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Experiences and perceptions on enablers and barriers for a one health collaboration on antimicrobial resistance

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Acronyms

AMR	Antimicrobial Resistance							
EC	European Commission							
EU-JAMRAI	European Union Joint Action on Antimicrobial Resistance and							
	Healthcare-Associated Infections							
FAO	Food and Agriculture Organization							
GAP	Global Action Plan							
GDP	Gross Domestic Product							
HCAIs	Healthcare-Associated Infections							
LMICs	Low and Middle Income Countries							
NAP	National Action Plan							
ОН	One Health							
PROMISE	Professional Community Network on Antimicrobial Resistance							
SBS	Social and Behavioral Sciences							
TrACSS	Global Database for Tracking Antimicrobial Resistance (AMR) Country							
	Self-Assessment Survey							
UNEP	United Nations Environment Programme							
WHO	World Health Organization							
WOAH	World Organization for Animal Health							

Abstract

The One Health approach promotes collaboration across sectors and is crucial to tackle global health issues such as Antimicrobial Resistance (AMR). Despite common agreements on the need to adopt the One Health approach towards AMR, its operationalization and intersectoral collaboration remain a challenge. By using the consortium of a European project working on AMR (EU-JAMRAI), this study aims to analyze experiences and perceptions of enablers and barriers to OH collaboration in Europe at the policy level. Qualitative semi-structured interviews were applied with key policymakers in Spain, France, and Slovenia, along with interviews and a focus group with experts. Key enablers of OH collaboration include intersectoral governance mechanisms, political prioritization, shared values, local engagement, effective communication, and collaborative social skills. Major barriers include resource constraints, lack of political attention, insufficient evidence in the environmental sector, coordination challenges, and communication gaps. The study concludes that enablers and barriers for OH collaboration vary based on context and implementation stage. Effective OH collaboration requires the alignment of interpersonal factors, groups and institutional settings, and structural governance conditions. The study highlights the social nature of OH collaboration and proposes a checklist based on identified enablers and barriers to guide future efforts.

Résumé

L'approche «One Health» prone la collaboration entre les secteurs et est crucial pour s'attaquer aux problèmes de santé mondiaux tels que la résistance aux antimicrobiens (RAM). Bien que tous s'accordent sur la nécessité d'adopter l'approche « One Health» pour lutter contre la RAM, son opérationnalisation et la collaboration intersectorielle restent un défi. En utilisant le consortium d'un projet européen travaillant sur la RAM (EU-JAMRAI), cette étude vise à analyser les expériences et les perceptions des facilitateurs et des obstacles à la collaboration OH en Europe au niveau politique. Des entretiens qualitatifs semi-structurés ont été menés avec des décideurs politiques clés en Espagne, en France et en Slovénie, ainsi que des entretiens et un groupe de discussion avec des experts. Les principaux catalyseurs de la collaboration OH sont les mécanismes de gouvernance intersectorielle, la priorisation politique, les valeurs partagées, l'engagement local, la communication et les compétences sociales en matière de collaboration. Les principaux obstacles sont le manque de ressources, d'attention politique, de données scientifiques, ainsi que les problèmes de coordination et les lacunes en matière de communication. L'étude conclut que les facilitateurs et obstacles à la collaboration OH varient en fonction du contexte et de la phase de mise en œuvre. Une collaboration OH efficace nécessite l'alignement de facteurs interpersonnels, de groupes et des cadres institutionnels, ainsi que de conditions structurelles de gouvernance. L'étude souligne la nature sociale de la collaboration OH et propose une « checklist » basée sur les facilitateurs et les obstacles identifiés pour guider ce type de collaborations.

1. Introduction

1.1. AMR, a multifaceted challenge

Antimicrobial resistance (AMR) is a major challenge for human, animal, plant, and environmental health due to multiple factors involved in the emergence and spread of resistances. Bacteria are highly adaptable organisms. They can easily acquire resistance to antimicrobials through different mechanisms but also have the ability to exchange resistance genes between them. Furthermore, bacteria know no boarders. They can easily travel from one country to another and from humans, to animals to environmental ecosystems. This also means that AMR can easily spread between all these reservoirs. The complex and diverse entanglements implicated in the dissemination of AMR are summarized in Figure 1.



Figure 1 : The spread of AMR across sectors Source : Switzerland Federal Office of Public Health (FOPH)

The increase of multidrug-resistant pathogens worldwide now represents a serious planetary health concern. AMR is already responsible for 1.27 million deaths worldwide and contributes to nearly 5 million more each year (AMR Collaborators, 2022). According to the renowned O'Neill report, if current trends continue, AMR could cause 10 million deaths annually by 2050 (O'Neill, 2016). It also represents a high economic burden for countries with an estimated additional healthcare costs of US\$ 1 trillion by 2050 and

gross domestic product (GDP) losses of US\$ 1 trillion to US\$ 3.4 trillion per year by 2030 (Jonas et al., 2017). Moreover, AMR is a global development issue and an indicator of health inequity, with low-income countries paying the highest price, requiring urgent political attention and policy action (Jasovský et al., 2016; Mendelson et al., 2024).

The way AMR has escalated as a growing threat acknowledges the key role antimicrobials are playing in multiple domains related to protecting and preserving humans, animals/food, crops, etc. Nevertheless, it also raises concern about anthropogenic actions, particularly those involving excessive and inappropriate usage, impacting planetary health. In recent years, research and policymaking have evidenced an important shift in addressing the conceptualization and understanding of this issue, recognizing the One Health (OH) approach as a broader and more holistic way to frame the problem (FAO, UNEP, WHO & WOAH, 2022). The One Health approach recognizes the interplay between human, animal, plant, and environmental health and advocates for intersectoral collaboration to tackle global health issues. The multifaceted nature of AMR, as shown in Figure 1, demands a departure from siloed perspectives towards interdisciplinary One Health collaboration and system-thinking (Anderson et al., 2019).

In this line, the publication of a One Health Global Action Plan (GAP) on AMR by the Tripartite in 2015 has marked a milestone. The Tripartite results in the collaboration of the World Health Organization (WHO) with the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (WOAH). This GAP provided a framework for the development of multisectoral National Action Plans (NAPs) and advocated for the adoption of a One Health approach to tackle AMR. In the European context, where AMR accounts for 35.000 deaths every year (EDCD, 2022), the EU Council urged member states to establish a national One Health AMR Action Plan by mid-2017, to make Europe a best practice region. Several of these important milestones are highlighted in Figure 2.



Figure 2. International and European Health Policy milestones for AMR.

1.2. One Health National Action Plans

NAPs represent important policy strategic tools. They are the opportunity for countries to design and implement a set of complementary policies to tackle a specific issue. In the AMRs case, the Global Action Plan provided the following criteria as guidance for countries on important elements to include in national policies: (1) Enhance the understanding and awareness of AMR (2) Strengthen the evidence base through surveillance and research (3) Reduce infection incidence through water sanitation, hygiene, and infection prevention and control (4) Optimize antimicrobial use in human and animal health and (5) Increase investment in diagnostics, new medicines, vaccination, and other interventions. Additionally, the GAP encouraged countries to adopt the One Health approach in their NAPs by bringing together different sectors, disciplines, and communities to promote common well-being and acknowledge the link between human health, animal health, plant life, and the environment (OHHLEP, 2022).

