RISKSUR TOOLS: TAKING ANIMAL HEALTH SURVEILLANCE INTO THE FUTURE THROUGH INTERDISCIPLINARY INTEGRATION OF SCIENTIFIC EVIDENCE

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SUMMARY

To enable wide-spread acceptance and adoption of risk-based surveillance approaches by stakeholders it is essential to provide those designing such systems with science-based frameworks guiding them through the systematic process of design and evaluation. The RISKSUR project has addressed this particular need through the development of integrated surveillance system design and evaluation frameworks and associated decision support tools (RISKSUR tools). This paper provides an overview of the RISKSUR tools and presents their application using several disease case studies relevant to EU member states. The RISKSUR tools provide user-friendly access to comprehensive, flexible and state-of-the-art integrated frameworks for animal health surveillance design and evaluation, thereby providing effective guidance during the complex decision making process. The tools will continue to be refined in response to user feedback and new methodological developments. Their availability in the public domain will facilitate access by users and allows widespread integration into training materials.

INTRODUCTION

The global demand for sufficient, safe and nutritious food continues to increase, requiring further intensification of livestock production, while at the same time recognising the need to protect our environment. The associated eco-social changes will increase the risk of emergence and spread of new and known infectious diseases affecting animals and humans. These developments lead to the need for conducting more effective disease surveillance, while they may reduce the availability of financial resources. Utilising knowledge about variation in risk of infection in exposed populations provides an opportunity for the animal health surveillance effort to be structured such that timely and maximum sensitivity of detection can be achieved while still being cost-effective. The development of such risk-based surveillance systems is complex, and requires an approach that is based on the most up-to-date knowledge effectively

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integrated between different scientific disciplines and transparent to stakeholders. Hence, for risk-based systems in particular, but also for non-risk based systems, surveillance design usually involves a process of comparing several options, which ideally should include a formal evaluation. These technical challenges and evaluation requirements mean that the process of surveillance design is best carried out by interdisciplinary teams. To enable wide-spread acceptance and adoption of surveillance approaches by stakeholders it is essential to provide those designing such systems with science-based frameworks guiding them through the systematic process of design and evaluation.

The RISKSUR project has addressed this particular need through the development of integrated surveillance system design and evaluation frameworks and associated decision support tools (RISKSUR tools) addressing four objectives: (i) early detection of exotic, new and re-emerging diseases, (ii) disease freedom documentation (iii) frequency estimation of endemic diseases, and (iv) detection of cases of endemic diseases. The project was conducted in 2012–2015 funded by the Seventh Framework Programme (FP7) of the European Union (EU). The Consortium involved 11 European partners and FAO, bringing together scientific expertise in veterinary medicine, veterinary epidemiology, statistical analysis, surveillance, risk assessment and animal health economics.

The objective of this paper is to provide an overview of the RISKSUR tools, and present their application using several disease case studies relevant to EU member states.

THE SURVEILLANCE DESIGN AND EVALUATION TOOLS

Preliminary activities

Initial activities informing the core of the surveillance design and evaluation tools included data collection to produce a high level overview of the animal populations, trade flows and animal health infrastructure, interviews with decision-makers, systematic literature reviews of surveillance systems and epidemiological methods targeting the different surveillance objectives, and information on ongoing surveillance systems in the EU.

Mapping and interviews: Secondary data on surveillance systems were collected in thirteen European countries (Belgium, Bulgaria, Czech Republic, Denmark, France, Germany, Great Britain, Ireland, Italy, the Netherlands, Spain, Sweden, and Switzerland) using data from public resources such as Eurostat, grey literature and websites of animal health services. Moreover, secondary data on critical infrastructure and primary data on existing decision-making processes for resource allocation to surveillance were gathered in France, Germany, Great Britain, the Netherlands, Spain, Sweden, and Switzerland. In these countries, 34 decision-makers were interviewed. Additionally, data on livestock and bee holdings in Europe, human and animal populations, gross domestic product, and farm values were collated from Eurostat. Data on trade were obtained from the EU's Trade Control and Expert System (TRACES), which records movements of live animals and livestock products in the EU. All data were entered into a database, cleaned and analysed descriptively (RISKSUR consortium, 2014).

