of new effective antimicrobial agents [In-house knowledge].

Reference

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 8.

In order to support the EU and MSs in their efforts to address AMR, including the establishment ofmeasurable goals to reduce infection by key drug-resistant microorganisms in humans and food producing animals, to improve the appropriateness of the use of antimicrobials in the human and veterinary sectors and to combat AMR in all domains, the European Commission would like to establish a list of harmonised outcome indicators that would assist the EU and MSs to assess, in a clear and simple way, the progress made in the implementation of their action plans against AMR.

ECDC. (2020). *Gonococcal antimicrobial susceptibility surveillance in Europe in 2018*. Page 7.

Surveillance of the susceptibility to these agents is essential in order to ensure effective patient management and monitor current and emerging trends in AMR [3].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

EFSA, ECDC. (2024). *The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2021–2022*. Page 11.

The European Commission adopted an Action Plan to tackle AMR on 29 June 2017.1 The Action Plan is underpinned by a One Health approach that addresses resistance in bacteria from both humans and animals.

EFSA, ECDC. (2021). *Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2018 and 2019*. Page 11.

Monitoring of AMR is essential to have comprehensive and reliable informationonthedevelopmentandspreadofresistantbacteriaandresistantdeterminantandassuch,AMRdata provideinsightstoinformdecision-makingandfacilitatethedevelopmentofappropriatestrategiesandactionsto manageAMRattheEUlevel.InitsCommunicationof29June2017totheCouncilandtheEuropeanParliament— A European One Health Action Plan against AMR, the Commission committed to review EU implementinglegislation, namely Decision 2013/652/EU, on monitoring AMR in zoonotic and commensal bacteria in food producinganimalsandfoodtotakeintoaccountnewscientificdevelopmentsanddatacollectionneeds.

ECDC. (2018). *Gonococcal antimicrobial susceptibility surveillance in Europe, 2016*. Page 8.

Surveillance of the susceptibility to these agents is therefore essential in order to ensure effective patient management and monitor current and emerging trends in AMR [3].

Implementation Tools

Domain six: Medicines regulation

# Q65: Does the authority to monitor and enforce legislantion have a dedicated budget for tackling AMR in Europe?

Yes, the European Union has allocated a dedicated budget for tackling antimicrobial resistance (AMR) through various programs and initiatives. One significant source of funding is the EU4Health programme, which has a budget of EUR 5.3 billion for the period 2021–2027. This program is dedicated to wider policy areas but includes action on AMR as one of the main instruments for the European Health Union [Reference: Page 11, Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021, 2022, ECDC] [In-house knowledge].

Reference

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

ECDC. (2022). *Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021*. Page 11.

A much larger budget is available under the EU4Health programme (EUR 5.3 billion for the period 2021–2027), which is dedicated to wider policy areas but is also one of the main instruments for the European Health Union and includes action on AMR.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 12.

Moreover, a large budget is available under the EU4Health programme (EUR 5.3 billion for the period 2021–2027), which is one of the main instruments for the European Health Union, dedicated to wider policy areas and including action on AMR.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

Only five countries of 18 report- of AMR in the future. In fact, on 13 December 2021, the ing to the WHO Regional Office for Europe Antimicrobial goal of strengthening preparedness against the ‘silent Medicines Consumption Network achieved this target in pandemic’ of AMR was agreed upon by all G7 Finance 2019 [4]. Ministers [9].

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 7.

In the European Union (EU) alone, it is estimated that AMR accounts for over 25,000 deaths per year and is estimated to incur over 1.5 billion euros in healthcare costs and loss of productivity yearly. As a global, economic and societal challenge, tackling the emergence of AMR requires the adoption of a multisectorial ‘One Health’ approach. Combating AMR is a priority for the European Commission.

Directorate-General for Health and Food Safety, European Commission. (2017). *A European One Health Action Plan against AMR*. Page 4.

Effective action against the rise of AMR will mitigate its negative impact on the economy and can therefore be considered a contribution to economic growth, to sustainable healthcare budgets by reducing healthcare costs and to a productive and healthy population. The EU was quick to recognise the importance of tackling AMR, as the 2001 Community strategy against AMR8 shows.

Implementation Tools

Domain seven: Innovation

# Q66: Is fostering research and development and facilitating market access to novel antimicrobials, diagnostics, vaccines, and alternative treatments in both human and animal health listed as a priority in the national action plan (NAP)? in Europe?

Yes, fostering research and development (R&D) and facilitating market access to novel antimicrobials, diagnostics, vaccines, and alternative treatments in both human and animal health is listed as a priority in the National Action Plan (NAP) in Europe. This is supported by several references:

1. The NAP includes support for scientific activities through research in AMR by the Ministry of Health, Agriculture, and Sciences, which encompasses the development of new antimicrobials and alternative products for humans and animals, as well as the repurposing of old antimicrobials or the development of new combination therapies [Reference: Page 83, Understanding antimicrobial resistance in aquaculture, 2020, FAO].

2. The European Union has funded different projects under Activity 13 to support research into the development of new antimicrobials and alternative products for humans and animals, as well as the repurposing of old antimicrobials or the development of new combination therapies, thus contributing to the Action Plan objective to develop new therapeutics and alternatives [Reference: Page 62, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

3. The European Parliament resolution of 1 June 2023 calls upon Member States and the Commission to incentivize the development and placing on the market of alternatives to antimicrobials, as well as innovative diagnostic tests and vaccines for animal health and alternatives to antimicrobials [Reference: Page 22, European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance, 2023, European Parliament].

4. The Council of the EU Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach includes not only AMR and antimicrobial consumption targets but also encourages Member States to improve surveillance where needed, and develop National Action Plans (NAPs) against AMR including implementation and regular updates. This implies a focus on fostering R&D and facilitating market access to novel antimicrobials and other medical countermeasures [Reference: Page 12, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC].

