Deliverable WP5.1 – Report on requirement analysis for "OHS roadmap template"

OHEJP JIP MATRIX – WP5

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REPORT ON REQUIREMENT ANALYSIS FOR “OHS ROADMAP TEMPLATE”

Acronyms

AH – Animal Health
AMR – Antimicrobial Resistance
EH – Environmental Health
FS – Food Safety
OHEJP – One Health European Joint Programme
OHS – One Health Surveillance
OH – One Health
PH – Public Health

Background

1. Introduction to MATRIX

MATRIX: Connecting dimensions in One Health Surveillance is an integrative project within the One Health European Joint Programme (OHEJP) aiming to advance the practical implementation of One Health Surveillance (OHS) by creating synergies between the public health (PH), animal health (AH), and food safety (FS) sectors at the national level. While other OHEJP projects focused on implementing OHS at the end of the surveillance continuum in each sector, MATRIX aims to strengthen OHS along the entire surveillance pipeline, from implementation to output. MATRIX focuses on building upon existing resources, rather than developing new systems, to account for the unique infrastructural capacities of each country.

Among other activities, MATRIX is developing a roadmap for the design and implementation of OHS at the country level. The roadmap will address barriers and facilitators between OHS sectors and will be designed with different starting points, allowing countries to apply the roadmap directly to their own situation, based on their capacities. The roadmap will also build upon the frameworks and ideas from other projects by presenting methods for practical OHS implementation. This requirement analysis lays the foundation for how to circumvent barriers and optimize facilitators.

This requirement analysis and subsequent roadmap will be beneficial for:

- Institutes working within PH, AH, FS and/or environmental health (EH) sectors involved in One Health (OH)
- The Consortium of MATRIX partners
- National health authorities involved in OH
- International and European organizations involved in OH
- Research and academic institutions involved in OH
- Interest groups involved in OH

2. MATRIX Workpackage 5, Task 1 – Requirement Analysis

In this requirement analysis, an OHS system is "a system in which collaborative efforts exist across at least two sectors (among human health, animal health, food safety and environment) in the surveillance process to produce and disseminate information with a purpose to improve any of human, animal or environmental health," as in the One Health Glossary developed in the OHEJP JIP-ORION project (One Health EJP ORION N.A.). The importance of adopting OHS is frequently highlighted in literature, although what exactly this entails and how to practically design, develop, implement, and monitor an OHS system is investigated significantly less often. Additionally, other OHEJP projects have investigated certain aspects of OHS, but not the entire surveillance continuum. Here is where this requirement analysis plays an important role in investigating barriers and facilitators (e.g. infrastructural, economic,

of other nature) to the successful design, development, and implementation, including monitoring of OHS along the entire surveillance pathway in European countries.

Rather than defining OHS or describing the characteristics for building an OHS system, we are interested in discovering what stands in the way of the practical implementation of the system. Then, we want to use this information to advise surveillance actors how to both circumvent barriers that prevent efficient OHS and value facilitators that support it. A special focus is given to the European context as per the OHEJP scope, something that has yet to be done within OHEJP or in the available literature. The main objectives of this deliverable are:

- To gather knowledge about the barriers and facilitators to the successful design, development, and implementation, including monitoring, of OHS at the national level in Europe
- To identify needs and priorities regarding the design, development and/or implementation of national OHS that could be integrated into the planned MATRIX OHS Roadmap

This deliverable is divided into three parts, each of which provides a unique perspective and approach to uncovering barriers and facilitators to the successful design, development, and implementation, including monitoring, of OHS. First, a systematic review of the literature was performed to incorporate published and grey literature into our findings. Secondly, user stories were collected from professionals and OHEJP MATRIX colleagues working directly with OHS systems, to include the voices and experiences of those on the ground. Lastly, a review of outputs from other relevant OHEJP projects was conducted to highlight knowledge gathered under the OHEJP umbrella. Together, these three components capture a snapshot of barriers and facilitators to the successful design, development, and implementation, including monitoring, of OHS from various dimensions and will subsequently contribute to a dynamic and relevant roadmap.

Systematic Literature Review

1. Introduction

In order to assess what is standing in the way of and/or can facilitate the adoption of an OHS system across all parts of the surveillance continuum in a European country, we gathered evidence from the existing literature via a systematic review.

1.1. Why a systematic literature review?

There is evidence of the challenges and loopholes to OHS activities and the literature highlights the needs for OHS in consequence of a lack of OH-ness (dos S. Ribiero et al. 2019). However, the specific challenges to integrating OHS into pre-existing surveillance structures are not fully evident. Other systematic reviews of the literature have recently addressed the topic of barriers and/or facilitators of OHS (Uchtmann et al. 2015; dos S. Ribeiro et al. 2019; Bordier et al. 2020; George et al. 2020). However, they demonstrated the following limitations to inform the objectives of the requirement analysis:

- Reviews did not have a primary European focus (Uchtmann et al. 2015; dos S. Ribeiro et al. 2019)
- Reviews had a focus on the implementation phase of OHS only (dos S. Ribeiro et al. 2019; Bordier et al. 2020)
- Reviews had a focus limited to barriers to OHS and not facilitators (dos S. Ribeiro et al. 2019; George et al. 2020)
- Reviews only focused on the PH and AH sectors (George et al. 2020)
- Reviews did not account for the most recent development in OHS in Europe e.g. they were conducted before the launching of OHEJP and could not capture the programme's achievements

1.2. Aim

The aim of this review was to ascertain the available evidence on the barriers and facilitators to the design, development, and implementation, including monitoring, of integrated OHS at country level in Europe.

2. Methods

This was a systematic literature review of the current evidence on the barriers and facilitators regarding the design, development, and implementation, including monitoring, of integrated OHS at the national level in Europe. We followed the PRISMA checklist as much as relevant, given the narrative nature of this review (Page et al. 2020).

2.1. Conceptual framework

Disease surveillance means "information for action" (CDC 2012 a; Orenstein & Bernier 1990). In order to pinpoint the operational components of surveillance, we

identified three dimensions relevant to integrated OHS i.e. design, development and implementation, including monitoring (CDC 2014; CDC 2012 b):

- Design - Creating the blueprint for an OHS system, its justification and objectives, who will be involved, what resources will be needed, what current structures will OHS build upon
- Development - Building the tools, relationships, and frameworks (legal, financial, etc.) to support an OHS system
- Implementation - Putting an OHS system into practice in real-time and integrating it into existing infrastructure (including monitoring its quality)

The identified evidence was primarily described and interpreted through the lens of the aforementioned dimensions.

2.2. Topic statement

We collected evidence about the "collaborative efforts across at least two sectors (among human health, animal health, food safety and environmental health) in the surveillance process" (One Health EJP ORION N.A.) and related to the design, development or implementation, including monitoring, of the system, with a possible focus on their integration.