Systematic reviews: The initial search forpublications was done on 'CabAbstract' and 'Scopus' databases using an algorithm defined by the RISKSUR consortium to ensure a homogeneous search across the surveillance objectives covered by the project. Screening of retrieved articles based on specific exclusion criteria resulted in 128, 132 and 69 articles used for the review of surveillance systems and methods aimed at early detection, disease freedom and endemic diseases, respectively (Comin et al., 2013; Schauer et al., 2013; Rodríguez-Prieto et al., 2014). Moreover, a systematic review was conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to identify and compare the advantages and limitations of existing evaluation guidelines for surveillance (Calba et al., 2015).

Review of existing surveillance systems in the EU: Information on ongoing surveillance systems in nine European countries (Denmark, France, Germany, Great Britain, Italy, The Netherlands, Spain, Sweden and Switzerland) was collected from both public available documentation and through private contacts with the aim to describe basic epidemiological characteristics of current surveillance systems, detect variation in legislation and highlight similarities and differences (Comin et al., 2014).

Development of the tools

Development of the design tool: The first step was constructing the design framework to identify all elements that compose a surveillance system, i.e. all the small details a surveillance designer must think of and decide on when designing a surveillance system or it components. The surveillance steps were defined using the background work previously described as starting point. This was followed by several rounds of brainstorming among the group developing this task, other experts within the RISKSUR consortium, and also experienced surveillance designers within the partner institutions. Surveillance steps were then organized into a proper flow and grouped into broader surveillance design sections. A general framework was created first, with the intention of outlining the steps of surveillance that are common to all surveillance objectives. This framework was then refined to address the specific surveillance goals of early detection, disease freedom documentation, case detection and prevalence estimation.

The framework was implemented as a questionnaire in a Microsoft Excel® spreadsheet using real data of a case study for each of the above-mentioned surveillance goals. At various stages of development, the framework was tested and revised with the help of surveillance stakeholders from the various partner institutions who agreed to participate in exercises of surveillance design using the framework as a tool. Finally, the framework was refined with the help of surveillance stakeholders from outside the RISKSUR consortium. A workshop on surveillance design was carried out in conjunction with the annual meeting of the European Society for Veterinary Epidemiology and Preventive Medicine (SVEPM) in 2015. Interested participants were encouraged to test the framework, and send feedback which was then used to refine the tool.

The design framework provides guidance for surveillance design via the wiki page at http://surveillance-design-framework.wikispaces.com/. The wiki content is based on the expertise of the RISKSUR consortium members developing the framework, and also incorporated feedback from user group workshops (provided via a standardised questionnaire) as well as comments from the wiki members. It also includes a glossary and links to statistical tools (e.g. sample size calculators) that can be used during the design process. The structure of the wiki is based on the Excel® tool, making it easy to retrieve the advice needed at each design step.

Development of the EVA tool: The aim of the tool is to produce protocols for an integrated epidemiological and economic evaluation. Based on the information collected through the preliminary activities, an initial conceptual framework and accompanying protocols were developed. This included online and face-to-face consultations with specialists within the consortium to capture guidance on the description of the evaluation context, the selection of appropriate evaluation questions, attributes, criteria and methods as well as communication of results. Eight case studies were used to support this process by providing input on terminology, suitable evaluation attributes and methods. The framework was then presented to, and approved by, the whole consortium and members of the advisory board. In a next step, the framework and protocols were applied to ten case studies so that users (consortium researchers) could test the logic of the tool and provide general feedback for refinement of the approach. Finally, an integrated epidemiological and economic evaluation of four case studies was conducted to validate the evaluation framework and tool.

Elicitation of expert opinion was used to identify the most relevant economic evaluation questions and evaluation attributes to be assessed according to each specific context. Detailed information on all the concepts and methods introduced in the EVA tool have been described in the dedicated wiki (http://surveillance-evaluation.wikispaces.com/). References to the wiki are available throughout the EVA tool to provide more in depth information and understanding on the process undertaken.