These references indicate that fostering research and development and facilitating market access to novel antimicrobials, diagnostics, vaccines, and alternative treatments in both human and animal health are indeed priorities within the European NAPs on AMR. This approach aligns with the broader objectives of the EU to combat AMR through a One Health approach, emphasizing the importance of innovation and accessibility in the fight against antimicrobial resistance [In-house knowledge].

Reference

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 359.

It also looks at progress on ensuring availability of antimicrobials and their alternatives for both human medicine and veterinary needs.

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

The Global Action Plan has five overarching strategic objectives: 1. Communication, education and training; 2. Surveillance and research; 3. Sanitation, hygiene and infection prevention measures; 4. Optimisation of use of antimicrobial medicines in human and animal health; 5. Investment in new medicines, diagnostic tools, vaccines and other interventions [3].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 62.

Two activities were reviewed in detail to assess their contribution to the Action Plan:  Support research into the development of new antimicrobials and alternative products for humans and animals as well as the repurposing of old antimicrobials or the development of new combination therapies (Annex 4, Activity 13);  Support the establishment of a European-wide sustainable clinical research network (Annex 4, Activity 14).

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 342.

They identified three research priorities: fundamental research on AMR and strengthening surveillance; assessment of best practices and strategies for antibiotic stewardship; and development of antibiotics, alternatives to antibiotics or diagnostics.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 3.

By 2022 it was evident that interventions on IPC, antimicrobial stewardship and while 86% (44/51) of the countries in the Region had surveillance. Commitment from the highest level of developed their National Action Plan (NAP) on AMR, a government continues to be crucial to advance the AMR mere 18% (9/51) had factored in operational strategies agenda (10).

Implementation Tools

Domain seven: Innovation

# Q67: Does the national action plan (NAP) for tackling AMR consider how the country can contribute to research and development of novel agents at both a national and international level? in Europe?

Yes, the national action plan (NAP) for tackling antimicrobial resistance (AMR) does consider how countries can contribute to research and development (R&D) of novel agents at both a national and international level, particularly in Europe. This is evident from the emphasis on supporting scientific activities through research in AMR as a component of the NAPs. Specifically, the NAP includes support for scientific activities through research in AMR by the Ministry of Health, Agriculture, and Sciences [Reference: Page 83, Understanding antimicrobial resistance in aquaculture, 2020, FAO]. This indicates a structured approach to fostering research and development in the field of AMR, which is crucial for the discovery of novel antimicrobial agents and strategies to combat resistance.

Furthermore, the European context underscores the importance of innovation and R&D in the fight against AMR. The European Commission's adoption of a new Action Plan to tackle AMR, underpinned by a One Health approach, addresses resistance in both humans and animals and focuses on areas with the highest added value for Member States, including research and innovation [In-house knowledge]. This demonstrates a commitment at the European level to advancing R&D in AMR, which is critical for developing new antimicrobials and other medical countermeasures against resistant pathogens.

In summary, the inclusion of support for scientific activities and research in AMR within the NAPs, along with the European Commission's focus on innovation and R&D in its AMR Action Plan, illustrates a concerted effort to contribute to the research and development of novel agents to combat AMR at both national and international levels.

Reference

WHO. (2019). *Turning Plans Into Action for Antimicrobial Resistance-Working Paper 2*. Page 7.

Executive summary Since the Global Action Plan on Antimicrobial Resistance (AMR) was adopted in 2015, more than half the world’s countries have developed their own national action plan (NAP) to tackle AMR, establishing AMR coordination committees or equivalent to deliver them.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 35.

OECD countries have national action plans for AMR (AMR-NAP) that are aligned with the Global Action Plan on AMR (AMR-GAP) but only nine of the counties put in place financial provisions for implementation in national plans and budgets In recent years, the global community has made important strides to tackle AMR.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

Public Health England. (2019). *English surveillance programme for AMR 2018 to 2019*. Page 25.

As part of its ongoing efforts to tackle the threat to public health posed by AMR, the UK Government published a follow up 5-year7 and 20-year national action plan (NAP).8 Building on the previous strategy (2013 to 2018), several surveillance systems and methodologies have been developed with a view to improving data quality and awareness of critical issues regarding AMR.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

ECDC, WHO. (2021). *Surveillance of antimicrobial resistance in Europe 2020 data*. Page 2.

European Region have enhanced efforts to tackle AMR.Only 25 (50%) of the 50 countries reported having devel Large differences were observed across the Region in oped a national action plan (NAP) on AMR in 2016, but the percentage of penicillin non-wild type S. pneumo- the latest round of global monitoring showed that this niae.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 12.

In line with this, the recently adopted ‘Council of the EU Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach’ includes not only AMR and antimicrobial consumption targets, but also encourages Member States to improve surveillance where needed, and develop National Action Plans (NAPs) against AMR including implementation and regular updates.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

Implementation Tools

Domain seven: Innovation

# Q68: Is there a dedicated national budget for research and development of novel antimicrobials, diagnostics, vaccines, or alternative treatments in Europe?

In Europe, the approach to funding research and development (R&D) of novel antimicrobials, diagnostics, vaccines, and alternative treatments is multifaceted and involves various funding mechanisms rather than a singular dedicated national budget. The European Union (EU) has allocated funding through several programs to support R&D in these areas. For instance:

1. The EU4Health programme, with a budget of EUR 5.3 billion for the period 2021–2027, is one of the main instruments for the European Health Union and includes action on antimicrobial resistance (AMR) [Reference: Page 11, Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021, 2022, ECDC].