2.3. Objectives of the systematic literature review

- To retrieve and describe the published, peer-reviewed and grey literature about integrated OHS in Europe from 2008 onwards
- To identify the barriers preventing OHS integration among PH, AH, FS, and EH at the national level in Europe
- To identify the facilitators enabling OHS integration among PH, AH, FS, and EH at the national level in Europe

2.4. Eligibility criteria

Documents were included in the review if they matched all the following criteria:

- They had a publication date between January 1, 2008 and August 11, 2021. January 1, 2008 was considered a relevant date, being the year of publication of the first jointly-developed tripartite guide "Zoonotic Diseases: A Guide to Establishing Collaboration between Animal and Human Health Sectors at the Country Level" (WHO 2008)
- They were published in either English, French, German, Dutch, Norwegian, Danish, Swedish, Italian, Spanish or Portuguese, as in the linguistic capacity of the researchers
- They related to one or more of the 47 countries that were members of the Council of Europe in 2021
- They were peer-reviewed studies (with a quantitative, qualitative or mixed design) or grey literature
- They had a focus on the design, development and/or implementation, including monitoring, of OHS at national level and on the related barriers and facilitators

Expert opinions, editorials, systematic literature reviews and OHEJP deliverables were excluded. Barriers and facilitators were respectively defined as the weaknesses (internal to the system) or threats (external to the system) and the strengths (internal to the system) or opportunities (external to the system), as in a Strength, Weakness, Opportunity and Threat (SWOT) analysis of a classic project cycle management (Teoli et al. 2021). This was done because the further away one looks at the operability of the system, the more one loses control of its determinants. Conversely, the closer one looks at operability of the system the less one might be able to influence its overarching determinants.

2.5. Information sources and search strategy

The following search strategy and selection process were first piloted in July 2021, before the final search was launched. This process led to the refinement of aspects related to both steps, including the eligibility criteria i.e., we increased the number of eligible publication languages, we elected the Council of Europe as the geographical dimension of interest, we expanded the focus of the review to the development of an OHS system, and all OHEJP-related documents were eligible for exclusion. Table 1 shows the search queries (with limits) that we launched on August 11, 2021 from four different information sources.

Table 1. Search queries (with limits) and information sources launched on August 11, 2021

Information Sources	***Search Query and Limits***
Medline https://pubmed.ncbi.nlm.nih.gov/	"One Health"[Mesh] AND ("Public Health Surveillance"[Mesh] OR "Population Surveillance"[Mesh] OR "Sentinel Surveillance"[Mesh] OR "Integrated Surveillance" OR "Disease Surveillance" OR Surveillance) Date of publishing: January 1, 2008 – August 11, 2021 Field of search: Title/Abstract
Scopus https://www.sciencedirect.com/	("One Health") AND ("Public Health Surveillance" OR "Population Surveillance" OR "Sentinel Surveillance" OR "Integrated Surveillance" OR "Disease Surveillance" OR Surveillance) Date of Publishing: 2008-2021 Field of Search: title, abstract, keywords
Web of Science https://www.webofscience.com/wos/woscc/basic-search	("One Health") AND ("Public Health Surveillance" OR "Population Surveillance" OR "Sentinel Surveillance" OR "Disease Surveillance" OR "Integrated Surveillance" OR Surveillance) Date of Publishing: January 1, 2008 – August 11, 2021 Field of search: Abstract
Google Scholar https://scholar.google.com/schhp?hl=en&as_sdt=0,5	filetype:pdf "One Health" AND "Integrated Surveillance" AND (Barriers OR Challenges) AND Europe Date of Publishing: 2008 –2021 Field of Search: no patents, no citations

Files from each information source were uploaded into EndNote (The EndNote Team 2013) and then exported as Research Information Systems files. Google Scholar metadata was manually added to Endnote in lieu of an abstract. All the following steps up to the data extraction were performed with the online, open-source application CADIMA (Julius Kühn-Institut - Federal Research Centre for Cultivated Plants 2021).

2.6. Selection process

The selection process included the following steps:

- Title and abstract review – Two researchers independently evaluated each title and abstract according to the inclusion criteria. Only if both reviewers agreed that the title and abstract were not relevant was the reference excluded from the full text evaluation to ensure sensitivity. In case of disagreement, the title and abstract were included. In the absence of an abstract or executive summary, the title alone was assessed.
- Full text review – Two researchers independently evaluated each retrieved document in full text according to the inclusion criteria and provided reasons for exclusion. The references of the reviewed documents were scanned based on their title and year of publication whether to consider including any of them for further assessment. Disagreements were discussed between the two researchers until resolved. A third reviewer was involved in case of a document written in a language other than English, French, Danish, Swedish and Italian.

2.7. Data extraction and data items

Two researchers independently extracted the following data items listed in Table 2 from the included documents using a spreadsheet. Prior to data extraction, researchers reviewed the following data items against those utilized by other systematic literature reviews on similar topics (dos S. Ribeiro et al. 2019; Bordier et al. 2020). Also, the data items and extraction were piloted with two additional references (Uchtmann et al. 2015; Bordier 2020).

Table 2. Data items utilized for data extraction of full text references included in the analysis

Variable	Description
Unique identifier	
Reference	
Type	Type of document e.g. electronic journal, electronic book, governmental publication, non-governmental publication, webpage, others
Time	Time coverage of the reported/analyzed system
Place	Geographic place of focus e.g. country, region, others
Topic	Main topic addressed. If possible, related to the document aim and objectives
Peer-reviewed (Y/N)	Source peer-reviewed (yes/no)
Applied/reported research	Applied research or reporting on research conducted elsewhere
Relevant methods	Relevant methods described (yes/no)
Methods 1	If methods described, quantitative, qualitative, or mixed methods
Methods 2	Free text to further describe methods

One Health Definition	If given, what definition of One Health
One Health Surveillance (pathway)	If given, what definition of the One Health pathway
One Health Surveillance (purpose)	If given, what definition of the One Health purpose e.g. early warning system, routine surveillance, outbreak detection
One Health Surveillance (scheme)	If given, what definition of the One Health scheme e.g. sampling regime, analytical methods, use of primary/secondary data
One Health Surveillance (level)	If given, what One Health level e.g. regional, national, supranational
One Health Surveillance (mandate)	If given, what definition of the One Health mandate e.g. responsibilities, legal framework, decision-making process
Sectors	Included sectors e.g. human health, animal health, environmental health, food safety
Definition of a barrier	If given, what definition of a barrier
Definition of a facilitator	If given, what definition of a facilitator
Identified barriers	Described barriers (as results)
Identified facilitators	Described facilitators (as results)
Barriers/facilitators reported not as results	Described barriers/facilitators not reported as results e.g. lessons learned, recommendations
Reviewer comments	

2.8. Study risk of bias and quality assessment

This review did not aim to identify and quantify the effect of any measure. Also, given the generally narrative nature of the retrieved documents, no further assessment of risk of biases was deemed relevant to this review. Researchers independently reviewed the included documents and agreed on their inclusion given the reasonable clarity of their methods and the internal (related to methods) and external (related to literature) coherence of their findings. Principles of assessing the quality of research and of grading the evidence of health care, both in the quantitative and qualitative domains, were considered in the design and execution of this review (GRADE 2022; Williams et al, 2020; Murad et al 2016).