Creation of a web-based interface: Once the conceptual models of the two tools were available, a user-friendly web interface was developed, integrating essential information on the design process, general evaluation concepts, the development of the evaluation plan and the full evaluation process. The web-based interface allows the user to outline the structure of an animal health surveillance system, and to produce a protocol for full epidemiologic and economic evaluation of such a system (Varan et al., 2015). The tool is complemented by two Wikispace Classroom applications (http://www.wikispaces.com/content/classroom/about) which provide information for the design and evaluation processes, but also serve as educational platforms, as well as platforms for continuous updating of experiences, examples, methods and best practices.

Principles and structure of the tools

The surveillance design framework: The surveillance design framework aims at structuring the process of designing, documenting and re-designing animal health surveillance. The target users are expected to be "competent and technical level users who design, implement or evaluate surveillance strategies for infectious livestock diseases within the European Union". Likely it will not be an individual, but rather a team, gathering knowledge in epidemiology and surveillance. The team is also expected to be supported by diagnostic experts and ideally an economic advisor.

The surveillance design framework has been structured in 14 main sections, as summarized in Fig. 1, each one comprising a separate worksheet in the Excel® questionnaire.

The first step in designing or documenting any surveillance activity is describing the surveillance system, which is defined as a collection of various surveillance components which all aim to "describe health-hazard occurrence and contribute to the planning, implementation, and evaluation of risk-mitigation actions", for one health-hazard in particular, and in a defined region (Hoinville et al., 2013). Secondly, the surveillance designer is encouraged to think about all surveillance components that are/will be part of the surveillance system, and list them to have an overview. A surveillance component has been defined as a surveillance activity against the identified hazard, in a particular target population and geographical area, using a given data collection strategy (i.e. means of data acquisition, sample type, point of sample collection).

Finally, each identified component is fully characterized through the definition of target population, disease suspicion, surveillance enhancements, testing protocol, study design, sampling strategy, data generation (sample collection), data/sample transfer, data translation (sample analyses), epidemiological analyses, dissemination of results and surveillance review. Steps one and two represent the general characterization of a surveillance system and have been incorporated in the web-based interface as well, as they serve as starting point to further evaluate surveillance.

