

D4.1 Inventarisation of goals, stakeholders and One Health surveillance systems in member states

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1. Executive summary

The close interactions between humans, animals, and the environment, can lead to the emergence of infectious diseases through spillover events. Early warning surveillance systems at the human-animal-environment interface are pivotal to enable timely public health actions. Work Package 4 (WP4) of UNITED4Surveillance aims to establish and strengthen partnerships in a One Health approach, emphasizing structured data sharing for effective public health surveillance. This is achieved by supporting European Union Member States and Join Action partner countries in developing One Health surveillance structures at the national level that integrate data from human, animal, and environmental domains. This integration is intended to enhance the capability of detecting emerging pathogens, identifying outbreak sources, and conducting research for targeted interventions.

WP4 is organized around three disease groups: foodborne diseases, zoonotic influenza, and vector-borne diseases. The tasks within each group encompassed three subtasks: 1) goal definition and stakeholder analysis, 2) systems mapping of the current and desired situation, and 3) piloting promising approaches. The first two subtasks were executed collaboratively across disease groups to ensure a consistent methodology. Countries aimed to align on specific pathogens within each disease group for shared experiences.

In the initial subtask included stakeholder analysis, utilizing Mendelow's matrix, which identified and prioritized key players based on their interest and importance. The analysis was conducted by a brainstorming sessions, or by updating existing stakeholder analyses.

The second subtask involved systems mapping, where the current status of One Health surveillance was visualized through a workshop or by evaluating and updating existing mappings. Stakeholders collaborated to create a draft map illustrating the system's operation, roles, and relationships, forming the basis for improvement. This process also identified legal and technical barriers/needs for effective data-sharing in a One Health context, which may be addressed during the project's piloting phase.

Piloting of One Health surveillance system implementation, designed at the country level, considers the varying development pace of One Health in different countries and addresses locally relevant needs. The approach integrates insights from stakeholder analysis and systems mapping to enhance the effectiveness of surveillance systems in a One Health framework.

This deliverable summarizes the activities undertaken during the first year of the project, specifically covering the first two subtasks: stakeholder analysis and systems mapping. It describes a total of 13 stakeholder analysis and systems maps, with a focus of five in the foodborne disease group, four in the zoonotic influenza disease group, and four in the vector-borne disease group. It also outlines upcoming piloting plans that will be conducted over the next one and a half years.

2. Description of task

Description of the task from the DoA: An overview will be provided of the goals descriptions, stakeholder analysis and systems mapping of One Health surveillance systems performed in different member states.

3. Description of work & main achievements

3.1 Background of the task

The close interactions between humans, animals and the environment hold a risk of emergence of infectious diseases, due to the likelihood of spillover events. Early warning surveillance at the human, animal, environmental interface able to trigger timely public health actions is a key pillar of effective public health surveillance regarding detecting emerging pathogens and outbreaks of existing zoonoses. The vision of WP4 One Health is to form and strengthen partnerships in a One Health manner where data for action is shared in a structured way.

The specific objective of WP4 is to support European Union Member State and Join Action partner countries in developing One Health surveillance structures with integration of data/signals from the human, animal, and environmental domains to enhance i) the capability of detecting (re)emerging pathogens with zoonotic potential and performing public health risk assessments, ii) source identification of outbreaks, and iii) research into targeting interventions. According to this scheme, the work of this WP is organized over three disease groups.

The first is foodborne diseases, of which causative pathogens originate from the animal reservoir from where they can spread to humans via food, water, direct contact with animals or the environment. Identification of the dynamics of the circulating pathogens' types (e.g., altered virulence and/or antimicrobial resistance) in the animal reservoir can provide an early warning for public health. In addition, the sharing of harmonized typing data provides opportunities to perform cross-sectoral clustering analysis of isolates obtained from clinical patients and food/animals/environment for rapid identification of clusters of cases and outbreaks' sources. Finally, harmonized datasets of typing information on pathogens from humans, animals/food, and the environment provides ample opportunities for enhanced epidemiological research into the relative importance of reservoirs and transmission routes to human disease burden.

The second is zoonotic influenza. Influenza viruses of swine and avian origin have the potential to adapt and cross the species barrier to humans. Since every human infection with a zoonotic influenza virus potentially poses a pandemic threat, all cases are notifiable to the World Health Organization (WHO) under the International Health Regulations and need to be closely investigated in a One Health setting.

The third are vector borne infectious diseases that are transmitted by vectors such as mosquitoes or ticks in which the causal pathogen can multiply and, in some cases, evolve and that have an active role in the transmission of a pathogen from one host to the other. Many factors may facilitate the introduction and establishment of disease vectors, reservoirs or pathogens in new geographic areas and could lead to the emergence of a disease in Europe: international travel and trade, e.g., legal, and illegal trade in animals and animal products, new agricultural practices and land-use patterns, socio-demographic evolution, and climatic changes. For this reason, often vectorborne diseases are emerging and re-emerging and their epidemiology is constantly evolving.

In this deliverable, we describe the tasks that were performed within each of these disease groups in each country during the first year of the project, and describe the piloting plans for the remainder of the project.

3.2 Description of the work carried out

Within each of the three disease groups (foodborne diseases, zoonotic influenza and vector borne diseases), three subtasks were planned, including 1) goal definition and stakeholder analysis, 2) systems mapping of current and desired situation, and 3) piloting promising approaches. The first two subtasks were executed jointly across the disease groups to ensure a common approach and methodology. Where possible, countries aligned on the pathogens they would focus on within the disease groups to be able to share experiences with each other. The primary focus was that it should be beneficial for the individual countries and thus this was the reason behind the fact that not every country would align with others. Within the foodborne disease group, countries focused on Salmonella or STEC due to their high disease burden and added value of having a One Health Surveillance system in place in order to decrease this burden. Within the zoonotic influenza disease group, countries focused on swine or avian influenza, or on both, depending on national needs. Within the vector borne disease group, countries could not align on the pathogen they would focus on because the needs were different within respective countries. This deliverable describes the outcomes of the first two subtasks and the plan for the third subtask.

As part of the first subtask, goal definition and stakeholder analysis, the goals and perimeter of the surveillance were discussed and refined (signaling, risk assessment, systematic surveillance for outbreak detection, research, etc.). Subsequently, a stakeholder analysis was performed which identified and characterized the key players and prioritized them according to their interest and importance. There were several methods available to perform a stakeholder analysis. We follow the guidelines of the One Health European Joint Programme Joint Integrative Project MATRIX, which recommended the Mendelow's matrix that classifies stakeholders by their level of interests and influence. The stakeholder analysis was recommended to be performed in a brainstorming setting where stakeholders were identified and placed in the specific quadrants of the matrix. This task could also include already available goal descriptions and/or stakeholder analysis present in Member States.

In the second subtask, systems mapping, the current status/organization of One Health surveillance was be mapped in a dedicated workshop with selected stakeholders, or a previously performed mapping was evaluated and updated if necessary. The mapping visualized how the system currently operates and what could be improved. Through iterative and successively broader integration steps, a draft map of stakeholders, their roles and relations were co-created. The map represents the joint perspectives of the participating stakeholders and shows current structures and practices, and lays the foundation for further improvement. This process also identified barriers/needs (legal, technical) to be addressed in realizing effective data-sharing in a One Health context, which could be part of the piloting phase of the project. This task could also include updating already existing mapping exercise that were previously done in in Member States.

Based on the stakeholder analysis and the systems mapping, piloting of implementation of One Health surveillance systems will be conducted. Pilots are now designed at country-level to take into account the different pace One Health is developed in the different countries, as well as locally relevant needs. Not all countries had planned to do a pilot in the proposal-writing phase of the project, including Austria for Salmonella and Italy for West Nile virus.

3.3 Results

This paragraph describes the work that has been carried out by country and pathogen. Some countries focused one pathogen in one disease group (the Netherlands, Norway and Spain), but there were also countries that worked on pathogens within multiple disease groups (Austria, Belgium, Denmark, and Italy). Furthermore, Lithuania worked on disease groups as a whole (i.e. tick-borne and foodborne diseases) instead of specific pathogen, due to the overlap in stakeholders involved in surveillance.

The Table below shows the work carried out by each country, including the diseases/pathogen(s) they focus on and the tasks they are involved in.

Table. Work carried out by each country participating in Work Package 4, One Health

Country	Disease/pathogen	T1: stakeholder analysis	T2: systems mapping	T3: piloting. To be started in Jan 2024
Austria	<i>Salmonella</i> <i>F. tularensis</i> Avian & swine influenza	Completed Completed Completed	N/A Completed Completed	N/A Planned Planned
Belgium	<i>Salmonella</i> Avian influenza	Completed Completed	Completed Completed	Planned Planned
Denmark	STEC Avian & swine influenza	Unknown Completed	Unknown Completed	Unknown Planned
Italy	STEC West Nile virus	Completed Completed	Completed Completed	Planned N/A
Lithuania	Foodborne diseases Tickborne diseases	Completed Completed	Completed Completed	Planned Planned
Netherlands	<i>Salmonella</i>	Completed	Completed	Planned
Norway	Swine influenza	Completed	Completed	Planned
Spain	West Nile virus	Completed	Completed	Planned

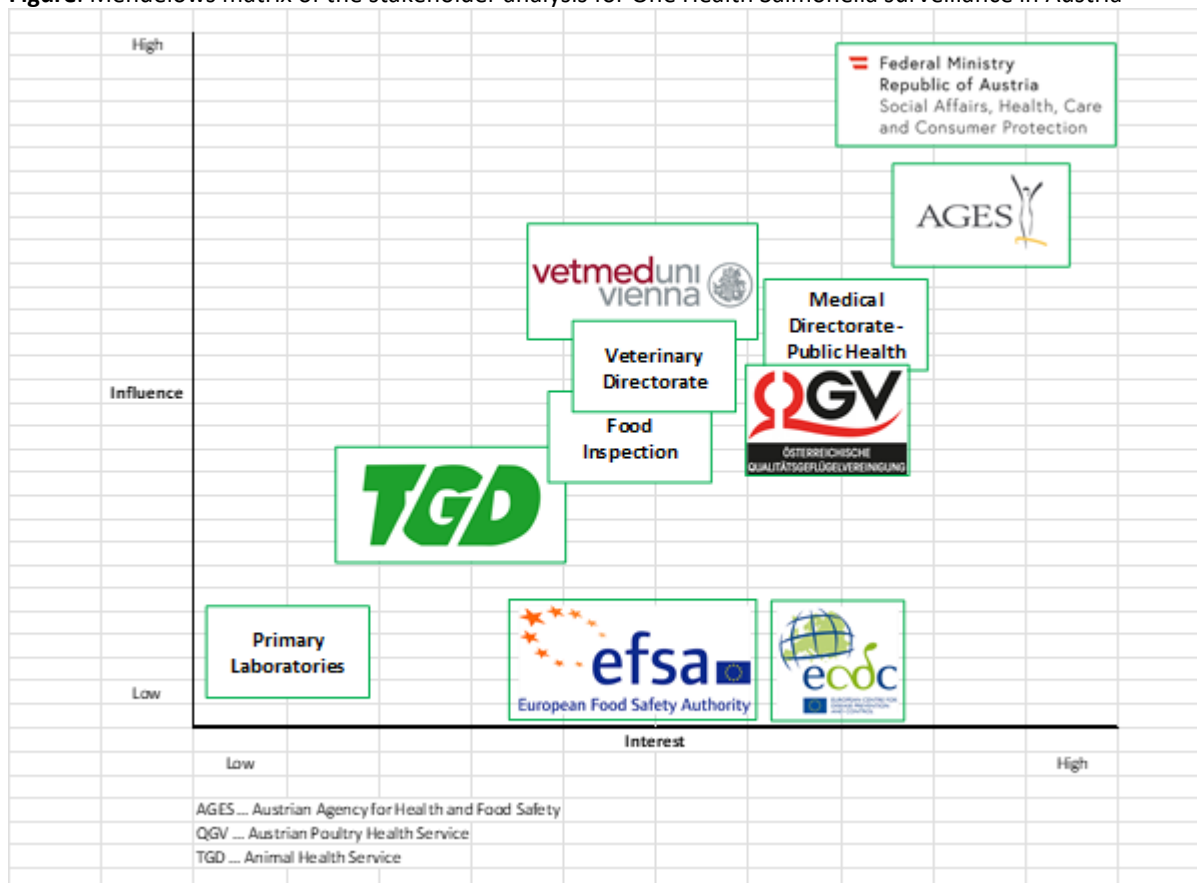
N/A: not applicable. This could be because the work was already carried out in e.g. a different project, or it was not planned as part of U4S.

3.3.1 Austria – One Health Surveillance of Salmonella

3.3.1.1 Stakeholder analysis

The stakeholder analysis was performed in April 2023, where all relevant stakeholders for the One Health surveillance of Salmonella were placed within the Mendelows Matrix.

Figure. Mendelows matrix of the stakeholder analysis for One Health Salmonella surveillance in Austria

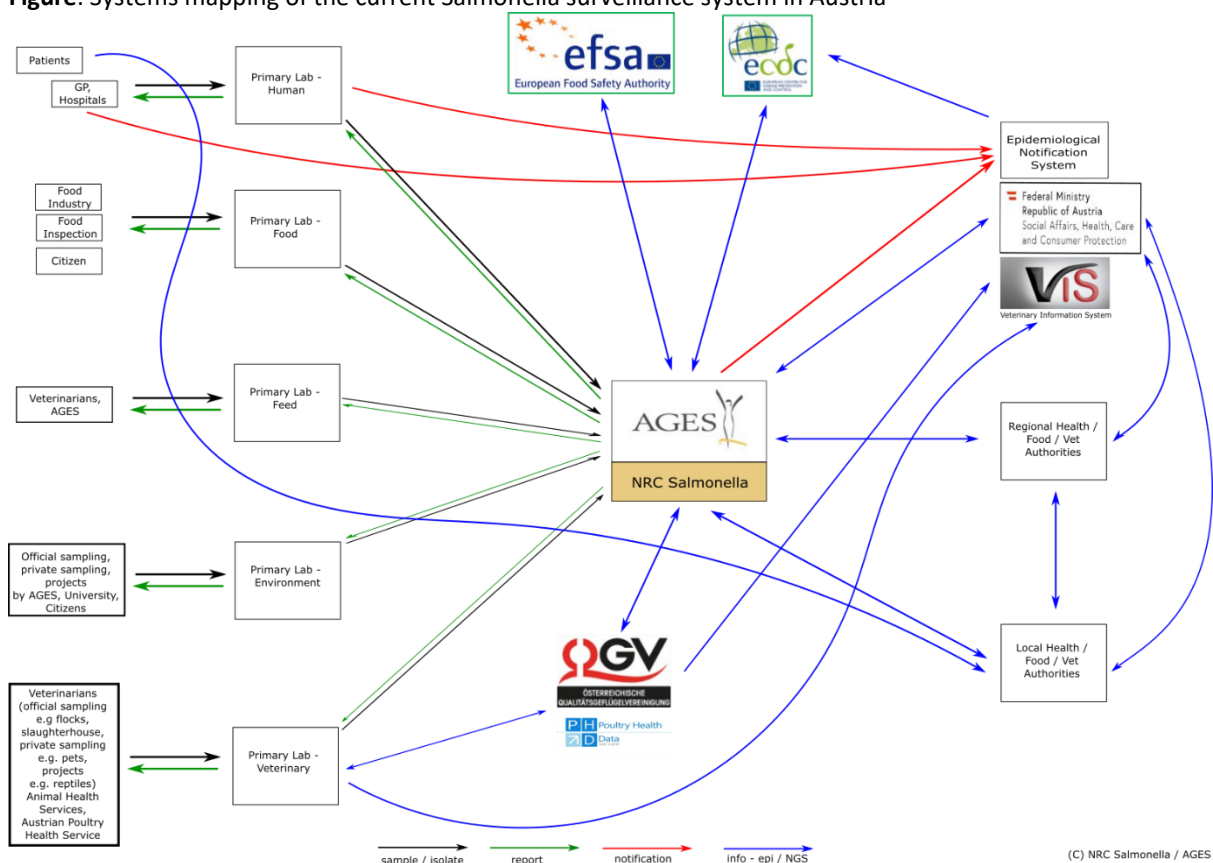


3.3.1.2 Systems mapping

We deemed it not necessary to organize a workshop with the relevant authorities in order to perform the systems mapping. In Austria, the reference centres/laboratories for foodborne diseases are responsible for all isolates (e.g. Salmonella) found in human, food, veterinary, feed, environmental samples. It is obligatory for all primary laboratories to send their isolates to the respective reference centres/laboratories. So on the one hand, we virtually get all the isolates, on the other hand we don't have any issues with lacking information flow between or different methods used by different laboratories.

In Austria we have - twice a year - meetings of the "Bundeszoonosenkommission" (~ federal committee for zoonosis), which consists of experts from different Ministries (Health, Agriculture, Environment), from all the provinces, from AGES (incl. reference centres and laboratories). Besides that, we have at least annually meetings of the "Landeszoonosenkommissionen" (committees for zoonosis in each of the nine provinces). One of the tasks of these committees is to permanently evaluate and improve our zoonosis surveillance and outbreak detection and management systems. For that purpose, we have a handbook describing the legal basis, the relationship and information flow between different competent authorities and organisations, outbreak management.