Although a successful implementation of NAPs has proven to be an important step towards reducing AMR and its consequences different challenges related to bringing policy into action remain (AMR Collaborators, 2023; Mudenda et al., 2023). Current assessments in this matter evidence the availability of NAP does not guarantee implementation or enforcement of recommended strategies to combat AMR (Willemsen et al., 2022). In many countries, the primary hurdle lies not in drafting a National Action Plan (NAP) but in effectively implementing it and demonstrating continuous commitment. Several factors compound the challenge of NAP implementation, including awareness and political commitment, financial constraints, coordination issues, monitoring and data collection, as well as technical capabilities. Furthermore, despite the acknowledgment of the One Health approach, the lack of concrete inter-sectorial actions, alignment or coherence in different plans calls for additional support and evidence on how to operationalize the One Health concept.

The last Commission's report (2022) highlighted the presence of National Action Plans in all Member States of Europe, but with significant differences in their content and depth. While most plans followed a One Health approach to some extent, there were notable variations in their comprehensiveness. Specifically, deficiencies were identified in environmental measures, which were often absent or underdeveloped. Moreover, critical components such as operational frameworks, monitoring, evaluation, and budgeting information were found to be lacking in both the action plans and associated documents. These shortcomings raise concerns about the sustainable implementation of the plans and the effectiveness of Member States' strategies in achieving One Health objectives.

1.3. Challenges in one health collaboration

Building upon the Tripartite (WHO-FAO-WOAH), with addition of the United Nations Environment Programme (UNEP), the Quadripartite recently issued a new One Health Joint Plan for Action (2022-2026), advocating for the strengthening of multisectoral actions and partnerships.

Multisectoral and intersectoral collaborations are key components of One Health's actions. They represent collaborative strategies that transcend boundaries between ministries, governmental bodies, non-governmental organizations, and diverse stakeholders with a common goal. Policymakers recognize them as a tool to tackle health challenges while addressing social and economic factors (Amri et al.,2022). They also imply the complex and political endeavor of incorporating the visions, mandates, functions, and perspectives of actors with different influences and pursuing different agendas (Abbas et al., 2022).

Collaborations "come in different shapes and sizes" (Abbas et al., 2022, p.391) depending on the scale, scope, formality, and strength. Engagement can be seen as continuum, progressing from siloed actions to more integrated partnerships. It starts with sectors working independently, moves through cooperation and coordination involving information exchange and joint planning, advances to collaboration with joint field operations and resource sharing, and culminates in integration marked by the merging of resources and blurred sectoral boundaries (See Figure 3.).



Figure 3. Types of collaboration. Source: Abas et al. (2022, adaptation of Harris and Drimie 2012, p.2)

While the creation of the Quadripartite evidences the longstanding collaboration relationship between organizations and sectors with different trajectories, the collaboration on AMR and the incorporation of the One Health approach represent a new ground (WHO, FAO, OIE & UNEP, 2022). Moreover, despite the well-known importance

of one health collaboration for health policy, the limited theorization on this matter remains a gap (Errecaborde et al., 2019a).

Collaboration across sectors and stakeholders on AMR is highly diverse and dynamic. Although the adoption of the One Health approach is paramount, in practice, actors often share different perspectives, issues, and even languages, hindering the implementation of collaborative actions (Dos S. Ribeiro, 2019; Wellcome Trust, 2019). The lack of awareness on the importance of the OH approach has also been identified as a root cause of AMR from public health, social and behavioral, and communicational perspectives (EU-JAMRAI, 2018), where knowledge translation stands out as a main issue (Humboldt-Dachroeden, 2023). The ambiguity surrounding the definition of One Health, along with the lack of clearly defined intersectoral collaboration practices, structures, and guidelines, has emerged as a significant challenge when implementing AMR policies. Effective collaboration across multiple sectors is essential for combating AMR. However, the existing dearth of well-defined collaboration pathways exacerbates knowledge gaps, impeding seamless coordination and communication (EU Commission, 2023).

1.4. EU-JAMRAI and thesis project:

The European Union Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (HCAIs)- (EU-JAMRAI) aims to foster synergies among EU Member States to help them in the development and implementation of effective One Health policies to combat the escalating threat of AMR and mitigate HCAIs.

The first action (EU-JAMRAI 1) took place from 2017 to 2021 following the adoption of a One Health Action Plan against AMR by the European Commission (EC) to make Europe a best-practice region. With the participation of 44 partners from the 27 Member States, the EU-JAMRAI facilitated the exchange of best practices and discussions among policymakers to develop new National Action Plans on AMR and HCAIs and improve existing ones. These efforts have contributed in bridging the gap between declarations and actions with concrete and operational measures to tackle AMR. Currently, the second edition of EU-JAMRAI has begun in February 2024, with a budget of 50 million euros. This joint action engages 128 partners from the 27 EU Member States, as well as Iceland, Norway, and Ukraine. Through its work program (see Appendix 1), this project aims to support countries in the development and implementation of concrete and sustainable One Health trans-sectorial actions and policies.

Considering the context previously exposed and to operationalize EU-JAMRAI 2 ambitions, there is an important gap in understanding (i) how One Health collaboration

operates and (ii) concrete actions to foster it or barriers to overcome. With its 128 partners from 27 Member State, the EU-JAMRAI consortium represents a unique opportunity to assess enablers/barriers for One Heath collaboration across Europe. By studying several examples of One health collaboration at national level (in the design and/or implementation of NAPs to tackle AMR) across EU, this study aims to contribute and provide exploratory insights from a qualitative perspective.

2. Study Objective

The main objective of this research was to describe and analyze the experiences and perceptions of enablers and barriers to One Health collaboration in the case of National Action Plans designing and/ or implementation across Europe, using EU-JAMRAI consortium as a study group.

Main objectives of this study are:

- To analyze literature on AMR and One Health collaborations and discuss it with actors' key discourses.
- To map and describe perceived barriers to One Health collaboration in the designing and/or implementation of NAPs across EU countries
- To map and describe perceived enablers to one health collaboration in the designing and/or implementation of NAP's across EU countries

3. Methods

3.1. Study design

To address the research question, the study followed a qualitative design that combined a literature search, interviews among key actors, and a focus group as represented in the Table 1.

