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OASIS: an assessment tool of epidemiological surveillance systems in animal health and food safety

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SUMMARY

The purpose of this study was to develop a standardized tool for the assessment of surveillance systems on zoonoses and animal diseases. We reviewed three existing methods and combined them to develop a semi-quantitative assessment tool associating their strengths and providing a standardized way to display multilevel results. We developed a set of 78 assessment criteria divided into ten sections, representing the functional parts of a surveillance system. Each criterion was given a score according to the prescription of a scoring guide. Three graphical assessment outputs were generated using a specific combination of the scores. Output 1 is a general overview through a series of pie charts synthesizing the scores of each section. Output 2 is a histogram representing the quality of eight critical control points. Output 3 is a radar chart representing the level reached by ten system attributes. This tool was applied on five surveillance networks.

Key words: Animal health, assessment, epidemiological surveillance, evaluation, food safety, OASIS, surveillance system.

INTRODUCTION

Epidemiological surveillance is a key activity for public veterinary services and other public and private organizations in animal health and food safety that require high-quality information in order to take appropriate decisions and implement activities for prevention and control of zoonoses and animal diseases [1].

The quality of health information relies on the quality of the surveillance systems from which it was obtained. It therefore is crucial to assess surveillance systems in order to estimate the usefulness and the correct application of the generated data [2]. The assessment of surveillance systems is consequently a component of both the risk analysis procedures agreed upon at international level [3] and the

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veterinary services assessment procedures implemented by the World Organization for Animal Health [4].

Several methods have been developed in recent years to assess surveillance networks. Some assess the operation of key activities of surveillance networks on a purely qualitative basis, like the surveillance network assessment tool used in the Caribbean [5], or in a semi-quantitative way, like the method used for countries in Africa [6]. Some other methods specifically assess critical control points (CCPs) of surveillance networks in a semi-quantitative way in order to produce recommendations for improvement [7, 8]. Finally, other methods developed for public health surveillance systems by the Centers for Disease Control (CDC), World Health Organization (WHO) and other health organizations are based on the assessment of surveillance system attributes such as sensitivity, timeliness or acceptability [9–12].

All these methods represent a panel of valuable and complementary tools (various questionnaires), objectives (comparison of systems, identification of weak points, improvement of surveillance), results (surveillance systems attributes, CCPs, operation points), and results display. Here we aimed to combine these methods to develop a complete and standardized assessment tool that could be used on a common basis for a wide range of surveillance systems in animal health and food safety and be able to produce multilevel results. The development of such a tool would be useful for standardizing the results produced and consequently enable better comparison of surveillance systems. It would also be of great help for evaluators and managers of surveillance systems for the implementation and follow-up of assessments. Our first objective was to develop a tool enabling assessment of a surveillance system with the aim of proposing recommendations for its improvement. At this stage, the assessment is only technical and no cost-benefit analysis process has been included.

We assembled a team of ten epidemiologists, developers and users of assessment methods and surveillance system managers in order to develop and apply this new tool known as OASIS (acronym for the French translation of 'analysis tool for surveillance systems').

MATERIAL AND METHODS

Three types of current assessment methods were used as a basis for the development of OASIS: (i) the Surveillance Network Assessment Tool (SNAT) developed in the Caribbean [5, 13], (ii) the CCP assessment method developed by Dufour [7] and (iii) the guidelines for evaluation of surveillance systems developed by the CDC and WHO [9, 11].

Surveillance network assessment tool

The SNAT is the result of a combined study started in 2005 and undertaken by a group of veterinary epidemiologists. This tool was specifically designed to assess national surveillance systems [5, 13]. It has been used extensively in the Caribbean region within the regional animal health network CaribVET. More than 15 countries have been assessed, and some of the national results can be accessed on the website of the regional network (www.caribvet.net). The SNAT consists of two logical phases. The first phase draws up a detailed inventory of the structures and procedures of the epidemiological surveillance network for animal diseases. The second phase presents a summary of the situation of the network for its principal fields of activity, through a summary table. The surveillance system is described using a questionnaire organized into ten sections which constitute a typical surveillance protocol: (i) objectives and scope of surveillance; (ii) central institutional organization; (iii) field institutional organization; (iv) diagnostic laboratory; (v) formalization of surveillance procedures; (vi) data management; (vii) coordination and supervision of the network; (viii) training; (ix) restitution and diffusion of information; (x) evaluation and performance indicators.