Figure: Systems mapping of the current Salmonella surveillance system in Austria



3.3.1.3 Piloting phase

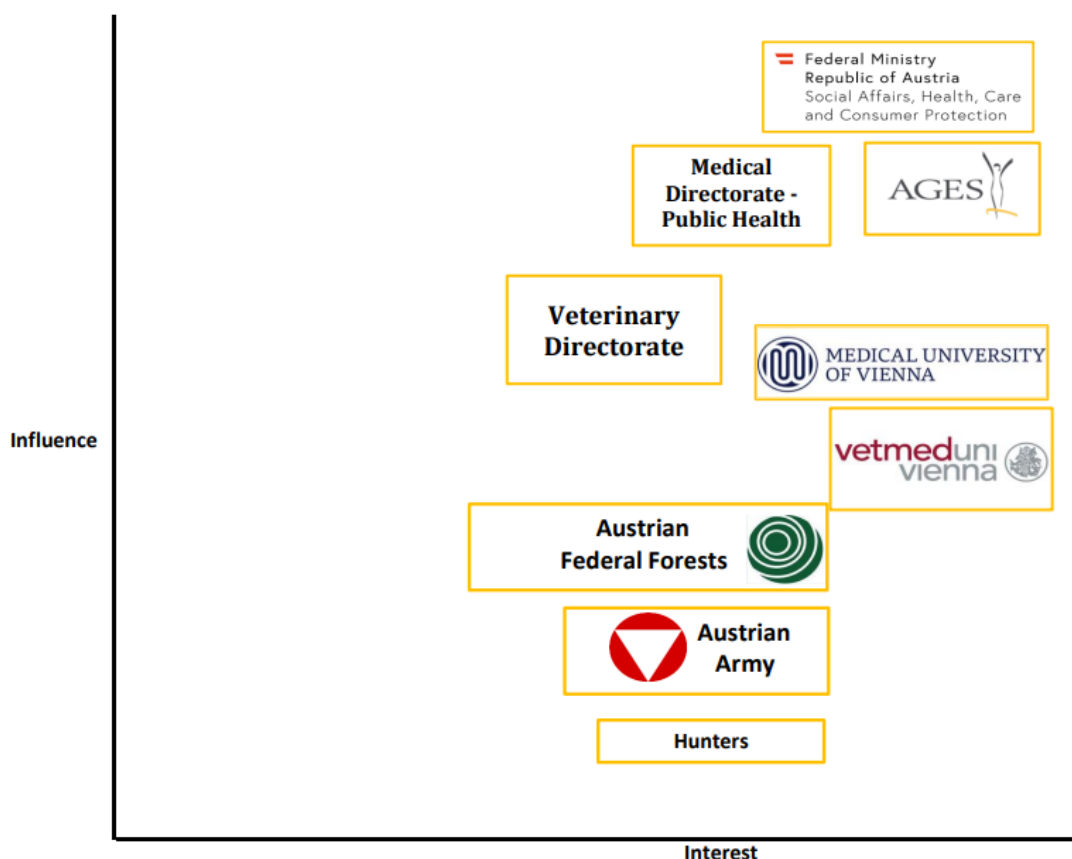
No piloting phase is planned.

3.3.2 Austria – One Health Surveillance *Francisella tularensis*

3.3.2.1 Stakeholder analysis

The stakeholder analysis was performed in April 2023, where all relevant stakeholders for the One Health surveillance of *Francisella tularensis* were placed within the Mendelows Matrix.

Figure. Mendelows matrix of the stakeholder analysis for One Health *Francisella tularensis* surveillance in Austria



3.3.2.2 Systems mapping

In order to perform the systems mapping, an online workshop with the relevant authorities was organized on the 9th of October 2023. We invited stakeholders with a high interest and high influence, which included the Federal Ministry of Republic of Austria, local medical directorates representing federal states, Medical University of Vienna, Veterinary University of Vienna and the Austrian National Forests. In the meeting we presented an overview on the epidemiology of tularemia in Austria, and we identified regions with the most reported cases based on the mandatory reporting system. Because representatives of only 2 federal states attended the meeting (one with of them with the most reported cases in Austria), the discussions on the surveillance of tularemia were limited only to these two regions. The main outcome of the meeting was the agreement to prepare a questionnaire, which will allow AGES to get timely information about new infections with *Francisella tularensis* focusing on routes of transmission. This will give us the possibility to explore the sources of infections by collecting and analyzing vectors in the regions of interest. Moreover, the collaboration between the medical authorities in the federal states and AGES will be enforced.

3.3.2.3 Piloting phase

Francisella tularensis, the causative agent of tularemia, is a zoonotic pathogen with a wide range of reservoir hosts. Transmission to humans takes place by contact with infected animals, by bites or arthropods or through contaminated water and soil. Two subspecies of *F. tularensis* cause human infection: *F. tularensis* subsp. *holartica* occurs throughout the northern hemisphere and is less virulent than *F. tularensis* subsp. *tularensis*, which probably is restricted to the Northern America only. *F. tularensis* subsp. *holartica* is divided into 2 distinct biovars. Biovar I is sensitive to erythromycin and occurs particularly in Western Europe and biovar II is resistant to erythromycin and it is prevalent in the Eastern Europe. Given these differences, surveillance of the circulation of the respective variants of *F. tularensis* not only affects the expected severity of the human disease but it has a direct impact on the treatment.

The clinical manifestation of human tularemia ranges from systemic infections to local affections of the skin and regional lymph nodes. The latter usually occurs after arthropod bites and is characterized by an ulcer at the site of the arthropod bite and regional lymphadenopathy. Abscess formations, which require a surgical intervention, are frequent complications.

It is not fully clear, which arthropods can transmit the pathogen to humans. Infections after tick bites were documented in Austria (Seiwald 2020; Markowicz 2021); however, tick bites might not explain all cases of ulceroglandular tularemia. Last year we have identified a patient who developed ulceroglandular tularemia attributed to an arthropod bite in late autumn (Heger et al. 2023). Given that the time was not common for *Ixodes ricinus* being active, one has to consider other potential vectors responsible for transmission of *F. tularensis* in our country. Mosquitos are known vectors of *F. tularensis* in the Scandinavian countries, but it is unclear if they are capable to cause the infection in Austria and such cases have not been reported yet. Likewise, deer flies were associated with outbreaks of tularemia in the United States (Calanan 2007), but despite their abundance in Austria, no infections related to these insects have been documented.

The aim of the study is to explore if human cases of tularemia are associated with prevalence of the pathogen in vectors like ticks, mosquitos and deer flies. Regions with high number of human tularemia cases will be identified based on reports to National Reporting Record. In these regions we will collect ticks, mosquitos and deer flies in and analyse them for presence of *F. tularensis* by PCR and whole genome sequencing. Arthropods collected in regions, where human tularemia does not occur will serve as controls. We will compare the frequency of *F. tularensis* from both groups of vectors and explore their impact on human infection. There are two scenarios, which will provide important conclusions. A higher abundance of *F. tularensis* in at least one group of arthropods will suggest that they might play an important role in for the accumulation of human cases. If we do not find any significant difference between the two groups, other sources of *F. tularensis* must be considered and explored in future projects.

The project is an integrative effort to link human health and animal reservoir to explore the etiology for a zoonotic disease. It will mobilize specialists from different research disciplines to collaborate in a one-health approach. Finally, it will lead to better surveillance of human tularemia and vectors transmitting the pathogen. We will start the piloting phase at the beginning of 2024.

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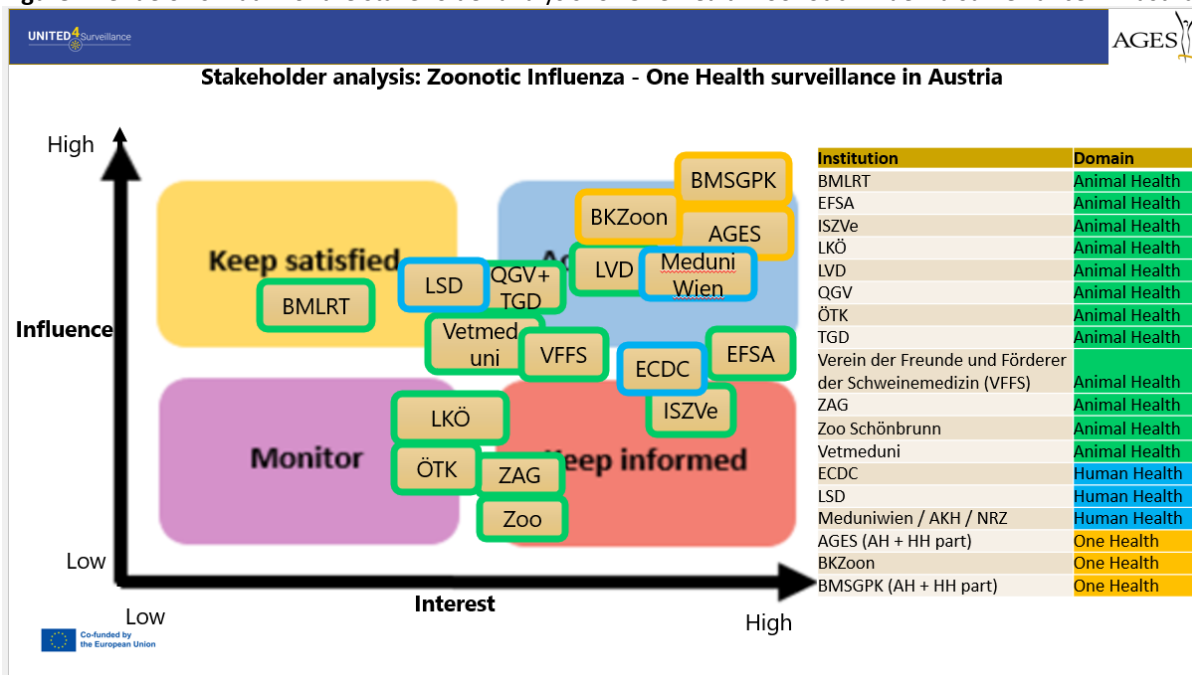
3.3.3 Austria – One Health surveillance zoonotic influenza

3.3.3.1 Stakeholder analysis

The stakeholder analysis was performed in April 2023, where all relevant stakeholders for the One Health surveillance of zoonotic influenza (avian influenza and swine influenza) were placed within the Mendelows Matrix.

Borders of the stakeholders are colored by domain, where blue represents human health, green represents animal health and orange represents one health (=stakeholder covers the topic from both domains).

Figure: Mendelows matrix of the stakeholder analysis for One Health zoonotic influenza surveillance in Austria



3.3.3.2 Systems mapping

In order to perform the systems mapping, a workshop with the relevant authorities was organized on the 20th of September 2023 at the Austrian Ministry of Health. We invited stakeholders with a high interest and high influence from the political and scientific side, which included specialists from the Veterinary University of Vienna (virology, porcine and poultry health departments), Poultry quality organization (QGV), [National Reference laboratory for Influenza viruses](#) at the Zentrum für Virologie der Medizinischen Universität Wien, Ministry of Health, Zoonotic Commission, AGES - Institute for medical microbiology and hygiene, AGES-Institute for veterinary disease control. During this day, we presented the project and defined the objectives of the Zoonotic Influenza One Health surveillance system, drew our current systems mapping (i.e. which are current Influenza surveillance system) and our desired Zoonotic Influenza surveillance system, which we would like to accomplish during the piloting phase of the U4S project. For that, we presented different ongoing and inspiring surveillances from different project partners and MS. Representatives from the Human health organizations shared their national flu surveillances programs. AGES presented the Biosecurity strategies used at bird culling recorded during some 2023 Avian influenza outbreaks and the SH discussed how these could be improved. Surveillance points at the veterinary clinics and the veterinary university were highlighted, especially for detection of Influenza A viruses in mammals other than human. During the workshop, additional potential stakeholders were identified that were not initially identified during the stakeholder analysis. Also, we identify that both animal and human experts aimed the same objectives and discussed about the necessity to intensify communication and common surveillance systems.

Desired Situation towards a strengthened One Health surveillance system:

- Definition of formal information paths between the Animal Health authorities and the Human Health authorities.
- Information and awareness raising of local public health authorities / medical staff regarding current outbreaks and/or culling actions.
- Planning of sampling process of humans with pathogen contact on infected farms (esp. after HPAI outbreaks).
- Enhancement of Surveillance/awareness at private veterinary clinics.
- Role of the National reference laboratories (animal health sector) and National reference centres (human health sector) and definition of formal information paths between the laboratories.
- Knowledge exchange on methods and/or sharing of materials, pathogen sequences, etc.

Figure. Systems mapping of communication lines between stakeholders of One Health zoonotic surveillance in Austria

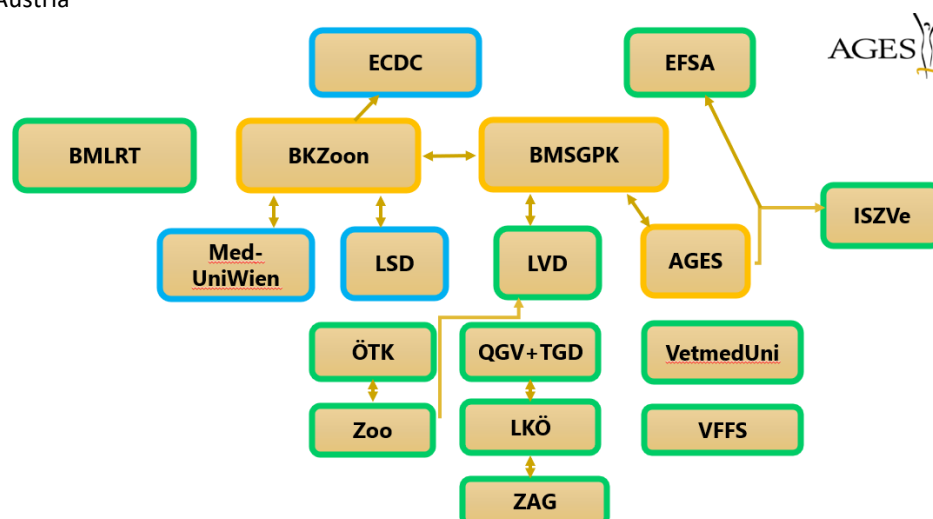
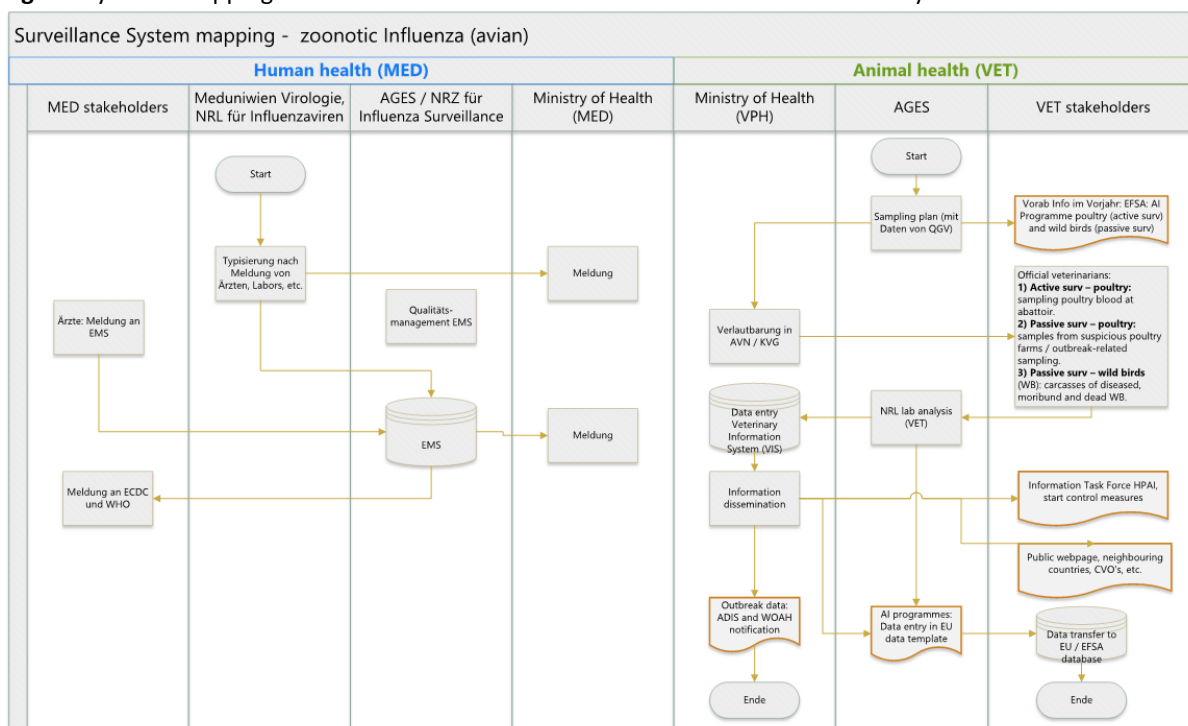


Figure: Systems mapping of the current One Health zoonotic influenza surveillance system in Austria



Objectives of the zoonotic Influenza Surveillance activities to be implemented and/or scaled up within the U4S project:

- (1) Monitor genetic evolution of endemic SIV and AIV to better understand endemic and emerging influenza virus ecology.
- (2) Inform private veterinarians about the detected subtypes in the sampled farms (improvement of vaccine use and vaccine strain)
- (3) Make available swine and avian Influenza A isolates for research and establish a common database for genetic analysis and clinical signs, etc.
- (4) Genetic comparison with Influenza A isolates detected in the EU/world-wide.
- (5) Notification to the authorities about mutations and possible increased zoonotic potential.
- (6) Preparation of reference isolates, updating of diagnostic assays.
- (7) Raising disease awareness to improve the biosecurity at the farms (veterinarians, occupational workers, culling workers).
- (8) Improvement of the direct communication between human and animal health sectors.