2.9. Reporting of results

We described and summarised the main findings of the retrieved data items. Barriers and facilitators were categorized based on whether they fell in the design/development and/or the implementation/monitoring stage(s) of OHS.

2.10. Limitations

This review had several limitations that we tried to mitigate. The temporal and geographical limits of our search might have ignored other relevant evidence. However, we applied those limits to keep the requirement analysis of this deliverable as focused and relevant as possible to the objective of the OHEJP MATRIX project i.e. to develop solutions for European countries to advance in OHS. Another limitation was in the inclusion of published evidence descending from both quantitative and qualitative methods, while the profile of the researchers conducting the review was primarily quantitative. We mitigated this risk by focusing on the overall design and

findings of the retrieved publications, rather than on the evaluation of the applied research methods. Moreover, given the widespread use of qualitative evaluations in the OHS arena, excluding the related evidence would have significantly limited our findings.

Another limitation was possibly that we included barriers and facilitators reported in the discussions but not in the results of the publications e.g. recommendations or lessons learned were included. We did this in the attempt to capture the broadest overview of barriers and facilitators to OHS and in recognition of the already descriptive nature of many identified documents. Logically, this introduced a degree of interpretation and personal judgement in the extraction and analysis of data. Barriers and facilitators not presented as results in the analysed documents were highlighted in our reporting. Additionally, we identified a limitation in the way OH is actually portrayed in the retrieved publications. OH has been defined as a "buzz word" in scientific literature. This means that 'One Health' is sometimes utilized to engage the reader, given the momentum of the concept, but without a clear relevance to the content of the publication (Stärk et al. 2015). This made the process of identifying the publications that were actually relevant to this review more challenging.

Finally, the European focus of the review may have led to an overly negative approach to OH. Zoonotic diseases, including food borne illnesses, are less common in Europe compared to many other continents, and Europe has a large degree of specialisation and segmentation of expertise within AH, PH and FS. Therefore, the perceived need to find common solution to a OH challenge may appear lower than what has been observed in other parts of the world. Furthermore, the focus on sharing and interpreting data across sectors becomes larger than in less specialised systems.

3. Results

3.1. Study selection

On August 11th, 2021, 1203 documents were identified from the four data sources. After removing duplicates and reviewing the retrieved titles and abstracts according to the inclusion criteria, 103 documents were reviewed in their full text. The references of the 103 documents were assessed by their title and 37 additional documents were included in the full text review. After the full-text review, 20 documents (Annex A) were retained for the data extraction and analysis. None of the 37 reviewed references of documents matched the inclusion criteria and they were excluded from further analysis (Figure 1).

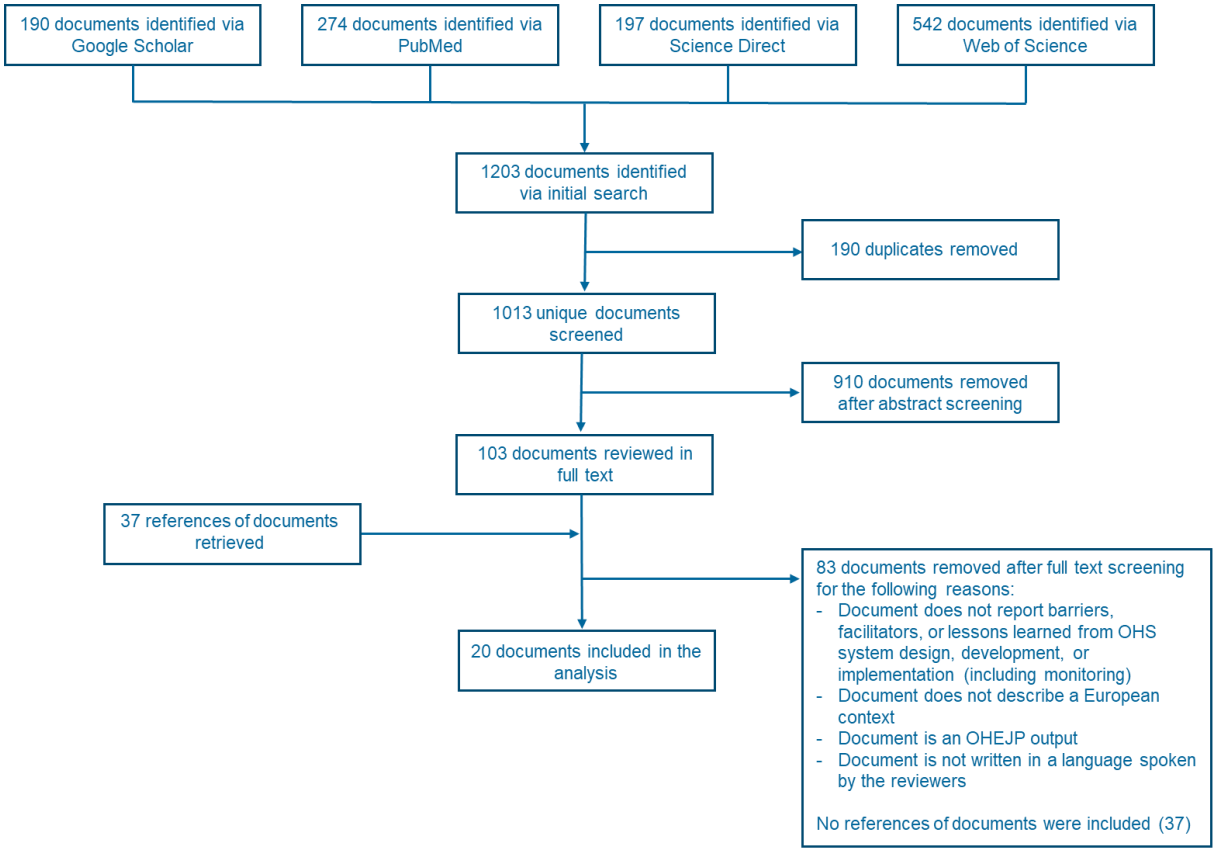

Figure 1. Study selection process within the Systematic Literature Review

3.2. Document type

Seventeen documents were peer-reviewed scientific publications, two were reports (grey literature), and one was a Ph.D. thesis (grey literature)[1].

3.3. Timeframe

Ten documents did not have a clear time reference in their methods i.e. they do not report the period relevant to the work. The others presented results spanning from 2007 to 2019. Five documents covered a period of time across multiple years.

