Deliverable D-WP4.3 – Report on the implementation of the OH-EpiCap evaluation tool on several study cases [1]

OHEJP JIP MATRIX – WP4

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REPORT ON THE IMPLEMENTATION OF THE OH-EPICAP EVALUATION TOOL ON SEVERAL STUDY CASES

ORIGINAL TITLE: REPORT ON THE IMPLEMENTATION OF EVALUATION APPROACHES ON TWO STUDIES CASES

Contents

1. Background

MATRIX is a project of the One Health European Joint Programme (OHEJP), a partnership of 44 food, veterinary and medical laboratories and institutes across Europe and the Med-Vet-Net Association. MATRIX connects existing cross-sectorial One Health programmes in European countries. Today, 19 partner institutes representing the animal health, public health and food safety sectors from 12 countries continue a collaboration that started early in 2020 and will end in December 2022. More information can be found here. The purpose of MATRIX is to create practical solutions for European countries to support and to advance the implementation of One Health Surveillance. These solutions are currently under development and will be finalised for release by the end of 2022. MATRIX invites European institutes working in the animal health, public health and food safety sectors to consider the opportunity to adopt these solutions and to further build upon them. The OH-EpiCap tool, developed in the framework of MATRIX WP4[2], aims to provide system-specific profiles of existing surveillance interoperability between sectors, highlighting both strengths and gaps in surveillance capacities and capabilities. The OH-EpiCap tool allows evaluation and improvement of 'One Health (OH)-ness' using a set of standardised indicators, which allows comparison across systems, countries and hazards of interest.

The OH-EpiCap tool facilitates discussion between surveillance representatives from different disciplines and programs, encouraging a more collaborative OH approach. It is based on a standalone interactive web-based application (https://freddietafreeth.shinyapps.io/OH-EpiCap/), which allows a panel with representatives from all sectors within the system being evaluated to complete an in-country surveillance evaluation. The tool focuses on evaluating "One Heath-ness" across three dimensions:

- Organisation of One Health, including the formalisation, coverage/ transdisciplinary, resources, evaluation and resilience;
- One Health in operational activities, with a focus on data collection / methods sharing; data sharing; data analysis and interpretation; communication;
- Impact of One Health regarding technical outputs, collaborative added values, immediate and intermediate outcomes, and ultimate outcomes.

The user guide is downloadable from the OH-EJP MATRIX webpage: https://onehealthejp.eu/jip-matrix/

During the MATRIX project, actors involved in the surveillance of health hazards in multiple European countries were contacted to introduce them to the OH-EpiCap tool during a one hour meeting, answering questions regarding the tool and the evaluation

[2] This document is a product of Work Package 4, Task 3 in the MATRIX project. Contributors to that Task are the OHEJP partners 1-ANSES, 23-UoS, 16-INIA, 33-NVI, 34-PIWET, 13-SSI, 36-INSA.

The MATRIX project is part of the One Health European Joint Programme. This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 773830.

process, and planning an evaluation of their system of interest. Annex 1 lists the institutes contacted in each country and the evaluations that were conducted.

2. Implementation of the OH-EpiCap evaluation tool

Eleven OH-EpiCap evaluations of multi-sectoral surveillance systems in European countries were conducted in the framework of the MATRIX project. Evaluations of the surveillance systems for psittacosis in Denmark, *Listeria* in Finland, *Salmonella* in Germany, and *Campylobacter* in Sweden were conducted through a half-day workshop. Other evaluations were conducted through completion of the questionnaire (in a Word format), either sequentially by an expert from several sectors of surveillance (e.g. AMR in Portugal, AMR in France, *Campylobacter* in Norway), or by one-to-two experts from one sector only but who have a good knowledge of the organisation of the surveillance and collaborations across sectors (e.g. *Salmonella* in France, *Listeria* and *Salmonella* in the Netherlands, *Listeria* in Norway). For these study cases, the OH-EpiCap team recorded the scores in the web application to generate the final report (displaying the results) that was sent to the participants.