3.3.3.3 Piloting phase

For swine influenza, we aim to start the piloting phase early 2024, where we aim to get from the current non-existing Swine Influenza surveillance system to the desired surveillance system. One of the main things to improve is to include the regional Animal Health Authorities (TGDs) into our SIV surveillance system, who perform diagnostics in the animal sector, to share and analyze retrospective and recent positive SIV samples and share the sequence data into the existing public database as GISAID. Moreover, we would like to include isolates from additional, mainly commercial, veterinary stakeholders, which will be engaged in the first months of the piloting phase.

For avian influenza, the pilot phase for surveillance activities directed towards avian influenza will also start in early 2024. The focus will first be on the implementation of sampling and analysis of human samples, taken from contact persons on HPAIV-infected poultry farms.

Active and passive sampling of wildlife will be focused on areas with confirmed HPAI cases in wild birds. These surveillance activities will complement the statutory passive wild bird monitoring and surveillance activities to be carried out under the call "EUBA-EFSA-2023-BIOHAW-06: Establishing capacities for active surveillance of highly pathogenic avian influenza in wild birds in Europe".

3.3.4 Belgium – One Health Surveillance Salmonella

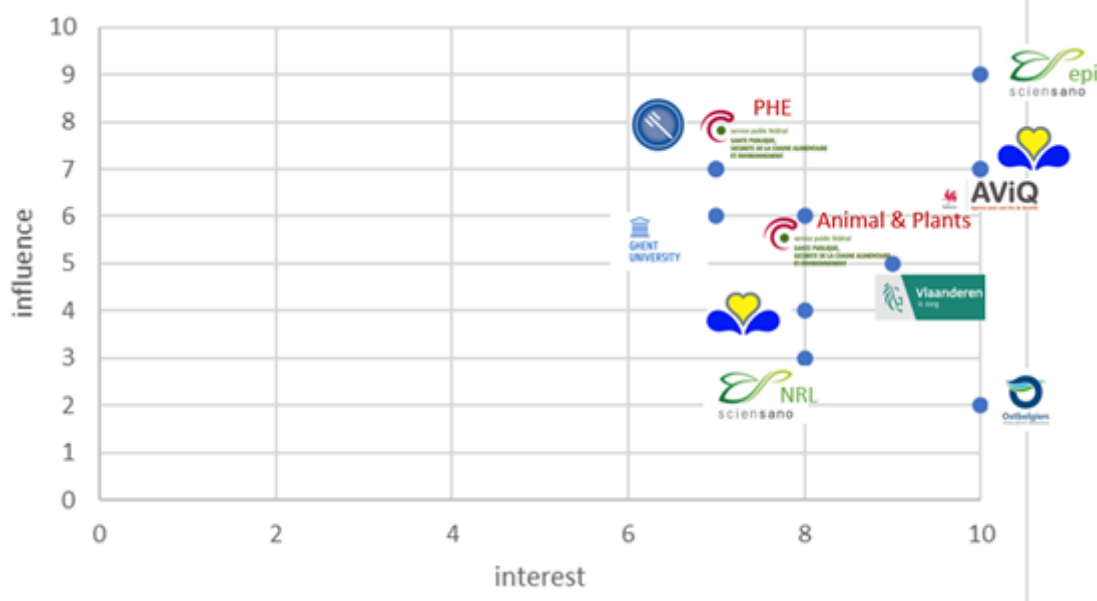
3.3.4.1 Stakeholder analysis

The stakeholder analysis was performed in the summer of 2023. All relevant stakeholders for the One Health surveillance of Salmonella in Belgium (table below) were asked to fill in a short survey to estimate their influence and interest in the Salmonella surveillance, focusing on a One Health approach. The Mendelow's Matrix was completed based on the survey answers (Figure below).

Table. List of relevant stakeholders for the One Health Salmonella surveillance in Belgium

Name of organization	Domain	(inter)national/regional	Role	Present 29/09
Sciensano - NRC Salmonella	Human, Animal	National	Typing human <i>Salmonella</i> isolates	yes
Sciensano - NRL FBO	Food	National	Typing food and animal <i>Salmonella</i> isolates	yes
Sciensano - NRL Food Feed	Food	National	Typing food and animal <i>Salmonella</i> isolates	yes
Sciensano - Epidemiology infectious diseases	Human	National	Epidemiological surveillance, outbreak support	yes
Sciensano - Crisis	Human	National	Crisis coordination	no
Federal Agency for the Safety of the Food Chain (FASFC)	Food, Animal	National	Assessment and management of risks throughout the food chain, animals and plants.	yes
Federal public service Health, public health emergencies	Human	National	crisis support, EWRS	no
Vlaams Agentschap Zorg en Gezondheid (VAZG)	Human	Regional	Prevention/outbreak investigations	yes
Agence pour une vie de Qualité (AViQ)	Human	Regional	Prevention/outbreak investigations	yes
Commission communautaire	Human	Regional	Prevention/outbreak investigations	yes
Ostbelgien	Human	Regional	Prevention/outbreak investigations	no
Arsia	Animal	Regional	Detection <i>Salmonella</i> in livestock	yes
Dierengezondheidszorg Vlaanderen (DGZ)	Animal	Regional	Detection <i>Salmonella</i> in livestock	yes
University of Gent	Animal	Academic		no
ECDC	Human	International	Cross border outbreaks, trends EU human salmonellosis	no
EFSA	Food, Animal	International	Cross border outbreaks, trends EU food/animal	no

Figure: Mendelow's matrix of the stakeholder analysis for One Health Salmonella surveillance in Belgium



3.3.4.2 Systems mapping

A joint workshop was organized, on September 29th 2023, with the stakeholders of the One Health surveillance of Salmonella and the stakeholders of the surveillance of zoonotic Influenza in Belgium. The workshop was divided into two parts: (i) a common session, where the current functioning of both surveillance systems was presented, and (ii) two parallel sessions, focusing on relevant aspects of each surveillance and gathering the stakeholders involved in each surveillance. The stakeholders participating to the parallel session dedicated to the Salmonella surveillance are indicated in the Table (last column). The organization of the surveillance system in Belgium was presented (Figure below).

As the surveillance system for Salmonella in Belgium is already in place, a SWOT analysis of the system was proposed to the participating stakeholders. They were grouped according to their role (laboratories, regional authorities, food safety agency and epidemiology). The strengths, weaknesses, opportunities and threats of the surveillance system, identified by each group are shown in the table below.

Figure: Systems mapping of the current Salmonella surveillance system in Belgium

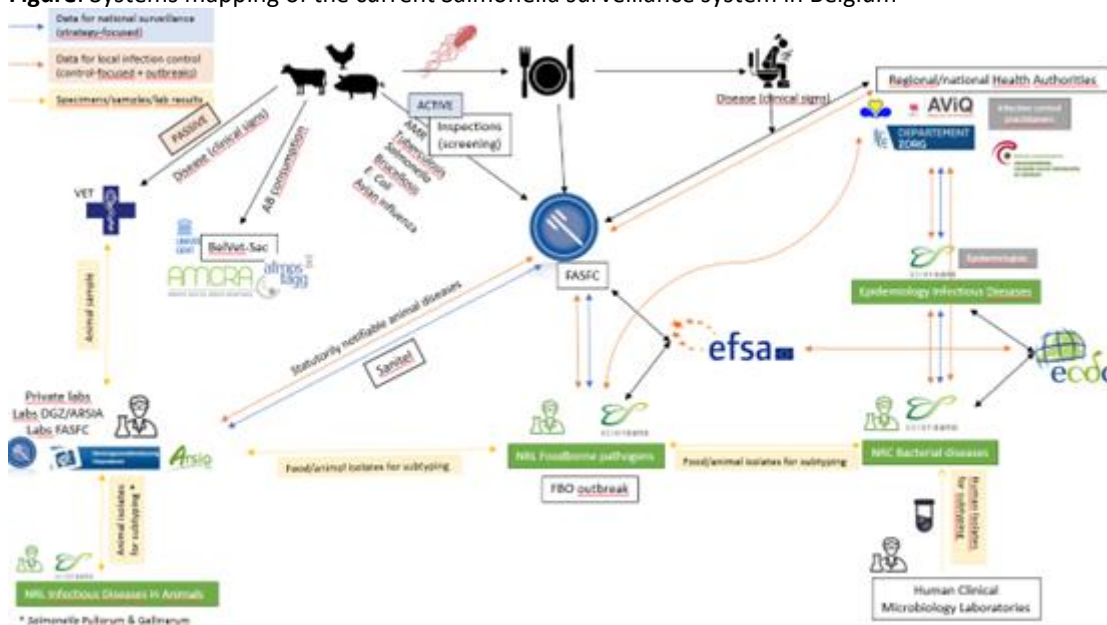


Table: SWOT analysis of Salmonella surveillance system in Belgium

STRENGTHS <ul style="list-style-type: none"> • Good collaboration between partners at national and international level • Existence of a foodborne outbreak platform • State of the art methods in place such as WGS • Poultry: extensive sampling (working group poultry Salmonella) • Centralization of sampling/microbiological investigation • Surveillance “farm to fork” from the Food Safety Agency • Important amounts of data available in the Food Safety Agency database • EU and national legislation available to mitigate Salmonella infections • WGS on strains from food control program in place • Legal framework for notification of outbreaks in place 	WEAKNESSES <ul style="list-style-type: none"> • Strains or data from private labs are not always shared with national reference labs • Legal rules might block progress, not adapted to new methods (blocks introduction of WGS) • New vaccine developed > methods should follow. • Imported food from third countries: less surveillance/control/legislation • Little knowledge about <i>Salmonella</i> in environment in general. • Control measures for primary production only for poultry, not for other animals • Low contamination in food > difficult to detect (heterogeneity) • Role of Federal Public Service • Understaffed at epi Sciensano • Time needed to do questionnaires/investigation • Lack of human sampling by physicians – cost for patient
OPPORTUNITIES <ul style="list-style-type: none"> • Working groups <i>Salmonella</i> for other animals (now only poultry). (NB: No measures taken for other animals if test positive (eg vaccination)). • Changes @ legal level regarding serotyping? e.g. too extended sequencing in poultry: because of legal obligation (EU). • Better explore WGS data available • Perform WGS on human and non-human samples • Sustainability of WGS infrastructures (BE HERA infrastructure until end of 2024) • Access to strains from food operators • Even better cooperation always possible • Increase epidemiological follow-up • Collection of basic information on cases also outside outbreaks • Trawling questionnaires • Outbreak management platforms developed at regional level (Flanders, Wallonia) 	THREATS <ul style="list-style-type: none"> • Culture-independent diagnostics: no access to actual strains if molecular methods/PCR are used • Financial aspect : sustainable funding is needed • Political and media pressure – communication actions • Economical context and different legislations in EU Member States • Migration of population (import of cases) • Climate change: research need to be carried out to evaluate and monitor epidemiology of <i>Salmonella</i> • GDPR (collection of data and information exchange) • Basic information on cases outside outbreaks lacking

3.3.4.3 Piloting phase

The SWOT analysis led to the identification of several action points intended at improving the current surveillance system and which will feed the piloting phase of the United4Surveillance project (table below). These action points will be taken forward starting in January 2024.

Table: Action points identified after the SWOT analysis of the Salmonella surveillance in Belgium

Action points		Who
AP1	Opinion paper sampling poultry	Sciensano - NRL FBO Federal Agency for the Safety of the Food Chain
AP2	Classical serotyping vs WGS	Sciensano - NRC Salmonella Federal Agency for the Safety of the Food Chain
AP3	Set-up a cross-sectoral database	Sciensano - NRC Salmonella Sciensano - NRL FBO BE-HERA-WGS Federal Agency for the Safety of the Food Chain
AP4	Proof of concept cross sectoral database for outbreak investigation <ul style="list-style-type: none"> Seminar FR, NL experience Seminar DK experience 	BE-HERA-WGS Sciensano - Epidemiology infectious diseases
AP5	Better communication - GDPR	Sciensano - NRL FBO
AP6	Early warning system to detect clusters	Sciensano - Epidemiology infectious diseases Sciensano - NRC Salmonella
AP7	Common questionnaires for outbreak investigation	Sciensano - Epidemiology infectious diseases Regional health authorities
AP8	Presentation of Regional outbreak management systems	Regional health authorities Foodborne outbreak management platform
AP9	Environmental sampling <i>Salmonella</i>	Federal Agency for the Safety of the Food Chain
AP10	Clarification role of Federal Public Service	Foodborne outbreak management platform
AP11	Climate change and <i>Salmonella</i>	Regional health authorities (Flanders)

3.3.5 Belgium – One Health Surveillance avian influenza

3.3.5.1 Stakeholder analysis

As for the foodborne part, the stakeholder analysis of the zoonotic influenza was performed in summer 2023. The relevant stakeholders for the One Health surveillance of Zoonotic Influenza in Belgium were listed (table below).

Table. List of relevant stakeholders for the One Health avian influenza surveillance in Belgium (1/2)

Name of the organization	Domain	(inter)national or regional	Role
Sciensano - NRC influenza	Human	National	Typing zoonotic influenza in humans
Sciensano - NRL avian influenza	Animal	National	Typing zoonotic influenza
Sciensano - Epidemiology infectious diseases	Human	National	Epidemiological surveillance, outbreak support
Sciensano - Coordination of Veterinary Activities	Animal	National	Veterinary epidemiological surveillance, risk assessment, outbreak support
Federal Agency for the Safety of the Food Chain (FASFC)	Food, Animal	National	Assessment and management of risks throughout the food chain, animals and plants.
FAO	Food, Animal	International	Implementation of surveillance programs in the field
ECDC	Human	International	Cross border outbreaks, trends EU human influenza
EFSA	Food, Animal	International	Cross border outbreaks, trends EU food/animal
Federal public service Health, food chain safety and environment	Human	National	Crisis support
Vlaams Agentschap Zorg en Gezondheid (VAZG)	Human	Regional	Operation side in outbreak investigations (interview cases)
Agence pour une vie de Qualité (AViQ)	Human	Regional	Operation side in outbreak investigations (interview cases)
Commission communautaire commune	Human	Regional	Operation side in outbreak investigations (interview cases)
Ostbelgien	Human	Regional	Operation side in outbreak investigations (interview cases)
Arsia	Animal	Regional	Detection of influenza in livestock
Dierengezondheidszorg Vlaanderen (DGZ)	Animal	Regional	Detection of influenza in livestock
Institute for agricultural and fisheries research (ILVO)	Animal, Environment	Regional	Research
Occupational medicine (SPF)	Human	National	Prevention
Occupational medicine	Human	Regional	Prevention
Revalidation centers wild birds	Animal	Regional	Detection of influenza in wild birds
Vlaams Agentschap Natuur en Bos (VANB)	Animal, Environment	Regional	Policy, sustainable management and enhancement of nature
SPW Agriculture, ressources naturelles et environnement	Animal, Environment	Regional	Safeguards natural and rural heritage in a sustainable development perspective
Leefmilieu.Brussels	Animal, Environment	Regional	Defining and implementing regional policy in all fields related to the environment
EURL avian influenza (Italy)	Animal	International	reference laboratory
WHO EURO (Copenhagen)	Human	International	
WHO (Paris)	Animal	International	Normative organ, notification of mandatory diseases
Royal Belgian Institute for Natural Sciences (IRSNR)	Animal, Environment	National	Scientific institute, responsible for birds ringing and avian biodiversity

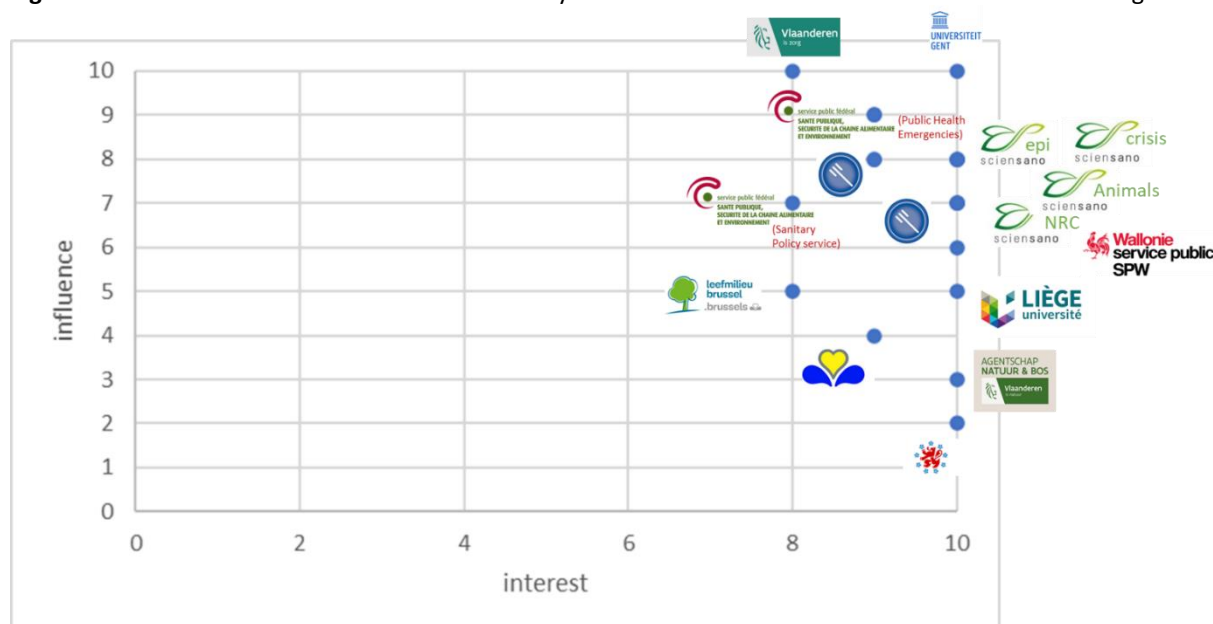


Table. List of relevant stakeholders for the One Health avian influenza surveillance in Belgium (2/2)

Name of the organization	Domain	(inter)national or regional	Role
WHO CC (London; CDC Atlanta)	Human, Animal	International	reference laboratory
EURL avian influenza (Italy)	Animal	International	reference laboratory
WHO EURO (Copenhagen)	Human	International	
WHO A (Paris)	Animal	International	Normative organ, notification of mandatory diseases
Royal Belgian Institute for Natural Sciences (IRSNB)	Animal, Environment	National	Scientific institute, responsible for birds ringing and avian biodiversity
Ornithologist associations (ringers, etc) or others linked to wild life (hunters? Etc)	Animal, Environment	Regional	First line surveillance
Professional associations (pig vets, poultry vets, farmers, etc)	Animal	Regional	First line surveillance
Universities - Vet med faculties (UGent, ULiège)	Animal	Regional	Research
Centre de Recherche Agronomique de Wallonie (CRA-W)	Animal, Environment	Regional	Research - satellite data - floor and ground data
Other Universities - Epidemiological units (ULB, ULouvain, UHasselt, KULeuven)	Animal, Environment, Human	Regional	Research - spatio-temporal epidemiology

The relevant stakeholders were asked to fill in a short survey where they estimated their influence and interest in the Zoonotic Influenza One Health surveillance. The Mendelow's Matrix was completed based on the survey answers (Figure below).