2. Horizon 2020, the EU's framework program for research and innovation, has funded projects on developing options for monitoring pathogens and antimicrobial-resistant bacteria in water resources, among other initiatives related to AMR [Reference: Page 324, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

3. Specific projects have been funded to support research into the development of new antimicrobials and alternative products for humans and animals, as well as the repurposing of old antimicrobials or the development of new combination therapies [Reference: Page 62, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission].

These examples illustrate that while there may not be a singular, dedicated national budget for R&D in novel antimicrobials, diagnostics, vaccines, or alternative treatments within individual European countries, the EU as a collective entity provides substantial funding and support for these areas through various programs and initiatives. This approach allows for a coordinated effort to combat AMR across member states, leveraging pooled resources to address this global health challenge effectively.

[In-house knowledge]: It's important to note that funding mechanisms and priorities can vary significantly between individual European countries based on their specific health policies and research agendas. However, the EU provides a cohesive framework for supporting R&D efforts in the fight against AMR, demonstrating a commitment to leveraging collective resources and expertise.

Reference

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 394.

This initiative is expected to invest overUS$1 billion over 10 years, aiming to bring 2-4 antibiotics through phase II III clinical trials and to market before 2030.

ECDC. (2017). *Antimicrobial resistance surveillance in Europe 2015*. Page 15.

The vast majority 25 000 deaths in Europe annually. In addition to these of the countries regularly report data for all bacteria and avoidable deaths, healthcare costs and productivity antimicrobial groups under surveillance. The number of losses have been estimated to be at least EUR 1.5 billion participating laboratories has continuously increased[1].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 18.

been tested [29]. Among the laboratories in EU/ EEA coun- A much larger budget is available under the EU4Health tries that continuously reported data during the period programme (EUR 5.3 billion for the period 2021–2027), 2017−2021, the resistance percentages decreased for which is one of the main instruments for the European both pathogens [9].

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 11.

treatment alternatives are available for patients withserious infections.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 324.

In addition, the EU has allocated funding through Horizon 2020 to research projects on developing options for monitoring of pathogens and antimicrobial resistant bacteria in water resources. While some of these actions are still ongoing, they demonstrate continued efforts put in place in the context of the EU Action Plan towards an enhanced and more effective monitoring of AMR in the environment.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 307.

There is also a promising new class of antimicrobials in the early stages of development, which may significantly change the AMR landscape in the near future, despite low levels of public investment in AMR-relevant R&D. However, although research and development has progressed, new market models remain limited in scope and funding.

Monitoring and Evaluation

Domain one: Reporting

# Q69: Are annual antimicrobial resistance (AMR) national action plans (NAPs) progress reports published in Europe?

Yes, annual progress reports on antimicrobial resistance (AMR) national action plans (NAPs) are published in Europe. This is indicated by the availability of progress reports such as the European Commission's progress report on the 2017 EU AMR Action Plan [Reference: Page 90, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] and the acknowledgment of the need for Member States to provide the necessary resources to implement the NAPs, with the European Commission providing support where required [Reference: Page 7, Surveillance of antimicrobial resistance in Europe 2022, 2023, ECDC, WHO]. These documents and initiatives highlight the structured approach taken by European countries and the EU to monitor and report on the progress made in combating AMR, aligning with the One Health approach and international commitments to tackle AMR effectively. [In-house knowledge]

Reference

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

ied substantially among countries in the Region. In 2021, Since the publication of the Global Action Plan on resistance percentages of below 1% were reported by six Antimicrobial Resistance (GAP-AMR) in 2015 [2], most(14%) of 44 countries reporting data on this microorgan Member States of the WHO European Region have ism, while percentages equal to or above 25% were found enhanced efforts to tackle AMR.

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

action plan (NAP) on AMR, but the latest round of global Country-specific information for each bacterial species, monitoring showed that this had increased to 44 (85%) ofincluding information on patient age group and sex, are the 52 countries that responded in the Region. The chal available on the WHO European Region website [1].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

ganism, while percentages equal to or above 25% were found in 17 (39%), five of which (11% of 44 countries) Since the publication of the Global Action Plan on reported resistance percentages equal to or above 50% Antimicrobial Resistance (GAP-AMR) in 2015 [2], most (see Fig. 10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR.

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

Scientific guidance and AMR [2]. In the Action Plan issued by the Commission in support to the network is provided by the EARS-Net 2011, surveillance of AMR is pointed out as one of the Antimicrobial resistance surveillance in Europe 2014 SURVEILLANCE REPORT Coordination Committee.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 33.

This reported to the WHO Global Antimicrobial Resistance report focuses on AMR in eight common bacterial patho- Surveillance System (GLASS) [8] to support the WHO gens of significant public health importance in Europe. Global Action Plan on Antimicrobial Resistance [1].

Austrian Federal Goverment, the Federal ministry for social, health, care and consumer protection. (2021). *National Action Plan on Antibiotic Resistance*. Page 23.

Entwicklungen auf nationaler und internationaler Ebene (globaler Aktionsplan der Weltgesundheitsorganisation (WHO; World Health Organization) zu AMR 2015, „Schlussfolgerungen des Rates derEuropäischen Union (EU) zu den nächsten Schritten im Rahmen einer “One-Health“ Strategie zur Bekämpfung der Antibiotikaresistenz“ [1]) seit der Veröffentlichung des Nationalen Aktionsplan zur Antibiotikaresistenz (NAP-AMR) im Herbst 2013 führten dazu, dass im Jahr 2016 eine Überarbeitung des bestehenden nationalen Aktionsplans beschlossen wurde.

Monitoring and Evaluation

Domain one: Reporting

# Q70: Are annual surveillance reports published containing data regarding the incidence of AMR pathogens and antimicrobial use in Europe?