Additional OH-EpiCap applications are being planned in the framework of the MATRIX project, see Table 1. In addition, the CoEvalAMR project is applying the OH-EpiCap tool on AMR surveillance systems in several countries, with the objective to evaluate the OH-EpiCap tool itself (using the methodology developed by Sandberg et al. 2021).

Based on the results of the OH-EpiCap evaluations conducted in the framework of the MATRIX project, we identified current strengths and weaknesses in the organisation and functioning of existing collaborations, and their impact on the surveillance system. For each dimension, we distinguished indicators where the scores across all systems were low (mostly between 1-2), intermediate (with values between 2-3 or with a large variability between surveillance systems), or high (mostly between 3-4) (Table 1).

Score	Dimension	Indicators
Low	Organisation	Shared leadership
	Operational activities	FAIR data
		Sharing techniques
		Indicators
	Impact	Effectiveness
		Operational cost
		Behavioural changes
		Health outcome
Intermediate	Organisation	Common aim
		Supporting documentations
		Coordination

		Geographic, populations, hazards
		Budget
		Human resources
		Sharing agreement
		Shared resources
		Training
		Internal evaluation
		External evaluation
		Corrective measures
	Operational activities	Protocol design
		Data collection
		Laboratory techniques
		Data warehouse
		Data quality
		Usefulness
		Joint analysis
		Sharing expertise
		Internal communication
		Dissemination
		Emergence
	Impact	Emergence detection
		Improved knowledge
		OH team
		OH network
		International
		Strategy
		Interventions
		Advocacy
		Awareness
		Research
		Policy changes
High	Organisation	Sectors
		Disciplines
		Actors
		Adaptability to changes
	Operational activities	External communication

	Impact	Preparedness

Table 1: Ranking of indicators according to their mean score among evaluated surveillance systems. The definition of each indicator is provided by Henaux et al (2022).

We discussed below the main results issued from the OH-EpiCap evaluations conducted in the framework of the MATRIX project.

2.1 Dimension 1: Organisation

2.2.1 *Formalization*

A **common aim** for the multi-sectoral surveillance system is usually defined from the expectations of stakeholders, through a gentlemen's agreement, or an inter-ministerial roadmap or commitment document, which defines cross-sectoral objectives. Similarly, **joint coordination committees** exist in most systems, but appear to be more functional during outbreaks. Weaknesses were observed in the formalisation of the OH-ness, with no or incomplete **supporting documentation** and a lack of **operational and shared leadership**. Experts from the OH-EJP COHESIVE project proposed a set of recommendations regarding OH governance, taking into account important elements such as transparency, accountability, and responsibility, in their Guidelines for setting up a OH risk analysis system (OHRAS) for zoonoses (COHESIVE 2021).

2.2.2 *Coverage/ transdisciplinary*

We noticed that the evaluated multi-sectoral surveillance systems included all or most **relevant sectors** (yet the environmental sector remains largely uncovered in most systems). Similarly, **relevant disciplines** are included, either formally or through research activities, like for social/human science, economics, and other more specific disciplines (e.g. environmental chemistry, microbiology, etc.). The **coverage of actors** between surveillance systems was more variable, with a more limited representation of the private actors (e.g. farmers and food business operators) and the general public (e.g. associations of patients). A mapping of the surveillance programs and stakeholders involved in or impacted by the surveillance is recommended to identify their roles and missions and characterize the interactions between them (Bordier et al. 2021; Cito et al. 2022; Ghai et al. 2022). The **geographic and population coverage** varied also between surveillance systems, underlining a lack of coverage of some minor geographic areas (e.g. overseas territories), specific populations (e.g. (non-captive) wildlife, a specific sector of production) or environmental compartments. In addition, the reinforcement of links with surveillance systems focusing on similar hazards (e.g. mosquito-borne diseases; abortive cattle diseases, etc.) has been shown to increase the surveillance capacities, the sharing and joint analysis of data, favouring preparedness and rapid mitigation response (Leandro et al. 2021).