Figure. Mendelow's matrix of the stakeholder analysis for One Health avian influenza surveillance in Belgium



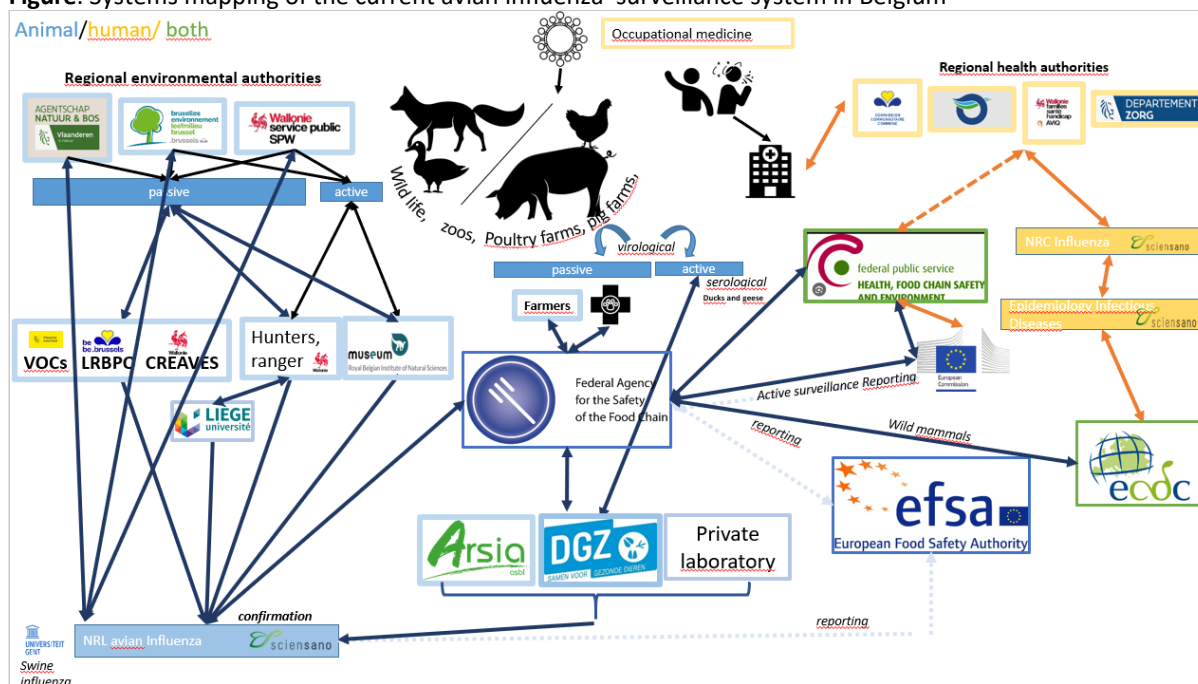
3.3.5.2 Systems mapping

A joint workshop was organized, on September 29th 2023, with the stakeholders of the One Health surveillance of Salmonella and the stakeholders of the One Health surveillance of zoonotic Influenza in Belgium. The workshop was divided into two parts: (i) a common session, where the current functioning of both surveillance systems was presented, and (ii) two parallel sessions, focusing on relevant aspects of each surveillance and gathering the stakeholders involved in each surveillance.

The session focusing on zoonotic influenza surveillance consisted mainly of a brainstorming on sustainable surveillance systems to detect human cases of animal influenza among workers who might be at risk of exposure and then to gather ideas about what should be implemented.

The first part was a feedback on the stakeholder analysis and the systems mapping. The organization of the surveillance of zoonotic influenza in Belgium, compiled by Sciensano, was presented (Figure below).

Figure. Systems mapping of the current avian influenza surveillance system in Belgium



In the second part of the session, the brainstorming was done by asking questions using the interactive Mentimeter tool. Questions mainly concerned the target populations and for some identified populations, the type of surveillance, when it should be operating, what can cause problems in the implementation, and how should results be reported.

Here is the summary of the brainstorming, giving the priorities for the three selected targeted populations.

In the poultry sector:

- surveillance of the workers in farms,
- on symptomatic cases,
- feasibility considered as moderate,
- through GPs or hospitals independent from sentinel or other,
- during all the year,
- barriers are willingness to participate because of risk of consequences, and budget.

In the pig sector:

- surveillance of the veterinarians,
- on asymptomatic cases,
- feasibility considered as easy,
- through cohorts or other,
- during all the year,
- barriers are budget for sampling, willingness to participate, and administrative obstacles.

In the wild life sector:

- surveillance of the workers/volunteers in the revalidation centers,
- on symptomatic and asymptomatic cases,
- feasibility to be evaluate,
- through cohorts, GPS or hospitals independent of sentinel,
- during all the year,
- barriers are administrative obstacles, budget for sampling, and willingness to participate.

3.3.5.3 Piloting phase

The pilot project named ZOOIS was launched this year in Belgium.

This project aims at implementing a more pro-active surveillance of potential transmission of influenza viruses to humans (zoonotic transmission). Clinical surveillance of influenza in humans and avian species is well organized and has been operating for decades, but currently there is no pro-active systematic surveillance of potential transmission of animal (swine or avian) influenza viruses to humans, only follow-up of people showing clinical symptoms. People working with potentially infected animals have the highest risk. Moreover, they can represent the first steps in a pandemic: if the virus adapts to humans, infected workers could potentially spread the virus to other people.

Currently, highly pathogenic clade2.3.4.4b H5 avian influenza viruses are continuously circulating in wild birds in Belgium and the number of introduction in poultry farms has raised, increasing the contact opportunities with high viral concentrations. Several reports of suspected human infection have been made by different countries, the latest in Spain. In addition, the virus was detected in sick non-human mammals. The large circulation in wild birds thus represents an increase risk of spill-over to mammalian species, including humans, (by contact directly with wild birds, or via outbreaks in poultry). This increased opportunity for accidental spillover to new host species increases the chances for the avian virus to adapt to mammals, including humans. Likewise, there have also been an increased number of human cases of swine influenza reported by several European countries. A pro-active surveillance aiming at also detecting asymptomatic infections would allow an early detection of transmission that could help to prevent a new pandemic.

As a piloting approach during this specific project, it is suggested to initiate some dedicated sentinel networks among at-risk workers: people in poultry farms involved with the management of outbreaks of highly pathogenic avian influenza; people working at bird (or more generally wild life) rehabilitation centers; people working in pig farms/slaughterhouses.

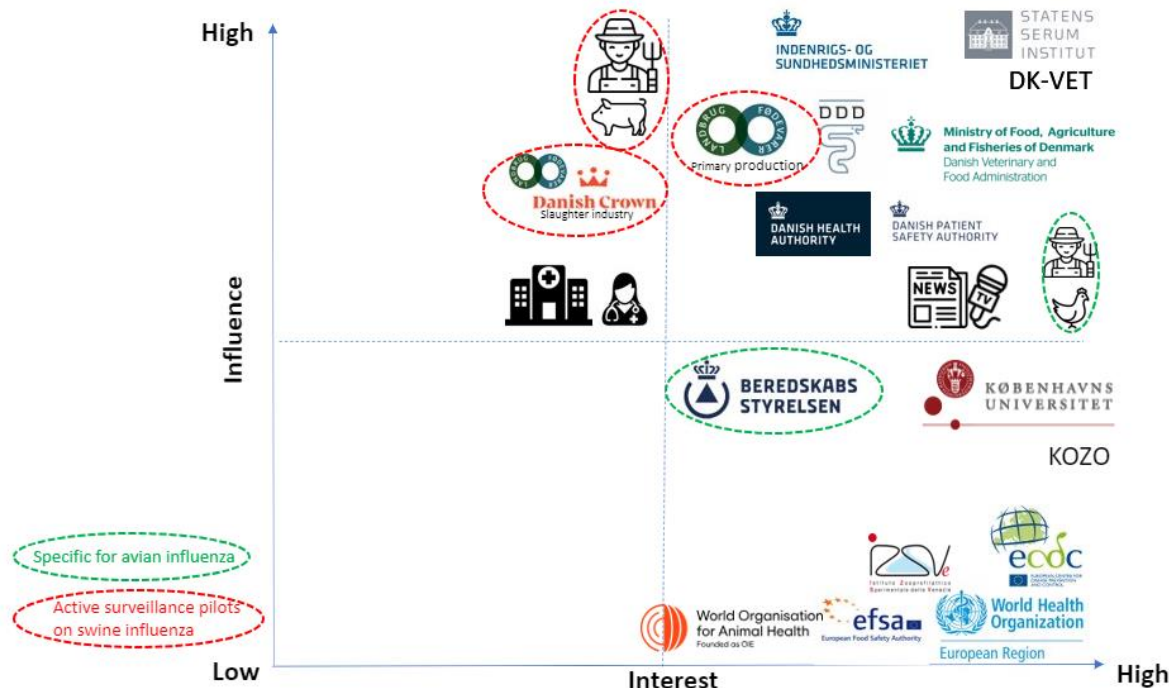
Participants will be monitored for the duration of the pilot study and will take a self-administered nasopharyngeal swab every fortnight. At each sampling, they will complete a questionnaire to assess the previous two-week period in terms of their activity with animals and any symptoms. The samples will be tested for influenza viruses by the National Influenza Reference Centre in Sciensano. The results will first be used to assess the feasibility of such surveillance (particularly in terms of the regularity of participation). If cases of influenza of animal origin are detected, an analysis of the data on animal handling practices will enable us to assess the need to adapt practices and legislation.

3.3.6 Denmark – One Health Surveillance swine influenza

3.3.6.1 Stakeholder analysis

In April 2023, we performed the first stakeholder analysis for zoonotic influenza virus infections in humans. All relevant stakeholders for the current, passive surveillance system for zoonotic influenza infections in humans, and for the planned, active surveillance pilots, were placed within a Mendelows Matrix. The matrix classifies stakeholders according to their level of influence and interest. During the workshop “Systems Mapping of Zoonotic Influenza Virus Infections in Humans” held in August 2023, the stakeholder analysis was reviewed and updated based on input from the participating stakeholders.

Figure. Mendelows matrix of the stakeholder analysis for One Health swine influenza surveillance in Denmark



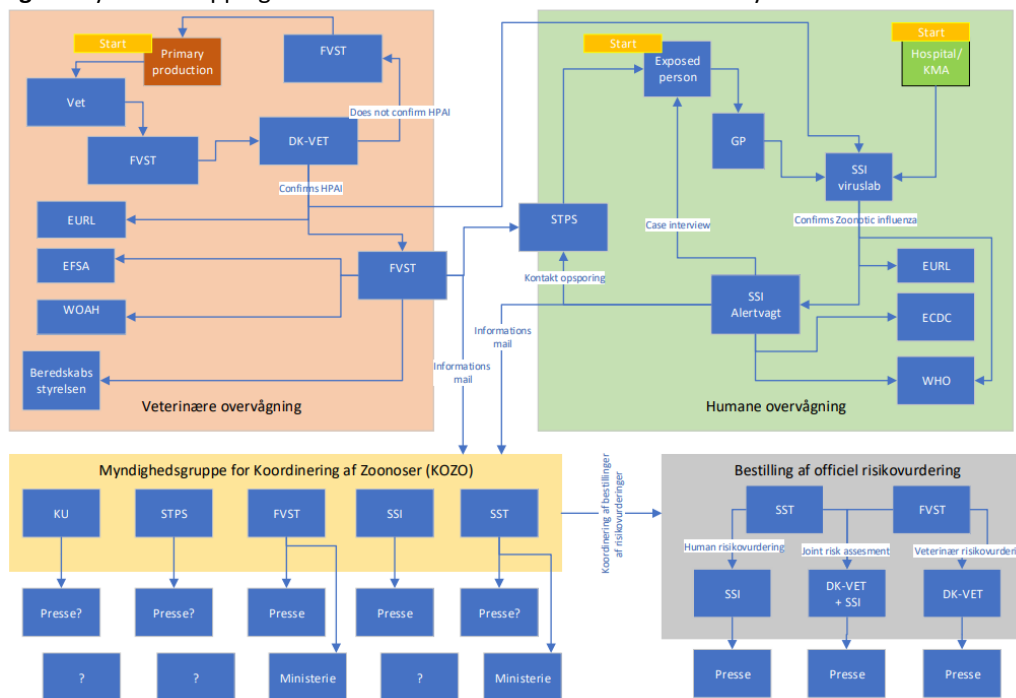
3.3.6.2 Systems mapping

To map the system for detecting and managing zoonotic influenza virus infections in humans, we held a workshop on 17 August 2023 at SSI. We invited stakeholders playing an active role in the surveillance and management of human infections of zoonotic influenza viruses in Denmark, as well as stakeholders representing the veterinary side. These included various departments of SSI, the University of Copenhagen (UCPH) as part of the DK-VET consortium (a consortium consisting of SSI and UCPH), the Danish Veterinary and Food Administration (DVFA), the Danish Agriculture and Food Council (DAFC; as representative of the poultry and swine industry), the Danish Health Authority (DHA) and the Danish Patient Safety Authority (DPSA).

The objectives of the workshop were 1) to review a stakeholder analysis of parties involved in the detection and management of human cases infected with avian (AIV) or swine influenza viruses (swIAV), 2) to map the current, passive, surveillance process for the detection of humans infected with AIV or swIAV, including structure for information sharing and identify needs and gaps, 3) to map the surveillance process for the planned pilots under UNITED4Surveillance on active surveillance of AIV and swIAV infections in humans, including the structure for information sharing, and 4) to discuss a draft communication plan for AIV or swIAV detections in humans involving key stakeholders.

During the workshop, we reviewed and updated the pre-prepared stakeholder analysis matrix and systems maps of the current passive surveillance system. We furthermore discussed the setups and system of the planned active surveillance pilots (see section “Description of piloting phase”). After the workshop, based on input from all stakeholders on practical aspects and feasibility, the scope and objectives of the pilots were adapted. Needs and gaps, as well as action points, were addressed in the adapted pilot scope and were summarized in a workshop report.

Figure. Systems mapping of the current swine influenza surveillance system in Denmark



3.3.6.3 Piloting phase

The planned pilots in Denmark focus on exploring the feasibility of conducting active surveillance of persons exposed to AIV and swIAV.

Surveillance of persons occupationally exposed to AIV-infected birds is currently passive in Denmark. The official guideline in Denmark states that persons with exposure to poultry flocks with suspected or confirmed AIV infection are offered prophylactic antiviral medicine prior to exposure to birds and are advised to contact their general practitioner to get tested if they develop influenza-like illness within ten days of exposure [1]. The extent of avian influenza virus infections in occupationally exposed persons in Denmark is currently unknown. The proposed project aims to address this knowledge gap and improve current surveillance by determining the frequency/ infection rate of spillover events from birds to humans by piloting active surveillance of AIV infections in asymptomatic persons with high-risk exposure (i.e. those without wearing personal protective equipment or a breach thereof) to AIV-infected birds and their environment.

For swIAV, two human cases infected with swIAV re-assortants have been detected in 2021 as part of the routine influenza surveillance in Denmark. To systematically investigate the extent of spillover events of swIAV to humans, the planned pilots will focus on testing pig veterinarians practicing in swine herds and working at slaughterhouses for infections with swIAV (reassortants).