Table 1. Research methods

Literature	A literature search focused on One Health collaboration at the policy
search	level was performed to map enablers and barriers in previous
	implementation experiences. The information gathered from the
	review was further used to the analysis and discussion of the interview
	insights

Semi-	To examine the experiences and perceptions of actors participating in								
structured	the designing/implementation of NAPs in different EU countries, a								
interviews with	series of interviews with key actors (human, animal, and								
actors involved	environmental health) were conducted during April and May 2024. To								
in NAPs	achieve this, a semi-structured interview guide (See Appendix 2.) was								
designing	previously designed to ask different topics concerning the participation								
and/or	and opinion of interviewees in the NAP of their respective country.								
implementation									
Interviews and	Interviews with key experts from different sectors were performed								
Focus Group	during the whole study to frame and nuance our understating of								
with key	One Health collaboration.								
experts	• Additionally, a focus group with several members of the								
	(Professional Community Network on Antimicrobial Resistance)								
	PROMISE ¹ project was conducted in May 2024 to provide an								
	expert perspective on One Health collaboration. PROMISE is one								
	of the three initiatives pointed out by the European Commission								
	as an example of good practices in terms of One Health								
	collaboration (2023).								

3.2. Data collection

• Interviews with people involved in NAPs designing and implementation

The selection of the interviewees and countries was limited to partners involved in the EU-JAMRAI 2 project. Additionally, to retrieve diverse experiences, the selection took into account the 2023 "Multi-sector and One Health collaboration and coordination" indicator of the Global Database for Tracking Antimicrobial Resistance Country Self-Assessment Survey (TrACSS). This indicator assesses the level of One Health collaboration in countries regarding AMR and ranks them into five categories exposed in Map 1.

¹ https://amr-promise.fr/fr/

Map 1. Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS)

2.1 Multi-sector and One Health collaboration/coordination

A - No formal multi-sectoral governance or coordination mechanism on AMR exists.

B - Multi-sectoral working group(s) or coordination mechanism committee on AMR established with Government leadership.

C - Formalized Multisector coordination mechanism with technical working groups established Multi-sectoral working group(s) is (are) functional, with clear terms of reference, regular meetings, and funding for working group(s) with activities and reporting/accountability arrangements defined.

D - Joint working on issues including agreement on common objectives.

E - Integrated approaches used to implement the national AMR action plan with relevant data and lessons learned from all sectors used to adapt implementation of the action plan.



Country selected include:

- France, a country reported to have good One Health collaboration/coordination according to TrACSS and with a health system coordinated at national level
- Spain, a country reported to have good One Health collaboration/coordination according to TrACSS and with a health system coordinated at regional level
- Slovenia, a country moving forward a more integrated One Health collaboration/coordination at national level

The interviews were conducted in Zoom and lasted an average of 45-60 minutes. In France, a group interview was conducted with 3 participants. A total of 9 interviews were conducted among policymakers of the three One Health sectors in three countries, as displayed in Table 2.

Characteristics	n						
Characteristics	п						
Gender							
Female	6						
Male	3						
Country							
France	5						
Slovenia	1						
Spain	3						
Sector							
Human Health	5						
Animal Health	2						
Environmental Health	2						
TOTAL of participants	9						

Table 2. Interviewees related to NAPs designing/implementing

• Interviews and Focus Group with experts.

For the interviewee's selection in the case of key experts and the focus group, the study seized the existing networks from EU-JAMRAI and PROMISE and contacted the participants following a snowball sampling. Characteristics of interviewees are displayed in Table 3.

Characteristics	n					
Gender						
Female	4					
Male	5					
Sector						
Human Health	4					
Animal Health	3					
Environmental Health	2					
TOTAL of participants	9					

 Table 3. Experts in One Health collaborations interviews

The interviews took place on Zoom and lasted 45-60 minutes. Before starting the conversation, the interviewee will be asked to provide oral consent for the interview to

be recorded. The transcription of the interviews will be obtained from Zoom and then subjected to a thematic analysis using qualitative software (Atlas.ti) to process the information.

3.3. Data analysis

Interviews with actors involved in NAP designing/implementation and the focus group were recorded and transcribed. The transcriptions were first done using Zoom's transcription functions and Whisper AI in one case, then they were corrected manually. Interviews with experts were mainly based on notetaking.

The interviews and the notes were subject of a content analysis. In qualitative studies, this type of analysis facilitates the systematic examination of data by making a structured identification, categorization, and interpretation of patterns and themes embedded within the data, aiming to reveal deeper meanings or insights (Hsieh et al., 2005). The content analysis was performed using the software Atlas ti, which allowed assigning codes to the quotes and ideas for categorizing and organizing the results. For this a code list aligned with the study objectives was developed after reviewing the interviews. The codes also took into account insights coming from the literature search.

3.4. Ethical considerations

The development of this study did not involve experimentation and the approval of an ethics committee. However, ethical considerations were taken into account according to the "Charte française de déontologie des métiers de la recherche" (2015) rectified by INSERM and EHESP. This implied fully informing the interviewees of the study's purposes and ensuring the anonymity of their participation, requesting and recording oral consent before starting the interviews, and securing the return of the results to the involved institutions.

4. Results

The study involved 18 participants. The results presented here gather input from both interviewees involved in NAP designing/implementation and experts (interviews and focus group with key experts). The interviews provided a broad landscape of enablers and barriers, which were summarized thematically according to One Health principles highlighted by the Quadripartite (2022): Collaboration, Coordination, Communication, and Capacity Building (See Table 4).

Table 4. Enablers and Barriers for One Health Collaboration in NAP's designing and implementation

	Collaboration		Coordination		Communication			Capacity Building				
ırs	Intersectoral governance mechanisms	•	Leveraging existing intersectoral structures Political prioritization	Building a sense of ownership	•	Local engagement Strategic stakeholders mapping	Ensuring a communication strategy	• •	Communication professional involved from the beginning Tailoring communication accordingly	Collaborative attitude and capacities	•	Emotional intelligence and conciliatory mindset Building up on professional backgrounds
Enable	Shared vision	•	Agreement on applying One Health approach Clear recognition of boundaries and role delineation	Meaningful participation.	• •	Participative process Visibility and legitimacy due to adequate funding	Strengthened formal and informal communication channels.	• •	Establishing multiple communication channels Sharing know- how through informal communication	Leadership	•	Effective leadership Management placed at a high- level position
3arriers	Lack of resources	•	Need of allocated funding Need of political commitment	Fragmentation	•	Resistance to coordination in early stages	Setting a common language	•	Different interpretations of key concepts Struggles to understand most technical aspects of AMR	Limited transdisciplinary perspective	•	Siloed thinking Difficulties for convincing sectors of collaborative work
Ш	Lack of evidence	•	Scarce data for environmental sector policymaking	Disjointed work styles	•	Sedimented working routines	Personifying the message	•	Need of a "champion" to embody the fight against AMR	Discretionary efforts	•	Efforts relying on personal work Need of motivation sustainability

4.1. Enablers

4.1.1 Collaboration

Seizing and building upon intersectoral governance mechanisms

The development of National Action Plans on AMR varies considerably across countries. Factors enabling One Health governance were also different and particular in each case. Spain highlighted the importance of leveraging existing intersectoral governance structures. The Spanish Agency for Medicines and Medical Devices (AEMPS), an established agency with prior experience and competencies in fostering collaboration between different sectors, was tasked to leadi the development and implementation of Spain's NAP. This decision, according to interviewees, capitalized on the AEMPS's existing strengths in intersectoral collaboration and also helped to deal with challenges in aligning ministerial priorities and intersectoral competition.