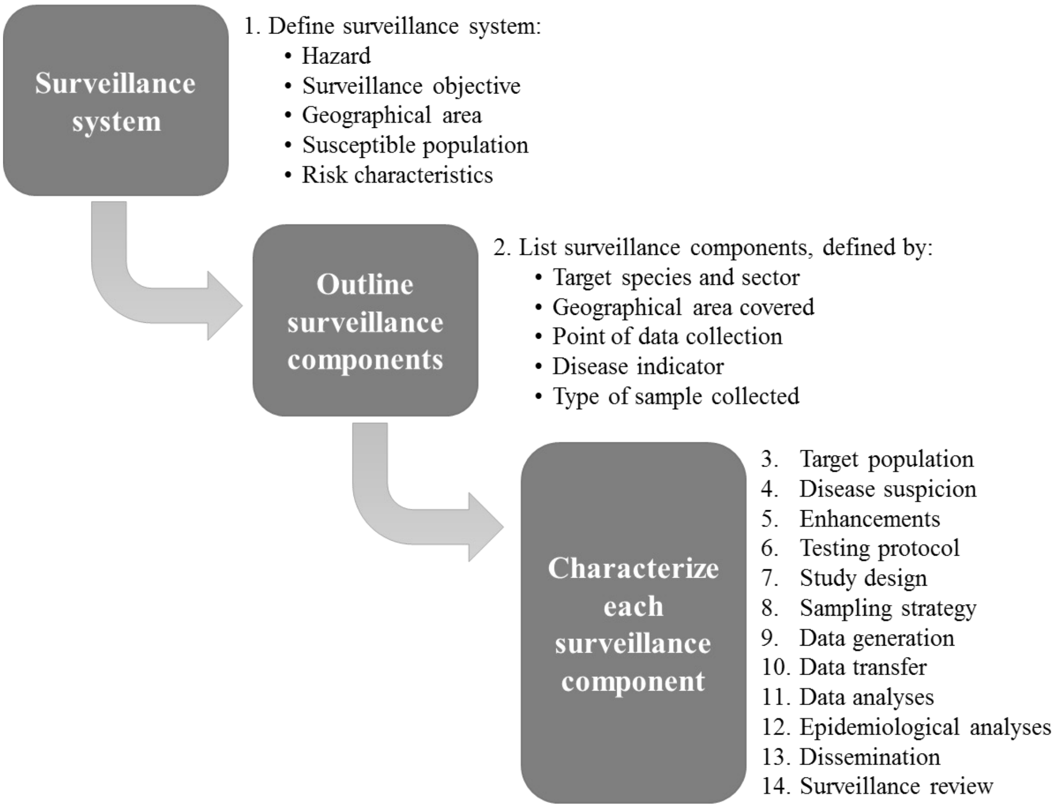

Fig. 1 Overall structure of the surveillance design framework

Although the focus of the framework is not on collecting information but on helping the users to define the necessary surveillance details, the Excel® spreadsheet provides the possibility to document the information entered, so that users can have a consistent documentation of the surveillance system design. This documentation can be used to assure transparency before international bodies or trading partners, or for later reference within the institution, representing the first step towards a harmonized and transparent reporting and documentation of design and achievements of animal health surveillance, which is currently missing in EU (Comin et al., 2014).

Many of the target users of the design framework will have surveillance activities already in place that they want to re-design in order to increase performance. Once a surveillance designer identifies that a particular performance attribute (e.g. sensitivity, or timeliness) needs to be improved (e.g. by applying the EVA tool, described below), the surveillance design framework offers the possibility to focus the re-design on that attribute. The user is then presented with the list of all the surveillance steps and advice on which ones can potentially impact the selected performance attribute.

The EVA tool: The EVA tool is a decision support tool for economic and/or epidemiological evaluation of surveillance components. It builds on existing evaluation framework methods and tools and provides specific guidance to the user to facilitate the selection of an evaluation approach according to their specific context of evaluation (e.g. surveillance system objective; economic context; decision maker needs), resource availability and expertise. The tool is organized into three main sections: The first section provides a general introduction to the tool and essential information on evaluation concepts, including evaluation attributes and economic methods. The second section provides guidance for the user on how to develop an evaluation plan. This section is organized into four main steps, namely Step 1: defining the evaluation context; Step 2: selecting the evaluation question; Step 3: selecting evaluation attributes and methods for the technical and economic assessments; Step 4: reviewing the summary of the evaluation plan. The third section provides guidance on how to perform the evaluation and how to report the outputs of the evaluation to decision makers.

After documenting the surveillance system under consideration, the user is asked to describe all the contextual elements that are critical in the elaboration of the evaluation plan (e.g. decision maker needs, legal requirements). A decision pathway leads the user step-by-step through a set of questions to help select a suitable evaluation question. The tool provides the list of evaluation attributes (i.e., effectiveness, functional and economic criteria) ranked in relation to the specific context (i.e. surveillance objective, evaluation context and evaluation question selected). The user is then guided to select the attributes to include in the evaluation plan and the method preferred for their assessment. Information on the pros and cons of including one or multiple attributes, and of the choice of one method over the other, is provided. This information is critical to assess the quality and limitations of the evaluation performed and to provide meaningful recommendations to decision makers according to i) the context of evaluation and ii) the extent of the evaluation plan. Finally, the EVA tool allows export of all the information from the web tool interface into a pdf document to support the implementation of the evaluation.

APPLICATION OF THE RISKSUR TOOLS TO CASE STUDIES

The developed tools were tested using case studies, as summarised in Table 1. Here we provide a short overview of the case studies conducted in relation to the two tools and highlight commonalities and differences across the case studies implemented.

Application of the surveillance design framework

The surveillance design framework was applied to design, redesign and document existing surveillance systems, aiming at assessing whether the structure of the tool is applicable to surveillance with various objectives – case detection, prevalence estimation, demonstrating freedom, or early detection – as well as multi-hazard surveillance. Eight case studies were selected for the purpose, covering endemic, exotic/re-emerging and absent animal diseases in several EU countries, namely: Salmonella in cattle in Sweden; Porcine Respiratory and Reproductive Syndrome (PRRS), Aujeszky’s Disease (AD) and Classical Swine Fever (CSF) in Sweden; Avian Influenza (AI) in the UK; African Swine Fever (ASF) in Poland; Bovine Viral Diarrhoea (BVD) in the UK, CSF in wild boar in Germany, Bovine Herpes Virus 1 (BHV1) in Germany and The Netherlands; and Bluetongue (BT) in Germany (Tab. 1).