References

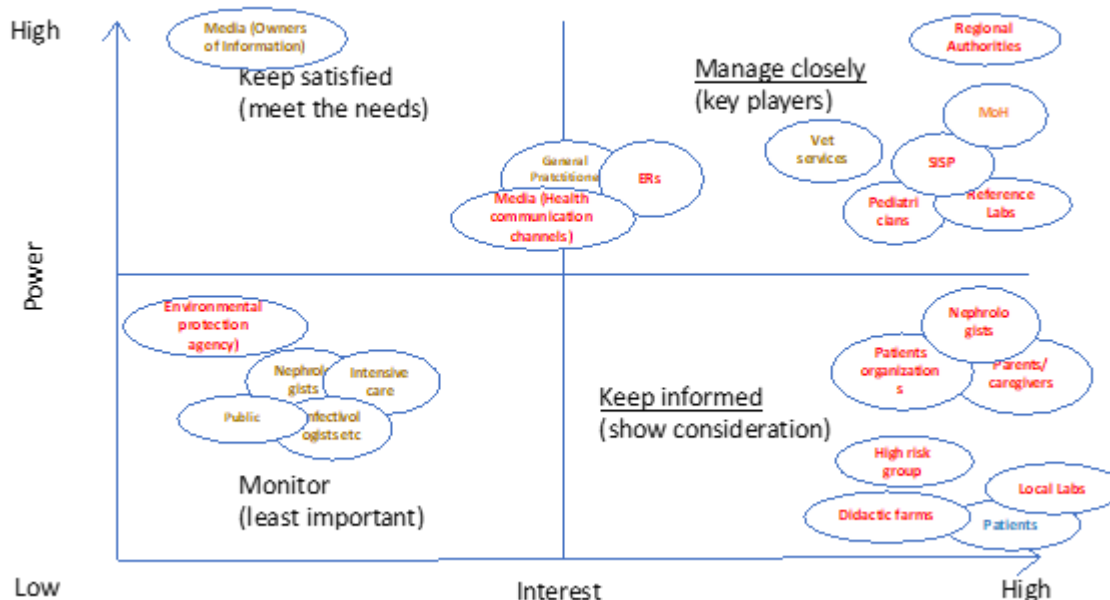
- [1] Sundhedsstyrelsen. Vejledning om forebyggende foranstaltninger hos mennesker ved influenza hos fugle 2016.

3.3.7 Italy – One Health Surveillance Shiga Toxin-producing *E. coli*

3.3.7.1 Stakeholder analysis

The stakeholder analysis was performed in April 2023, where all relevant stakeholders for the One Health surveillance of STEC were placed within the Mendelows Matrix.

Figure. Mendelows matrix of the stakeholder analysis for One Health STEC surveillance in Italy



3.3.7.2 Systems mapping

A consultative process including all relevant stakeholders to the health threat STEC has been conducted by means of phone interviews, E-mail exchange and online discussion. Such an activity has been considered preparatory to the pilot on MTA, that will revolve around STEC. Such a threat is of relatively low level of awareness and its risks at peripheral level needs to be better perceived and extended beyond the HUS cases.

The mapping exercise, has considered the following:

Describe the challenge / area of improvement that we want to address for the pilot.

STEC infections are relatively rare in the population but may be associated with outbreaks. STEC are foodborne pathogens causing a range of symptoms in humans, including diarrhoea, haemorrhagic colitis and the most severe form, the haemolytic uremic syndrome, which is a systemic pathology affecting mainly children and causing renal failure. For the prompt identification and one-health investigation of both cases at risk of developing a severe course of illness (HUS) and community-wide foodborne outbreaks of STEC it is important that patients undergo STEC laboratory investigation soon after the onset of illness, in particular in presence of prodromic bloody diarrhoea. This may be challenging for the reasons described as follows:

- Low level of awareness of STEC infection and illness by families, GP and paediatricians, emergency rooms.
- Lack of pathognomonic clinical symptoms (diarrhoea is a very frequent symptom in paediatric population) leading to delay the lab testing and lack of common understanding between families and doctors.
- Few laboratories with STEC test available. In addition, it is not clear if the STEC test is reimbursed by the NHS or not (who will pay for test??)
- Failure in STEC case notification to Local Health Authorities (STEC infections in Italy is mandatory since April 2023)

- Non-optimal level of awareness of the relevance of STEC infection in terms of public health and epidemiology of STEC among professionals from local Health Authority leading to delay in taking action in public health, food safety and veterinary public health
- Lack of communication and Intersectoral 'blaming' in case of failure of collaborative integrated reaction by the Health system professionals leading to prompt investigation of cases and control of STEC risk

Figure. Systems mapping of the current STEC surveillance system in Italy

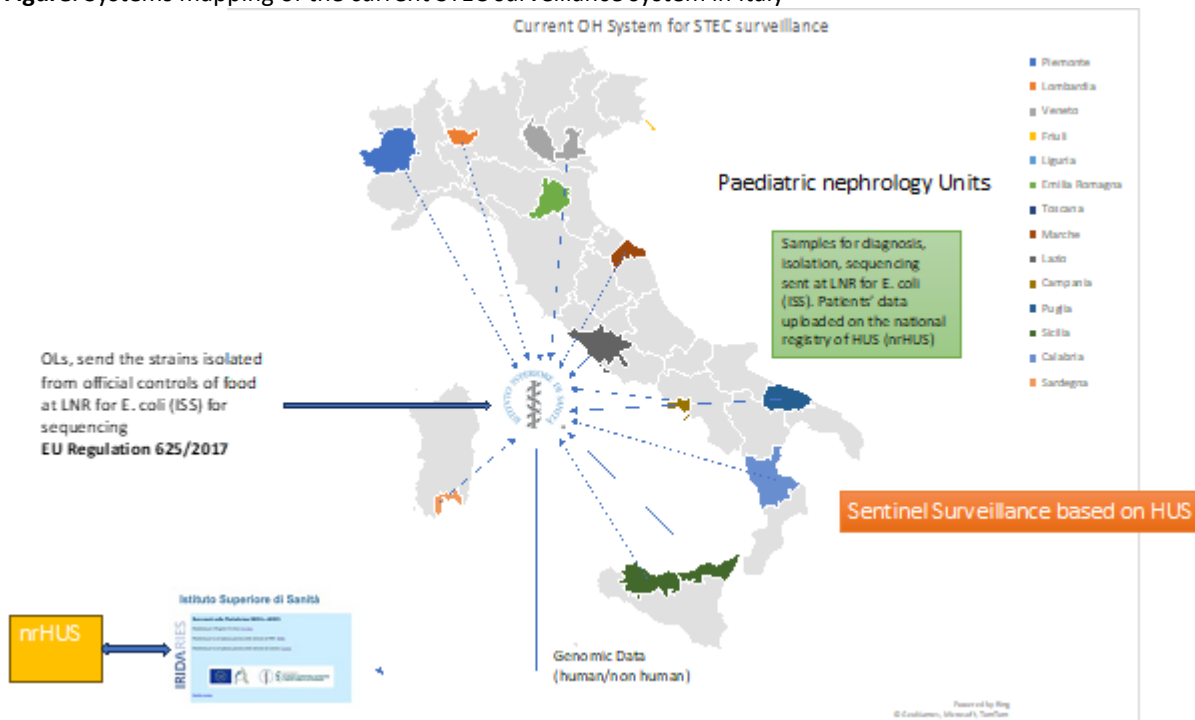
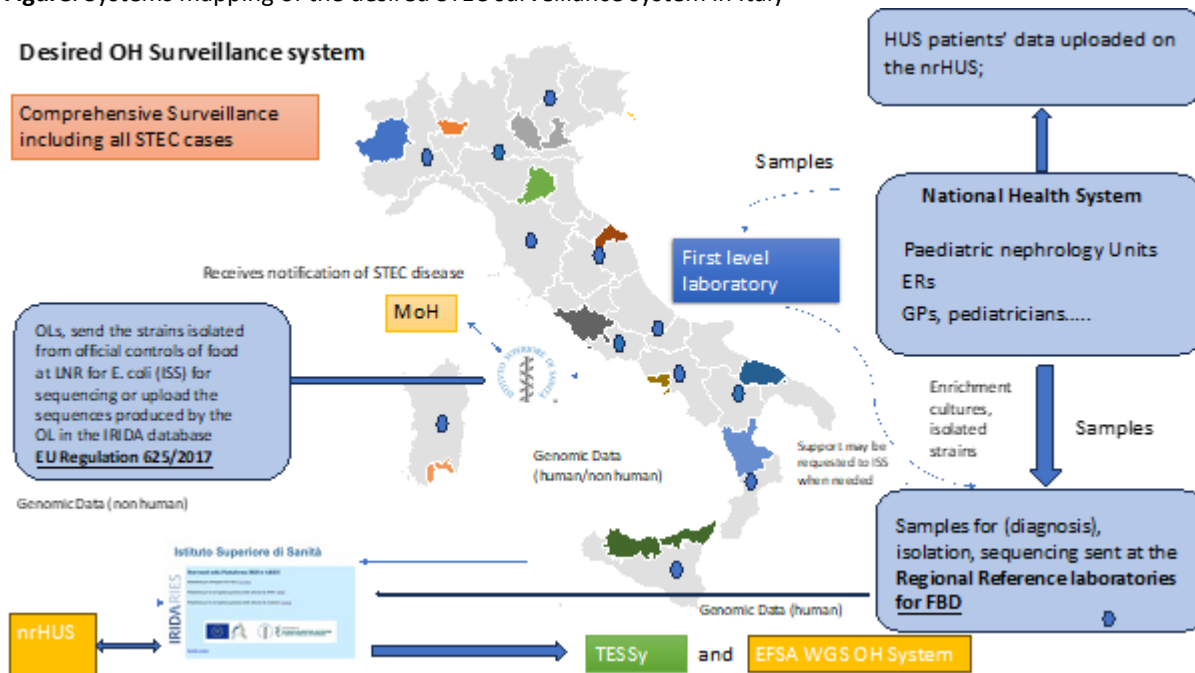


Figure. Systems mapping of the desired STEC surveillance system in Italy



3.3.7.3 Piloting phase

We will start the piloting phase in the first quarter of 2024. The pilot will be based on the desired One Health (OH) system and is meant to mark the transition from the current system based on the sentinel surveillance of HUS, to the extended OH surveillance of STEC cases of infection. The OH dimension of the new system will continue being ensured by the influx of the food/feed/animal isolates or their genomic sequences that are sent to the National Reference Laboratory (NRL) for E. coli or uploaded onto the IRIDA ARIES platform, respectively. Initially, the pilot will involve two regions where a regional reference laboratory for the food-borne diseases (rcFBD) is already established (Puglia and Lombardia) and the definition of an agreement with the health systems is ongoing to establish the flow of the samples from the hospital/medical centers/diagnostic laboratories to the rcFBD. Such a flow will concern the submission of samples to the rcFBD for the diagnosis of infection, isolation and sequencing of the isolated strains in one case (Puglia) and the the conduction of the diagnosis of the disease at the hospital laboratory and the shipment of the isolated strains from the latter laboratory to the rcFBD for the sequencing of the isolates (Lombardia). Both the rcFBD have already been provided with accounts to access the IRIDA ARIES platform for the submission of the sequencing data, while the reporting of the cases to the MoH will continue following the official procedure but will make use of the new software platform developed that is expected to be made operative during the 2024 year. The described flows of the samples in the pilot regions include the HUS cases, which, however, could be still sent to the NRL for E. coli as it is done in the current surveillance system, in case of difficulties in the diagnosis or the isolation of the STEC. In any case the reporting of the patients' data to the national registry of HUS will continue following the actual procedure. The piloting phase not only will regard the operationalization of the system but will also include the delivery of education to all the actors involved in the OH management of STEC infection, mainly through e-learning, the availability of technical training on the laboratory procedures at the NRL for E. coli and the provision of EQA either on the diagnosis of STEC infections in stool samples or on the characterization of STEC strains through WGS to the involved laboratories. After the initial involvement of these two regions, the addition of two more regions is currently under negotiation and these territorial units may be added in the course of the piloting phase, bringing the total number of participating regions to four and extending the test to two additional local arrangements of procedures. This pilot phase will only concern the described asset of samples and data flow and will not modify the actual procedures for outbreak investigation, which will remain unaltered, for the moment. The piloting phase will last at least one year and a complete report on the activities done, the results of the test phase, as well as the assessment of any hindrances encountered in the application of the desired OH system for STEC infections will be compiled and illustrated to all the Italian regions and the central competent authority in a report and the organization of a dedicated meeting in 2025 at ISS or the MoH will be evaluated.

3.3.8 Italy – One Health Surveillance West Nile virus

3.3.8.1 Stakeholder analysis

The national level stakeholder analysis of West Nile Virus One Health surveillance in Italy was conducted through an online engagement of all relevant stakeholders for the One Health surveillance and placed in a stakeholder matrix adapted from ECDC AAR methodology (Conducting in-action and after-action reviews of the public health response to COVID-19. Stockholm: ECDC; 2020) as shown in the table below.

Table. Mendelows matrix of the stakeholder analysis for One Health West Nile virus surveillance in Italy

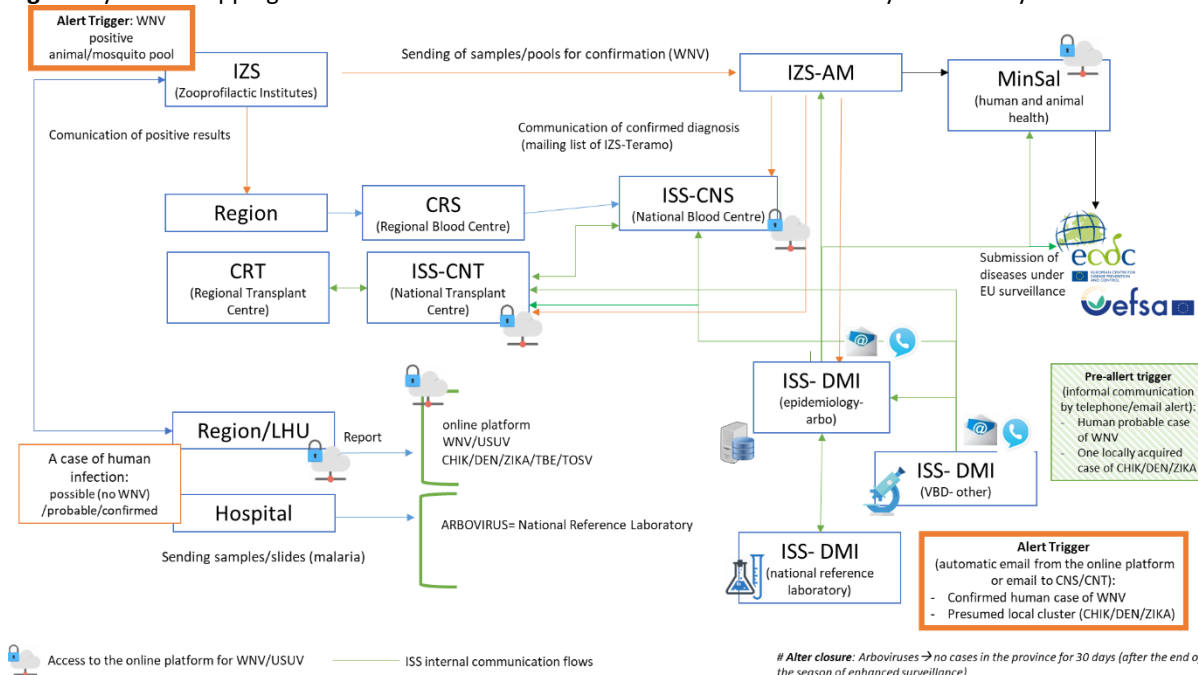
	Human Health	Medical entomology and vector control	Animal Health	Safety of Transfusions and Transplants
Surveillance and early warning	Istituto Superiore di Sanità ISS-DMI -epidemiology Italian Ministry of Health – DG Prevention Regional authorities (Departments of prevention)	Istituto Zooprofilattico (IZS) Abruzzo e Molise – IZM-AM national coordination IIZZSS network across Italy ISS-DMI- entomology Regional authorities (Departments of prevention)		ISS-National Blood Centre ISS-National Transplant Centre Regional blood and transplant centres
Health policy	Italian Ministry of Health – DG Prevention Regional Authorities Municipal authorities	Italian Ministry of Health – DG Animal Health and veterinary drugs Regional Authorities Municipal authorities		
Laboratory preparedness and response	ISS-DMI –National Reference Laboratory Regional reference laboratories (designated by the Ministry of Health)	Istituto Zooprofilattico (IZS) Abruzzo e Molise – IZM-AM national coordination IIZZSS network across Italy		
Clinical management	Hospitals under Regional coordination	-	Private veterinarians (local level)	

3.3.8.2 Systems mapping

In order to perform the systems mapping, a structured systems map was developed with the stakeholders engaged in the mapping exercise and reviews to gain consensus on the functions and interplay of actors. The map was circulated and commented upon by stakeholders and a final version with all comments included re-circulated and finalized.

The final product (Figure below) shows a response oriented framework based on early warning triggers for public health action that draw on data from the animal (bird and equid surveillance), entomological (mosquito surveillance) and human (clinical cases and screening of blood donors) sectors. The system is based on a collaborative approach. Surveillance data from human, animal and the entomology sectors is combined in an integrated bulletin that is updated weekly during the season of higher mosquito activity.

Figure. Systems mapping of the current One Health West Nile virus surveillance system in Italy



The sectors communicate through a well interconnected network of procedures to ensure rapid exchange of information for the activation timely investigations as well as prevention and control measures in respect of data protection requirements.