2.2.3 *Resources*

The **budget** and **human resources** for OH activities varied among surveillance systems (according to the national funding programs for surveillance). Political will (along with an inter-ministerial commitment; COHESIVE 2021) appears to be a necessary condition for an optimal (i.e. sufficient and sustainable) budget allocation for OH activities and governance. **Sharing of resources** concerned mostly laboratory data (e.g. typing strains results, isolates) and occurred mostly during crises. Other resources could be shared for sampling, data storage, analysis and communication. However, in spite of the importance of sharing information between health authorities and other stakeholders, many barriers (ethical, organisational, legal, technical, political, economic, etc.) can prevent an accurate, timely and effective sharing of data. Causes of obstacles to efficient sharing of information as well as some drivers enabling information sharing are described in the OHRAS website (COHESIVE 2021). At last, surveillance representatives mentioned that **OH-focused training** opportunities exist but remain insufficient and limited to a small number of persons. Experts recommend organising joint communication training or pre-emptive collaborative training (such as outbreak simulation exercise in which roles are switched) and to reinforce OH education (by co-training students from relevant sectors) to get familiar with each other's vocabulary and principles (COHESIVE 2021; Lerner and Berg 2015). Accordingly, the OH glossary supports communication and information exchange between the human health, animal health and food safety sectors (Buschhardt et al. 2021).

2.2.4 *Evaluation and resilience*

Overall, the evaluated surveillance systems demonstrated good capacities to **adapt to internal and external changes** and to critical situations within appropriate timelines. In contrast, **internal** and **external evaluations** are rarely carried out; yet, when an evaluation was conducted, some **corrective measures** were implemented, underlying the interest of those evaluations. We stress that the OH-EpiCap evaluation framework provides a standalone tool for surveillance representatives to conduct an internal evaluation in a short time (half-day workshop). Other evaluation tools, such as the Evaluation of Collaboration for Surveillance (ECoSur) tool and the Network for Evaluation of One Health (NEOH), enable to deeper assess the organisation and functioning of multi-sectoral collaborations in a surveillance system, and to identify the necessary preconditions and actions to be taken to reach long-term goals (Rüegg et al. 2018, Bordier et al. 2019).

2.2 Dimension 2: Operational activities

2.2.1 Data collection/ methods sharing

There is some variability in the level of OH-ness regarding **protocol design**: in most systems, each programme develops its own protocols (based on experience and what is normal within their sector), with various levels of sharing to other programmes and

sectors. Yet, in few surveillance systems, actors (sanitary agencies and competent authorities) from most or all sectors work together to schedule annual surveillance plans. Collaboration in **data collection** exists routinely or for investigation purposes, within specific inter-sectoral program frameworks (e.g. analytical results and metadata centralised in a volunteer base from animal, feed and food sectors; sequencing data and metadata collected from human sector and the agro food chain). The collection of accurate and comparable data is a prerequisite for informed risk assessment and management, and European Food Safety Authority (EFSA) has put in place a number of technical procedures and systems to ensure data standardisation. The OH-EpiCap evaluations showed that, when relevant, **laboratory techniques** and procedures are standardised within sectors, especially for the surveillance of foodborne hazards; standardisation across sectors occurs mostly for characterization methods. Joint **data warehouses** exist within sectors, in particular for Whole genome sequence (WGS) or notification data, depending on systems. Examples of joint aggregate surveillance databases are presented in Zinsstag et al. (2009) and Nielsen et al. (2011). More recently, the Cohesive Information System (CIS) has been designed to integrate and harmonize WGS data and related metadata from the human and veterinarian organizations of a country (Di Pasquale and Caldarelli 2019).

2.2.2 Data sharing

Sharing agreements do exist within sectors, but except for punctual research activities, there is currently no multi-sectoral data sharing agreement (yet, most evaluated systems indicated that they are in the process of creating one). **Data quality** evaluation is not systematically conducted and findings are not usually shared with other sectors. The development of an interactive tool to evaluate data quality facilitates the monitoring of data quality and communication to data providers and other relevant stakeholders. As an example, in France, the Qualiplan tool developed by the food chain surveillance platform (SCA) evaluates the quality insurance of data issued from official surveillance and control plans for contaminants in the food chain (Bres et al. 2022). Evaluated systems underlined the **usefulness** of the data shared across sectors, but the sharing of data generally occurs on a punctual basis (e.g. in case of alert investigations or as part of research activities). Resource limitation appears to be a barrier to more data sharing. In spite of the recognised importance of having **FAIR data** (Wilkinson et al. 2019), in practice the application of these principles remains challenging. In particular, in the evaluated surveillance systems, data accessibility was limited by data confidentiality issues, and data interoperability by a lack of harmonised indicators, standards and/or interpretation criteria.