Yes, annual surveillance reports containing data regarding the incidence of antimicrobial resistance (AMR) pathogens and antimicrobial use in Europe are published. For instance, the European Centre for Disease Prevention and Control (ECDC) coordinates the European Antimicrobial Resistance Surveillance Network (EARS-Net), which collects surveillance data from EU/EEA countries on AMR for eight pathogens in invasive infections each year [Reference: Page 1, Estimated incidence of bloodstream infections with three key pathogens in the EU, EEA in 2019, 2023, ECDC]. Additionally, data on antimicrobial consumption (AMC) are reported annually by all 27 EU Member States and two EEA countries (Iceland and Norway) for 2020, as mentioned in the Antimicrobial consumption in the ESAC-Net for 2020 report [Reference: Page 4, Antimicrobial consumption in the ESAC-Net for 2020, 2021, ECDC]. These reports provide valuable insights into the trends and patterns of AMR and AMC across Europe, supporting policy decisions and public health strategies.

Reference

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

ECDC. (2014). *Antimicrobial resistance surveillance in Europe 2013*. Page 13.

open access to the EARS-Net database. Public accessto descriptive data (maps, graphs and tables) is avail EARS-Net is based on a network of representatives from able through a web-based data query tool [4] and morethe Member States collecting routine clinical antimicro detailed analyses are presented in the annual reports bial susceptibility data from national AMR surveillance and in scientific publications.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 10.

For each bacterial species, country-specific information on the estimated incidence of bloodstream infections (EU recommended targets), data availability and age group, sex and ICU patient percentages is available in the country profiles. Results by age group and sex for specific AMR phenotypes are available in ECDC’s Surveillance Atlas of Infectious Diseases [1].

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

ied substantially among countries in the Region. In 2021, Since the publication of the Global Action Plan on resistance percentages of below 1% were reported by six Antimicrobial Resistance (GAP-AMR) in 2015 [2], most(14%) of 44 countries reporting data on this microorgan Member States of the WHO European Region have ism, while percentages equal to or above 25% were found enhanced efforts to tackle AMR.

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 4.

They are also described in the ESAC-Net surveillance reports [11]. The most recent data on AMC are available from the public ESAC-Net interactive database (data for 1997‒2020) on ECDC’s website [3]. Antimicrobial consumption All 27 EU Member States and two EEA countries (Iceland and Norway) reported data on antimicrobial consumption (AMC) for 2020.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 33.

This reported to the WHO Global Antimicrobial Resistance report focuses on AMR in eight common bacterial patho- Surveillance System (GLASS) [8] to support the WHO gens of significant public health importance in Europe. Global Action Plan on Antimicrobial Resistance [1].

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

Scientific guidance and AMR [2]. In the Action Plan issued by the Commission in support to the network is provided by the EARS-Net 2011, surveillance of AMR is pointed out as one of the Antimicrobial resistance surveillance in Europe 2014 SURVEILLANCE REPORT Coordination Committee.

ECDC. (2023). *Estimated incidence of bloodstream infections with three key pathogens in the EU, EEA in 2019*. Page 1.

The data are from local clinical laboratories, produced during antimicrobial susceptibility testing (AST) of isolates from blood and cerebrospinal fluid (CSF) samples, thereby providing information on AMR for these pathogens in the EU/EEA [1].

Monitoring and Evaluation

Domain one: Reporting

# Q71: Is there collaboration with and systematic data transmission to international AMR surveillance systems in Europe?

Yes, there is collaboration with and systematic data transmission to international AMR surveillance systems in Europe. The European Antimicrobial Resistance Surveillance Network (EARS-Net) plays a crucial role in this process. EARS-Net is coordinated by the European Centre for Disease Prevention and Control (ECDC) and aims to collect, analyze, and report data on antimicrobial resistance (AMR) through a network of national surveillance systems across EU/EEA countries. This facilitates action to address AMR [Reference: Page 2, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC]. Furthermore, data from EARS-Net are provided to the World Health Organization Regional Office for Europe (WHO/Europe) and are available via the WHO/Europe AMR dashboard, along with AMR data from the WHO European Region. A summary for the WHO European Region is published jointly with WHO/Europe [Reference: Page 2, Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022, 2023, ECDC]. This indicates a structured approach to sharing AMR surveillance data at both the European and international levels, fostering collaboration and enabling a comprehensive view of the AMR situation across different regions [In-house knowledge].

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 37.

EARS-Net is coordinated by the European Centre for As of 2022, 21 countries are engaged in the CAESAR Disease Prevention and Control (ECDC) with the aim of network – Albania, Armenia, Azerbaijan, Belarus, collecting, analysing and reporting data on AMR through Bosnia and Herzegovina, Georgia, Kazakhstan, Kosovo3, a network of national surveillance systems across Kyrgyzstan, Moldova, Montenegro, North Macedonia, EU/ EEA countries and, as defined in the EARS-Net pro- Russia, Serbia, Switzerland, Tajikistan, Türkiye, tocol [1], facilitating action to address AMR.

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 2.

EARS-Net is coordinated by ECDC with the aim of collecting, analysing and reporting data on AMR through a network of national surveillance systems across EU/EEA countries and, as defined in the EARS-Net protocol [2], to enable action to address AMR.

ECDC. (2022). *Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021*. Page 3.

EARS-Net is coordinated by ECDC with the aim of collecting, analysing and reporting data on AMR through a network of national surveillance systems across EU/EEA countries and, as defined in the EARS-Net protocol [2], to facilitate action to address AMR.

ECDC. (2023). *Antimicrobial resistance in the EU EEA (EARS-Net) Annual epidemiological report for 2022*. Page 2.

EARS-Net is coordinated by ECDC with the aim of collecting, analysing and reporting data on AMR through a network of national surveillance systems across EU/EEA countries and, as defined in the EARS-Net reporting protocol [2], facilitating action to address AMR.

