Assessing the use of animal health platforms: user's needs, preferences and constraints

Juana Bianchini[1], Xavier Simons[2], Christel Faes[3], Gaëlle Nicolas[4], Aline Vilain[2], Guy Hendrickx[4], and Claude Saegerman[5]

[1]University of Liège
[2]Sciensano
[3]Hasselt University
[4]Avia-GIS NV
[5]Universtiy of Liege

July 1, 2020

Abstract

Animal health information systems or risk analysis tools are indispensable not only for animal health surveillance, but also to observe the evolution and risk of disease incursion into a disease-free area. Given their essential function in animal disease prevention, different international and national organizations have created their own aforementioned systems/tools. Moreover, with the increase of technology and data storage, they have become more accessible and widely used by professionals in animal and human health sciences. This study aimed to establish their preferences, needs and constraints in respect of these tools. An online survey was conducted and answered by 213 respondents from 132 countries. The respondents were animal or public health professionals in different employment sectors (mostly in government, research and university institutions) and various fields of competency (highest for animal and public health). The majority of respondents used the animal health information systems frequently and on a weekly basis, with prevention measures of diseases being regarded as the most useful information. Descriptive epidemiology is more used/needed than analytical epidemiology. Risk analysis was performed by the majority of the respondents (70%), using a qualitative approach more than a quantitative or semi-qualitative. The primary objectives was to produce risk assessment and preparedness in areas involving origin and spread of animal diseases. The features most sought after in risk assessment tools were pathways of introduction and spread assessment. The level of satisfaction was higher for the platform which is most used by the respondents. Thus, the platform choice is most likely influenced by its efficiency and functionality. Overall, these results could be taken into consideration when improving an already available platform, or when creating a new efficient tool.

1. Introduction

Over the last couple few decades, increasing globalization and international trade have made a world in which there is extensive trade in animals and animal products. Both people and animals can travel long distances in a very short time. These socio-economic changes have led to an increase in the emergence and spread of new and known infectious diseases affecting animals and humans (Bianchini et al., 2020). Consequently, infectious animal diseases have entered new frontiers, emerging in countries for the first time, as seen with the recent outbreaks like African swine fever (Linden et al., 2019), Lumpy skin disease (Bréard, 2016) and West Nile fever (Sambria et al., 2013) in different European countries. Therefore, now more than ever, national and international disease surveillance systems play a crucial role not only in preventing but also in foreseeing these threats by providing vital information on current or future potential threats.

Moreover, with the advances in data storage methods and computational power, animal health information systems and risk analysis tools have increased in their importance, and have become essential tools for animal disease control and surveillance.

Given the importance of information management, many national and international authorities have produced several animal information systems which every day gain more importance in their use. Notable examples of world animal health information systems are: i) the WAHIS platform, from the World Organization for Animal Health (0IE, 2019), OIE; and ii) Empres-i by the Food and Agriculture organization of the United Nations, FAO (FAO, 2014).

Efficient decision-making on risk management of animal disease threats requires knowledge of which disease poses the highest threat and should therefore receive more attention (Bianchini et al., 2020; Humblet et al., 2012). This ensures that policy makers and researchers allocate adequate resources for the prevention and surveillance of human and animal diseases. Risk assessment has consequently become an essential method for prevention. Thus, different risk analysis tools have been created, each with different functions or objectives. Examples of such: i) MINTRISK, Method for INTegrated RISK assessment of vector-borne diseases, by Wageningen University & Research (MINTRISK, 2015); ii) SVARRA (De Vos et al., 2019), Rapid Risk Assessment tool for introduction of exotic disease to the Swedish animal population, and iii) SPARE (2020), Development of a Spatial risk assessment framework for Assessing exotic disease incuRsion through Europe (United Kingdom, Defra).