The summary part of each section of the questionnaire is always presented in the form of four criteria that may or may not be met by the network being studied. If a criterion is met, the corresponding box is ticked. Levels of compliance are indicated by corresponding pie charts and the output of this method is represented in a series of ten pie charts (one for each section).

The SNAT was later adapted for the assessment of national bee mortality surveillance systems in Europe [14].

CCP assessment method

This assessment method is based on the identification of the critical points in the operation of an epidemiological surveillance system [7]. The critical points were identified using the HACCP (Hazard Analysis and

Critical Control Point) method. This method, initially developed for food hygiene, was transposed to epidemiological surveillance. A list of 'hazards' was drawn up corresponding to possible biases resulting from poor network operation, thereby identifying the critical points enabling control of these hazards.

The evaluation grid is made up of a list of criteria necessary for assessing each critical point.

Considering that surveillance systems operate differently for existing endemic diseases and exotic diseases (sampling strategy, importance of communication, etc.), two different evaluation grids were developed.

A score is attributed to the control of each critical point in order to obtain a total network score of 100 points. The score achieved as a result of evaluation first enables the measurement of the possible margin for improvement for each critical point, and then a comparison of the operational quality of different networks.

A questionnaire and a scoring guide are provided to collect all necessary information and to help users complete the assessment grid. The graphical output is a histogram, each bar representing the level reached by a CCP.

As a result of the assessment, the critical points with the poorest scores are identified and proposals for improvement are made.

This method has been used to assess several surveillance systems in France [15] and in Africa [8].

Assessment of surveillance system attributes

Since their first publication in 1988 [16], the guidelines [9, 10] of CDC in the USA have been regularly updated in order to provide standards for public health services to assess surveillance systems. These guidelines take into account the great variety of surveillance systems and are intended to be suitable for all these systems.

The evaluation method focuses on assessing how well the system operates in achieving its purpose and objectives.

This method recommends that the assessment include ten system attributes: (i) simplicity, (ii) flexibility, (iii) data quality, (iv) acceptability, (v) sensitivity, (vi) positive predictive value, (vii) representativeness, (viii) timeliness, (ix) stability and (x) usefulness. It should be noted that the importance attached to the evaluation of each attribute is system-dependent, in keeping with the purpose of the surveillance. Depending on the version of the guidelines or frameworks, other attributes are included, e.g. portability or system cost [10].

The evaluation process involves several successive tasks including the involvement of the stakeholders in the evaluation, a detailed description of the surveillance system (objectives, activities, resources), gathering information regarding system performance (description and estimation of each system attribute), stating conclusions and making recommendations. A checklist for the evaluation process and relevant standards for task details are also provided. No specific graphical output is attached to this method.

Other organizations such as WHO [11, 17–19] and the Canadian Public Health Organization [12] base their assessment on a similar list of attributes.

In all these methods, the assessment of system attributes is strictly qualitative.

Work process

A team of ten researchers from the French Agency for Food, Environmental and Occupational Health Safety (ANSES) was formed. These researchers were epidemiologists, developers and users of assessment methods, or managers of surveillance systems in animal health and food safety.

The method used for the study included the content and outputs of the three assessment methods mentioned above in order to assess their complementarities, to consider the possibility of combining their processes, tools and outputs and finally to produce a complete and standardized methodology.

The resulting method was applied to five different French surveillance systems [foot-and-mouth disease (FMD), rabies in bats, poultry disease network, antimicrobial resistance in pathogenic bacteria from animal origin, laboratory network for *Salmonella* detection in the food chain].

RESULTS

OASIS methodology

The analysis of the existing evaluation methods showed that they nearly all follow the same process: setting up of an assessment team, onsite evaluation for the collection of all relevant data for the description of the structure and operation of the surveillance system, use of a questionnaire or a checklist to collect these data, analysis of data and statement of conclusions and recommendations.

All topics addressed for the description of the surveillance systems are very similar, supporting the statement that most surveillance systems operate according to the same standards whatever their scope (animal health or public health), even if their components vary considerably. We therefore considered the possibility of developing an information collection questionnaire including most of the useful information, attempting to concentrate more on functions that have to be integrated in the operation of a surveillance system (strategic decision taking, data management) than on specific structure which might differ greatly from one system to another (steering committee, database, geographical information system). A balance had to be found between too detailed questions unable to address all possible components of a surveillance system and too general questions leading to imprecise answers. Further experiences on the questionnaire's application will help to refine this questionnaire and find the appropriate balance.