3.4. Place

The geographic representation of the 20 documents was Italy (3), the Netherlands (2), France (2), Germany (2), the United Kingdom (2), Denmark (1), Serbia and Georgia (1), the European Union/European Economic Area (1), the Mediterranean including or not the Black Sea regions (3), Global, including Europe (3).

3.5. Topics

All document had a clearly described topic. Eight focused on a specific pathogen or class of pathogens, six of which were arboviruses. Five documents were about the study of antimicrobial resistances (AMR). Seven documents covered broader themes

[1] The peer-reviewed publications of the PhD thesis were counted once.

related to the design, development, implementation, including monitoring, of OHS systems.

3.6. Applied methods

Seven documents applied mixed quanti-qualitative methods, six qualitative methods and three quantitative methods. Quantitative methods were often utilized to conduct evaluations of OHS systems. The studies applying quantitative methods were descriptive analysis of survey and/or expert opinion findings. Four had no methods described and were narrative reports. Nine documents included more than one method of analysis. Four documents included a review of peer-reviewed and/or grey literature (systematic or not) in addition to other methods of analysis. Given the diverse nature of the documents, which included more classic research approaches together with narrative reports, creating a coherent classification of the applied methods was challenging. The retrieved evidence comes from a variety of designs and studies.

3.7. One Health definition and pathway

Fifteen documents reported a definition for OH in general (e.g. as an approach or a concept) or specifically for OHS. The provided definitions are scarcely referenced and not uniform. Five documents reported no definition and one document described the OHS pathway of relevance.

3.8. One Health Surveillance objectives

Seven documents reported specific objectives of the OHS system, including the routine surveillance of one or more hazards (4), the routine surveillance of one or more hazards and AMR (1), the routine surveillance of AMR (1), and an early warning system (1). Hazards of relevance were arboviruses (2), *Salmonella* (2), *Campylobacter* (1) and *Echinococcus* (1).

3.9. One Health Surveillance scheme, level and mandate

The OHS schemes and mandates were reported in four and seven documents, respectively, but they were poorly defined. The described systems referred to the national level in European countries (5), the regional level (2) or a combination of different levels from the regional to the supranational ones (2). Studies included and covered a variety of relevant sectors and institutions, both from the public and private domain.

3.10. Definition of barriers and facilitators

One study reported a definition of barrier and facilitator that was similar to the one considered in the methods of this review.

3.11. Results of individual studies

The identified barriers and facilitators related to both stages of OHS (design/development and/or the implementation/monitoring) and were specific to a single country and/or pathogen in 13 cases. Fifteen publications reported barriers and/or facilitators related to data management. Barriers and facilitators regarding

monitoring of OHS were scarcely identified. Narrow political vision and infrastructure were dominant overarching barriers to OHS. Table 3 reports all the identified barriers and facilitators categorized by whether they fall in the design/development and/or the implementation/monitoring stage(s) of OHS and whether they are internal (weaknesses and strengths) or external (threats and opportunities) to the system. Annex B shows a series of flash cards with the main findings of the reviewed documents. These are presented as a general overview of the retrieved evidence and a glimpse of the main identified barriers and facilitators from Table 3.

Table 3. Identified barriers (orange) and facilitators (green) categorized by i) whether they fell in the design/development and/or the implementation/monitoring stage(s) of OHS and ii) whether they are internal (weaknesses and strengths) or external (threats and opportunities) to the system, 2010 - 2021. Elements in grey are barriers and facilitators derived from the discussion of the reviewed documents and not from their results.

Barriers		**Facilitators**	
Weaknesses (internal)	**Threats (external)**	**Strengths (internal)**	**Opportunities (external)**
DESIGN & DEVELOPMENT Barriers of the existing systems • Poor/different articulation existing programmes (Border 2021; Dente 2016) • Poor sharing infrastructures (Paternoster 2017) Barrier of the focus (poor representation) • Geographical (Blake 2019) • Environment/ecology (Blake 2019; Bennai 2021; Vlieg 2017) • Wildlife (Amato 2020) • Early warning (Dente 2019) • Veterinary sector (Mader 2021) **IMPLEMENTATION (incl. monitoring)**	**DESIGN & DEVELOPMENT** Poor national governance (Bordier 2021) Unclear responsibilities, structural gaps and communication gaps at ministerial levels (Stärk 2015; Houe 2019) Legal uncertainties (Ribeiro 2018) Missing the opportunity to tackle already identified barriers (Houe 2019) Different priorities of sectors and stakeholders (Ribeiro 2018) Poor OH funding opportunities (Stärk 2015; Paternoster 2017; Noll 2018; Dente 2019)	**DESIGN & DEVELOPMENT** Power of the issue (e.g. AMR) and its momentum (Blake 2019; Wendt 2016) Improved communication and collaboration across sectors (Blake 2019) Existence of sectorial examples of best practices (Bordier 2021) Existence of mutual initiatives across sectors (Bordier 2021; Vlieg 2017; Mader 2021); collaborations of different actors (Bordier 2019) and transdisciplinary (Paternoster 2017) Existence of multi-sectorial committees (Dente 2019; Jourdain 2019; Cringoli 2021)	**DESIGN & DEVELOPMENT** Regulatory obligations and policies (Bordier 2021; Dente 2016) Existence of public-private collaborations (Stärk 2015; Wendt 2016) Education (Stärk 2015; Vairo 2018) Innovation in surveillance and new technology (Vairo 2018) Occurrence of emergencies (e.g. emerging threats) as flywheel for OHS (Stärk 2015) – paradox **IMPLEMENTATION (incl. monitoring)** Existence of multidisciplinary initiatives (Bordier 2021; Mader 2021)

Barriers of the existing systems • Poor surveillance requirements (Bordier 2021) • Passive surveillance (Mader 2021; Wendt 2016; van der Giessen 2010; Vairo 2018) • Different timelines (Mader 2021; Wendt 2016; van der Giessen 2010) Barriers at laboratory level (Vairo 2018; Queenan 2016; Bennai 2021) • Lack of commercial kits, validation panels, sharing platforms (hazard specific) • Poor/different standards across sectors Barriers of Data • Lack of notification criteria (Vlieg 2017) • Technical hiccups, different formats and poor ITs (Bordier 2021; Mader 2021; Blake 2019; Bennai 2021) • Poor compliance, lack of regulation, confidentiality issues, poor information sharing and communication (Bordier 2021; Ribeiro 2018; van der Giessen 2010; Paternoster 2017)	Educational gaps (Paternoster 2017) Nature of emerging threats (van der Giessen 2010) **IMPLEMENTATION (incl. monitoring)** Overall lack of resources (Bordier 2021) Poor sustainability of OH workforce (Stärk 2015) Barriers of Data • Structural barriers and communication gaps among ministries, public/private sectors and OH-relevant sectors (Stärk 2015)	OH thinking and planning (Paternoster 2017; Mader 2021; Queenan 2016), including epidemiological-driven thinking (Jourdain 2019; Dente 2019) Shared objectives across sectors (Dente 2021; Wendt 2016; van den Giessen 2010) **IMPLEMENTATION (incl. monitoring)** Short communication lines between the political level and operations (Vlieg 2017) Centralised OHS programmes (Queenan 2016) Multidisciplinary coordination (Mader 2021; Dente 2016) Simplicity of OHS for its sustainability (Mader 2021), scalability and cost-effectiveness (Bennai 2021) Availability of continuing training for laboratories (Mader 2021) Facilitators of data • Existence of integrated data (Dente 2016; Wendt 2016) • Availability and compatibility of online data (Houe 2019; Amato 2020) • Existence of common	Conduction of evaluations and assessments (Bordier 2021; Dente 2016; van den Giessen 2010)