As such animal information systems have rapidly increased in use, by professionals from i) operational field activity or ii) animal health and control of diseases. R.S. Morris (1991) stated in 1991: "As in most other technical and management fields, information management is fast becoming the key to effective action in animal health". Thus, a modern veterinary or public service requires effective systems for gathering relevant information from the field. In turn, this information should be processed such that it provides maximum value, and presented in a form which easily informs national policy making and effective disease control. Different professionals (academia, livestock industry, policy maker) which use these systems vary in the detail and type of information they require. It is therefore important to establish first, i) what are their professional expectations (preferences, needs and constraints) in respect of these tools and ii) what are the related existing gaps . This online cross-sectional study aimed to obtain a general picture of what animal and public health professionals require of animal health systems or risk analysis tools and the constraints of these applications.

2. Material and methods

2.1 Study design and sampling

An online cross-sectional study was set up to investigate the users' perceptions (e.g. needs, preferences and constraints) of animal health platforms and risk analysis tools. The study population consisted of professionals around the globe whose professional activities involved the use of different platforms; either animal health or risk analysis tools or both. For this, a survey was produced and distributed in two ways. First emails, requesting participation in the proposed online questionnaire were sent to 573 professionals at different international levels. Most of them were known professional contact points who were previously or at the time involved in animal or human health activities. A snowball sampling strategy was then used (Lupo et al., 2016) where certain first wave respondents were asked to distribute the questionnaire link to other pertinent persons via e-mail. Therefore, the same email was sent by the OIE to country focal points responsible for notifying animal diseases.

2.2 Data collection and survey

The responses were collected in an anonymous online survey which was created, hosted and shared using the LimeSurvey® software. The survey questionnaire was divided into 6 sections, each with a subset of questions: (i) personal information of the respondents, to have a general profile of people who use this type of tools (8 questions); (ii) utility of the animal health information systems, based on how often professionals used the systems and the type of information they sought (16 listed type of information and 17 questions in total); (iii) data sources, related to the issues and constraints regarding the data type that the respondents needed or had (19 questions); (iv) risk assessment tools - this part was only to be answered by professionals working in risk assessment. Questions were on type of risk assessment and what they are trying to achieve with it (21 questions); (v) perception of using animal health platforms or risk analysis tools (15 questions), and finally; (vi) the assessment of available animal health platforms or risk analysis tools (5 questions). In total, the questionnaire contained 85 questions, 66 of which required a response on a 5-point Likert scale (i.e. never, rarely, sometimes, very often, and always).

The questionnaire was sent in September 2019 and was open to responses until the 1st of November of the same year. It was anonymous, did not include personal or sensitive data, and according to the European legislation, did not specifically require approval by an Ethical Committee.

2.3 Data Analysis

Responses were extracted from the LimeSuervey® application to an Excel® spreadsheet for analysis. Data was cleaned and records were deleted if the respondent did not complete the questionnaire. Responses of the Likert scale were coded from 1 to 5 (1 being the lowest degree and 5 the highest). These were then described in terms of frequency grouped by thematic categories. Univariate Poisson regressions were used to determine any differences among the measured percentages of the coded form (the Likert scale) within subgroup of both answers and questions. The explanatory variable was the group that was being analysed and was inserted as a categorical variable. Wilcoxon rank sum test was used to compare if two groups were equal or not. The Kruskal-Wallis equality-of-populations rank test was used to evaluate the differences of the median. Fisher's exact test was used to measure association. Significant p-value cut-off was set to 0.05.

Open-ended questions were sorted manually by theme or topic and summarized in an interpretative way. All statistical analyses were conducted using Microsoft Excel® and STATA S.E. 14.2® software (College Station, Texas, USA).

3. Results

3.1 Survey response

A total of 573 emails with the link to the survey were sent to professionals around the world. A questionnaire was opened for 341 of these emails. After cleaning and deleting incomplete records, a total of 213 respondents completed the survey (i.e. 37.17% response rate 213/573).

3.2 Respondent's characteristics

The most represented age group was 41-50 years old with 82 respondents, followed by 51-60 (53 counts), 31-40 (51 counts), over 60 (14 counts) and the lowest group 20-30 (13 counts). The years of work experience ranged from 1 year to 40 with the majority of the respondents (38%) having between 11 and 20 years' experience.