Table 1. Overview of the case studies applied to test the two tools

Case studies	1	2	3	4	5	6	7	8
Hazard under surveillance†	*Salmonella*	PRRS, AD, CSF	AI	ASF	BVD	CSF	BHV1	BT
Target species	cattle	pigs	laying hens	pigs	cattle	wild boar	dairy cattle	rumi-nants
Surveillance goal:								
·Case finding	✓	–	–	–	✓	–	–	–
·Demonstrate freedom	–	✓	–	–	–	✓	✓	✓
·Early detection	–	–	✓	✓	–	–	–	–
·Prevalence estimate	✓	–	–	–	✓	–	–	–
Level	country	country	country	country	country	region	herd & country	country
Surveillance structure:								
·multi-component	✓	✓	✓	✓	✓	–	✓	✓
·single component	–	✓	–	–	–	✓	–	–
Use of the case study:								
·Document existing surveillance	✓	✓	✓	✓	✓	✓	✓	✓
·Design new surveillance	✓	–	✓	✓	–	✓	–	–
·Redesign surveillance	✓	–	✓	✓	✓	✓	✓	–
·Assess epidemiological performance	✓	–	✓	✓	–	✓	✓	–
·Multi-objective surveillance	–	✓	–	–	–	–	–	–
·Cost or economic evaluation	✓	–	✓	–	✓	✓	–	–
Descriptive assessment	OASIS	–	SWOT	–	SWOT	OASIS	–	–
Functional attributes evaluated:								
·Acceptability	–	–	–	–	✓	✓	–	–
·Availability	–	–	–	–	✓	–	–	–
·Engagement	–	–	–	–	✓	–	–	–
·Simplicity	–	–	–	–	✓	–	–	–
·Sustainability ·	–	–	–	–	✓	–	–	–

† PRRS = Porcine Respiratory and Reproductive Syndrome, AD = Aujeszky's Disease, CSF = Classical Swine Fever, AI = Avian Influenza, ASF = African Swine Fever, BVD = Bovine Viral Diarrhoea, BHV1 = Bovine Herpes Virus 1, BT = Bluetongue

Table 1. Cont'd

Case studies	1	2	3	4	5	6	7	8
Performance attributes evaluated:								
·Coverage	–	–	–	–	✓	–	–	–
·Detection fraction	✓	–	–	–	–	–	–	–
·Precision	–	–	–	–	✓	–	–	–
·Sensitivity	–	–	✓	–	–	✓	–	–
·Timeliness	–	–	✓	–	–	✓	–	–
Economic attributes evaluated:								
·Cost	✓	–	–	–	✓	✓	–	–
·Economic efficiency ·	✓	–	✓	–	–	✓	–	–

Multi-hazard surveillance is defined here as the secondary use of data/samples collected as part of a surveillance activity designed for one specific hazard (which will be called mother component) to make inference on additional hazards (which will be called child components). The way the framework deals with multi-hazard surveillance is to first document the surveillance system containing the mother component and then activate the multi-hazard tab to design/document the child components. This creates as many duplicates of the mother component as the number of child components to design, making it easy to perform the adjustments needed.

When designing or documenting a surveillance system, the individual surveillance components are described side by side, which allows an easy comparison of them. The framework includes specific sections for passive surveillance (i.e. Section 4, on the definitions of disease suspicion) and for active surveillance (i.e. Sections 7 and 8, on detailed sampling strategy), therefore being flexible in capturing different needs. The last sections (i.e. 9 to 14) are very descriptive and ask for information that are possibly not essential for the documentation of an existing surveillance system. However, when designing a new surveillance system, they provide useful insights into all the aspects to be considered when building an efficient and sustainable system. In general, the process of designing/documenting an existing surveillance system has been proved to be time demanding by nature but straightforward and comprehensive. Once a system has been designed/documented, adjustments as part of re-design are easy to implement.