A unique feature of the Italian collaborative WNV surveillance and response approach is around the prevention of transmission through SoHOs (transfusions and transplants). In particular province-level (NUTS3) for SoHO safety measures are triggered by confirmed viral detection in mosquito pools, or by confirmed infection in animals or humans, implementing a One Health oriented early warning framework. Measures include donation deferral and nucleic acid testing (NAT) to detect and so prevent transmission of WNV infection through donated substances of human origin (SoHO).

3.3.8.3 Piloting phase

No piloting phase planned.

3.3.9 Lithuania – One Health surveillance foodborne diseases

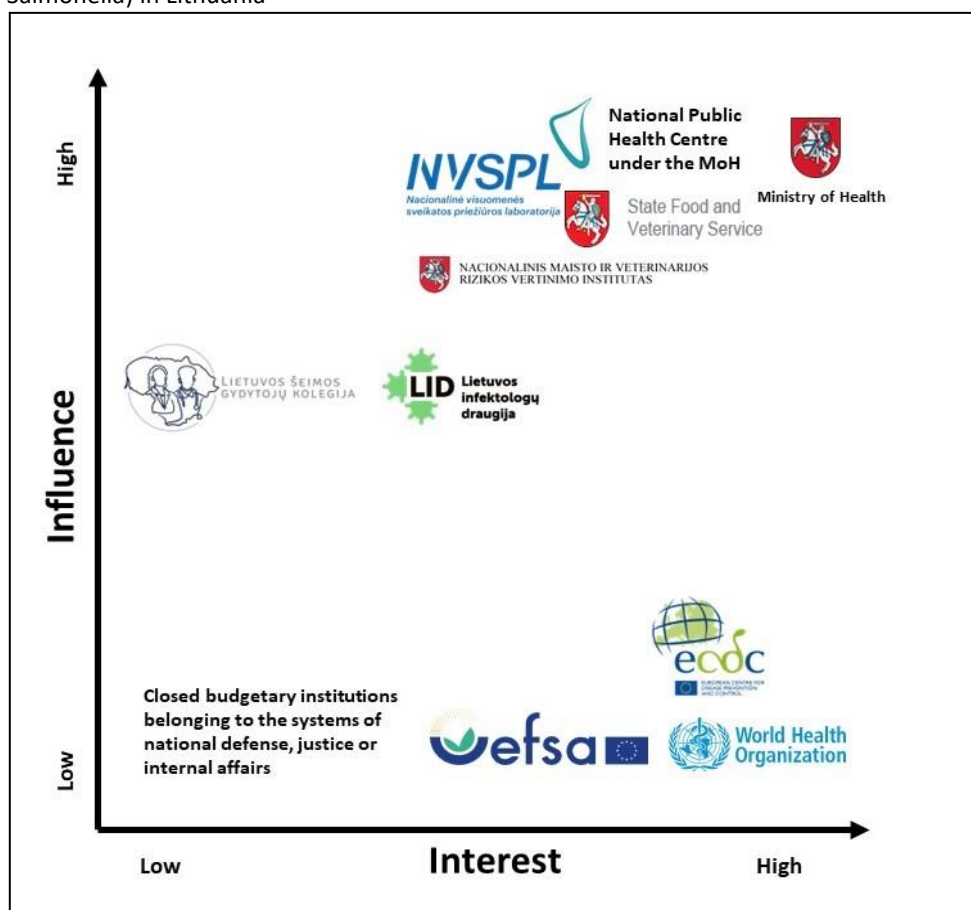
4.2.9.1 Stakeholder analysis

The stakeholder analysis was performed in May 2023, where all relevant stakeholders (table below) for the One Health surveillance of Foodborne diseases were placed within the Mendelows Matrix (Figure below).

Table. The list of stakeholders for food borne diseases (incl. Salmonella) surveillance in Lithuania

Name of organization	Domain	Area of activity (local/regional/national/international)
Ministry of Health of the Republic of Lithuania	Human	National
National Public Health Centre under the Ministry of Health	Human	Local / regional / national
National Public Health Surveillance Laboratory (also laboratories of personal health care institutions)	Human	Regional / national
State Food and Veterinary Service	Food, animal	Local / regional / national
National Food and Veterinary Risk Assessment Institute	Food, animal	Regional / National
Closed budgetary institutions belonging to the systems of national defense, justice or internal affairs	Human	Local / regional
Lithuanian Society for Infectious Diseases	Human	Local / regional / national
Lithuanian College of family Physicians	Human	Local / regional / national
European Centre for Disease Prevention and Control	Human	International
European Food Safety Authority	Food, animal	International

Figure. Mendelows matrix of the stakeholder analysis for One Health foodborne disease surveillance (incl. Salmonella) in Lithuania



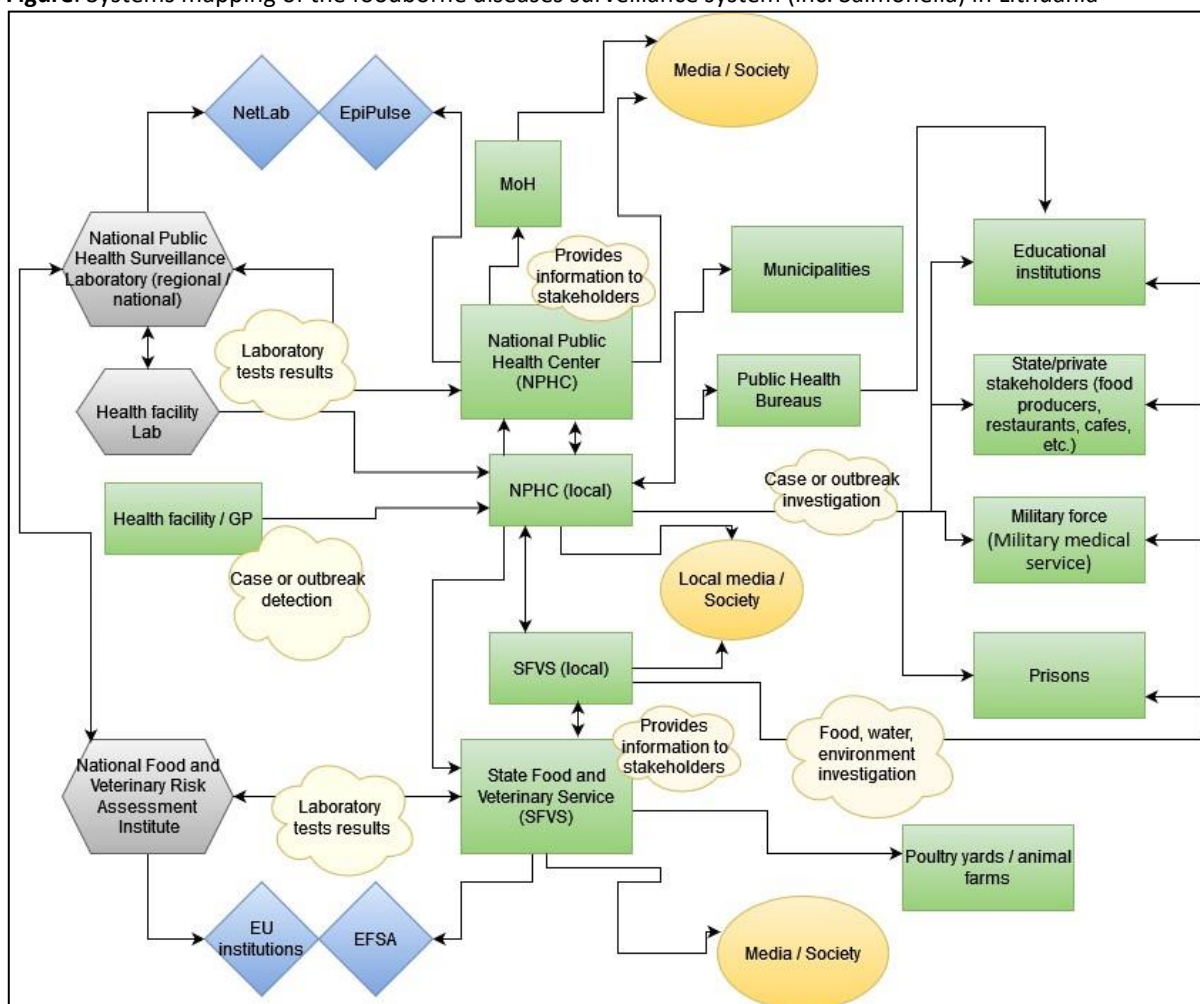
3.3.9.2 Systems mapping

On the 17th of October 2023 a workshop with different stakeholders was organized. Representatives from different institutions (National Public Health Center under the Ministry of Health (NVSC-LT), Ministry of Health of the Republic of Lithuania, State Food and Veterinary Service, Lithuanian Society of Infectious Diseases, Lithuanian Pediatric Society, Dr. Jonas Basanavičius military medical service, Lithuanian Prison Service and National Public Health Surveillance Laboratory) discussed about main gaps and needs and possibilities for the improvement of foodborne diseases (incl. Salmonella) surveillance system (both domains human and animal) in the country. The mapping system is presented in the Figure below.

During the discussion the issue that the identification of outbreaks of foodborne diseases are difficult in terms of the different diagnoses according to the ICD codes, outbreaks are usually identified by location and time.

Studies on genotyping (whole genome sequencing) of clinical samples of National Public Health Surveillance Laboratory have recently started. Until then, the identification of outbreaks by linking the possible source of infection to the person(s) who contracted the foodborne disease and the relationship between them was only hypothetical. Against this background, genotyping (whole genome sequencing) must become a routine test.

Figure. Systems mapping of the foodborne diseases surveillance system (inc. Salmonella) in Lithuania



3.3.9.3 Piloting phase

We will start the piloting phase in the first quarter of 2024. The main task during the piloting phase:

1. Review the legislation related to food borne diseases (incl. Salmonella) case and outbreak management.
2. Improve the collaboration and data related to food borne diseases (incl. Salmonella) sharing between different stakeholders (e.g., digitalized information systems).
3. Improve publicity tools about foodborne diseases and it's prevention.
4. Strengthen the core capacities of specialists involved in food borne (incl. Salmonella) diseases outbreak investigation and management.

3.3.10 Lithuania – One Health surveillance tickborne diseases

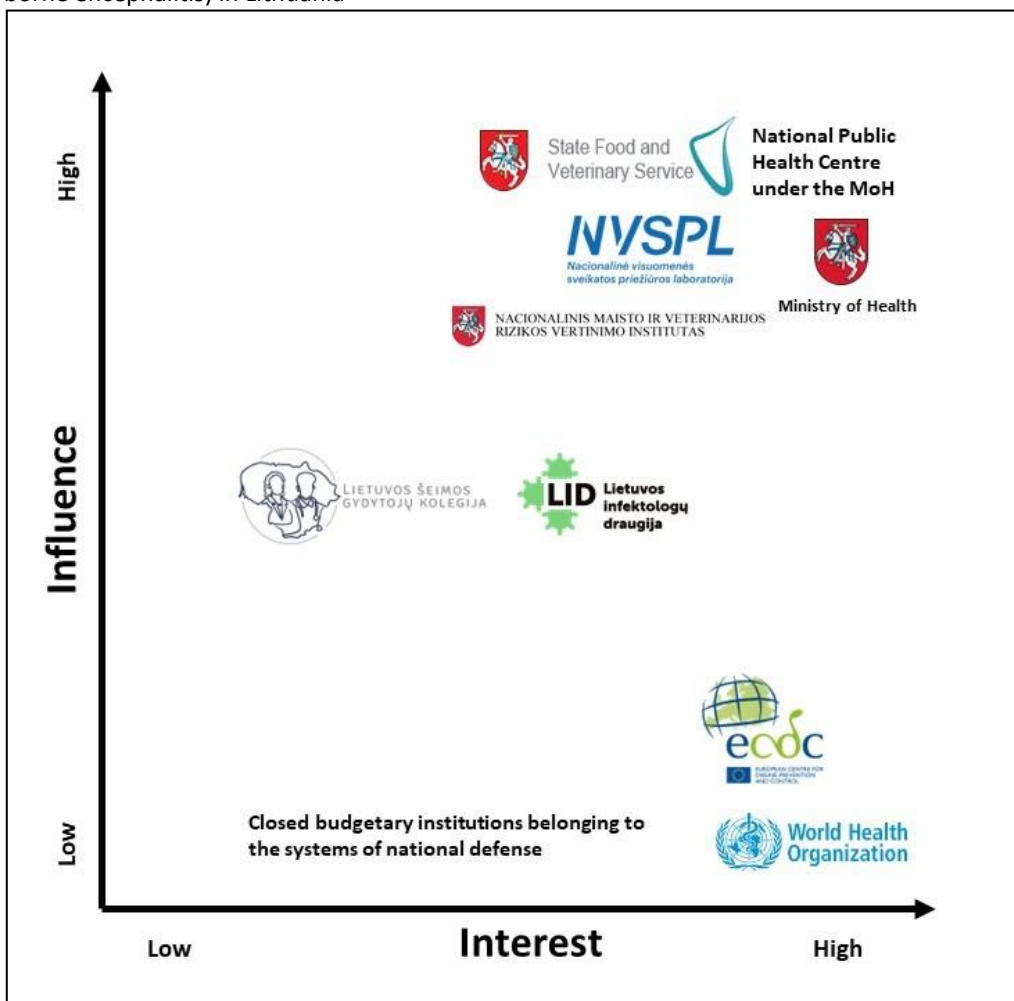
3.3.10.1 Stakeholder analysis

The stakeholder analysis was performed in May 2023, where all relevant stakeholders (Table below) for the One Health surveillance of Foodborne diseases were placed within the Mendelow's Matrix (Figure below).

Table. The list of stakeholders for food borne diseases (incl. tick-borne encephalitis) surveillance in Lithuania

Name of organization	Domain	Area of activity (local/regional/national/ international)
Ministry of Health of the Republic of Lithuania	Human	National
National Public Health Centre under the Ministry of Health	Human	Local / regional / national
National Public Health Surveillance Laboratory (also laboratories of personal health care institutions)	Human	Regional / national
State Food and Veterinary Service	Food, animal	Local / regional / national
National Food and Veterinary Risk Assessment Institute	Food, animal	Regional / National
Closed budgetary institutions belonging to the systems of national defense	Human	Local / regional
Lithuanian Society for Infectious Diseases	Human	Local / regional / national
Lithuanian College of family Physicians	Human	Local / regional / national
European Centre for Disease Prevention and Control	Human	International
European Food Safety Authority	Food, animal	International

Figure. Mendelows matrix of the stakeholder analysis for One Health tick-borne diseases surveillance (incl. tick-borne encephalitis) in Lithuania

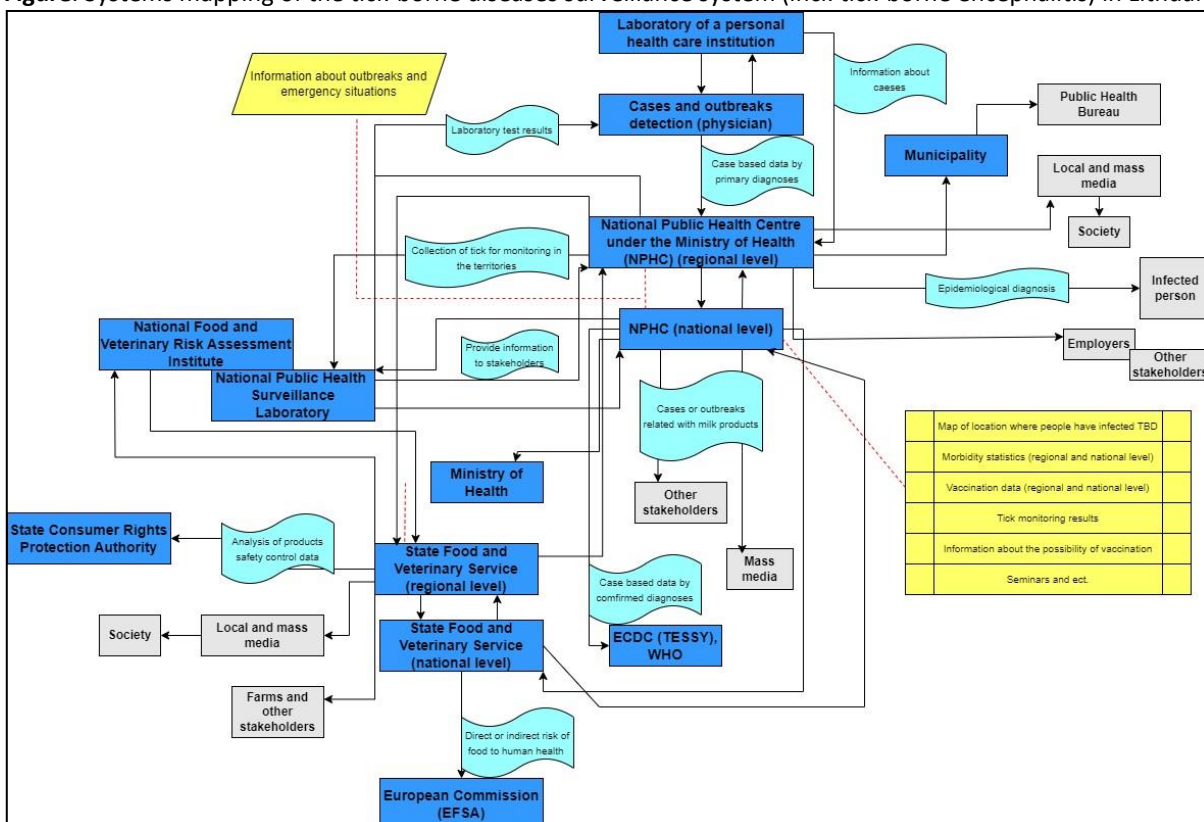


3.3.10.2 Systems mapping

On the 17th of October 2023 a workshop with different stakeholders was organized. Representatives from different institutions (National Public Health Center under the Ministry of Health (NVSC-LT), Dr. Jonas Basanavičius military medical service, National Public Health Surveillance Laboratory and National Food and Veterinary Risk Assessment Institute) discussed about main gaps and needs and possibilities for the improvement of tick-borne diseases (incl. Tick-borne encephalitis) surveillance system (both domains human and animal) in the country. The mapping system is presented in the Figure below.