The three evaluation methods differ significantly in the way information is compiled and treated. One method is purely qualitative (CDC method), another is based on standardized qualitative assessment criteria (SNAT) and the third can be considered as semi-quantitative, with the scoring of assessment criteria (CCP). These differences led the authors of each method to use three different graphical outputs to present the results of the assessment as previously detailed. We considered them to be complementary and thus chose to retain all three (with some modifications) as the outputs for the OASIS method. To achieve this, it was necessary to find an appropriate way to link the collection of information from the system to each output. We decided to produce them using a semi-quantitative method. We therefore developed a set of criteria to be scored, thus providing a semi-quantitative assessment of all the activities and structures of a surveillance system. Once this scoring is completed, each output, generated using a specific combination of the scores of the assessment criteria, can be automatically calculated.

The OASIS tool

A list of 78 assessment criteria describing the situation and operation of a surveillance system was produced (Table 1). These assessment criteria were divided into ten sections according to the structure and activities of a surveillance system. Each criterion was scored on a scale from 0 to 3 according to the level of compliance of the system under examination. Criteria were rated 'not applicable' if not relevant to the surveillance system considered, this criterion was then not considered in the synthesis. Scoring was done according to a guide detailing, for each individual score, the situation in which that score should be awarded. An example of a scoring guide for one criterion is given in Table 2.

A questionnaire of 42 pages was developed to support the collection of useful information to be used for the scoring of the assessment criteria.

Output 1 is based on the SNAT method, some sections of which were modified. One section was integrated into another ('supervision' into 'central institutional organization') and one section was split into two sections ('formalization of surveillance procedures' into 'surveillance tools' and 'surveillance procedures'). The number of sections has thus been maintained at ten: (i) objectives and scope of surveillance; (ii) central institutional organization; (iii) field institutional organization; (iv) diagnostic laboratory; (v) surveillance tools; (vi) surveillance procedures; (vii) data management; (viii) training; (ix) restitution and diffusion of information; (x) evaluation and performance. These sections are used as the basis for the distribution of the 78 assessment criteria. Each section is summarized by a pie chart representing the result of the scores obtained by all criteria of the section (Fig. 1). The contribution of the assessment criteria to the section result is not weighted. Output 1 is considered as a general view of the structure and operation of the surveillance system. The series of pie charts enables the weak parts of the system to be identified easily.

Output 2 is based on the CCP assessment method. We determined the CCPs to which each assessment criterion contributes. The scores of the appropriate assessment criteria were then integrated into the initial scoring grid of the CCP method, enabling an automated calculation of the control point once the assessment criteria are scored. Considering the various levels of contribution of the assessment criteria to the control points, weightings were introduced into the calculation. As in the CCP method, the graphical result of this output remains a histogram (Fig. 2). Output 2 can therefore specifically identify the level of control of the CCPs of the surveillance system. This output is thus particularly useful for proposing relevant improvements to the operation of the surveillance system.

Output 3 is based on the surveillance system attributes developed by the CDC and WHO. Ten system