The number of respondents, who were carrying out their professional activities in a single country was 145 (13 of which did not specify which country) represented by 66 different countries**.** The countries were Belgium, France and Ireland with 18, 10 and 6 counts respectively. Ecuador, Niger, Tunisia, Vietnam at 5 counts each; Algeria with 4 counts; Democratic Republic of Congo, Italy, Sweden, Switzerland 3 counts each; Estonia, Greece, Israel, Kenya, Norway, Portugal, Romania, Singapore, South Africa, and Spain 2 counts each. The rest of the indicated countries had one count each: Afghanistan, Albania, Argentina, Armenia, Australia, Austria, Azerbaijan, Benin, Bulgaria, Burundi, Canada, Cyprus, Czech Republic, Denmark, Egypt, Eswatini, Finland, Georgia, Germany, Guinea-Bissau, Hong Kong, Hungary, Iraq, Ivory Coast, Libya, Macedonia, Malawi, Malaysia, Mali, Mongolia, Nepal, Netherlands, Pakistan, Palestine, Papua New Guinea, Peru, Serbia, Slovakia, Suriname, Tanzania, Trinidad and Tobago, United Kingdom and Zambia (**Figure 1)** .

A total of 68 professionals were working in several countries (i.e. at international level) of which 30 worked both in European and non-European countries, 20 in European countries only and 18 in non- European countries only.

For type of employment, field of competency and responsibilities regarding animal disease threats, the number of responses varied. Each respondent could answer more than one option, therefore the number of answers were higher than the number of respondents. Regarding the type of employment (total number of responses N = 272), respondents were mainly employed in government institutions (112/272), followed by research institutions (65/272), universities (52/272), international organizations (16/272), private companies (9/272), as sector representatives (5/272) and lastly as animal producers with 3/272. There were 12/272 respondents which marked the option "other". They further specified that they were employed as private veterinarians (6/274), in consultancy companies (2/272), different non-governmental associations (3/272) and 1/272 was a retired professional. The most common fields of competency (total number of responses N= 433) were animal health and public health with 191/433 and 92/433 respondents, respectively. Food safety had 62/433, animal welfare 55/433, environment 15/433 and plant health 5/433. There were 16 respondents for the option "other" where 5 further specified animal husbandry, 3 animal conservation and economics, parasitology, epidemiology, global health, insect pest control, microbiology veterinary epidemiology and wildlife health, each had 1 count. As for their responsibilities regarding animal disease threats, many respondents answered with more than one option (total number of responses N = 554) with risk assessment (134/554) and signal capture (102/554) having the highest counts. Risk communication followed with 85/557 counts, risk management with 77/554, policy making with (66/554) and decision making with 61/554. There were 32 counts for the option "other" where on specification research and funding (9/32) and surveillance and control (8/32) had the highest counts. Other respondents' specifications were not clear in their meaning – these were not analysed any further.

Three univariate Poisson models (one per question on: type of employment, field of competency and responsibilities related to animal disease threats) were made to observe any differences in frequency of use (outcome variable for all 3). The following types of employment were not included in the analysis due to low counts (i.e. less than 17 counts): animal producer, sector representative, private company (e.g. pharmaceutical company, animal nutrition company). Using the category "university" as the reference, the two types of employment that were significantly higher in use than university in decreasing order were international organization (e.g. FAO, OIE, NGO) and government institutions. Type of employment in a research/scientific institution was not significant; hence, the frequency of use of animal information systems is the same as for university.

Three fields were excluded (environment, plant health and other) from the Poisson model for the field of competency, for the same reason mentioned above in type of employment. Remaining categories were not significant. The same result was obtained for the question, "what is (are) your responsibility(ies)" related to animal disease threat, none were significant.

Experts mentioned that the key words which best described their areas of expertise were: epidemiology (59 times); animal health (43 times); zoonoses (20 times); surveillance (16 times); food safety (15 times); microbiology (12 times); animal husbandry (11 times); animal welfare (9 times); veterinary and veterinary epidemiology (8 times each); biosecurity (7 times); and contingency planning and virology (7 times each) (**Figure 2**).