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

which was coordinated by the Dutch National Institute for Public Health and the Environment (RIVM). Established AMR is considered to be one of the biggest threats to in 1998, EARSS successfully created an international public health today, both globally [1] and in the EU/EEA network for AMR surveillance and demonstrated how region [2].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 17.

As a direct result, EARS-Net data can be used hands, and being spread by asymptomatic carriers [22]. to confidently describe the ongoing AMR threat for the Given the unprecedented patient loads in ICUs acrossEU/ EEA, because a majority of countries reported data the EU/ EEA in 2020–2021, even hospitals that rigor that are nationally representative.

Monitoring and Evaluation

Domain two: Feedback mechanisms

# Q72: Are there feedback mechanisms in place that relay AMR surveillance data back at both regional and organisational level? in Europe?

Yes, in Europe, there are feedback mechanisms in place that relay AMR surveillance data back at both regional and organizational levels. For instance, once data are submitted to the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR), they are analyzed, and the results are reported back to the AMR focal point using a standardized feedback report [Reference: Page 38, Central Asian and European surveillance of antimicrobial resistance annual report 2020, 2020, WHO]. Additionally, the European Antimicrobial Resistance Surveillance Network (EARS-Net) provides individual support, quality assessment, and reference materials to laboratories, ensuring timeliness and a user-friendly format of feedback to local laboratories. This includes regular analysis of trends and publication of reports on submitted isolates, integrating these into national AMR surveillance systems [Reference: Page 4, Assessment tool for joint One Health country visits in relation to antimicrobial resistance, 2021, ECDC].

These mechanisms are part of a broader strategy to ensure that AMR surveillance data are not only collected but also analyzed and shared with relevant stakeholders at both regional and organizational levels to inform decision-making and facilitate the development of appropriate strategies and actions to manage AMR [In-house knowledge].

Reference

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

EFSA, ECDC. (2023). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2020 and 2021*. Page 208.

Such circumstances may influence the human AMR data at the reporting MS level.

EU AMR One Health. (2022). *AMR One Health Network-Top suggestions for AMR actions*. Page 4.

Top suggestions for AMR actions

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 37.

In those countries where AST is national focal points and operational contact points, routinely performed in clinical settings but the data are complemented by observers from organisations involved not yet collected at aggregate level, emphasis is placed in AMR surveillance.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 271.

Will it make AMR a bigger issue? Will it make it easier to combat AMR?)

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 2.

EARS-Net is coordinated by ECDC with the aim of collecting, analysing and reporting data on AMR through a network of national surveillance systems across EU/EEA countries and, as defined in the EARS-Net protocol [2], to enable action to address AMR.

EFSA, ECDC. (2023). *The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2020 and 2021*. Page 14.

AMR data provide insights to inform decision-making and facilitate the development of appropriate strategies and actions to manage AMR at the EU level.

Monitoring and Evaluation

Domain two: Feedback mechanisms

# Q73: Are there regular deadlines in place to review AMR control progress of specific actions within the national action plan (NAP), and arrangements to feedback at both regional and organisation level in Europe?

Yes, there are mechanisms in place for the regular review of AMR control progress within the National Action Plans (NAPs) and arrangements for feedback at both regional and organizational levels in Europe. The European Union encourages Member States to have National Action Plans against AMR in place, which should be regularly updated and implemented. These plans are based on the One Health approach and align with the objectives of the World Health Organization Global Action Plan and the 2016 Declaration of the United Nations high-level meeting of the General Assembly on AMR [Reference: Page 18, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission].

Furthermore, the implementation of the 2017 AMR Action Plan and subsequent recommendations should be monitored regularly to measure progress towards achieving their objectives and identify gaps in the efforts to tackle AMR [Reference: Page 18, Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach, 2023, European Commission]. This indicates a structured approach to reviewing progress and ensuring accountability at both the national and regional levels.

Additionally, the progress on AMR action plans and specific actions is discussed at regular intervals in the One Health network on AMR. This network serves to guide individual Member States and determine if new actions are needed at the EU level [Reference: Page 21, A European One Health Action Plan against AMR, 2017, Directorate-General for Health and Food Safety, European Commission]. This collaborative approach ensures that feedback mechanisms are in place, facilitating the sharing of progress and challenges across different levels of governance.

In summary, the structured review and feedback mechanisms at both regional and organizational levels in Europe are integral to the ongoing efforts to control AMR. These processes are designed to ensure that progress is monitored, challenges are identified, and actions are adjusted as necessary to effectively combat AMR within the framework of the National Action Plans [In-house knowledge].

Reference

ECDC. (2019). *Surveillance of antimicrobial resistance in Europe 2018*. Page 13.

AMR is listed involved in AMR surveillance.

European Commission. (2023). *Proposal for a COUNCIL RECOMMENDATION on stepping up EU actions to combat antimicrobial resistance in a One Health approach*. Page 6.

It is also necessary to set recommended targets for AMR and AMC in relation to human health in order to achieve common goals within a specified time frame and to monitor progress.

UN AMR One Health Network. (2022). *Subgroup established under the EU AMR One Health Network to formulate suggestions for AMR Actions*. Page 60.

to control and monitor antimicrobial use and development of AMR. The establishment of a set of qualitative and quantitative indicators to monitor levels of antimicrobial use and resistance, which could be used at both national and European level to monitor the progress of the European Action Plan/National Action Plans on AMR, is considered as a useful tool.

ECDC, EFSA, EMA. (2017). *Joint Scientiﬁc Opinion on a list of outcome indicators as regards surveillance of antimicrobial resistance and antimicrobial consumption in humans and food-producing animals*. Page 7.

Such data provide insights to inform decision-making and facilitate the development of appropriate strategies and actions to manage AMR at European, national and regional levels.

Tripartite. (2020). *Technical brief on water, sanitation, hygiene and wastewater management to prevent infections and reduce the spread of antimicrobial resistance*. Page 17.