Table 1. *List of assessment criteria for scoring in the OASIS method*

Sections	Assessment criteria
1. Objectives and scope of surveillance	1.1 Relevance of surveillance objectives 1.2 Level of detail, precision and formalization of the objectives 1.3 Consideration of partners' expectations 1.4 Consistency of diseases under surveillance with the health situation (existing/exotic diseases or dangers)
2. Central institutional organization	2.1. Existence of an operational management structure (central unit) 2.2. Existence of an operational steering body representative of the surveillance partners (steering committee) 2.3. Existence of a technical and scientific committee of the surveillance system 2.4. Organization and operation of the system as planned in the regulation, a charter or a formal agreement between partners 2.5. Frequency of central coordination meetings 2.6. Implementation of supervision activities by the central level over intermediate units 2.7. Adequacy of financial and material resources at the central level
3. Field institutional organization	3.1. Existence of formalized intermediate units over the whole territory 3.2. Active role of the intermediate units in the operation of the system (validation, management, feedback) 3.3. Implementation of supervision activities by the intermediate level 3.4. Harmonization of the activities of intermediate units 3.5. Adequacy of financial and material resources at the intermediate level 3.6. Existence of coordination meetings at intermediate level 3.7. Exhaustiveness or representativeness of coverage of the target population by agents in the field 3.8. Adequacy of financial and material resources of agents in the field
4. Laboratory	4.1. Effective integration of the laboratory in the surveillance system 4.2. Adequacy of human, material and financial resources for diagnostic needs 4.3. Use of quality assurance for the laboratory analysis 4.4. Quality of work standardization between the different laboratories 4.5. Proportion of analyses subjected to inter-laboratory assay 4.6. Existence of an investigation unit to support agents in the field 4.7. Relevance of diagnostic techniques 4.8. Sensitivity of diagnostic techniques 4.9. Specificity of diagnostic techniques 4.10. Control of laboratory reagents 4.11. Technical level of data management in the laboratory 4.12. Laboratory analysis time period (formalization, standardization, verification, transfer of results to the central unit) 4.13. Quality of returned results
5. Surveillance tools	5.1. Existence of a formalized surveillance protocol for each disease or danger under surveillance 5.2. Standardization of collected data 5.3. Relevance of measuring tools (excluding the laboratory tools) 5.4. Sensitivity of case or danger definition 5.5. Specificity of case or danger definition 5.6. Simplicity of case or danger definition 5.7. Quality of completion of the investigation questionnaires 5.8. Relevance of samples 5.9. Standardization of samples 5.10. Quality of collected samples 5.11. Respect of the time period between notification of case or danger and returned result 5.12. Simplicity of the notification procedure 5.13. Simplicity of the data collection procedure 5.14. Acceptability for the data source or data collector of the consequences of a suspicion

Table 1 (*cont.*)

Sections	Assessment criteria
6. Surveillance procedures	6.1. Suitability of the surveillance procedures to the system objectives 6.2. Existence of passive (event-based) surveillance showing exhaustive and representative results 6.3. Existence of activities for the sensitization of data sources in passive surveillance 6.4. Relevance and suitability of active surveillance protocols 6.5. Surveillance of susceptible wildlife 6.6. Surveillance of vectors 6.7. Representativeness of sampling of targeted populations in active surveillance 6.8. Precision of results on active surveillance samples 6.9. Level of satisfaction of active surveillance completion rate
7. Data management	7.1. Suitability of data management to the needs of the surveillance system (relational database, etc.) 7.2. Time period of data entry in agreement with the objectives and use of the results of the system 7.3. Specific, available and qualified personnel for data acquisition, management and analysis 7.4. Adequacy of material and financial resources for data management and analysis 7.5. Efficient and formalized data verification and validation procedures 7.6. Complete descriptive data analysis 7.7. Exploitation of the data aligned with the needs of the system (if possible regular and multidisciplinary)
8. Training	8.1. Satisfactory level of graduation in epidemiology of the central unit members 8.2. Initial training implemented for all agents in the field on entering the system 8.3. Objectives and contents of the initial training for agents in the field aligned with the operational needs for the surveillance 8.4. Regular refresher training organized 8.5. Adequacy of human, material and financial resources for training
9. Communication	9.1. Reports and scientific publications on the results of the surveillance published regularly 9.2. Feedback of the results of the individual analyses to the agents in the field 9.3. Regular distribution of a news bulletin 9.4. Systematic distribution to field agents of reports on the results of the system (except bulletins) 9.5. Existence of a communication system organized transversally and vertically between the agents in the field (email, web, telephone, etc.) 9.6. Consistent external communication policy 9.7. Adequacy of human, material and financial resources for communication
10. Evaluation	10.1. System performance indicators developed and validated by the managers of the system 10.2. Performance indicators regularly calculated, interpreted and distributed 10.3. External evaluation implemented 10.4. Implementation of corrective measures following evaluation

attributes were retained to represent the quality of a surveillance system: (i) sensitivity; (ii) specificity; (iii) representativeness; (iv) timeliness; (v) flexibility; (vi) reliability; (vii) stability; (viii) acceptability; (ix) simplicity; (x) usefulness. We determined the attribute to which each assessment criterion contributes. The numerical result of each attribute is the result of the combination of the score of each assessment criterion. Considering the various levels of contribution of the assessment criteria to the attributes, weightings were introduced into the calculation. The results of the attribute assessments are placed in a radar chart enabling the strengths and weaknesses of the surveillance system to be visualized clearly (Fig. 3). The radar chart has been chosen to easily differentiate this output from the two others.