• Lack of trust (Bordier 2021; van der Giessen 2010) • Poor ownership (Bordier 2021; Ribeiro 2018) • Need for autonomy (Blake 2019) • Poor quality incl. completeness and harmonization (Mader 2021; Wendt 2016; Queenan 2016; Blake 2019; Bennai 2021) • Legal issues, role of the private sector and different responsibilities (Stärk 2015)		definitions (Wendt 2016) • Existence of performance indicators (Ribeiro 2018) • Data availability for improved early warning (Amato 2020) • Joint analysis and reporting (Benanni 2021) • Joint data dissemination (Dente 2019) • Existence of professional data managers (Houe 2019)	

User Stories

1. Introduction

The second component of this requirement analysis is the user stories, which aimed to focus on the lived experiences of experts in the field of OHS. Many OHS systems are in their infancy or are currently being designed and implemented, limiting the widespread availability and breadth of published literature. Therefore, the knowledge gained from hearing firsthand accounts regarding the design, development, implementation, and monitoring of OHS systems from experts and health professionals from different countries of varying capacities and capabilities was of paramount importance. This was done in the form of a workshop organized by MATRIX Work Package 2 – *Best-practices and multi-sectorial collaborations*[2], which was held in October 2021 among a subset of MATRIX consortium members. The aim of the workshop was to capture barriers and facilitators to OHS design, development, and implementation, including monitoring, experienced firsthand and discuss them among the group of attendees.

2. Methods

Seven MATRIX partners from different countries each presented a surveillance system in their country on one of the four hazards[3] of interest i.e. *Salmonella*, *Campylobacter*, *Listeria*, and Hepatitis E virus. Each country was asked to describe the objective and scheme of the surveillance system, relevant sectors involved, as well as any barriers, facilitators, recommendations, and lessons learned from their experiences. The presentations from this workshop were recorded and data was transcribed and extracted based on 11 variables derived from the aforementioned systematic literature review (see Table 1): country/hazard, OHS objective/purpose, OHS scheme, OHS level, OHS mandate, relevant sectors, reported barriers, reported facilitators, recommendations/lessons learned, and reported limitations. Additionally, five out of seven representatives submitted supplementary comments and insights after the workshop, which were added to the data extracted from the workshop. Project partners and workshop attendees also had the chance to further discuss various obstacles and opportunities after each presentation, discussions that were also included in the data extraction.

[2] Information about the JIP MATRIX Work Package 2 – *Best-practices and multi-sectorial collaborations* and the aforementioned workshop can be found here: Cito F, Amato L, Ågren E, & Holmberg M. (2022). Deliverable D-JIP-MATRIX-WP2.1 MAPPING OF THE SURVEILLANCE CHAIN FOR ALL HAZARD TRACKS, AND CROSS-SECTORIAL LINKAGES. Zenodo. https://doi.org/10.5281/zenodo.6406150

[3] MATRIX aims to advance the implementation of OHS in practice, by building on existing resources, adding value to them and creating synergies among the sectors. This work has two fundamental premises:

i) the need for a problem-oriented approach using real-life cases
ii) the understanding that different countries have different realities.

The problem-oriented approach of the project is reflected in the creation of hazard-specific tracks to ensure that the solutions that MATRIX develops are relevant to specific pathogens, making MATRIX "a frame of solutions and hazards". The hazards were chosen based on the operational priorities of MATRIX partner institutes and their OH relevance. They are *Listeria*, *Salmonella*, *Campylobacter* and emerging threats, including AMR.

There are some limitations to this component of the requirement analysis. Firstly, there is a potential lack of representativeness of surveillance systems presented. Presenters may have chosen to present a more developed system for the workshop instead of focusing on more underdeveloped systems, for example. Additionally, the data collected from this workshop regarding each surveillance system was presented by a single sector-specific expert from each country and are therefore unavoidably biased. Therefore, some information may be not complete or up to date, reflecting the knowledge of the people involved at that time of the workshop. There is also a potential lack of representativeness of countries and capacities, failing to highlight certain experiences, including barriers or facilitators, experienced by specific countries. Lastly, while the workshop was used to collect user stories for this requirement analysis, it had other main objectives for a different MATRIX work package and task and can therefore not be considered an exhaustive collection of information regarding barriers and facilitators to OH surveillance.

3. Results

Sweden and Denmark presented about their respective *Campylobacter* surveillance systems, France and Germany about *Salmonella*, Norway and the Netherlands about *Listeria*, and Italy about Hepatitis E as an emerging threat. All systems described in the workshop were at the national level, though some incorporated authorities at regional and local levels as well. Many of the systems did not involve all three sectors, with PH and FS being the most common sectors represented among the reported surveillance systems. Additionally, many of the systems reported prioritized human health, highlighting a potential primary focus of PH among OHS systems. Table 4 reports barriers and facilitators to OHS surveillance design, development, implementation, including monitoring, from representatives from seven countries stratified by hazard.

Table 4. Reported barriers and facilitators to OHS design, development, implementation, including monitoring, from representatives from seven countries, stratified by Hazard Track

Campylobacter

	Reported Barriers	*Reported Facilitators*
Design and Development	-Legislation preventing the sharing of detailed information between sectors, including WGS results -Infrequent/irregular sharing of data	-Designated outbreak working group -National strategy plan and surveillance backed by legislation -Common database for secure data sharing
Implementation (incl. monitoring)	None reported	-Training for industry and authorities -Evaluations as learning experiences

Salmonella

	Reported Barriers	*Reported Facilitators*
Design and Development	-Lack of data ownership and confidentiality -Lack of data sharing infrastructure -No formal agreement between sectors regarding data sharing (how often and what) -Miscommunication between sectors	-Collectively defined surveillance and data sharing objectives between public vs private sectors -Legislation supportive of OH strategy - formalized roles, working groups, and meetings -Application of sociological skills
Implementation (incl. monitoring)	-Sectorial competitiveness -Conflict of competencies and assessment of problems	-Common standards and procedures -Feedback given to data providers -Evaluations and sociological skills