"This (AEMPS coordination) has prevented several things. First, ego wars between ministries. "I have to do it." "You have to do it." "He has to do it." Since we're not ministries, we're an agency, coordinating it puts all the ministries on the same level, and therefore, there are no ego wars. Second, in the agency, we always worked on One Health. A medicine is a medicine, whether it's for humans or animals, it has its environmental impact, so we were very used to working on One Health. Maybe I'm evaluating a medicine for an animal that already exists for humans, I'll involve the human part, which has more experience, or vice versa. In other words, we were used to working like this, even if we didn't call it One Health, so we were very clear about it." (Int-6)

In contrast, in France's case, despite the absence of an interministerial delegated mediator, collaborations were sustained and reassured through constant coordination and tools such as roadmaps for NAP development. The establishment of a permanent committee with regular meetings helped the process, particularly at the technical level. The perceived drivers for the participants to foster intersectoral governance were funding and setting the topic as a political priority.

Agreeing on a shared vision and clear roles

Interviews conducted in Spain and France revealed a growing recognition of the importance of collaborative work as a systematic approach and not as an initiative in the framework of NAP. Participants point out a positive shift in attitudes over time, with a transition from a previous reluctance to a greater understanding and inclination for collaborative OH approaches.

"I think that in the administrative field, in the research field, everyone agrees that the One Health approach is important and is relevant. I don't know one of my colleagues who disagrees with this approach" (Int-1)

Another factor mentioned as an enabler was a clear recognition of boundaries and role delineation. This process implied dialogue between sectors and mapping the spectrum of influence of each one which enforced trusting relationships.

Now we well know the different topics which could be complicated [sensitive] for the Ministry of Health or for the Ministry of Environment, and we are very careful to really keep our field, and not to go to the field from another ministry. (...) So we respect our boundaries, and I think it's easier. It's easier for us to communicate, and it creates ,yes, a great trust on each other. (Int-1)

4.1.2 Coordination

Building a sense of ownership

In the experience of most interviewees, work on the NAP requires a very procedural perspective where time commitment is required to build ownership. Engaging stakeholders effectively proved to be a long-term process, taking years in some cases. To complete this, a prioritized action was mapping stakeholders and their influences. By identifying existing stakeholder networks and understanding their power dynamics within the policy landscape, targeted outreach and collaboration strategies were facilitated.

"First, gather all stakeholders, interest groups, and involved actors around the table. Trying to bring together different perspectives, viewpoints, and finding the right people in the right places, identifying institutions, relevant individuals, opinion leaders striving for agreement." (Int 3)

In Spain's case, local engagement proved to be a valuable practice for building a sense of belonging among stakeholders Visiting stakeholders in their own environments fostered a sense of commitment to understanding their context and concerns. From the interviewee's perspective, stakeholders felt more valued and integrated into the process when they were engaged in their own communities. Moreover, Spain's case stands given its existing territorial organization and communication was seized for approaching actors in their contexts.

Additionally, in all cases, it was stated that engaging stakeholders presented differences to take into account before approaching them such as the number of stakeholders involved in the sector and the level of awareness they had regarding the topic and how they were implicated in it.

Ensuring a meaningful participation

A distinction was also made between convincing stakeholders and integrating them meaningfully. In all countries, the importance of moving beyond mere persuasion was addressed. Effective engagement required creating opportunities for stakeholders to contribute their expertise and perspectives as part of the process.

For this, visibility and resources also played a significant role. Stakeholders needed to see themselves as part of a broader collective effort. The involvement of multiple ministries, international agencies, and institutions working together, along with funding backing up the initiative legitimize the initiative and contributed to a sense of purpose and belonging in the endeavors. By showcasing a united front with dedicated resources, it was explained the stakeholders felt more confident in the overall effort to participate in the NAP's actions.

"As soon as they give a brief introduction of what the NAP is, people are aware of the scale. When you see that there are, I don't know how many ministries are involved, the number of experts, hundreds of experts. All communities, mmm, budget, actions. It's very easy in 2, in 2 slides, to show them that it's quite a big thing, and that also makes people say "I want to be part of that". (...) Having the backing of something as big as the NAP makes things much easier, truthfully". (Int-4)

4.1.3 Communication

Ensuring a communication strategy

Interviews consistently highlighted the importance of communication and counting with communication strategies. This was seen as critical for both internal collaboration among stakeholders and external outreach to the broader public. Participants in one case specifically mentioned the adoption of a communication strategy from the outset as a game-changer for their NAP development and implementation. The involvement of communication professionals led to substantial changes in how they communicated and approached the challenge.

Interviews revealed that actors involved in developing or implementing the NAP recognized the importance of targeted communication strategies. Given the multiplicity of stakeholders and actors involved, along with the multi-level nature of the actions needed to address AMR, a tailored approach to communication was essential.

"When we involved them (communicators), it was a radical change in everything. In the way of conveying messages, making a poster, making a presentation, identifying events, where to participate and how to do it, and such. It was really a before and after, and it improved a lot, without a doubt, the outreach, especially to the general public, once communication professionals started working with us. They guide us a lot, they have given us many new ideas that have propelled us much further, and today it really is one of the fundamental pillars of our plan" (Int-3)

Strengthened formal and informal communication channels

The interviews emphasized the need to establish multiple communication channels to facilitate effective collaboration among actors involved in NAP development and implementation. This implied both formal and informal communication mechanisms.

Participants described various formal communication channels that enabled joint work. These included regular online meetings, supplemented by annual in-person meetings. Shared virtual platforms facilitated information sharing and collaboration on specific tasks or documents. In France, a stepwise approach of communication with continuous feedback mechanisms was also mentioned, addressing it allowed iterative improvement and validation of work products.

In all countries, participants recognized the value of informal communication channels as a key enabler for sustaining collaboration. The fact that the AMR community tends to be relatively small was seen as an advantage. Many policymakers know each other personally and have established good relationships based on shared professional backgrounds, age ranges, and other commonalities. This foundation of trust and familiarity made it easier to work together. Informal sharing also made room for sharing know-how on how each one was building policy in their own sector and learning from the others.

"I remember (...) in a meeting, a high level participant, maybe from the WHO organization, who explained that if you don't have the phone number of your homologue in the other ministries, or other organizations, . it's impossible to build One Health [approaches]. And I think yes, it's very. It's very important". (Int-1)

"First, there were physical meetings, now we have many online meetings. Physical meetings allowed you to get to know each other more directly, to talk about other things over coffee, and to realize that the problems we face are practically the same, regardless of your profession. Essentially, they are the same, only that each of us might approach them from a different perspective, which enriches the experience of having different viewpoints together." (Int-6)

4.1.4 Capacities and skills

Collaborative attitude and capacities

In interviews, building and promoting a collaborative mindset was perceived as essential. For participants, this mindset was based on values such as flexibility, adaptation, curiosity and resilience. Working under these principles enabled actors to adjust approaches and find common grounds for action. The importance of conciliatory attitudes was also pointed out. A shift from focusing on blame (e.g., "who is guilty" for AMR) towards a collaborative problem-solving approach was seen as central. Also, a factor playing an important role in participants awareness to the One Health approach was the professional background. In some cases, extensive experience with joint actions across sectors contributed to a strong foundation for collaboration. In the animal sector, the veterinary profession and expertise, was conceived as having an advantage in conceptualizing AMR as a OH problem.