The size of the questionnaire (42 pages), the large number of assessment criteria to be scored (78 criteria) and the various combinations and weightings applied to generate the graphical outputs required the development of a spreadsheet file to integrate the scores of criteria and automatically process the

Table 2. *Example of the scoring guide: scoring benchmark for assessment criteria 5.10 'quality of collected samples'*

Score	Standard of application
3	More than 95% of the collected samples are considered suitable for analysis at their arrival at the diagnostic laboratory
2	Between 80% and 95% of the collected samples are considered suitable for analysis at their arrival at the diagnostic laboratory
1	Between 60% and 80% of the collected samples are considered suitable for analysis at their arrival at the diagnostic laboratory
0	Less than 60% of the collected samples are considered suitable for analysis at their arrival at the diagnostic laboratory
Not applicable	The system does not plan sample collection. Nevertheless, in a case where the system uses the results of sample analysis done outside the surveillance system (e.g. laboratory network), it is necessary to score the quality of their standardization

Section	Graphical result	Recommendation for improvement
Section 1 : Objectives and scope of the surveillance		Partners expectations should be better taken into consideration
Section 2 : Central institutional organization		Attributions of the steering committee could be more clearly defined
Section 3 : Field institutional organization		Recruiting new laboratories would improve coverage of the target population. But one should be careful not overpass the capabilities (human and financial) of the network
Section 4 : Laboratory		It is recommended to estimate the laboratory assessment criteria using punctual surveys
Section 5 : Surveillance tools		It should be intended to progressively improve standardisation of collected data by insisting about this critical point towards the laboratories
Section 6 : Surveillance procedures		Representativeness is bad but difficult to improve considering that the network is based on existing activities not depending from the network actions.
Section 7 : Data management		It should be contemplated to group the two databases in one unique database with an access to the two involved coordinating entities
Section 8 : Training		An initial laboratory training protocol (usually realised through repeated phone contacts) should be formalised
Section 9 : Communication		Horizontal communication means between laboratories (such as an Internet forum) could be envisaged
Section 10 : Evaluation and performance indicators		Scoring of this section will automatically improve considering the implemented activities : development of performance indicators and system evaluation

Fig. 1. Output 1 for the French antimicrobial resistance surveillance network assessment.

calculation used to produce the outputs. This spreadsheet enables a comment to be included for each score and also at the end of each section. This last comment can be a complementary explanation of the score chosen or a recommendation for the improvement of the score. In order to facilitate the use and improvement of OASIS, all necessary resources are freely available on the website (www.survepi.org/oasis) and placed under the Creative Commons licence (http://creativecommons.org).

The development of the scoring guide, the combination of assessment criteria and attribution of weightings is inevitably subjective. We attempted to reduce this subjectivity by applying a consensus

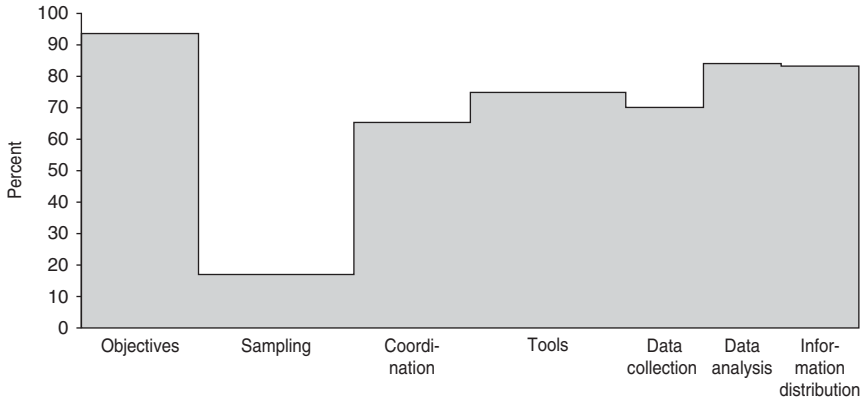

Fig. 2. Output 2 for the French antimicrobial resistance surveillance network assessment (critical control points).

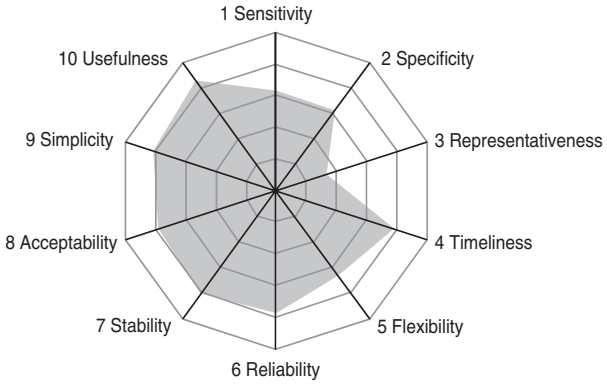

Fig. 3. Output 3 (system attributes) for the French antimicrobial resistance surveillance network assessment.

process within the working group. Nevertheless, this consensus does not mean that the best options have always been chosen and further application of the tool might lead to further refinement of the list of criteria, weights applied and scoring guide.