The assessment of the epidemiological performance of newly designed surveillance components provided an evaluation of the compliance of the surveillance design framework in designing and improving surveillance system/components aiming at case finding, early detection and demonstration of freedom from disease. Risk-based surveillance played a central role in redesigning surveillance to improve its effectiveness. Risk-based surveillance components was shown to result in a better sensitivity for demonstrating freedom from CSF in wild boar in Germany and higher timeliness for early detection of AI in the UK. On the other hand, for case detection of Salmonella in cattle in Sweden a conventional surveillance approach would allow the detection of more infected herds in the short run. However, a risk-based surveillance would achieve the same effectiveness with much less resources in a longer time span.

Application of the EVA tool

The EVA tool was applied to four case studies (early detection of AI in the UK, freedom from CSF in wild boar in Germany, case detection of Salmonella in cattle in Sweden, and documentation of disease BVD in the UK) to do a descriptive evaluation of the system, to assess the performance and associated functional attributes and to judge the economic value of the newly designed or re-designed components.

The majority of the evaluation questions focused on achieving a higher effectiveness at lower or equal cost or to identify the least-cost option among components of similar effectiveness. Only one case study selected to identify the component (out of two or more) that would generate the biggest net benefit. All evaluators deemed their evaluation questions feasible and proceeded to select attributes and associated methods relevant for the selected question. For each case study 4-6 performance attributes were identified by the EVA tool and the user as relevant for the evaluation, but only 1-2 were assessed in the case studies (Tab. 1), which was mainly due to resource constraints. Of the functional attributes, the only attribute selected by more than one case study was 'acceptability'.

All case studies conducted an assessment of the costs in comparison to one or more effectiveness criteria in either least-cost or cost-effectiveness analyses. One case study translated the effectiveness measures into a monetary benefit for inclusion in a cost-benefit analysis. Because all case studies looked at new designs to either complement or replace old designs, the analyses were prospective / ex ante. Regarding implementation of the economic evaluation methods, difficulties encountered included the estimation of fixed and variable costs, non-monetary benefits, and co-benefits resulting from using synergies, and the selection of a meaningful effectiveness measure. None of the case studies reported to use discounting, which may indicate limited awareness of the importance of this economic principle. Two cost-effectiveness analyses conducted faced challenges associated with the interpretation of the effectiveness metrics and demonstrated the importance of reflecting on the wider aspects of the surveillance and intervention efforts and to find out what the ultimate aim of the programme is to make an informed judgement.

The CSF case study highlighted the importance of considering more than one evaluation attribute to provide meaningful results and to discriminate between the different surveillance designs under evaluation. Indeed, most of surveillance designs (including the current one) reached the target effectiveness value defined in terms of surveillance system sensitivity. However, the timeliness, simplicity and acceptability differed between the different designs under evaluation. The combined analysis of all these different attributes allowed identifying the most preferable design in terms of function, performance and economic attributes.

Generally, the users were able to navigate the EVA tool without major difficulties and were able to set up an evaluation plan making use of the guidance provided. Several users reported that the information provided on suitable attributes and the limitations or requirements of methods helped them to structure their evaluation.

DISCUSSION

The surveillance design framework provides support for surveillance professionals in setting up appropriate animal health surveillance systems. It provides a tool to document their decisions for communication and review, and helps with the re-design of surveillance components when improvement of performance is needed. It needs to be emphasized that the framework itself does not suggest any preferential choice nor assess epidemiological performance; the user still makes all the decisions and carries out the epidemiological analyses. However, the step-by-step process of the design framework aims at helping users navigate through the variety of tools and information available to make such decisions. The choice of providing advice and guidance through a wiki was motivated by the intention of keeping it constantly updated by the input from the surveillance community. Members of the wiki can edit advice, post questions and examples and engage in discussions: all fundamental activities to make the surveillance design framework a living tool. Since its first release in May 2015, the wiki already counts 62 members, 43 of which are outside of the RISKSUR consortium (to 15 December 2015).