"I mean, I believe that from veterinary medicine, from animal health, we have a broader perspective, about diseases. We work with diseases, pandemics, epidemics. We are very used to it. Whereas the human perspective is patientoriented. I have a case, I have a patient, and I treat this patient. So, from veterinary medicine, it's much easier for us, or easier, let's say, to see the bigger picture. If we don't stop the disease here, it will go to this other extreme. And there will be patients, but many patients. And COVID has proven it, you know? So, we always have that perspective because our profession provides it. You heal humanity; the doctor heals the patient. It's two different perspectives. In human medicine, perhaps it's more difficult for them to have that global point of view. We all influence each other." (Int-6)

Leadership

Effective leadership emerged as a key enabler. Interviewees emphasized the need for leaders with a multi-faceted skillset, encompassing both technical expertise and strong social skills. Leadership for the NAP implementation required the ability to make practical decisions, prioritize effectively, and manage resources. Social skills and emotional intelligence were also pointed out as equally important in terms of knowing how to deal with different perspectives, building trust with diverse stakeholders, serving as an authorized voice, and inspiring continued motivation and commitment.

"you have to know how to react and change your point of view if the situation requires it, not just because someone proves you wrong. What you have to know is to assume your mistakes, be capable of changing and solving (...) I also believe it's important to know how to listen and, well, to stop being stubborn. (...) I have no problem assuming mistakes and knowing that it's not possible to know everything" (Int-3)

Furthermore, interviewees pointed out the importance of high-level leadership for effective NAP implementation. In Slovenia, it was emphasized that positioning NAP leadership within a high management position facilitates decision-making and the implementation of broad-spectrum actions. Additionally, there were nuances between leadership and hierarchies between sectors. In some instances, participants acknowledged that the NAP prioritized human health, and actions were primarily focused on safeguarding human health. However, others emphasized that ensuring human health would only be achieved through a truly integrated approach addressing animal and environmental health as well.

4.2. Barriers

4.2.1. Collaboration

Lack of resources

The lack of resources emerged as the main challenge for NAP's implementation and update. Furthermore, financial constraints were stated as negatively impacting the sustainability of collective intersectoral efforts. In Slovenia, external events such as the COVID-19 pandemic also impacted the NAP development and resources. The interviews conducted in France and Spain identified a lack of political commitment as a root cause behind insufficient funding for AMR. While they perceived growing public attention towards the topic, the combination of limited dedicated funding sources and unsupportive legislative frameworks made it difficult to secure budget allocations.

"We are still fighting to get an economic provision [for the NAP]. (...) The important thing is to convince the politicians. We have always had tremendous support [from management and directors]. Tremendous support that has made it possible for us to accomplish many things, but it has been difficult to convince politicians. Convincing the politicians is crucial because, in the end, you need legislation, and if you don't have them, you have nothing." (Int-6)

Lack of evidence for policymaking

Interviewees in all countries pointed out the lack of comprehensive data on AMR in the environmental sector as a critical barrier, significantly hindering the sector's ability to contribute effectively to National Action Plans (NAPs). This gap creates a two-fold challenge: it hindered the development of evidence-based environmental policies for AMR control and weakened the environmental sector's representation. From the participant's viewpoint in France and Spain, it was hard to propose effective environmental interventions within NAPs without strong supporting data. The difficulties in quantifying the environmental contribution to AMR transmission created a dilemma in how to proceed with policy:

"The lack of evidence is very significant for us because when you face committees and regulatory issues, evidence is always required, and I find that logical. I mean, it's not just a crazy idea (laughs) but rather, "Hey, give me something substantial." And it's not easy. As time goes by, I become more certain that we won't be able to close all the gaps we have in the way we would like, because it might require technology we don't even have (...) What is the fraction in which the environment contributes to the transmission of resistance? (...) We reach a crossroads where we ask, do we take actions based only on a suspicion or do we take no action due to the lack of evidence? And I don't have an answer to that question." (Int-4)

4.2.2. Coordination

Overcoming fragmentation

One of the recurring challenges identified during the interviews was the promotion of collaborative work across different sectors. This challenge was particularly noticeable in the initial stages of NAP design and was evident at both the policy level and during stakeholder coordination. Interviewees highlighted the inherent fragmentation between sectors as a structural barrier to collaboration. They described the challenges of convincing and guiding professionals from diverse sectors to work together effectively, given their established work styles and priorities. Shifting towards a collaborative approach often required participants to step outside their comfort zones, which initially led to resistance. Furthermore, the lack of standardized management tools across sectors, exemplified by the absence of a specific sectoral plan in some environmental sectors, further complicated coordination efforts.

"Most of my colleagues, they are used to just focusing on one research or one field of expertise. They're doing that, and it's very hard to make some shifts in their perspective and their way of working because it's very, you know (...) in public health perspective [is] it's one way, [in] clinical microbiology, it's completely another way, and from an environmental perspective ...it's different aspects." (Int-5)

4.2.3. Communication

Setting a common language

The lack of a common language also posed a challenge to people implementing the NAP. Participants explained that knowledge on AMR encompasses a vast and complex landscape. This resulted in different interpretations and applications of key concepts across sectors at the policymaking level. Furthermore, the highly technical nature of the topic posed a challenge for professionals without backgrounds in life sciences. This technical jargon likely contributed to difficulties in communication and understanding.

"But I think it would have been easier for me if I had a training in microbiology or something like that, because I don't understand every, everything. (...) AMR in the environment. It's very technical. (...) And I don't have this technical tools this technical background. Sometimes it's a bit, it's a bit hard for me to understand everything. And I really have to ask the researchers and the experts to explain better" (Int-2)

Need of an AMR health champions

The interviewees stressed the need to generate more engagement trough communication to foster political involvement. They emphasized that increasing community engagement is crucial not only for raising awareness but also for motivating politicians to boost the topic. During one interview, the need to personify health messages to engage and involve the community actively was recognized. This approach involved having a health champion— a person who had personally experienced the health issue at hand—to communicate the topic's significance. However, it was also contrasted that this type of advocacy came from an American model and its implications for the European contexts could be different.