Listeria

	Reported Barriers	*Reported Facilitators*
Design and Development	-Legislation limits sharing of data -Responsibility for sampling lies outside official OH organizations -Managed by setting quantitative criteria in food	-Legislation supporting data sharing – when, what, how -Data sharing via official channels -Sequence more industry isolates
Implementation (incl. monitoring)	-Different focus among authorities/ organizations -Limited time and resources to dedicate to OHS	-Common surveillance objectives -Training and education for industry and authorities -Communication and collaboration

Emerging Threats – Hepatitis E virus

	Reported Barriers	*Reported Facilitators*
Design and Development	-Lack of data sharing infrastructure -Issues exchanging sensitive data -Lack of legal mandate for surveillance	-Harmonization of laboratory and typing protocols in all sectors -Involvement of environmental sector
Implementation (incl. monitoring)	-Lack of capacity building for laboratories	-Harmonize analytical approach via standard operating procedures (SOPs)

The User Stories visualised differences between various hazards, including the level of characterisation that is needed. For hazards with low prevalence and low infective dose, detection of the hazard on the species level may be sufficient in an OH perspective. For hazards with a high prevalence and a high infective dose, detection of the hazards on species level may not be highly relevant in an OH perspective. However, if quantitative data indicates whether the infective dose is likely to be exceeded or the strains are characterised to investigate whether the strains are high or low virulent (for instance, at the clonal complex level), the relevance increases. Therefore, descriptions of the characterisation levels needed for a hazard to give value will likely reduce some of the doubts surrounding data sharing and at the same time, increase the value of the data for the other sectors.

OHEJP Output Review

1. Introduction

The third and final component of this requirement analysis accounted for various relevant OHEJP project outputs[4]. These outputs were reviewed to gather knowledge specifically produced within the OHEJP project umbrella regarding barriers and facilitators to OHS design, development, and implementation, including monitoring. These outputs included previously submitted MATRIX deliverables from other work packages as well as outputs from the following other research and integrative projects:

- NOVA[5]– The main objective of the joint research project NOVA was to optimize and harmonize the use of surveillance data by developing new surveillance tools and methods
- ORION[6] - The main objective of the joint integrative project ORION was to strengthen inter-institutional collaboration and communication regarding surveillance
- COHESIVE[7] – The main objective of joint integrative project COHEISVE was to strengthen signalling and risk assessment and analysis within and between the PH and AH sectors

The review of these outputs was kept separate from the systematic literature review to ensure that findings from other OHEJP projects concerning OHS were given special consideration and acknowledgement due to their relevance and shared overarching goals with MATRIX and the topic of OHS. Additionally, it was of paramount importance for the working group to build upon the work from other projects and learn from the findings of our colleagues as the first step in this requirement analysis.

2. Methods

OHEJP project outputs were included in this review based on the Work Package 5.1 working group's familiarity with and/or previous participation in one or more projects. For MATRIX, COHESIVE and NOVA, the outputs for review were chosen based upon a non-systematic review of output titles and descriptions involving barriers and facilitators. For ORION, each work package had an initial task of carrying out a requirement analysis, which reviewed existing barriers and facilitators, resources, and needs already in existence within the OH community. These requirement analyses were subsequently included in the review of outputs. For all projects, additional outputs were introduced to the working group by convenience through other OHEJP colleagues and networks and/or as additional outputs were finalized and made public.

Table 5 lists the various outputs reviewed by OHEJP project. These outputs were reviewed and data was extracted using a subset of the variables utilized for the other

[4]Throughout this deliverable, the term "output" referes to project deliverables and any other form of output (e.g. websites).
5 https://onehealthejp.eu/jrp-nova/
6 https://onehealthejp.eu/jip-orion/
7 https://onehealthejp.eu/jip-cohesive/

two deliverable components (see Table 1): output name and project, aim of output, OHS level, OHS mandate, relevant sectors, reported definition of barrier, reported definition of facilitator, identified barriers, identified facilitators, barriers and facilitators not reported as results, lessons learned, recommendations, reported limitations, and reported study quality/bias. Identified barriers and facilitators were then categorized by whether they were more relevant for the design/development phase or the implementation/monitoring phase of OHS.

Table 5. Deliverables and outputs included in the OHEJP output review, by OHEJP project, available on Zenodo (European Organization For Nuclear Research & OpenAIRE 2013)

OHEJP Project Name	Deliverable/Output Name
MATRIX	D_WP1.1_20210630_MATRIX - Commonalities and Differences of the Different Operational Frameworks in Animal Health, Public Health and Food Safety of the MATRIX Project
COHESIVE	One Health Risk Analysis System Roadmap Website
NOVA	D-JRP6-1.2: Mapping of food chain surveillance across countries
ORION	JIP1-D1.1 Report on requirement analysis for OH Surveillance Codex
ORION	D-2.1Report on "Definition of requirements for the literature research and mapping
ORION	D-JIP1-D2.2 OHEJP-JIP-ORION-D2.2 Report on requirement analysis for an OH Knowledge Base -Hub - NGS (ORION)
ORION	JIP1-D2.3 Report on requirement analysis for an "OH Knowledge Base – Integration" (ORION)
ORION	JIP1-D3.1 Report on requirement analysis for an "OH Harmonisation Infrastructure Hub" (ORION)
ORION	JIP1-1.3 Revised OH Surveillance Codex, including lessons learned from the OH pilots
ORION	JIP1-2.9 Revised OH Knowledge Base - Integration, including lessons learned from the OH pilots
ORION	JIP1-2.7 Revised OH Knowledge Base - Epi, including lessons learned from the OH pilots
ORION	JIP1-2.8 - Status report on OH Knowledge Base – NGS
ORION	OHS CODEX/KIP

This assessment of OHEJP outputs included an unavoidably biased degree of judgement and interpretation. Selection bias may have played a role, as projects were included based upon the familiarity members of the Work Package 5.1 working group had with the project/output. Also, there is an imbalance in the number of outputs reviewed for each project, which was due to both the difference in structure of project outputs (e.g., projects having fewer outputs or one main output) as well as to a lack perceived relevance by the reviewer, both of which may have skewed the results. Additionally, MATRIX is the only OHEJP project included in this review that has a direct focus on cross-sectorial collaboration along the entire surveillance pathway. The other projects included address barriers and facilitators within specific sectors at various points along the pathway that were relevant to that project. Lastly, each OHEJP project has different consortium members from different European countries contributing to its

outputs, limiting generalizability of the results to countries of certain capacities and capabilities. Therefore, this review of other OHEJP outputs is not comprehensive or reflective of all OHEJP project findings nor the totality of barriers and facilitators experienced in OHS systems.