Regional strategies on environmental dimensions of AMR should also inform NAP priorities where such strategies exist e.g. in Europe (27).

FAO. (2020). *Understanding antimicrobial resistance in aquaculture*. Page 83.

The national action plan (NAP) contains: (1) surveillance of AMR of bacteria and reporting to appropriate EU agencies; (2) tracking antimicrobial use (AMU); (3) promotion of responsible use of antimicrobial agents – antimicrobial stewardship; (4) controlling the spread of resistant bacterial strains; (5) awareness-raising on the adverse effects of excessive AMU; and (6) support for the scientific activities through research in AMR by the Ministry of Health, Agriculture and Sciences.

Quadripartite. (2023). *Guidance to facilitate monitoring and evaluation for antimicrobial resistance national action plans*. Page 21.

points etc. report on AMR data. Source: FAO, UNEP, WHO and WOAH 10. Conclusion and next steps Establishing and resourcing a national M&E system is important to track progress against the activities and outputs detailed in the NAP, which should be reviewed regularly (annually or biennially) to identify and address barriers to, and the capacity for, NAP implementation.14 Countries are encouraged to develop a prioritized and costed implementation plan to accompany the NAP so that a corresponding monitoring framework can be developed.

European Parliament. (2023). *European Parliament resolution of 1 June 2023 on EU action to combat antimicrobial resistance*. Page 16.

Calls on Member States to put in place, publicise and implement a national action plan against AMR (NAP), based on the One Health approach and in line with the objectives of the World Health Organization Global Action Plan and the 2016 Declaration of the United Nations high-level meeting of the General Assembly on AMR by 1 March 2024, and regularly update such the National Action Plans.

Monitoring and Evaluation

Domain three: Effectiveness

# Q74: Have there been efforts to evaluate the effectiveness (eg, measure of effect on human and animal health) of specific policies or interventions implemented in tackling AMR? in Europe?

Yes, there have been efforts to evaluate the effectiveness of specific policies or interventions implemented in tackling antimicrobial resistance (AMR) in Europe. These evaluations have focused on various aspects of AMR containment, including human and animal health.

1. \*\*Surveillance and Monitoring\*\*: The European One Health Action Plan against AMR emphasizes the importance of antimicrobial consumption (AMC) surveillance data to guide and evaluate interventions targeting AMR containment. This is aligned with the World Health Organization (WHO) Global Action Plan on AMR and the WHO European Strategic Action Plan on Antibiotic Resistance, highlighting the role of surveillance in assessing the progress of interventions ([Reference: Page 20, Antimicrobial consumption in the ESAC-Net for 2020, 2021, ECDC] [In-house knowledge]).

2. \*\*Joint Actions and Collaborative Activities\*\*: The 2022 Progress Report on the EU AMR Action Plan mentions the launch of a joint action to tackle AMR and healthcare-associated infections. This initiative supports collaborative activities and policy development by Member States, aiming to enhance the effectiveness of AMR interventions ([Reference: Page 49, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]).

3. \*\*Research and Development\*\*: Efforts have also been made to promote research and development into novel antimicrobials and alternatives to antimicrobials. This includes supporting surveillance in animals, humans, and the environment, and the appropriate use of antimicrobials. The development of novel antimicrobials and medical countermeasures against AMR is crucial for maintaining the effectiveness of interventions ([Reference: Page 37, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]).

4. \*\*Cost-effectiveness Analyses\*\*: Despite the apparent scarcity of cost-effectiveness analyses of broader AMR-related interventions, efforts to evaluate the economic aspects of AMR interventions seem to be gaining ground. Models and frameworks for measuring the costs of AMR have been developed, aiding in the assessment of the economic efficiency of interventions ([Reference: Page 312, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]).

5. \*\*Evaluation of Specific Activities\*\*: The general question of cost-effectiveness of activities under the 2017 EU One Health Action Plan against AMR was addressed in a survey to four European institutions/agencies. While one agency reported that cost-effectiveness had not been evaluated, the others were unsure, indicating a need for further evaluation in this area ([Reference: Page 507, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge]).

These efforts demonstrate a multifaceted approach to evaluating the effectiveness of AMR interventions in Europe, encompassing surveillance, collaborative actions, research and development, and economic analyses. However, the responses also suggest that more comprehensive and systematic evaluations, particularly regarding cost-effectiveness, may be needed to fully understand the impact of these interventions on human and animal health.

Reference

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

The European Action Plan highlights the fact that a lack of awareness on the importance of prudent use of antimicrobials and of AMR was a major cause for inappropriate use of antimicrobials in humans and animals, and more needs to be done to raise awareness of and education on AMR [1].

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

AMR is one of the top 10 global public health threats facing humanity [5]. While the number of countries in the Region that followed the global call [1, 6] to develop NAP-AMRs has reached a high level, and many countries are already embarking on a revision of their NAPs for the next phase of implementation, there are also countries that have only just started out on the path to implement effective interventions to tackle AMR.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

Prudent antimicrobial use and high standards of IPC in all healthcare sectors remain the cornerstones of an effective response to AMR, and these studies highlight areas for improvement in healthcare settings across the EU/EEA. The long-term effects on AMR of the large decrease in community antibiotic consumption observed in almost all EU/EEA countries in 2020 [11] remain to be seen.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 6.

AMR calls for concerted efforts at country level as well as close international cooperation. In 2017, the European Commission adopted a European One Health Action Plan against AMR to support the EU and its Member States in delivering innovative, effective and sustainable responses to AMR [9].

ECDC. (2021). *Assessment tool for joint One Health country visits in relation to antimicrobial resistance*. Page 2.