"Yeah, and to complete, I just want to add that we need the mobilization of the public. Because if the population takes part in this topic, it will become a political topic, and it will be easier to secure funding and resources. On the topic, we try to think about the way we communicate, and we heard something that is not yet implemented in France. (...) that is to say, having someone who survived an infection with resistant bacteria come in front of people and say, 'Okay, it's a very important topic. I was about to die, and we need to do something.' That's not very European, or at least French, to do it. But in the different conferences that we listened to, they said that it would be one of the keys to have people involved." (Int-7)

4.2.4. Skills and Capacities

Limited transdisciplinary perspective

Interviews highlighted a significant challenge regarding the limited transdisciplinary perspective among those involved in NAP development. This manifested in the difficulty participants experienced convincing policymakers and stakeholders of the added value of working together across sectors. Siloed thinking, where different sectors operate independently with limited communication was a significant obstacle to overcome. Furthermore, guiding people toward data and knowledge sharing across disciplines presented an additional hurdle.

"When I talk about the NAP, I always say that the first success it had was getting doctors, veterinarians, pharmacists, microbiologists, nurses, dentists, etc., to sit around a table from the very beginning. Now everyone talks about One Health, but before, when you approached people and talked to them about One Health, they looked at you like you were crazy or something. In the early meetings, things were really complicated because what we didn't know was that we were all saying the same thing, we all wanted the same thing, but each of us was speaking a different language. So the first step was to adapt to each other, to see that we were all talking about the same thing and all working on the same issue" (Int-6)

Discretionary efforts

While technical expertise is crucial for NAP development, the interviews revealed another hurdle: sustaining effort over time. Across all countries, interviewees highlighted the difficulty in maintaining motivation and ensuring consistent action throughout the NAP process. Interviewees specifically pointed to the reliance on the personal effort of a few committed individuals to drive NAP development forward. It was also suggested that a more systematic approach is needed to support motivation and ensure long-term implementation of NAPs.

"No, it's very individual, probably a lot of personal effort. So, a lot of dedication, especially when there is not just a linear way up but also downs—a lot of downs in my experience. You need to be prepared to take that into account. It's not a clear, straightforward career in AMR as a public health specialist. There are ups and downs, and the downs are not nice. Especially when they happen for the first time, because you need to re-establish and regain your strength and start again from a slightly different perspective, maybe" (Int-5)

5. Discussion

One Health Collaboration at policy level

This study investigated the experiences and perceptions on enablers and barriers for effective One Health collaboration at a policy level (design and implemention of National Action Plans on AMR) across Europe.

This research contributes to a limited body of literature on AMR assessing One Health collaboration at a policy level. Most existing studies tend to focus on NAPs alignment with the Global Action Plan recommendation (Willemsen et al., 2022), their implementation (Berman et al., 2023; Thomas et al., 2023; Hein et al., 2022), and their impacts (Gu et al., 2021), offering valuable insights for strengthening governance frameworks (Chua et al., 2021; Frumense et al., 2021a; Anderson et al., 2019). However, qualitative studies exploring the experiences and perceptions of those involved in One Health collaborative initiatives on AMR remain scarce and focus on surveillance (David et al., 2024; Collineau et al., 2024; 2023; Bourély et al., 2023).

This study confirms, as addressed by Davis et al. (2024) and Bourely et al. (2023), that effective OH collaborations on AMR transcend a purely technical exercise encompassing scientific inquiry, planning, implementation, and regulation. It is equally constituted by social relations implying shared understandings and norms that underpin knowledge practices and enable resultant actions. In this line, the One Health approach, as conceived by these authors, can also be framed as an ethical practice where understanding oneself and others represents a way to build collaborative responses to complex health challenges such as AMR.

Moreover, this study stresses the need to understand functional One Health collaborations relying on the complex interplay between structural and institutional

factors alongside personal relationships between individuals with collaborative capacities (See Figure 4).

Findings emphasize the critical importance of fostering dynamic and continuously evolving collaborations with adaptability and flexibility as core features (Bryson et al., 2015; Emerson & Gerlak, 2014). In line with previous literature, our results also show that



Figure 4 NAPs One Health Collaboration

there is no one-size-fits-all formula for successful collaboration (Abbas et al., 2022; Amri et al., 2022).

Enablers and barriers for effective One Health collaboration are specific of their context. Findings from this study should, therefore, be interpreted within a procedural context, recognizing that some enablers and barriers may hold greater influence depending on specific circumstances. Spain and France have extensive AMR policymaking histories but differ due to their contexts. France manages health and AMR centrally, while Spain does so regionally, involving more stakeholders and leading to varied experiences in One Health collaboration. Slovenia, in an earlier stage of NAP implementation, faces challenges like effort fragmentation and difficulty in prioritizing AMR initiatives. Interviewing more countries could help consolidate findings and explore different procedural contexts..

The qualitative insights addressed by this study are crucial to inform and strengthen monitoring and evaluation processes for future NAPs and political measures in a context where OH reviews and evaluations overlook the role of qualitative indicators (Lam et al., 2024). Even if context specific, results from this study could also provide valuable insights to understand important determinants for other trans-sectorial health issues, such as zoonotic diseases or climate change, in the European context.

Facilitating One Health policy-making on Antimicrobial Resistance

Several key enablers were identified for successful One Health collaboration. Effective governance mechanisms facilitating collaboration were enhanced in the participants' perspective by <u>dedicated intersectoral task forces</u> or existing agencies playing an intermediate role. This aligns with literature identifying appropriate OH governance

based on balanced power dynamics, calibrated interactions between sectors, and equitable stakeholder engagement (Ruckert et al., 2024; Mwatondo et al., 2023). Furthermore, as pointed out in other studies, the findings underscore the necessity of meticulously considering the initial conditions within each case and strategically capitalizing on existing structures and collaborative relationships (Bronzwaer et al., 2022; Errecaborde et al., 2019b).

Interviews revealed that a <u>shared understanding and acceptance of the One Health</u> <u>approach</u> and a <u>clear definition of each sector's responsibilities</u> within the NAP framework facilitated coordination and minimized confusion and duplication of efforts. This finding supports the concept of accountability in the One Health literature and addresses the gap often identified regarding the lack of formal accountability mechanisms, meaning <u>promoting awareness within policymakers</u> and <u>defining</u> <u>boundaries</u> contributes to intersectoral work (Chua et al., 2021; 2019). Also, the perception of acceptance and shared vision of the OH approach at the policy level evidences in the cases studied a shift in the narrative where a transition from advocating and calls for collaboration are turning into a more prominent recognition of its importance where the weight is shifting towards building concrete actions for implementation (Stephen et al., 2024).

Effective coordination strategies, as described by participants, included establishing regular meetings (both physical and virtual), creating shared online platforms for document collaboration, and encouraging informal communication channels. These strategies contributed to building trust and facilitating knowledge exchange, consistent with literature emphasizing effective coordination and communication mechanisms relying on components such as prioritizing and putting in value good relationships as well as careful consideration and work towards a strong stakeholder engagement (Joshi et al., 2021; dos S. Ribeiro et al., 2019).

Communication was another critical element. The results stressed the need for a <u>well-defined communication strategy</u> that facilitates internal collaboration and external outreach. Engaging communication professionals, as seen in some cases, significantly improved outreach efforts by tailoring messages to diverse audiences. Even though this finding has already been pointed out in literature (Humboldt-Dachroeden, 2023), it becomes particularly important in light of Charani et al.'s (2023) results, where out of 108 NAPs assessments, the acknowledgment of tailored messages for different audiences was null.