A large part of the workshop was devoted to the discussion about the issues related to the laboratory testing, lack of data about tick-borne encephalitis strains. Also, it was mentioned that two projects are planned related to tick monitoring and laboratory testing (one from human domain side and one from animal side).

Figure. Systems mapping of the tick-borne diseases surveillance system (incl. tick-borne encephalitis) in Lithuania



3.3.10.3 Piloting phase

We will start the piloting phase in the first quarter of 2024. The main task during the piloting phase:

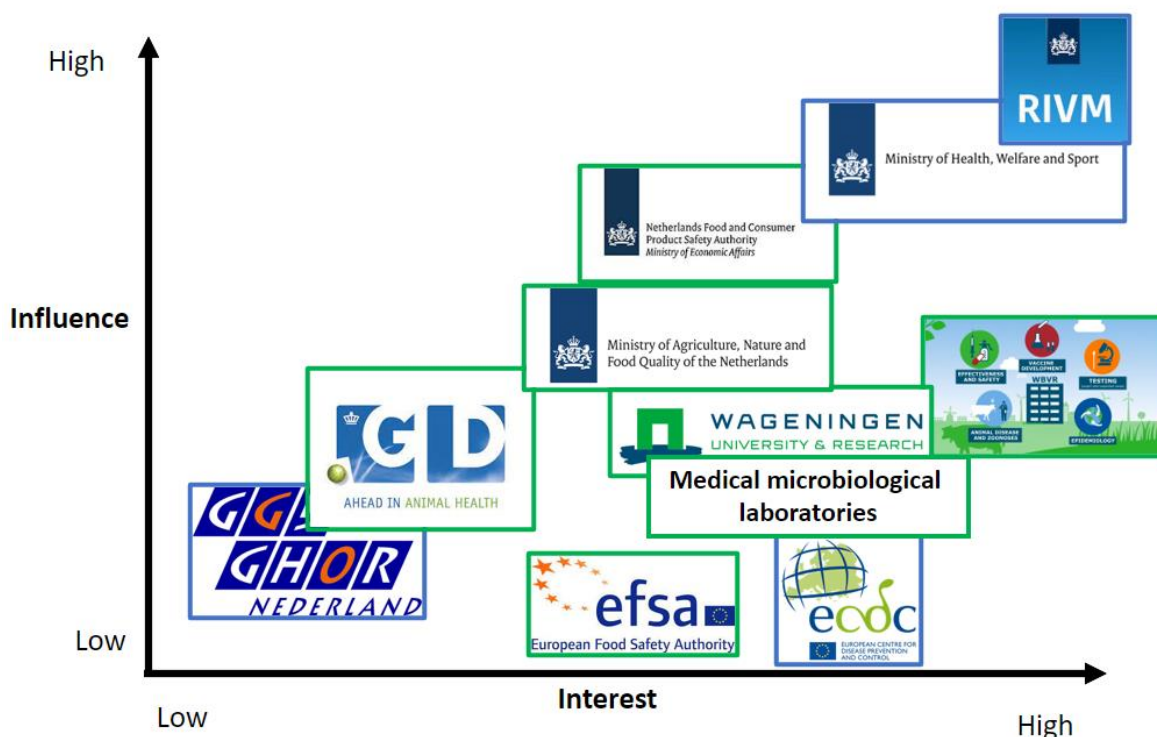
1. Review the legislation related to tick-borne diseases (incl. Tick-borne encephalitis) case and outbreak management.
2. Improve the collaboration and data related to tick-borne diseases (incl. Tick-borne encephalitis) sharing between different stakeholders (e.g., digitalized information systems).
3. Improve publicity tools about tick-borne diseases and its prevention (e. g. vaccination).
4. Strengthen the core capacities of specialists involved in tick-borne diseases (incl. Tick-borne encephalitis) case and outbreak investigation and management.

3.3.11 Netherlands – One Health surveillance Salmonella

3.3.11.1 Stakeholder analysis

The stakeholder analysis was performed in April 2023, where all relevant stakeholders for the One Health surveillance of Salmonella were placed within the Mendelows Matrix. Borders of the stakeholders are colored by domain, where blue is human and green is non-human (Figure below).

Figure. Mendelows matrix of the stakeholder analysis for One Health Salmonella surveillance in the Netherlands



3.3.11.2 Systems mapping

In order to perform the systems mapping, a workshop with the relevant authorities was organized on the 25th of September at the RIVM. We invited stakeholders with a high interest and high influence, which included the Food and Consumer Safety Authority (NVWA), Wageningen Bioveterinary Research (WBVR), Wageningen Food Safety Research (WFSR), Ministry of Health, Welfare and Sport (VWS), Ministry of Agriculture, Nature and Food Quality (LNV) and the RIVM. During this day, we defined the objectives of the Salmonella One Health surveillance system, drew our current systems mapping (i.e. what are current Salmonella surveillance system looks like, Figure below) and our desired Salmonella surveillance system, which we would like to accomplish during the piloting phase of the U4S project (Figure below). During the workshop, additional potential stakeholders were identified that were not initially identified during the stakeholder analysis, and roles and responsibilities of each of the stakeholders were defined.

Figure. Systems mapping of the current Salmonella surveillance system in the Netherlands

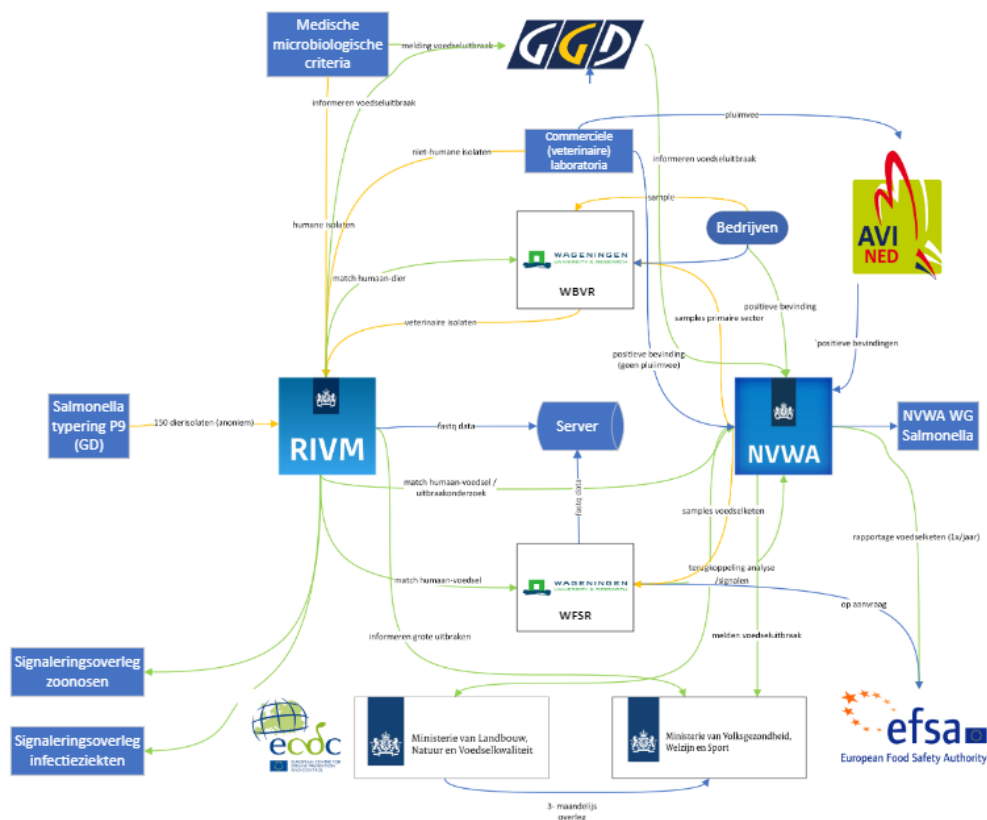
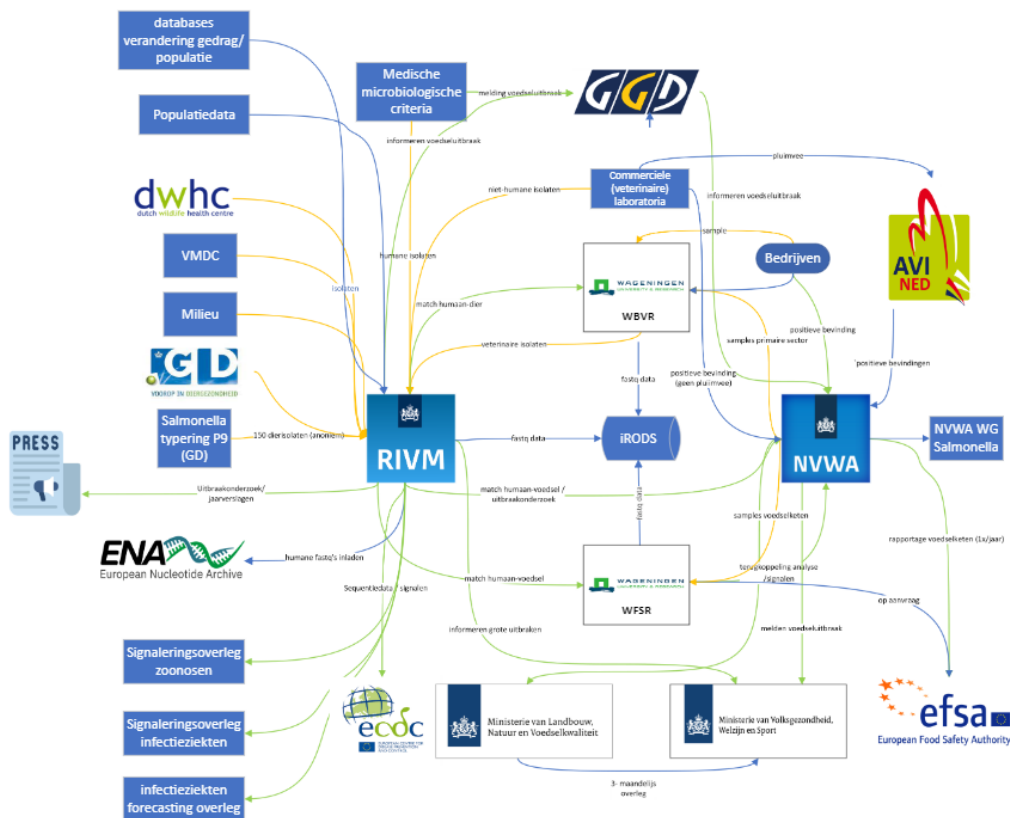


Figure. Systems mapping of the desired Salmonella surveillance system in the Netherlands



3.3.11.3 Piloting phase

We will start the piloting phase at the beginning of 2024, where we aim to get from the current Salmonella surveillance system to the desired surveillance system. One of the main things to improve is to include the WBVR into our Salmonella surveillance system, who perform diagnostics in the animal sector, and include their sequence data into the existing combined database of the RIVM and WFSR. Moreover, we would like to include isolates from additional, mainly commercial, veterinary stakeholders. The first meetings with those partners are already planned in December 2023. Also, we want to have an automated data sharing of our human sequence data with the ECDC, and later with ENA/Enterobase, to facilitate international cluster/outbreak detection. We will use the first few months of the piloting phase to discuss press releases of ongoing Salmonella outbreak investigations, which is currently not done.

Although we have not done a stakeholder analysis and systems mapping workshop for Campylobacter, we do plan to expand our Campylobacter surveillance system, which currently only includes that from the human domain, with data from the animal domain. For this purpose, we will collaborate with WBVR, which was also present during the systems mapping workshop for Salmonella and is an affiliated partners within the project. The aim is to extend the human WGS-based surveillance with WGS data of isolates from e.g. pigs and cattle, that are sequenced by the WBVR, and potentially with data from other partners as well. The aim is to explore the benefit of integrating these data for early warning and possibly source attribution.

Additionally, we might also include additional foodborne pathogens, including Listeria, and STEC, which have a large overlap in stakeholders with Salmonella.

3.3.12 Norway – One Health surveillance swine influenza

3.3.12.1 Stakeholder analysis

Stakeholder analysis for swine influenza can help identifying the key players in the effort to prevent and control the spread of the disease, as well as provide insights into their interests, concerns, and potential actions. By engaging with these stakeholders, it is possible to build a coalition of support and promote effective strategies for addressing this important public health issue. Selected stakeholders will be invited to have a system mapping workshop to discuss on risk analysis for swine influenza in Norway based on signalling, risk assessment, risk management and coordinated communication.

The stakeholder analysis was started during the workshop on 10 of March 2023 in a brainstorming setting where stakeholders were identified using simulated outbreak scenarios such as:

“A new (non-H1N1pdm09) swine influenza virus (SIV) is detected in a pig herd in Norway. There is indication of herd-to-herd spread. The farmer in one of the farms develops influenza-like illness (ILI), is hospitalized and tests positive”.

The potential scenario highlighted above was used to identify all the relevant Norwegian stakeholders involved in the process. Stakeholders were organized based on the type of institutions as: public health institution, governmental agency, veterinarian, livestock industry, private company, international organization, non-governmental organization, consumers, and media (table below).

Table. Norwegian stakeholder classification for swine influenza.

Stakeholder	Type Institution	Stakeholder	Type Institution
Norwegian Institute of Public Health	Public Health Institution	Norsk Landbrukssamvirke	Livestock Industry
Municipal Doctors	Public Health Institution	Animalia	Livestock Industry
Hospital Laboratories	Public Health Institution	Nortura	Livestock Industry
Norwegian Veterinary Institute	Government Agency	Den Norske Veterinærforening	Veterinarian
Norwegian Food Safety Authority	Government Agency	WHO	International Organization
Ministry of Health	Government Agency	WOAH	International Organization
Ministry of Agriculture and Food	Government Agency	EFSA	International Organization
Norwegian Directorate of Health	Government Agency	ECDC	International Organization
Norwegian Directorate of Agriculture	Government Agency	Insurance Companies	Private Company
Kjøtt- og fjørfebransjens landsforbund (KLF)	Livestock Industry	Animal Rights	Non-governmental Organization
Norsvin	Livestock Industry	Consumer Institutions	Consumers

Additionally, the experts participating in the workshop explained and discussed the typical roles of the stakeholders in the Norwegian settings. See below some of the comments and most important points discussed:

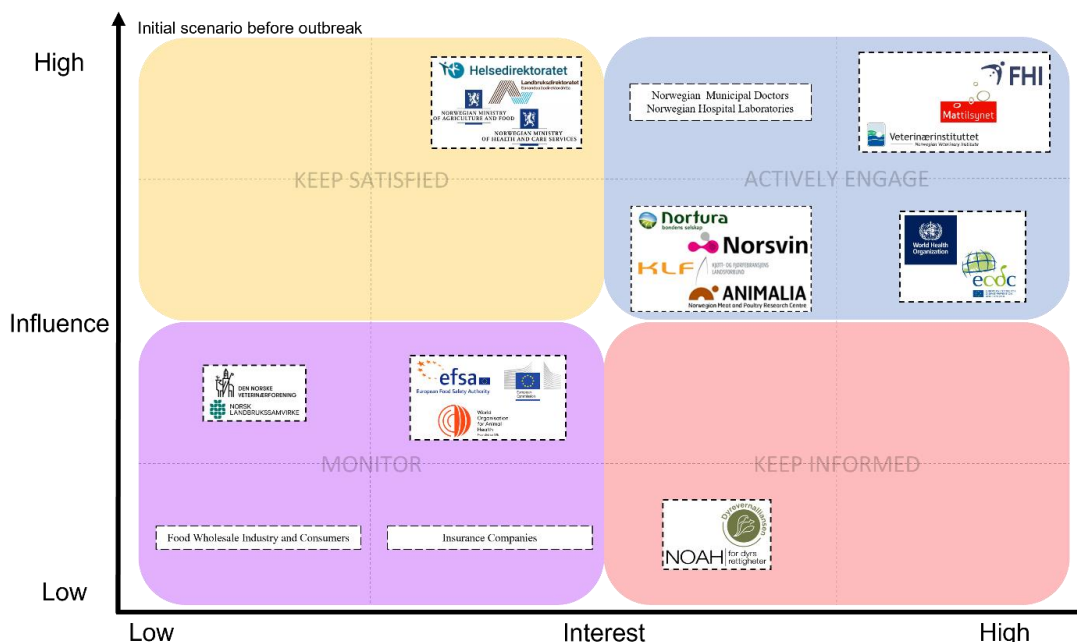
1. Role of farmers and veterinaries during a potential outbreak scenario
 - Farmer would alert if a) person has developed influenza-like illness or b) the pigs have developed classic symptoms such as mild fever, loss of appetite or coughing.
 - Usually, there is one or two people per herd checking the pigs. Upon symptoms or suspicion, farmers will contact the veterinarian.
 - Mild respiratory symptoms in the pigs alone would probably not be detected.
 - Norwegian pigs are free of several respiratory pathogens leading to cough (i.e., *Mycoplasma hyopneumoniae*).
 - Specific pathogen free (SPF) herds are also free of *Actinobacillus pleuropneumoniae*.
 - H1N1pdm09 rarely causes cough in the pigs.
 - Therefore, coughing is not an important indicator in Norway now.
 - In a situation with emergence of a new swine influenza virus (SIV), symptoms would probably be more severe in the pigs (and possibly also in humans), and this would trigger an alert at an earlier stage.
 - The number of SPF herds is increasing. Farmers from SPFs would alert earlier in case of cough in the herd.
 - There may be a situation where the first signal of a new SIV is picked up in a hospitalized person, where the animal source is unknown. If this occurs, the NIPH should notify the NVI and the Norwegian Food Safety Authority (NFSA).
 - Therefore, farmers and veterinaries have a key role for the early identification and notification of the swine influenza.