3.3 Utility of animal health information systems

When asked "how frequently they use the animal health information systems", 0.93% of the respondents answered never, 8.88% rarely, 26.64% sometimes, 35.05% often and 28.50% always. There was no association between the frequency of animal health information system use and the type of information that they find useful in them (all types of information were not significant in the Poisson model where frequency of use was the outcome; p-value > 0.05).

The univariate Poisson regression model, using degree of usefulness as the outcome variable and type of information (listed in questionnaire**Appendix S1**) as the explanatory variable ("treatment" being the reference category) showed that there was a difference in the usefulness of type of information available in the animal health information systems (**Figure 3).** Overall the 5 most important were "prevention measures" (extremely useful category with 42.52%), "efficiency of currently available control measures" (extremely useful category, 33.8%), "cases/incidence information" (extremely useful category, 33.3%), "zoonotic potential" (extremely useful category 39.4%) and "evolution/spread of the disease during time (days, weeks, months)" (extremely useful category, 33.3%). The 5 least useful ones were "regulations which are currently in place regarding a specific disease", "methodologies for risk analysis which have been described so far", "produce risk estimation", "pathogenesis of the disease" and "treatment", with 22.5%, 21.1%, 21.1%, 17.4% and 15% respectively in the extremely useful category. The information "methodologies for risk analysis which have been described so far", "produce risk estimation" and "pathogenesis of the disease" had the same degree of usefulness as "treatment" given that they were not statistically significant (p-value <0.05) in the Poisson model.

3.4 Data sources

On the question of whether descriptive or analytical data was used or needed the Wicoxon rank-sum test showed a significant difference between the two data types. Descriptive epidemiology was the most frequently used and with a slightly higher percentage of answers in the "very frequently" category compared to analytical epidemiology data, i.e. 30.99% against 23%. However, in the "frequently" category, both descriptive and analytical epidemiology had a 44.13% of answers (which corresponds to 94/213). A total of 1.4% of respondents never used analytical epidemiology.

The use and need for the different types of information listed in the questionnaire was evaluated. (**Figure 5)** . When comparing each data source's need with use, there was significant difference. The need was greater than the use in all types of data sources listed: Scientific literature (i.e. published papers in peer-reviewed journals), international/national databases (e.g. OIE, WHO. EUROSTAST, FAOSTATS, EFSA, ECDC), national agencies (data comes from the member states' national institution, laboratories databases, expert opinion, questionnaires) **(Figure 5).** National agencies, expert opinion and laboratory data bases were the data sources which differed the most in use versus need (the rank sum test had the highest difference between the two groups), with national agencies with 30% extremely needed versus 16% extremely used, expert opinion 22% extremely needed versus 8% extremely used, and laboratories databased with 29% extremely needed versus 14% extremely used.

Obtaining or acquiring this sort of data is not straightforward, as they answered "sometimes" and "very often", with "very often" having a high score 63 out of the 213 respondents, although 105 respondents determined they get good quality data. **Table 2** shows counts of respondents' opinion of the quality of data obtained and if they had issues obtaining it. There was no association between the difficulty in obtaining data and the data quality. (Fisher's exact test; p-value < 0.001).

Most of the respondents considered that they acquired data of fair (85/213) and good (105/213) quality. However many said they sometimes (117/213) or very often (63/213) had issues obtaining data. Data availability (i.e. degree to which data can instantly accessed) was suggested to be a bigger hurdle and constraint than data accessibility (i.e. physical conditions in which users can obtain data (e.g. where to go, how to order, delivery time)) (Wilcoxon's rank sum test; p-value <0.05) **(Figure 6).** Regarding the preferred form of data, 38.42% preferred excel, 27.25% PDF, 16.35% Text, 7.90% HTLM and 10.08% had no preference (**Figure 7)** .