Enablers related to social skills and capacities were also addressed. Core soft skills such as <u>flexibility</u>, <u>adaptation</u>, <u>transdisciplinary</u> thinking, and, most importantly, <u>leadership</u>

were valued among the interviewees. The findings support other frameworks related to understanding OH core competencies and reinforce the vision of an OH competent person as a bridge between disciplines and sectors, capable of approaching health holistically. In alignment with the interviews, OH competencies are essential to being an effective communicator and knowing how to ethically and responsibly navigate diverse groups to achieve shared goals. It also involves knowing how to handle complexity and uncertainty and appreciating different perspectives and local knowledge (Laing et al., 2023).

Additionally, several challenges hindered effective One Health collaboration among the identified enablers. <u>Insufficient funding</u> and a <u>lack of political prioritization</u> significantly hamper NAP implementation and sustainability. This, as pointed out by several authors reviewing NAPs, remains a main area to improve, given its impact on collaboration sustainability (Adnyana et al., 2023; Frumence et al., 2021a; Sumpradit et al., 2021). Literature also suggests that a key way to address this challenge is by improving awareness through translating AMR knowledge into political and institutional levels to make it as tangible as possible. This can be achieved by framing knowledge in a way that directly addresses the priorities and concerns of political and institutional leaders, making it relevant (Humboldt-Dachroeden, 2023).

Another key barrier identified by this study was the lack of evidence for policymaking, which to date represents one of the main challenges concerning the environmental sector and stresses the need for further research its role played on AMR (Lam et al.,2024). To address knowledge gaps, research prioritization and financing are key facilitators. In Europe, the Joint Programming Initiative on AMR – JPIAMR -(https://www.jpiamr.eu/) has been working since 2013 on developing a strategic research agenda for AMR in Europe and has financed, since then, more than 170 research projects in Europe, including projects on the environment. Even when evidence is available, knowledge transition and translation from researchers to policy-makers may come as an issue (Delnord, 2021). Tools to facilitate this transition are crucial for the implementation of evidence-based policies. This was shown for instance in the development of Thailand's NAP, where a strategy to tackle scarce and fragmented data on AMR and AMU in the human sector was set-up, with the development of a scientific platform oriented to generate evidence and guidance for policy development (Sumpradit et al. 2021).

Our study also delved into the challenges of OH coordination. One of them was <u>overcoming fragmentation</u> across sectors, where established work styles and priorities were seen as obstacles, especially at the early stages of NAP implementation. This

finding portrays one of the most relevant challenges for NAPs which involves bridging the gap between only promoting the OH concept and truly implementing OH actions with balanced and equitable sector participation (Frumence 2021b). Fragmentation across sectors arises from diverse educational and professional paths, organizational structures, and is influenced by historical, geographic, and social factors. This leads to varied methodologies, conflicting actions, values, and disparities in knowledge and capacity (dos S. Ribeiro et al., 2019). Addressing these challenges is complex, but key aspects include enhancing professional to generate collective knowledge from previous successful OH experiences.

The <u>lack of a shared understanding of AMR terminology</u> across sectors was identified as a communication barrier. This aligns with previous research that identifies technical jargon as a main barrier for OH collaboration on AMR. Authors have notably highlighted that different names and technical expressions can impede understanding and hinder collaboration and communication between domains (Wellcome Trust, 2019; Mendelson et al., 2017). Studies examining how the public perceives the language used by the scientific community and in awareness campaigns about AMR have raised similar issues (Karvanen & Cars, 2024). Consequently, a process to improve and generate a more intelligible language about AMR and OH collaborations is still on call.

Finally, this study highlighted the challenge of <u>limited transdisciplinary thinking</u>, which aligns with previous studies showing that disciplines maintaining siloed practices hinder collaboration in important aspects of AMR, such as sharing of data/knowledge/practices (Frumence et al., 2021a; Anderson et al., 2019). In this line, building collaborative capacities through training and awareness is crucial especially at the professional level (Hailat et al., 2023; Abbas et al. 2021). An effective example of silo-breaking project is the PROMISE network in France which united professionals, researchers, policymakers around AMR.

Perspectives on measuring One Health collaboration and including behavioral aspects.

The design and implementation of OH NAPs in Europe still represents a recent endeavor. As shown in this study and by TrACSS, countries are at varying stages of development and capacity, making it challenging to establish standardized metrics for measuring collaboration effectiveness. While international organizations like the Quadripartite have offered useful frameworks to guide countries on how to implement a One Health Joint Plan of Action (2023a), and to monitor and evaluate AMR NAPs (2023b), a clear measurement of what constitutes a proper OH collaboration, particularly in the context of AMR, remains still under development. This lack of established metrics for monitoring and evaluation activities remains a major gap despite the acknowledging of OH collaboration importance (Errecarbode et al. 2019a). This underscores the crucial need to understand factors that support collaboration and how teams can evaluate their performance and outcomes in relation to those factors. As the authors point out, a significant disparity exists between the assumed benefits of One Health and the availability or use of standardized metrics to demonstrate them (Baum et al., 2016)

Consequently, it's equally important to reflect critically on the One Health approach put into practice. This entails analyzing unequal power dynamics, which make a sector stand more than the rest. As this study has exposed, the environmental sector remains still underrepresented and limited in actions compared to the other sectors. Between many explanations and going beyond technical limitations, the literature suggests the prevalence of hierarchies centered within the human health sector, potentially linked to an anthropocentric perspective (Kamenshchikova et al., 2021). This human-centered reasoning, as discussed by Craddock & Hinchliffe (2015), results in OH policies that favor human interests, often at the cost of other species and the environment.

Likewise, authors have stressed the need to ensure collaborations produce effective outcomes that go beyond mere labeling or self-identifying as "One Health". For instance, in research, it has been addressed how studies claiming a OH approach are not as integrative as stated, evidencing limitations to a real capacity to tackle environmental dimensions and develop policy instruments (Giraudoux et al., 2022; de Thoisy et al., 2021; Morand et al., 2020).

Finally, the results of this study represent a close approach to policy "in the making", reassuring Wernli et al., (2017) idea where AMR, as part of global health policy, is a contested space both in the scientific and political arena where actors also pursue goals and are involved in power relationships. Analyzing actors' perspectives and opinions brings a social and behavioral science (SBS) approach to a traditionally biomedical and microbiological field in a context where SBS are mistakenly conceived as tool limited to knowledge dissemination, tasked with translating scientific discoveries (often framed as "in vitro") to the general public ("in vivo"). This linear knowledge flow model neglects the inherent "social situatedness" of scientific inquiry. An effective OH perspective on AMR hinges on a nuanced understanding of both the biological and social dimensions of the issue. Therefore, what is required is a framework that integrates biological knowledge with social practices, forming a "micro-biosocial knowledge and practice system (Whittaker, in press cited in Davis et al. 2024; Whittaker & Do, 2023).