3. Results

In total, 13 OHEJP project outputs were included in the review: one from COHESIVE, 10 from ORION, one from NOVA, and one from MATRIX. The objectives of the outputs reviewed varied widely and included signalling and risk assessment, foodborne disease surveillance, harmonization of OH data, and operational frameworks of OHS. Additionally, relevant sectors differed among the projects, with NOVA, for example, focusing predominantly on FS and other projects including a more multi-sectoral approach. Table 6 reports barriers and facilitators to OHS surveillance design/development and implementation/monitoring stratified by OHEJP projects ORION and NOVA.

Table 6. Barriers and facilitators to OHS surveillance design, development, and implementation, including monitoring, stratified by OHEJP project

ORION - Strengthen inter-institutional collaboration and communication regarding surveillance

	Reported Barriers	*Reported Facilitators*
Design and Development	- Lack of harmonization of data	-Strategic cross-sectoral collaboration -Frequent meetings between partners -Clearly defined areas of responsibility -Focus on the outcomes and goals
Implementation (incl. monitoring)	-Lack of mutual understanding and interpretation of data from the different OHS domains -Data sensitivity/misuse -Lack of communication and collaboration -Lack of sufficient leadership	-Clearly established definitions and goals at project start -Build upon existing partnerships and previously established trust -Implementing fit-for-purpose data sharing

NOVA - Optimizing and harmonizing the use of surveillance data

	Reported Barriers	*Reported Facilitators*
Design and Development	-Lack of common data sharing infrastructure -Issues regarding data privacy and availability -Unclear surveillance objectives	-Legislation facilitating data sharing -Harmonized analytical methods -Common database linking data between sectors
Implementation (incl. monitoring)	-Non-harmonized analytical methods between agencies -Inadequate or absent surveillance of certain pathogens -Time consuming nature of cross-sectorial communication	None reported

The OHEJP project COHESIVE focused on signaling and risk assessment and analysis in OH. In the COHESIVE output, the following barriers related to the design and development of OHS systems were identified: a lack of political will, inadequate cross-sectorial trust, poor cross-sectorial communication (including the sharing of surveillance information), scarcity of available resources for OH and their prioritization (also affecting capacity building), geographical barriers to the integration of sectorial surveillance systems (e.g. data collection occurring at different administrative levels) and conflicts of interest among the PH, AH and FS sectors in the public and private domain. Contemporarily, similar issues were also identified and reported as facilitators to the design and development of OHS systems. It was not possible to clearly allocate any of the aforementioned to the implementation phase of an OHS system, while some might certainly apply.

The MATRIX output remarked the importance of ensuring consistency in the terminology and labeling of hazards under surveillance as key to harmonizing surveillance systems across sectors.

Main Findings and Their Importance

This requirement analysis encompasses a triangulation of methods aiming to investigate the same question: what barriers and facilitators exist to OHS design, development, and implementation, including monitoring? Despite the use of different methods, our results show that barriers and facilitators exist and are similar across all components of our analysis. However, the results and experiences described tended to be context specific, driven primarily by context-related conditions within the individual sectors and systems themselves. Similar observations were also made for the different hazards addressed. These factors limit the overall generalizability of the results to other European countries and the broader global audience. Given the limitations of the our methods, it is notable that in both the systematic literature review and the user stories, France consistently presented the most standardized and scientific findings, which came from multiple official evaluations with systematic metrics and an integrated use of social sciences. In the literature, there were few examples of problem analysis and engagement with economic and social sciences in the country (Bordier et al. 2021).

Barriers and facilitators were identified both in the design/development phases and in the implementation of the system. However, there is a lack of identified barriers and facilitators relating to the monitoring of implemented OHS systems. This could possibly be because the current OHS systems are not yet "mature" and have therefore not reached the point where monitoring is deemed a priority. Poor design and development of OHS could also play a role in the limited reporting of barriers and facilitators relating to implementation and monitoring i.e. the difficulties that sectors might face initiating a collaboration multiply down the line of the implemented cross-sectorial activities. The evidence identified through this requirement analysis – which is a representation of the available OH initiatives, including those related to other OHEJP projects – largely focused on the barriers affecting the data management within OHS systems, while other elements also seem relevant and frankly overlooked e.g. education and training, political vision and will.

Facilitators identified relating to the implementation and monitoring of an OHS system can also be considered relevant for design and development of OHS. For example, facilitators such as the existence of digitalized systems and link-able databases as well as the momentum around the topic and public/political attention are relevant for both phases and are important prerequisites for starting and then sustaining a system. Similarly, facilitators were often presented as recommendations stemming from experienced barriers and/or the absence of a barrier rather than first hand experiences of actual enablers. This could be in part because it is challenging to recognize facilitators in one's own context, particularly without a barrier as a counterpart.

Most of the findings were derived from the personal understandings of experts and end-users. This also makes the evidence behind the identified barriers and facilitators

scarcely generalizable and potentially biased. With the systematic literature review, this seems to be primarily driven by the nature of the documents and the topic of OH itself. Additionally, the reported understanding of the topic of OH and its surveillance was not necessarily aligned among authors, which is a limitation when trying compare across countries or assess overall relevance of the barriers and facilitators reported. Also, the identified evidence often came from the documentation of an ongoing process and not the assessment of an intervention.

The barriers and facilitators identified in the various components of this deliverable are consistent with what has been previously reported in both Europe and globally regarding the barriers to OHS and its implementation. Other authors have considered the following (Bordier et al. 2020; Houe et al. 2019; Uchtmann et al. 2015):

i) Heterogeneity of the involved professional subjects, institutions, and authorities
ii) Generally different needs across sectors, which is reflected in a heterogeneous availability of data
iii) Sector-specific allocation of budgets
iv) Poor cross-sectorial knowledge exchange (including terminology) and data collection, analysis, interpretation
v) Partial understanding and use of the available data, including the related ethical implications
vi) Unaligned cross-sectorial alert systems
vii) Presence of underserved populations across sectors
viii) Territorial and administrative barriers

A conventional linear approach to solving health problems amplifies the disconnection between the PH, AH, environmental and ecosystems health (Queenan et al. 2017). Authors have already concluded that the identified challenges on the pathway to OHS are still to be addressed (Houe et al. 2019; Stärk et al. 2015). Understanding what the overarching barriers and facilitators are may help surveillance actors identify a hierarchy of priorities to advance the implementation of OHS.

Use of the Deliverable

As per the MATRIX project plan, the findings of this requirement analysis will directly inform and aid in the creation of the OHS roadmap template. The context specific nature of our findings supports the overall structure of the roadmap, which was not intended to be a one size fits all solution, but rather a guide catered to countries of varying capacities and capabilities.