3.5 Risk analysis

A total 150 respondents answered this section, thus 70% of the respondents produced risk assessments and used the available tools. The Poisson model obtained (with the outcome being the Linkert coded score and the explanatory variable being the type of risk assessment approach) showed that the qualitative risk assessment approach was the one most used followed by quantitative and semi-qualitative **(Figure 8a)** . Quantitative and semi-qualitative risk assessment had no significant difference between them. When asked about the type of risk assessment they generally worked on, there was no difference among release, exposure and consequence assessment. The Poisson model with the type of risk assessments as the explanatory variable suggested absence of significance for all the factors. The percentages in all the five categories of the Linkert scale were similar for all the three types of risk assessment (**Figure 8b)** . When asked which was the primary objective of producing a risk assessment, in decreasing order of frequency of the always category were: " Risk assessment and preparedness in areas involving origin and spread of animal diseases, including zoonoses", "Provide stakeholders with relevant information and expert advice on issues related to disease preparedness and surveillance of animal diseases and zoonoses", "identify key questions for targeted research", "provide veterinary diagnostic laboratory services for zoonotic, epizootic and other animal notifiable diseases", "evaluate the need for action to support policy changes", "identify plausible future scenarios to be prepared to future animal incursions"**(Figure 8c)** . The Poisson model applied to determine the primary objective of respondents' risk assessment suggested that the categories "to identify key questions for targeted research", "to provide veterinary diagnostic laboratory services for zoonotic, epizootic and other animal notifiable diseases" and "identify plausible future scenarios to be prepared to future animal incursions" were of significantly higher importance than the reference category "risk assessment and preparedness in areas involving origin and spread of animal diseases". The other two primary objectives: "evaluate the need for action to support policy changes", and "provide stakeholders with relevant information and expert advice on issues related to disease preparedness and surveillance of animal diseases and zoonoses" were not significant with regards to the reference category. Therefore, they had the same importance of being the primary objective as risk assessment and preparedness in areas involving origin and spread of animal diseases.

A Poisson model was applied to study the most important feature required by experts when using a risk analysis platform tool. Significance for each category was suggested when using the category "Produce a risk assessment for two diseases for comparison" as the reference category. In decreasing order of importance: "spread assessment", " pathways of introduction of a disease until the border", "produce a quick risk assessment", "Produce a report using the system", "Produce a risk assessment detailed for a single disease", "Produce a risk assessment for two diseases for comparison", with the reference category being the least important (**Figure 9).**

To assess the risk of threat, 85% of the respondents used different data sources and tools. To report a risk assessment result however, 67% answered that they did not combine the outputs of several types of methods.

3.6 Perception on using animal health platforms or risk analysis tools

When evaluating the systems or tools the respondents usually worked with, there was a total of 198 respondents to this section. The user opinion was equally shared (51% saying yes and the remainder saying no) regarding the question of systems or tools being user friendly. Respondents were asked about which issues/problems they encountered (more than one option could be chosen giving a total of N=397 responses). These were in decreasing order: data accessibility (33.5%), not enough information (31.74%), slow (16.88%), difficult to understand the page (12.34%) and other (5.54%). When observing the two subgroups of user friendly or not **(Figure 10)** , respondents who did not find the animal information systems user friendly considered the biggest issue to be difficulties understanding the page (69.39%). On the other spectrum, the respondents who did find these systems user friendly had an issue with the systems being slow (47.76%).

Regarding what feature the respondents considered important the Poisson model suggested that when using the feature "be able to customise the interface and functionality that you use" as the reference category that with the exception of the feature "login fewer times with fewer user accounts and passwords" all the other features were significantly higher in importance than the reference. In decreasing order of importance these features were: "data accessibility and availability", "extraction of information", "extraction of results/information", "display of information", "user friendly", "the way the results are displayed", "easy to find during web search", "risk assessment methodologies", "easy contact for help", "queries and other information", "access software and information while off campus/work space", "publications regarding the tool used", with "login fewer times with fewer user accounts and passwords" and "be able to customise the interface and functionality that you use" being equally of least importance (**Figure 11**).