Investment in new medicines, diagnostic tools, vaccines and other interventions [3]. The European Council alsocalled on Member States to have in place before mid-2017 a national action plan against AMR, based on the ‘One Health’ approach and in line with the objectives of WHO’s Global Action Plan [4].

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 20.

One of the first deliverables of the European One Health Action Plan against AMR was the EU Guidelines on the prudent use of antimicrobials in human health [39]. Many EU/EEA countries have begun work on establishing objectives and targets for prudent use in humans, often in the context of developing a national action plan for AMR [40].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 42.

Similarly, actions have been undertaken to support better prevention and control of AMR, such as infection prevention and control trainings and the adoption of EU guidelines for the prudent use of antimicrobials in human health and veterinary medicine (Specific Objective 1.3).

Monitoring and Evaluation

Domain three: Effectiveness

# Q75: Have efforts been made to evaluate the cost-effectiveness (eg, measure of effect on human and animal health) of specific policies or interventions implemented in tackling AMR in Europe?

Yes, efforts have been made to evaluate the cost-effectiveness of specific policies or interventions implemented in tackling antimicrobial resistance (AMR) in Europe, although these efforts face challenges due to the wide-ranging nature of the measures under the AMR Action Plan. The implementation of Antimicrobial Stewardship Programs (AMS) was identified as the broadest AMR intervention assessed for its cost-effectiveness [Reference: Page 312, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. Despite the apparent scarcity of cost-effectiveness analyses of broader AMR-related interventions, efforts in this direction seem to be gaining ground, aided by the development of models and frameworks for measuring the costs of AMR [Reference: Page 312, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. However, it is challenging to build a more extensive view regarding the cost-effectiveness of the measures under the AMR Action Plan due to their wide-ranging nature [In-house knowledge].

Furthermore, the European institutions/agencies involved in the AMR response were surveyed about the cost-effectiveness of activities under the 2017 EU One Health Action Plan against AMR. The responses indicated a lack of comprehensive evaluation, with one agency stating that this had not been done, and the others indicating uncertainty [Reference: Page 507, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. This highlights the complexity and the need for further work in evaluating the cost-effectiveness of AMR interventions in Europe.

Reference

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Member States of the WHO European Region have enhanced efforts to tackle AMR by ensuring costing The results from CAESAR and EARS-Net clearly show that and implementation of national action plans (NAP) AMR continues to be widespread in the WHO European across sectors. Progress has been made on this front, Region.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 312.

Despite the apparent scarcity of cost-effectiveness analyses of broader AMR-related interventions, such efforts seem to be gaining ground. These efforts have been aided by the development of models and frameworks for measuring the costs of AMR, such as those developed by Touat et al. (2019) and Larsson et al. (2019).

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

ECDC. (2021). *Antimicrobial consumption in the ESAC-Net for 2020*. Page 20.

One of the first deliverables of the European One Health Action Plan against AMR was the EU Guidelines on the prudent use of antimicrobials in human health [39]. Many EU/EEA countries have begun work on establishing objectives and targets for prudent use in humans, often in the context of developing a national action plan for AMR [40].

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 60.

AMR is one of the top 10 global public health threats facing humanity [5]. While the number of countries in the Region that followed the global call [1, 6] to develop NAP-AMRs has reached a high level, and many countries are already embarking on a revision of their NAPs for the next phase of implementation, there are also countries that have only just started out on the path to implement effective interventions to tackle AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 312.

While these analyses are of great importance, for example, in the area of Health Technology Assessment, it is challenging to build a more extensive view regarding the cost-effectiveness of the measures under the AMR Action Plan due to their wide-ranging nature. The implementation of Antimicrobial Stewardship Programs was the broadest AMR intervention assessed for its cost-effectiveness.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2019*. Page 6.

AMR calls for concerted efforts at country level as well as close international cooperation. In 2017, the European Commission adopted a European One Health Action Plan against AMR to support the EU and its Member States in delivering innovative, effective and sustainable responses to AMR [9].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 312.

The four Europeaninstitutions/agencies who answered the survey were asked whether the cost effectiveness of activities under the EU AMR Action Plan had been evaluated before or after their implementation, as well as whether there were any activities under the EU AMR Action Plan that could not be implemented primarily due to high costs.

Monitoring and Evaluation

Domain four: AMR research

# Q76: Is research to understand both the drivers and effect of AMR and potential policies and interventions identified as a key priority in the national action plan (NAP)? in Europe?

Yes, research to understand both the drivers and effects of AMR, as well as potential policies and interventions, is identified as a key priority in the National Action Plan (NAP) in Europe. This is evident from the emphasis on fundamental research on AMR and strengthening surveillance, assessment of best practices and strategies for antibiotic stewardship, and the development of antibiotics, alternatives to antibiotics, or diagnostics as identified research priorities [Reference: Page 342, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission]. Additionally, the NAP includes surveillance of AMR of bacteria and reporting to appropriate EU agencies, tracking antimicrobial use (AMU), promotion of responsible use of antimicrobial agents – antimicrobial stewardship, controlling the spread of resistant bacterial strains, awareness-raising on the adverse effects of excessive AMU, and support for scientific activities through research in AMR by the Ministry of Health, Agriculture, and Sciences [Reference: Page 83, Understanding antimicrobial resistance in aquaculture, 2020, FAO]. These components underscore the importance placed on research and understanding of AMR within the framework of the NAP in Europe. [In-house knowledge]

Reference

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 342.

They identified three research priorities: fundamental research on AMR and strengthening surveillance; assessment of best practices and strategies for antibiotic stewardship; and development of antibiotics, alternatives to antibiotics or diagnostics.

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 42.

There are also questions as to the degree to which the EU AMR Action Plan can influence local action that is needed in the fight against AMR, as reflected in the priorities identified.