2.2.3 Data analysis and interpretation

Results from study cases showed some weaknesses in data analysis and interpretation, with usually few **joint analyses** of surveillance data (originating from multiple sources), limited **sharing of statistical analyses and visualisation procedures** across networks and sectors, and little **harmonisation of indicators/**

metrics used to analyse and interpret the data. Nevertheless, the **sharing of scientific expertise** between actors from different sectors to interpret the results was more frequent. Regarding joint data analysis and interpretation, the interest of combining data from different syndromic surveillance components for foodborne diseases in animals, food or the environment for improving the surveillance of foodborne disease outbreaks in humans was evaluated in the framework of the OH-EJP NOVA project (Huneau 2021).

2.2.4 Communication

In most study cases, joint **external communicatio**n (through different support: scientific articles, reports, regular publication of surveillance results in the form of newsletters, web platforms/Shiny interfaces, etc.) is well established. **Internal communication** between actors and sectors, either routinely (through seminar reports, official letters, meeting minutes, or emails shared between actors of surveillance sectors) or in the **event of a suspected or detected case**, is also established but could be reinforced and occur in shorter delays. Similarly, information **dissemination to decision-makers** encompass most sectors but could be improved. Good practices for One Health Coordinated communication are provided in the OHRAS guidelines (COHESIVE 2021). In the framework of the MATRIX project, a dashboard step-by-step guide is being developed (based on dashboards operational within the pilot participating agencies) to facilitate the design and implementation of One Health Surveillance dashboards using open source tools (MATRIX 2022).[3]

Based on a review of existing practices in the design, development and implementation of a OH surveillance system, MATRIX WP2 proposed common best practices regarding data collection, sharing, analysis and interpretation, and dissemination (listed in Deliverable MATRIX WP2-T4).

2.3 Dimension 3: Impact

2.3.1 Technical Outputs

The capacities of **detection of emergencies** vary strongly among evaluated systems: large outbreaks appear to be detected in real time, but retrospective analyses (in particular sequence analyses) showed that some emergencies remain undetected in some sectors. Except for one system that indicated that no assessment of the potential influence of OH surveillance on the knowledge about the epidemiological situation has been conducted, the implementation of OH surveillance resulted in an **improvement**

[3] The Dashboard Information Centre is a “living document” that contains an inventory of planned, ongoing and finished dashboard projects, a practical manual and a best practice guide to the development of One Health Surveillance dashboards. It covers the following topics: i) information context and end-user considerations; ii) technical and legal barriers associated with cross sector data sharing; iii) the pitfalls and biases of co-analysing One Health data; iv) the selection of the most suitable technical implementation. It is meant to be used as a “companion” when planning or developing a dashboard. https://sva-se.github.io/MATRIX-dashboards/

of the knowledge on the epidemiological situation of the hazards. In particular, it was reported that sharing WGS-data provided new insight in the genetic diversity and clustering of foodborne hazard isolates from different sectors. It was also beneficial in improving the overall **effectiveness** of the system with an increased number of sources of infection detected annually. However, the operational **costs** are rather augmented, due to the actions taken in case of a link between human cases and a production facility, and more time is spent (i.e. higher personnel costs) on the analyses of surveillance data with the arrival of WGS typing. Other evaluated systems reported that the impact of OH on the system's effectiveness and operational costs has not been formally assessed yet using a well-known and complete evaluation method. Studies comparing the economic efficiency of OH approaches to uni-sectoral approaches remain scarce. Some studies proposed potential outcome metrics and methodological frameworks that may be used to evaluate OH interventions (Baum et al. 2017; Paternoster et al. 2017; Canali et al. 2020). Thus, although joint surveillance efforts are resource intensive activities, the economic return of such cooperation has also been evidenced (Paternoster et al. 2017).