Application

From the five surveillance systems to which the method was applied, we chose the surveillance network of antimicrobial resistance in pathogenic bacteria from animal origin (known as RESAPATH) as an example for this publication.

French public or private veterinary diagnostic laboratories participating in RESAPATH on a voluntary basis (59 members in 2009) send the results of the antibiograms they performed for field veterinarians to the surveillance network via electronic or paper forms. The network is coordinated by two ANSES laboratories, Lyon and Ploufragan–Plouzané. A steering committee comprising all partners of the network meets annually.

Antibiogram data include information on the samples and the context in which they were performed (laboratory performing the analysis, species, age of the animal, observed pathology, type of sample, location, etc.) as well as antibiotics tested and the diameters of inhibition zones measured.

Antibiogram techniques are recommended by the network and annual information and training sessions for the laboratories are organized to standardize collected data. According to the antibiogram results, some interesting bacterial strains are collected by ANSES in order to perform specific studies on resistance mechanism and to contribute to the veterinary reference frame.

The assessment method was applied by two members of the working group involved in the coordination of RESAPATH. Completing the questionnaire and scoring the assessment criteria took 2 days.

Output 1 of the assessment (Fig. 1) displays a global, good operation of the surveillance network, except for the surveillance procedures (section 6). The other main areas capable of improvement are the central and field institutional organization, training, and evaluation. Output 2 (Fig. 2) shows that CCP 'sampling' is not sufficiently controlled while confirming the overall quality of the other points. Output 3 (Fig. 3) highlights mainly a lack of representativeness and an improvement margin for sensitivity, specificity and flexibility, while the other attributes appear to be correct.

DISCUSSION

Use of the tool

The application process (assessment of five different systems) showed that the method was easy to use for

the evaluators, bearing in mind that they had taken part in its development. The very high level of detail of the scoring guide appears to be of great help to the assessment teams and enables unambiguous scoring of the assessment criteria. Nevertheless, some scoring criteria can be difficult to assess in the event of a lack of available data on the operation of the surveillance system. The example given in Table 2 illustrates this for surveillance systems unable to produce data on the quality of samples collected in the field. In these cases we arbitrarily decided to use the worst-case scenario by applying the worst score when data was absent.

Nearly all the application processes needed about 2 days for completion. It must be taken into account that these assessments were performed to validate the applicability of the tool. A complete classical evaluation process as described for most of the methods would require more time to ensure an appropriate involvement of the various participants in the surveillance and onsite verification when the assessors are not the individuals involved in the day-to-day management of the surveillance. Such a complete evaluation process needs to be further developed, especially in order to guide the users of the tool in the interpretation of its different outputs.

The scoring of each criterion and the use of the scoring guide clearly help to highlight the improvement margin and to formulate specific recommendations.

All these practical considerations validate the applicability and ease of use of a unique list of criteria to produce the various graphical outputs of the system. Nevertheless this decision needs to be analysed in relation to each output and the initial process that produced it. The relevance of the use of three different outputs also needs to be discussed.

Outputs

Considering Output 1, the original concept of SNAT used four criteria to summarize each section and each criterion could only be considered as 'satisfied' or 'not satisfied'. This process was considered as very reductive and some sections clearly needed more criteria to be correctly summarized. It was also difficult to decide in the original SNAT whether a criterion was satisfied or not, because it was sometimes only partly satisfied. These problems are solved in OASIS with various numbers of criteria used to summarize a section (from 4 to 14 according to the section) and a scoring scale from 0 to 3 with a clear definition of each score. The reorganization of the section contents allows more emphasis to be placed on the description of surveillance procedures and some parts of the surveillance description to be completed that appeared weak in the original method.