A Checklist for Reflecting on effective OH Cooperation

As evidenced earlier, proper assessment of OH cooperation is a crucial challenge. Based on the enablers and barriers identified in the study the following checklist is proposed as a self-assessment tool to evaluate effective OH cooperation. It can also be used as a guidance tool to progress toward a more integrated OH collaboration.

Collaboration	Have intersectoral governance mechanisms been built on the basis of existing networks or institutions?
	Have representatives of all sectors agreed on the One Health approach and its importance in addressing AMR?
	Are the roles and responsibilities of each sector clearly defined within the NAP framework?
	Is there sufficient dedicated funding allocated for NAP development and implementation?
	Are there established mechanisms for resource sharing across sectors?
Coordination	Have relevant stakeholders from all sectors been identified and engaged in the NAP process?
	Are there clear communication strategies to keep stakeholders informed and involved?
	Do stakeholders have opportunities to contribute their expertise and perspectives to the NAP?
	Are resources available to support stakeholder participation, such as travel and technical assistance?
	Are regular meetings (both online and in-person) established for stakeholder collaboration?
	Are there recognized informal communication channels which can be seized for know-how sharing?
	Do sectoral policies and work plans align with the One Health approach to AMR?
	Are there standardized management tools used across sectors to facilitate coordination?
Communication	Is there a dedicated communication strategy for the NAP, targeting several publics?
	Are communication professionals involved in the whole developing and implementing the strategy?
	□ Are there training programs or resources available to educate policymakers and stakeholders on key AMR concepts?
	Are efforts made to simplify technical language for broader public understanding?
	Are there public awareness campaigns planned to raise awareness about AMR and the importance of the NAP?
	Are there opportunities to engage community leaders or individuals affected by AMR in advocacy efforts?
Capacity	Are the professionals involved sensitized with skills concerning flexibility, adaptability, and active listening?
Building	Are the professionals involved sensitized in a leadership that builds consensus?
	Are there mechanisms to promote the involvement of the sectors in equity?
	Are risks on discretionary work mapped and limited?
	Are there strategies in place to maintain motivation and ensure long-term implementation of the NAP?

6. Limitations

This study, while qualitative and exploratory, offers rich insights into the experiences and perceptions of key actors involved in one health collaboration on AMR in Europe. However, the generalizability of these findings is limited due to the qualitative approach and a limited number of participants and countries involved. This research prioritizes indepth understanding over statistical representation, offering a nuanced picture but not necessarily applicable to the broader European AMR landscape.

Furthermore, participation in the interviews was limited by the actors' busy schedules and time constraints. This may have resulted in a less comprehensive view of the experiences and perspectives on One Health collaboration. Despite these limitations, the study serves as a valuable springboard for further research, informing future studies with richer methodologies and contributing to the development of National Action Plans in Europe. Additionally, the study focuses on a high-income country setting. It is important to foster perspectives on the low- and middle-income country (LMIC) setting and develop frameworks according to their specific needs.

7. Conclusion

This study examined policymakers' experiences and perspectives on enablers and barriers to One Health collaboration on AMR at a policy level in Europe. Despite efforts and guidelines promoting cross-sector collaboration, gaps in implementation persist. To address this, a qualitative methodology was used to identify key enablers and barriers.

Key insights regarding enablers and barriers for collaboration, coordination, communication and capacity building stood out. Encouraging intersectoral mechanisms based on existing structures, fostering the integration of targeted communication, understanding the social context and promoting awareness in a multilevel way were pointed out as facilitators. Likewise, lack of resource and political involvement, institutional fragmentation, and limitations in building a common language and promoting transdisciplinary thinking represented challenges for participants.

This study concludes that effective OH collaboration implies the convergence of interpersonal dynamics, intergroup and institutional settings, as well as structural governance conditions. Highlighting the inherently social nature of OH collaboration, this research proposes a self-assessment checklist, informed by identified enablers and barriers, to guide further endeavors.

8. Appendices



Appendix 1. EU-JAMRAI Work Packages

Appendix 2. Interview Guide Actors involved in NAPs designing/implementation

1. Introduction

This is a study of your experience and perceptions, therefore, there is no good or bad answer. The aiming to improve processes of policymaking

Before proceeding with the interview, I would like to confirm your consent to record this meeting. Your participation and your statements will be anonymized.

2. Personal Information and Professional Background

- Personal information, studies
- Work trajectory
- Values related to work culture
- Strategies and practices for multidisciplinary/collaborative work

-Please introduce yourself, your background, and your work experience -What previous experiences did you have with AMR?

-What previous experiences did you have with inter-sectoral work?

-In your perspective, what are the most important values leading your work?

-What do you consider the most important values when working with tasks requiring collaboration?

3. National Action Plan Overview

- Country NAP overview, state of play
- Current situation of NAP
- Pandemic impact

-Can you describe your contribution to the NAP? What tasks have you undertaken? Since when? What tasks do you perform now?

-Deep into designing

-Deep into implementation

-Overall, how do you characterize this experience? In terms of improvements and effective working towards reducing and controlling AMR?

What major changes have you noticed since you started with this? What is the state of play now compared to when you started?

-What would you say are the priorities of the NAP now?

-I would like to know how COVID-19 impacts the designing and implementation of NAP. What is your impression regarding the pandemic?

-I understand this plan as an interministerial action plan.

-How was the collaboration organized

- -How was the coordination organized
- -How was the communication organized

4. Sector Role in NAP

- Role played in designing/ implementing NAP
- Process/steps to achieve designing/implementation
- Prioritization of actions
- Valorization of NAP, GAP impact on the country's context

-What is AMR's role in the sector? Is it a prioritized topic? Why yes/no? -Could you describe the actions undertaken in the sector to tackle AMR?

What are the sector's priorities in AMR?

How is the process to put this high on the agenda?

-Besides AMR, what other collaborative experiences exist in the sector? -Do you have any successful/challenging experiences in mind? -In the case of (country) and the _____ sector, what fosters collaboration? What type of factors have you experienced?

5. Perceptions of OH approach, collaboration enablers, and barriers

Networks – Languages- Hierarchies/Power Relationships- Resources

- Conceptions of actions to tackle AMR and OH approach
 -Narrowing and valorization of AMR (concrete actions for tackling AMR)
 -Narrowing and valorization of OH approach (concrete definitions/actions)
- Conceptions on collaboration

 Factors fostering collaboration (previous structures, values)
 Factors challenging collaboration.
 Experiences with collaboration work
- Conceptions on coordination
 -Factors fostering coordination
 -Factors challenging coordination.
 -Experiences with coordination work
- Conceptions on communication

 Factors fostering communication
 Factors challenging communication.
 Experiences with communication work

6. Suggestions

- Envisioned collaboration structure
- Prioritization of activities to foster collaboration
- Resources needed for collaboration
- Skills/competencies considered required for this task
- Country particularities on collaboration fostering/hindering

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