2.3.2 Collaborative added value

The overall study cases analysis showed that although there is no official **OH team**[4] and **OH network**[5] (Khan et al 2018), the collaboration (and trust) between the active actors between sectors has grown with the implementation of the OH surveillance system (in some countries, it is the collaboration between actors that actually strengthened the organization and functioning of the OH surveillance system). The main challenges to overcome to foster greater multidisciplinary collaborations between the human, animal, and environmental sectors and build operational OH networks are described in Khan et al. (2018). The evaluated systems indicated that each sector has developed its own **international collaborations**, through specific networks or international health agencies: EFSA and European Centre for Disease Prevention and Control (ECDC) for human and vet sectors, European Environment Agency (EEA), European Chemicals Agency (ECHA) and EU commission for the environment sector. For AMR, an effective international collaboration is established, via the Joint Inter-Agency Antimicrobial Consumption and Resistance Analysis (JIACRA), with the human and animal sectors (the environmental sector is not included at this stage) (ECDC, EFSA, EMA 2021). Besides, global action plans for AMR surveillance that encompass the human, animal and environmental sectors have been established. For other hazards, **common strategic plans** defining the major steps or milestones needed to be reached by all stakeholders are under construction. The quadripartite OH Joint Plan of Action (FAO, UNEP, WHO and WOAH 2022) provides guidelines and support to advance and sustainably scale up OH policy and activities (collaboration,

[4] A OH team (formal or informal) consists of members of different disciplines, working collaboratively to set goals, make decisions and share resources and responsibilities to achieve better health outcomes (it could be formal or informal).

[5] The OH network is defined as an engagement between two or more discrete stakeholders/actors with at least two of the sectors represented.

communication, capacity building and coordination). A website compiles OH Strategic Action Plans for zoonotic diseases and AMR: https://www.onehealthcommission.org/en/resources__services/one_health_strategic_action_plans/

2.3.3 Immediate and Intermediate outcomes

Study cases showed that **preparedness** and response capacity are emplaced, but further actions are needed to react in real-time. Similarly, the surveillance system provided quality evidence for **intervention** measures but not in a timely manner and most alarms were issued from the human sector. The importance of **advocacy** activities varied between countries and hazards; in one system, the lack of a OH team was identified as an important limit to the implementation of advocacy activities. At last, the contribution of the OH surveillance system to the increase of the level of **awareness** about the epidemiological situation of the particular hazard under surveillance remains limited for some stakeholders. The impact of OH activities on stakeholders awareness may be evaluated through a Knowledge, Attitude and Practices (KAP) survey, to identify misconceptions or misunderstandings and potential barriers to behaviour change, alike the study conducted by Kusumaningrum et al. (2022).

2.3.4 Ultimate outcomes

In most study cases, the impact on **behavioural changes** and **population health outcomes** of the interventions informed by the OH surveillance has not been evaluated. However, few **changes in policy** related to the hazard have been made based on evidence derived from the OH surveillance system and few **multi-disciplinary research collaborations** initiated. In spite of an increasing interest for OH in academic research, a recent bibliometric analysis showed a lack of inclusion of environmental themes and social science (Humboldt-Dachroeden et al. 2020).

3. Conclusion

OH-EpiCap enabled the surveillance representatives to provide system-specific profiles of existing surveillance interoperability between sectors, and highlight both strengths and gaps in surveillance capacities and capabilities. Based on our study, the main challenges to the effective implementation of OH surveillance, and barriers that contribute to its sub-optimal functioning include a lack of shared leadership, FAIR data, sharing of techniques, and harmonised indicators. All participants of our surveillance evaluations emphasised the importance of the effective implementation of OH surveillance to collect and consolidate pertinent data, detect and notify health events, and investigate outbreaks.

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5. Annexes

Annex 1: List of institutes contacted in each country in order to plan a OH-EpiCap evaluation of specific surveillance systems. The OH-EpiCap presentation meeting organized by the WP4 team aimed to introduce the OH-EpiCap tool to surveillance representatives, answer their questions regarding the tool and the evaluation process, and plan an evaluation of their system of interest. Last updated: 28/10/2022.