Feedback from pilot testers highlighted room for improvement of the surveillance design tool. Some of the suggested improvements have already been scheduled (e.g. improvement of the section on sampling strategy, objective-specific advice for redesign), while some other must be accepted as limitations. In particular, the balance between complexity and simplicity is an important issue. The surveillance design framework has been chosen to be reasonably simple and generic, so that it can be used to design surveillance targeted at many possible hazards. This in turn penalizes more complex designs (e.g. a three-stage sampling design) or uncommon situations (e.g. when there are two equally important surveillance objectives). Furthermore, the framework has not been assessed for the design of particular surveillance systems such as those for aquatic organisms and bees. Nevertheless, the framework was successfully used for a wide range of case studies, representing current surveillance activities for diseases that are present, absent or exotic/re-emerging in important terrestrial species in EU member states.

Evaluation of surveillance activities is receiving increasing attention from both veterinary services as well as other providers such as private industry. Some countries started to integrate evaluation into the policy cycle of surveillance. While there is published guidance for conducting evaluation in general, there is a lack of information to specifically support the evaluation of animal health surveillance. Also, there are not yet many published reports of completed evaluation projects in the public domain. The tool and documents provided by RISKSUR provide an attempt to fill these gaps.

Similarly as in the design of surveillance activities, it is important to define the expectations and focus of evaluation projects clearly at the very beginning. This requires a specific evaluation question to be agreed upon and understood by all parties involved from the outset. The selection of evaluation attributes and criteria will be driven by this question, but it will also be strongly influenced by the resources that are available. Some quantitative attributes require extensive data collection and skills that may not be feasible or accessible. To assure data availability, it is recommended to consider evaluation at an early stage such that the required information can be collected prospectively, ideally during the surveillance design stage. Particularly, economic information is often found to be patchy and difficult to collect in retrospect.

Along with specific guidance on the choice of evaluation question and attributes, the EVA tool provides general information on evaluation concepts, evaluation attributes and economic evaluation methods along with practical example of surveillance system evaluation. This is necessary for promoting the understanding of the evaluation process and the documentation of the quality of the data generated by the evaluations in order to better inform the decision making process. The EVA tool was developed to integrate the different level of evaluation and degree of complexity and to guide the users in the development of their evaluation plan and framing the boundaries of their evaluation. The objective of the tool was to promote the use of comprehensive evaluation including economic evaluation by providing detailed information on the available methods and relevance according to a specific evaluation question and context.

Sometimes, the selection criteria for effectiveness and economic efficiency may not be the same and it is important to think thoroughly about the potential outcomes of the analysis and what information these outcomes will provide. This is complicated by the fact that it is rare to find users that possess both advanced technical and economic knowledge and skills. Assuming that the target user for the evaluation tool would be a person with strong technical surveillance expertise, but limited economic knowledge, it was decided to provide an introduction to critical concepts, suitable methods, data and time requirements for the economic evaluation of surveillance. This approach is expected to nurture the use of economics applied to surveillance, which is still in its infancy. In particular, the three-variable relationship between surveillance, intervention and loss avoidance (Howe, Häsler & Stärk, 2013); value of information (Stärk & Häsler, 2015), and non-monetary benefits are elaborated and linked to economic analysis methods commonly used in animal health (Rushton, Thornton & Otte, 1999). In the long term, increased awareness and understanding of the economic theory underpinning the economic evaluation of surveillance as well as an appreciation of challenges that can accrue from application of differing paradigms is expected to increase professional capacity and help to address the problem of resource allocation for surveillance to the benefit of all.

CONCLUSIONS

The RISKSUR tools provide user-friendly access to comprehensive, flexible and state-of-the-art integrated frameworks for animal health surveillance design and evaluation, thereby providing effective guidance during the complex decision making process. The use of the surveillance design framework should be immediately compatible with the needs of veterinary authorities, while the evaluation framework makes a new and essential dimension of the process accessible to decision makers. This inclusion of structured evaluation in both short- and long-term surveillance implementation cycles will enhance the validity of surveillance system outputs and stakeholder acceptance of the utility of animal health surveillance. With tools now being available, the aim will be to expose stakeholders from around Europe and beyond to the RISKSUR tools and the underlying concepts. During this phase, the tools will continue to be refined in response to user feedback and new methodological developments. Their availability in the public domain will facilitate access by users and allows widespread integration into training materials.

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