However, due to the lack of data regarding monitoring in this requirement analysis, the roadmap will in part be tasked with exploring the unknown. Limited metrics for monitoring OHS systems as well as a lack of consensus regarding certain definitions makes the desired end destination of the roadmap somewhat ambiguous and the road to get there an uncharted one. Additionally, OHS is defined by the concept of collaboration, often relating to data exchange. However, the findings presented in this requirement analysis highlight the absence of a definition for what ideal data sharing looks like and what the desired outcome is. This is in line with findings from the user

stories regarding *Listeria*, which describe differing and sometimes conflicting objectives among different actors and different sectors. Similarly, the issue of emerging threats being by definition "unknown a priori" is a barrier in and of itself, inevitably leading to other roadblocks to OHS (e.g. lack of an overarching political vision/will, societal portrayal of the issue, and infrastructural setup).

This requirement analysis has called attention to many of the roadblocks faced at this particular juncture in the ongoing adoption and assessment of OHS in Europe. Understanding these overarching barriers and facilitators may help to identify a hierarchy of priorities in order to advance the implementation of OHS, especially considering that many barriers are also solutions. Given this, we are confident that this requirement analysis and the subsequent roadmap will be able to utilize the barriers and facilitators identified regarding OHS design, development, and implementation, to drive meaningful action across a broad audience.

Below are five identified opportunities for the practical use of the findings of this requirement analysis in the MATRIX OHS Roadmap.

1. The requirement analysis identified barriers and facilitators that are both internal and external to the considered OHS systems and their design/development and implementation (including monitoring). The further away one looks at the operability of the system, the more one loses control of its determinants. Conversely, the closer one looks at operability of the system the less one might be able to influence its overarching determinants. The roadmap could invite users to identify operational strategies based on the realistic, contextual capacities of the actors involved.

2. The identified barriers and facilitators to OHS directly relate to different professional competencies when it comes to address them. The roadmap could help its users to translate the specific problems encountered along the OHS pathway into the necessary, context-specific skillsets and competencies needed to solve them e.g. during the System Thinking Workshops[8].

3. The requirement analysis identified barriers and facilitators to OHS that were logically summarized under the domain of design/development and implementation (including monitoring) of OHS. Additionally, the identified barriers and facilitators to OHS could be allocated under three major areas i.e. governance, the nature of the sectors, and data. The roadmap, or parts of it, could be structured around these three components.

4. As previously discussed, the requirement analysis could not identify generalizable barriers and facilitators to OHS given the contextual specificities of the retrieved

[8] OHEJP JIP COHESIVE created a roadmap to setting up a One Health Risk Analysis System. One of the steps of the roadmap is to use systems thinking (via a workshop) to map/visualize the current situation in order to ientify where improvemnts can be made. See more infomration here: www.ohras.eu

evidence. However, the roadmap could prompt its users with a catalog of contextual experiences for inspirational purposes. Annex B offers a glimpse of this option.

5. The identified barriers and facilitators are necessarily dependent on the objectives of the various OHS initiatives that were identified. The roadmap could make the description of the justification of the OHS system and its specific and measurable surveillance objectives a crucial step to its use.

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Annexes

Annex A. List of 20 documents included in the systematic review of the literature, January 2008 - August 2021

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Annex B. Flash cards with the main findings of the reviewed documents. Barriers (B) and facilitators (F) were selected among those more evidently resulting in the documents

Blake et al 2019 Time: 2013-2018 Place: United Kingdom Hazard: AMR Method: Qualitative OH definition: Yes Level: National B: Local perspective F: Creating awareness	**Bennani et al 2021** Time: not applicable Place: United Kingdom Hazard: AMR Method: Mixed OH definition: Yes Level: not applicable B: Data limitations F: Cross-sectorial reporting	**Houe et al 2019** Time: not applicable Place: Denmark Hazard: AMR, Salmonella, Campylobacter Method: Qualitative OH definition: No Level: National B: Inaction to OHS F: Data availability	**Amato et al 2020** Time: 2019 Place: Mediterranean/Black Sea Hazard: Arboviruses Method: Mixed OH definition: Yes Level: not applicable B: Lack of wildlife data F: Data integration	**Wendt et al 2016** Time: 2013-2014 Place: Germany Hazard: not applicable Method: Mixed OH definition: Yes Level: not applicable B: Data limitations F: Data integration
Vairo al 2018 Time: 2010 Place: Italy Hazard: Arboviruses Method: Quantitative OH definition: No Level: not applicable B: Passive surveillance F: Education/training	**Stärk et al 2015** Time: not applicable Place: Europe Hazard: not applicable Method: not applicable OH definition: Yes Level: not applicable B: Poor infrastructures F: Education/training	**Cringoli et al 2021** Time: 2010-2018 Place: Italy Hazard: Echinococcus Method: Quantitative OH definition: No Level: Regional B: not applicable F: Multi-sectorial collaborations	**Jourdain et al 2019** Time: not applicable Place: Mediterranean Sea Hazard: Arboviruses Method: Mixed OH definition: Yes Level: not applicable B: not applicable F: Multi-sectorial collaborations	**Bordier et al 2019** Time: not applicable Place: Various places Hazard: not applicable Method: Mixed OH definition: Yes Level: not applicable B: not applicable F: Multi-sectorial collaborations
Queenan et al 2016 Time: not applicable Place: Europe Hazard: AMR Method: not applicable OH definition: Yes Level: Various B: Data limitations F: Multi-sectorial collaborations	**Paternoster et al 2017** Time: 2016 Place: Italy Hazard: Arboviruses Method: Qualitative OH definition: Yes Level: Regional/inter-regional B: Poor infrastructures F: OH thinking/planning	**Dente et al 2016** Time: 2014-2017 Place: Mediterranean/Black Sea Hazard: Arboviruses Method: Mixed OH definition: Yes Level: not applicable B: not applicable F: Political will	**Noll et al 2018** Time: not applicable Place: Germany Hazard: not applicable Method: not applicable OH definition: No Level: National/supranational B: Lack of political will F: Political will	**Van der Giessen et al 2010** Time: 2007-2010 Place: The Netherlands Hazard: not applicable Method: not applicable OH definition: Yes Level: not applicable B: Data limitations F: Political will
Ribeiro et al 2018 Time: not applicable Place: Europe Hazard: not applicable Method: Mixed OH definition: Yes Level: not applicable B: Data limitations F: Political will	**Bordier et al 2021** Time: not applicable Place: France Hazard: Salmonella Method: Qualitative OH definition: Yes Level: National B: Poor infrastructures F: Regulations	**Dente et al 2019** Time: 2016? Place: Serbia and Georgia Hazard: Arboviruses Method: Qualitative OH definition: Yes Level: not applicable B: Uncertainty of resources F: Shared objectives	**Vlieg et al 2017** Time: not applicable Place: The Netherlands Hazard: not applicable Method: Qualitative OH definition: Yes Level: National B: Poor notification criteria F: Short communication lines	**Mader et al 2021** Time: 2018 Place: France Hazard: AMR Method: Quantitative OH definition: No Level: National B: Passive surveillance F: Education/training