- The veterinary must notify the NFSA. If the NVI is contacted first, they will notify FSA.
 - The abattoir may in some cases be the one notifying a suspension if for example, typical lung lesions (interstitial pneumonia) are detected in the pigs in the post-mortem examination.
 - Fear of restrictions may influence reporting.
 - The number of wild boars in Norway is increasing. Surveillance for influenza is good in this population. No influenza virus has been detected. If wild boar is to be included in a future scenario, the Norwegian Environmental Agency would be an additional stakeholder.
2. Role and information of the three main institutions: NVI, NFSA and NIPH
- **NVI:** the NVI analyses the samples and notifies NFSA and NIPH about the test results. NVI covers the costs of the analysis. There are some differences in notification routines between NFSA and NVI. NVI would also characterize the virus by whole genome sequencing (WGS) and share the sequences with the NIPH.
 - **NFSA:** the local NFSA office will assess the information and decide if samples should be collected from the pigs (may also be the local veterinarian). The NFSA covers the costs of the sample collection. The local NFSA office alerts the regional and head office and sends the samples to the NVI for analysis. NIPH and other organizations are also notified. The local office also places restrictions on the farm. SIV is a list III disease in Norway and if the virus is detected the farm gets restrictions for 7 days after last positive test. In case of a new SIV, this may be a list II disease, and have even more rigorous restrictions.
 - **NIPH:** the NIPH receives notifications about detections from NFSA and NVI (copy of test result) and makes sure that the municipality doctor is informed. NIPH support NFSA and the municipality doctor with advice as required. If a new SIV is detected in a human patient, NIPH would report this to WHO via IHR. NIPH will also alert and provide control measures about the situation. Samples that are influenza A with either a clinical/epidemiological suspicion, non-seasonal H1 and non-seasonal H3, must be submitted to reference laboratory at NIPH for further characterization to determine if it is SIV. Reference laboratory will also share the virus with WHO. Sequences are uploaded to GISAID and should also be shared with NVI (GDPR may be a limitation for sequence sharing) to compare with the pig sequences or vice versa.
3. Other roles and extra information
- **Ministry of Health and Care Services:** determines the funding of NIPH and The Norwegian Directorate of Health and is responsible for regulations and laws related to human health. Will be notified by NIPH.
 - **Norwegian Directorate of Health:** responsible for hospitals in Norway and notified about the situation by NIPH.
 - **Ministry of Agriculture and Food:** determines the funding of NVI and NFSA and is responsible for regulations and laws related to animal health and food.
 - **Agriculture directorate:** determines compensation for the farmers in case of culling (list I and II).
 - **Municipality doctors:** notified on suspicion or confirmation by NFSA of SIV in pigs. When NIPH is notified, the "sykdomsansvarlig" also checks with NFSA that the municipality doctor has been notified. The role of the municipality doctor is to follow up human health in the local outbreak situation and have a good dialog about the situation with NFSA at local level. The doctor should map if the farmers or other exposed to the pigs have symptoms and should be followed up and tested. Local contact tracing if needed.
 - **Primary health care:** may detect human case if mild and if they have information about pig exposure. Not so likely that a case would be detected at this level without increasing awareness.
 - **Hospital clinicians:** may be the first to alert an unusual event (detection of SIV) in a patient. Treat the patients. Must notify any case to NIPH (smittevernvakta).

- **Oslo University Hospital:** CBRN point in Norway. It handles patient infected with high-risk pathogens in Norway. May be involved in treatment of patients.
- **Local medical microbiological laboratories:** may detect influenza A non-H1 non H3 virus in a patient sample. Should trigger a notification to ref.lab at NIPH and sample must be submitted for further characterization.
- **Norsvin, KLF or Animalia:** farmers may be members and need to fulfil certain requirements for production. They also obtain knowledge and information through the organizations. Organizations for food and trade are also relevant.
- **WOAH:** outbreaks in pigs are reported to WOAH from the CVO.
- **EFSA:** NVI reports to EFSA on an annual basis for SIV.
- **Insurance companies:** partially cover costs in case of culling or restrictions.
- **Animal rights organizations (NOAH, Dyreveralliansen):** may react to restrictions or culling.
- **ECDC:** a human case would be reported from NIPH through EWRS.
- **WHO:** a human case would be reported from NIPH through IHR.
- **EU:** new EURLs planned that may compete with the WHO national influenza centres.
- **Consumers:** may be afraid to eat pork and affect the trade/sale of pork products.
- **Media:** will write about the event and influence how it is perceived. Both NIPH, NFSA and NVI publish news items (should be done in a coordinated manner).

Stakeholder analysis and classification for the engagement strategy: during a series of online meetings in May 2023, representatives from NIPH and NVI performed the stakeholder analysis. Stakeholder's level of influence and interest were evaluated using a rating system in an open discussion. By defining influence and interest with low, medium low, medium high and high level (or 1-4), each stakeholder was positioned in a Mendelow's matrix (Figure below). These results are relevant to assess the engagement strategy for the Norwegian system mapping workshop on swine influenza. However, these results must be considered just as a reference. The real levels of influence and interest are dynamic and will change based on different scenarios (i.e., non-emergency phase vs emergency; or phases 1-3 vs 5-6 see WHO guidance 5). In this case, the scenario presented in the Figure below is for a potential initial pandemic phase 1-3.

Figure. Mendelows matrix of the stakeholder analysis for One Health swine influenza surveillance in Norway



3.3.11.2 Systems mapping

Figure. Systems mapping of the desired swine influenza system in Norway. Note that this is a draft version.



3.3.11.3 Piloting phase

Influenza virus was for the first time introduced into the Norwegian swine population by humans during the 2009 H1N1 pandemic (1). Prior to that, sero-surveillance for influenza in swine had been performed since the 1990s by the Norwegian Veterinary Institute, and no other influenza viruses had been detected. Today, H1N1 is still the only influenza virus that has been detected in swine in Norway. This is unique compared to the situation in large parts of the world.

After the 2009 pandemic, the A(H1N1) pdm09 virus became endemic in swine herds in Norway (2). However, it is unclear to what extent spillover-events with virus introductions from humans or virus circulation within the swine population influences the endemicity. The seroprevalence in swine has decreased from about 50% in 2012 to 19% in 2021 (3, 4). In Norway, influenza surveillance in swine is mainly conducted through serological examinations. In case of suspected outbreaks in swine, which is rare, virological testing is performed. However, as A(H1N1) pdm09, causes mild and unspecific clinical signs in swine, outbreaks are likely to go unnoticed (3). There is a knowledge gap regarding how the A(H1N1) pdm09 viruses have evolved in swine in Norway in the last years, and enhanced surveillance is therefore recommended.

Pigs are susceptible for influenza viruses from humans and other animals and are sometimes referred to as a “mixing vessel” for creation of new influenza viruses through reassortment (exchange of gene segments) (5). Better knowledge about the influenza viruses circulating in pigs is therefore important for public health to rapidly detect new viruses with zoonotic and pandemic potential. No cases of zoonotic influenza have so far been detected in humans in Norway. To prevent reassortment between influenza viruses in pigs and seasonal influenza viruses in humans, annual vaccination against seasonal influenza is recommended for swine workers and others in close contact with live swine. However, the vaccine coverage in this group is unknown. Information about the circulation of influenza viruses in pigs in Norway is also important to provide targeted and risk-based recommendations about vaccination.

The objective of this pilot study is to enhance the virological surveillance in swine in Norway and assess the vaccine coverage in swine workers and veterinarians. This will be performed as follows:

- Active virological screening of swine at farm level (sentinel)
 - Test new method for saliva sample collection using chewing rope samples (+questionnaire?) as a part of targeted, risk-based sampling.
 - In case of clinical suspicions, notifications and outbreaks in swine: sampling of humans and animals associated with the farm to monitor spill-over (swabs, serology, questionnaire)
 - Improve existing methods used in influenza virus surveillance.
- Compare any influenza viruses detected in swine with influenza viruses from humans.
 - Whole genome sequencing, characterization, and phylogenetic analysis
 - Improve methods for collection of information on exposure to swine that follows samples analyzed for influenza-like illness at the national reference laboratory.
 - Strengthen inter-laboratory collaboration, harmonization of methods and exchange of laboratory personnel.
- Vaccination coverage survey
 - Questionnaire to veterinarians and swine workers
 - Challenge: may be difficult to reach non-resident workers

Suggested partners and collaborators that will be contacted include:

- Norwegian Veterinary Institute (Veterinærinstituttet)
- Helsetjenesten for svin/Animalia, Norsvin
- Veterinærforningen
- Municipality doctors

Ethical considerations

- Ethical considerations are being discussed as part of the planning. Participation is voluntary.

References

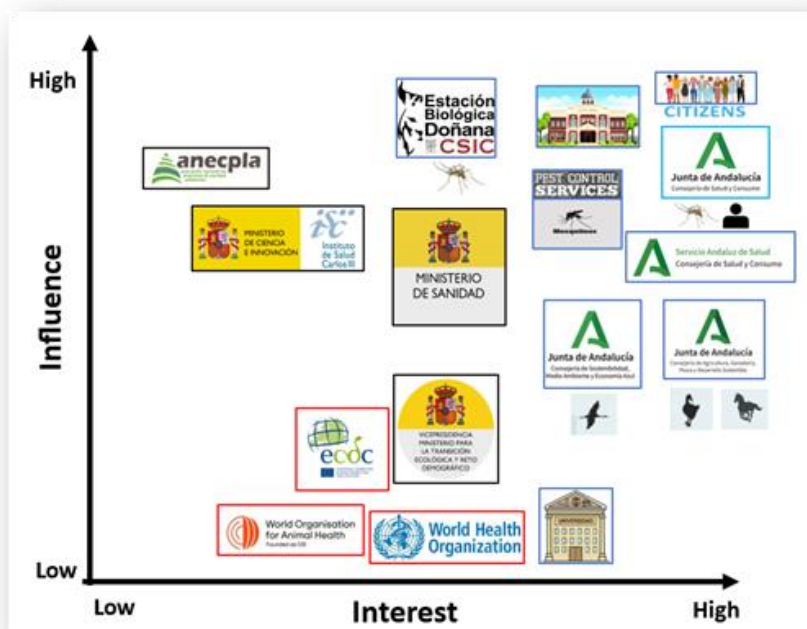
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3.3.13 Spain – One Health surveillance West Nile virus

3.3.13.1 Stakeholder analysis

The stakeholder analysis was performed in May 2023, where all relevant stakeholders for the One Health surveillance of West Nile fever were placed within the Mendelows Matrix. Borders of the stakeholders are colored by domain, where red is international level, black is national level and blue is regional or local level.

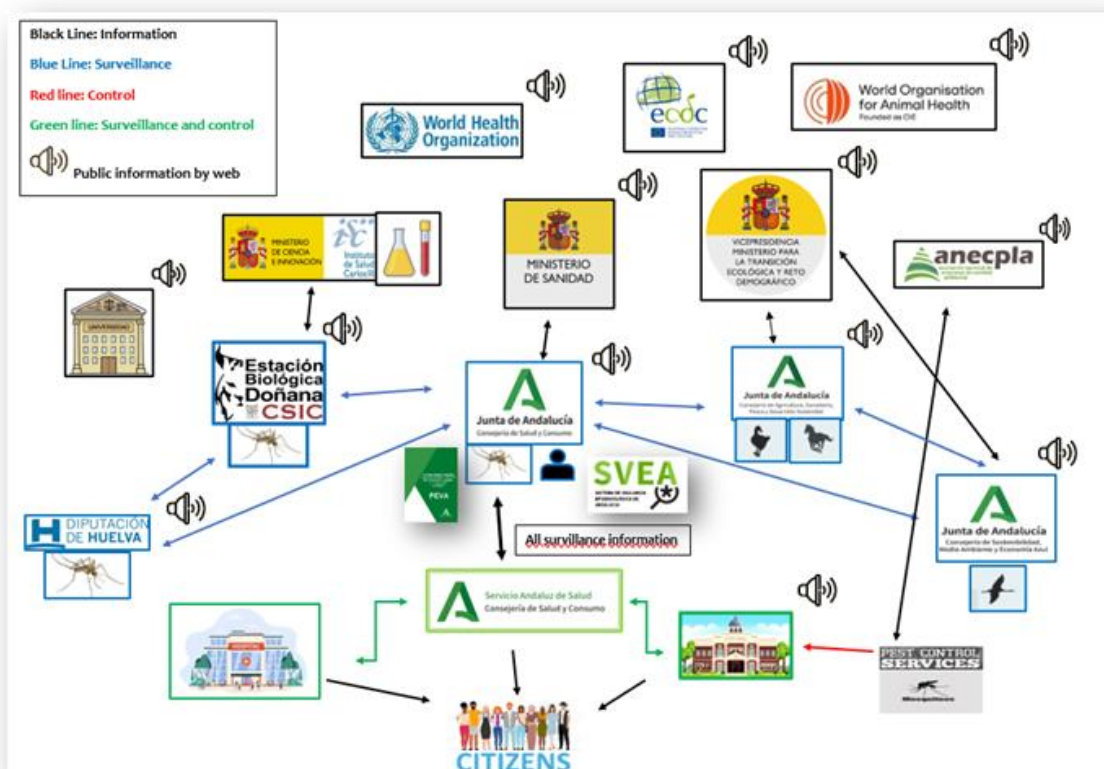
Figure. Mendelows matrix of the stakeholder analysis for One Health West Nile virus in Spain



3.3.13.2 Systems mapping

During 2023 we have held several workshops and work meetings in which we have addressed the integration of surveillance (human, animal and entomological), vector control and communication aimed at reducing the incidence of diseases transmitted by vectors, the result of which will be reflected in an Andalusian strategic plan for surveillance and control of arthropod vectors with health indecency that will be released next 2024. Specifically, the main arthropod vectors are mosquitoes, ticks and sandflies. In meetings related to west Nile fever we have invited stakeholders of great interest and influence from the national, regional and local levels. Based on the information obtained in these meetings, a mapping has been carried out with all the desired stakeholder with the information flows on the integration of surveillance (human, entomological and animal) and vector control.

Figure. Systems mapping of the desired West Nile virus surveillance system in Spain



3.3.13.3 Piloting phase

We will start the piloting phase in early 2024, where we aim to transition from our current integrated west Nile Fever surveillance system in which we will make the following improvements:

- More detailed inclusion of all stakeholders and the roles and/or responsibilities of each stakeholder in the WNF approach.
- Implement a database that integrates all the information on the surveillance carried out each year.
- Consider a flexible system to incorporate possible collaborations with other stakeholders that carry out different type of surveillance. For example, some local councils that carry out entomological surveillance which share their information with others.
- Reduce reporting times of virus circulation by all stakeholders involved.
- Improve communication to citizens, through simple and practical documents incorporating prevention and protection measures.

3.4 Evaluation and conclusions

A total of 13 stakeholder analysis and 13 systems maps were conducted during the first year of the project. Over the next one and a half years, four countries will perform pilots in the foodborne disease group, four in the zoonotic influenza disease group, and three in the vector borne disease group. Pathogens that countries will focus on include Salmonella (Belgium, Lithuania and the Netherlands), STEC (Italy), avian influenza (Belgium), swine influenza (Denmark and Norway), both avian and swine influenza (Austria), West Nile virus (Spain), tickborne encephalitis (Lithuania) and Francisella tularensis (Austria). The aim is to have disease-group specific meetings during the piloting phase, which the zoonotic influenza disease group also had during the first year of the project, to maximize the learning experience for each of the countries involved.

4. Deviations from the work plan

It was not possible for all countries to organize the systems mapping workshop in person. This was because the allocated travel-budget in WP4 was not always sufficient to cover the actual travel-costs for the stakeholders. However, this was solved by using previously available systems mapping material which was then updated, and/or by organizing an online workshop. Therefore, we do believe that the system maps were still successfully completed. For the foodborne disease group in Denmark, no input was received on the template that was provided to fill in the stakeholder analysis and systems map, as well as a description of piloting plans. Hence, it is missing in this deliverable.

5. Performance of the partners

All except one partner has provided input with regard to the work that has been done around stakeholder analysis, systems mapping and a description of their piloting plans. It is only missing for the foodborne disease group in Denmark, who have not provided input on the template for stakeholder analysis, systems mapping and pilot description. However, they have provided information on stakeholder analysis and system mappings for STEC that were performed as part of previous projects, on which they could build in U4S. WP leads will plan meetings with the task-leads from the foodborne group in Denmark in February/March 2024 to gain insights into any challenges they faced in providing input for the deliverable and provide support (if necessary) in ensuring they are able to meet expectations moving forward.