Country	Hazard	Institutes contacted	OH-EpiCap presentation meeting	OH-EpiCap evaluation
Denmark	Psittacosis	**Animal health:** Danish veterinary and Food administration (Fødevarestyrelsen) **Public health:** Statens Serum Institut (SSI)	✓	**Workshop**
Denmark	*Campylobacter*	**Animal health / Food safety:** Danish Veterinary and Food Administration (Fødevarestyrelsen) **Public health:** Statens Serum Institut	✓	To be planned
Denmark	*Listeria*	**Animal health / Food safety:** Danish Veterinary and Food Administration (Fødevarestyrelsen)	✓	To be planned
Finland	*Listeria*	**Food safety:** Finnish Food Safety Authority (Ruokavirasto) **Public health:** Finnish Institute for Health and Welfare (THL)	✓	**Workshop**
France	Antimicrobial resistance (AMR)	**Food safety:** France's National Health Security Agency (ANSES) **Animal health:** French ministry of Agriculture and Food **Public health:** French Public Health Agency	NA	**Questionnaire filled sequentially**
France	*Salmonella*	**Food safety:** France's National Health Security Agency (ANSES)	NA	**Questionnaire filled by food safety sector and sent to other sectors for validation**

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Germany	*Salmonella*	**Animal health:** Friedrich-Loeffler-Institut (FLI) **Food safety:** Federal Institute for Risk Assessment (BfR) **Public health:** Robert Koch Institute (RKI)	✓	**Workshop**
Germany	*Campylobacter*	**Animal health:** Friedrich-Loeffler-Institut (FLI)	✓	To be planned
Italy	Hepatitis E	**Public health:** Italian National Institute of Health (ISS)	✓	NA
Italy	West Nile virus	**Animal health / Food safety:** Istituto Zooprofilattico Sperimentale (IZS)	NA	NA
Italy	*Salmonella*	**Public health:** Italian National Institute of Health (ISS) **Animal health / Food safety:** Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe)	✓	NA
Italy	*Campylobacter*	**Public health:** Italian National Institute of Health (ISS) **Animal health / Food safety:** Istituto Zooprofilattico Sperimentale (IZS)	✓	NA
Italy	*Listeria*	**Public health:** Italian National Institute of Health **Animal health / Food safety:** Istituto Zooprofilattico Sperimentale (IZS)	✓	NA
Norway	*Campylobacter*	**Animal health / Food safety:** Norwegian Veterinary Institute (NVI) **Food safety:** Norwegian Food Safety Authority (NFSA)	✓	**Separate questionnaires filled by each sector**
Norway	*Listeria*	**Animal health:** Norwegian Veterinary Institute (NVI) **Food safety:** Norwegian Food Safety Authority (NFSA)	✓	**Questionnaire filled by animal health sector**
Portugal	AMR	**Public health:** Instituto Nacional de Saúde and Direção-Geral da Saúde (INSA) **Animal health:** National Institute of Agricultural and Veterinary Investigação (INIAV) **Environment:** Portuguese Environment Agency (PEA)	NA	**Separate questionnaires filled by each sector**

Spain	*Listeria / Salmonella*	**Food safety:** Spanish Agency for Food Safety and Nutrition (AESAN) **Public health:** Instituto de Salud Carlos III (ISCIII)	✓	To be planned
Sweden	*Campylobacter*	**Animal health:** National Veterinary Institute (SVA) **Food safety:** Swedish National Food Agency (SLV), Swedish Board of Agriculture (Jordbruksverket) **Public health:** Public Health Agency of Sweden (Folkhalsomyndigheten)	✓	**Workshop**
The Netherlands	*Listeria*	**Public Health:** National Institute for Public Health and the Environment (RIVM)	✓	**Questionnaire filled by public health sector**
The Netherlands	*Salmonella*	**Public Health:** National Institute for Public Health and the Environment (RIVM)	✓	**Questionnaire filled by public health sector**