Considering Output 2, we stated that all useful information needed to complete the scoring grid was already contained in the list of assessment criteria. The new scoring guide therefore incorporates all the items from the original CCP scoring guide and the work mainly consisted of attributing the appropriate assessment criterion to each item of the original scoring grid in order to produce the results of the CCP method automatically, once the assessment criteria have been scored. A decision had to be taken regarding which items of the scoring grid should be attributed to each assessment criterion. This decision was reached through consensus throughout the group, but this does not mean that the optimum configuration was reached. Although the application performed supports the current status of the tool, further use of OASIS might lead to proposals for improvements on this point.

Regarding complementarity between outputs 1 and 2, besides the difference of the graphical layout, some sections of the two outputs appear to be comparable, e.g. 'objectives' and 'information diffusion' in Output 2 that are analogous to 'objective and scope of surveillance' and 'communication' in Output 1. The application example given for antimicrobial resistance surveillance shows that they give comparable results. Nevertheless, other sections differ significantly. Output 1 describes all aspects of a surveillance system (e.g. field organization, laboratory, training) while Output 2 specifically targets CCPs. Therefore, even if some aspects of these two outputs were clearly related, we chose to maintain both because each one illustrates different views of the same reality.

With regard to Output 3, we also stated that the useful information needed to estimate the level of compliance with the internationally recognized system attributes developed by the CDC and WHO were already contained in the list of assessment criteria. OASIS is a first attempt to quantify these system attributes on the basis of the structure and operation of the surveillance system. The added value of the working group has thus been to attempt to link the list of assessment criteria with the list of quality criteria. This work highlighted the fact that the system attributes are clearly not independent (one assessment criterion often contributes to several

system attributes). For example 'the implementation of regular refresher training courses for agents in the field' contributes to both the sensitivity and flexibility of the system. Weightings had to be applied to represent the appropriate contribution of the respective assessment criteria. Weightings and criteria distribution were reached through consensus and, as for Output 2, further use of OASIS might lead to proposals for improvements on the decisions taken.

Output 3 appears to be clearly complementary to the two other outputs and gives a marked result for the interpretation of the quality of surveillance systems. While Output 3 is directly useful for understanding the quality of a system (e.g. a lack of sensitivity clearly highlights a problem), Output 2 shows which CCPs could explain this situation and what margins there are for improvement, whereas Output 1 indicates what part and structure of the system needs to be targeted to modify this situation.

It was intentionally decided not to mention any value (percentage or number of points) for Output 3. Even if the chart was the result of a percentage (weighted score of all the assessment criteria for the considered system attributes on the maximum possible score), mentioning a rate could lead to a misuse of the number given. For example, a rate of 24% for sensitivity could be interpreted as if the real sensitivity of the surveillance system had been estimated using quantitative methods, which is not the case. OASIS is a semi-quantitative tool that should be used to draw the general shape of the performance of a surveillance system. Its results should therefore not be over-interpreted.

Although it is recommended that all outputs be provided in the form of bar charts for a better visualization of the results, three different graphical layouts have been chosen to easily differentiate the three outputs in order to reduce the risk of confusion between them and to clearly reinforce the statement that they represent different aspects of the surveillance system. Nevertheless, the use of the tool enables the production of different graphical layouts.

No cost or cost-benefit analysis is proposed at this stage. Further development of the tool could, as a first stage, provide a system to quantify the cost of the improvements proposed in order to make it possible to simulate the cost-benefit of any improvement to be implemented.

The five teams who applied the tool considered that the outputs correctly described their system and that no specific surprise in these results was observed. The teams acknowledged that implementation of the tool forced the coordination team of the surveillance system to address all activities of the system, which represents a valuable step in the improvement process.

CONCLUSION

The OASIS method is an attempt to ease the work of surveillance systems evaluators by providing a questionnaire and a complete scoring process of 78 assessment criteria leading to the production of three complementary assessment outputs. The OASIS package comprises a questionnaire, a list of assessment criteria, a scoring guide and a spreadsheet for scoring integration and the production of outputs. The complete assessment process for the implementation and interpretation of the outputs of the tool still needs to be developed.

This method was applied to five surveillance systems and is considered to be easy to use and also probably usable for a large range of surveillance systems. Nevertheless, the choice of criteria and the combination of these criteria to produce the various outputs could be further refined by using OASIS on additional surveillance networks.

ANSES therefore plans to use OASIS to assess the existing surveillance systems on animal health and food safety in France.

So far, OASIS has been used on these two types of surveillance systems. With the help of some adaptation, it could conceivably also be applied to plant health or environmental health surveillance systems.

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DECLARATION OF INTEREST

None.

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