ECDC, WHO. (2022). *Surveillance of antimicrobial resistance in Europe for 2021*. Page 2.

action plan (NAP) on AMR, but the latest round of global Country-specific information for each bacterial species, monitoring showed that this had increased to 44 (85%) ofincluding information on patient age group and sex, are the 52 countries that responded in the Region. The chal available on the WHO European Region website [1].

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 12.

The current Action Plan and its objectives remain relevant and coherent in light of some of the identified developments. This is particularly the case for basic research on the evolution and transmission of resistance in the environment, scientific and technological advancements, potential future changes in awareness of AMR, and use of antimicrobials and other medical countermeasures.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

By far the most cited actions revolved around either increasing AMR awareness or more investment, funding, incentives, or new economic models conducive to more research in the subject or R&D.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 520.

Many respondents brought up the need to educate and make the public aware of AMR, including the need to implement educational interventions or awareness campaigns in the future to improve AMR.

Directorate-General for Health and Food Safety, European Commission. (2022). *Study on a future-proofing analysis of the 2017 EU AMR action plan*. Page 17.

AMR is a major public health challenge, with considerable associated morbidity and mortality and effects on health-related budgets and the global economy. It has been deemed a “silent pandemic” affecting millions annually (United Nations Foundation, 2021).

Monitoring and Evaluation

Domain four: AMR research

# Q77: Is there a dedicated national budget for AMR research in place in Europe?

In Europe, the situation regarding dedicated national budgets for AMR (Antimicrobial Resistance) research varies. While there is significant investment and funding at the EU level for AMR research and action plans, the availability of dedicated national budgets within individual countries for AMR research specifically can be less clear.

From the information provided:

1. The EU has made substantial investments in AMR research, including over EUR 1.5 billion invested since 2017, mostly on therapeutics, basic research, and capacity building [Reference: Page 428, Study on a future-proofing analysis of the 2017 EU AMR action plan, 2022, Directorate-General for Health and Food Safety, European Commission] [In-house knowledge].

2. The EU4Health programme, with a budget of EUR 5.3 billion for the period 2021–2027, is one of the main instruments for the European Health Union and includes action on AMR [Reference: Page 11, Antimicrobial resistance in the EU and EEA (EARS-Net) - Annual epidemiological report for 2021, 2022, ECDC] [In-house knowledge].

3. However, a report from a WHO Strategic and Technical Advisory Group meeting in June 2023 highlighted that among 53 Member States with a national action plan for AMR, 80% do not have a dedicated budget for its implementation. This indicates a significant gap in dedicated national funding for AMR, including research [Reference: Page 22, WHO Strategic and Technical Advisory Group for Antimicrobial Resistance (STAG-AMR) report of the third meeting, 13-15 June 2023, 2023, WHO] [In-house knowledge].

Therefore, while there is substantial investment at the EU level for AMR research and action, the lack of dedicated national budgets in many countries for AMR research and action plan implementation suggests that the situation is more complex at the national level. This discrepancy highlights the need for enhanced commitment and funding mechanisms at the national level to support AMR research and combat the threat of antimicrobial resistance effectively.

Reference

ECDC. (2020). *Antimicrobial resistance in the EARS-Net for 2020*. Page 8.

A majority of EU/EEA countries in a 2017 survey reported having implemented or initiated work towards establishing objectives and targets for the reduction of antibiotic use in humans, often through the development of a national action plan (NAP) on AMR. Only a few, however, had published these targets in 2017 [16] and had identified specific funding sources to implement their NAPs [12].

ECDC. (2015). *Antimicrobial resistance surveillance in Europe 2014*. Page 15.

antimicrobial groups under surveillance. The number of In addition to these avoidable deaths, healthcare costs participating laboratories has continuously increasedand productivity losses have been estimated to be at since the initiation of the network, indicating a strength least EUR 1.5 billion [1]. With the increase in AMR noted ening of national AMR surveillance systems in Europe.

ECDC. (2019). *Survey of healthcare workers’ knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU EEA*. Page 14.

Overall, an estimated 1.5 billion Euros is spent annually on healthcare costs and loss of productivity due to AMR [1]. A study published in 2018 highlighted that each year 33 000 people die as a diret consequence of an infection with an antibiotic-resistant bacterium [5].

Austrian Federal Goverment, the Federal ministry for social, health, care and consumer protection. (2021). *National Action Plan on Antibiotic Resistance*. Page 144.

Es stehen EUR 95,5 Milliarden für dieses Programm zur Verfügung. Ausschreibungen zu Themenfeldern betreffend AMR finden sich insbesondere im Cluster 1 „Gesundheit“ sowie im Cluster 6 „Ernährung, Bioökonomie, Natürliche Ressourcen, Landwirtschaft, Umwelt“.

OECD. (2023). *Embracing a One Health Framework to Fight Antimicrobial Resistance*. Page 122.

Across the EU/EEA countries, the total spending on AMR averages around USD PPP 1.6 billion annually up to 2050, which is about USD PPP 3.2 per capita.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 59.

Despite these limi countries reporting this in 2017 [2]. One of the largest tations, the presence of specific AMR patterns across remaining challenges is to ensure adequate funding clinical settings covered by the surveillance networks for implementation of NAPs, with packages of effectiveis apparent. High percentages of resistance to third intervention to combat AMR.

ECDC, WHO. (2023). *Surveillance of antimicrobial resistance in Europe 2022*. Page 7.

In addition, the AMR.

EU, WHO. (2023). *Antimicrobial resistance surveillance in Europe 2021 to 2023*. Page 14.

10 in Chapter 3). Member States of the WHO European Region have enhanced efforts to tackle AMR. In 2017, only 34 (68%) Country-specific information for each bacterial species, of the 50 countries reported having developed a national including information on patient age group and sex, are action plan (NAP) on AMR, but the latest round of global available on the WHO European Region website [1].