3.7 Assessment of available animal health platforms or risk analysis tools

The section regarding the assessment of the available animal health platforms or risk analysis tools was answered by 147 respondents (there were many missing values and data entry errors resulting in deletion of some responses). When asked if they had encountered issues with using different animal health platforms or risk analysis tools due to the fact these were not adaptable to their country's conditions, 45% said yes and 55% no. Regarding the platforms they most used respondents had to only indicate the ones they used, therefore the total number for the categories most used, intermediate usage and least used differed as some respondents only used one unique animal health/tool platform, and others two or more. In total most used, intermediate usage and least used had 147, 128, and 94 responses respectively. When asked what three animal health information systems they mostly used the WAHIS or WAHID (i.e. the platform of the OIE) was the one mentioned the most (data not shown). Sixty-two used this platform every day whilst 7 responded once a semester (**Table 3).** The percentage of satisfaction was not similar amongst the 3 groups having median of 75%, 70% and 63.5% for most used, intermediate use and least used respectively (Kruskal-Wallis equality-of-populations rank test; chi-square (2 d.f.; $\alpha = 0.05$) = 11.54; p-value = 0.0031) (**Figure 12)** .

4. Discussion

This study is a first attempt at reporting the uses of and perspectives on animal information systems and risk analysis tools by professionals from all around the world. Similar surveys have been conducted but referring specifically to a single animal health information system (i.e. analysing the WAHIS database only or giving general summary of animal health platforms) (OIE, 2017; OIE, 2020; FAO, 2011). To date, attitudes towards the use of these platforms have not been discussed/analysed. However, this same point highlights a limitation of this study only in that it gives only a general picture of the constraints and attitudes. This is because there is too wide a variability of i) animal health information systems (national and international) as well as ii) risk analysis tools, to be able to provide details. A larger study, specific to these systems or tools would be required.

The response rate to this study could be considered as overestimated given the fact that a snowball strategy was used. The anonymous form of the survey forbids quantification of the number of experts who could have been added to the survey using the network of the original set of identified professional (snowball strategy) (Lupo et al., 2016). Although a low response rate was achieved, this strategy provided a good representation of professionals who used the systems as the survey was specifically sent to focal points responsible for notifying animal diseases. Moreover, the years of experience in the field and age of the respondents were well represented as well as international location and area of professional activities of the respondents. The sample population carried out their professional activities from a broad range of nations, which gives a good general picture of the uses of these systems at an international level. The survey also captured the international activities of the respondents, probably at different levels or at international organizations. The responses were analysed as a group (i.e. without dividing it into subgroups by professionals' provenance) and did not compare relationship between issues or restraints and regions (i.e. differences in term of animal health institutionalisation or data accessibility). It is important to highlight that the snowball strategy was done using specific focal, thus there may have been differences in issues by regions. The sample would have differed if the snowball strategy for example was used in an institution of a university in the United States. The sample would have represented more the United States universities, which may have arisen other issues or restraints.

Most of the respondents in this survey were employed in governmental institutions, research and universities with animal and public health being the field of competency most represented. Academia and governmental institutions were the places where animal health information systems and risk analysis tools are most used, most likely them having easier access to these tools and a level of understanding of using the tools.

As for the utility of animal health information systems, it is important to consider that an animal health information system is only as good as the data it contains (OIE, 2020). This survey highlighted that the degree of frequency of animal health systems use and the information type found in them was not related. According to the gathered expert opinion, prevention of disease occurrence is more important than treatment. This study highlighted how professionals give important focus to the type of information related to i) disease incursion and ii) epidemiological characteristics of diseases (i.e. information on cases/incidence, the evolution/spread of the disease). The latter informs actions to limit the introduction of a disease into a country free from the infection.

Data sources were more needed than used, showing there is a lower access to data sources than required. However, there were no questions to know if there were issues in having a knowledge (i.e. understanding the known databases, mechanisms of extraction, obtaining information) or due to limitations in technology.

Although, there is accessibility to certain data (e.g. by officially demanding access to international organizations) respondents showed that access to databases on public and animal health, access limitation are still high (Bellet et al., 2012; EFSA, 2020; Humblet et al., 2016). Additionally this access can be hindered by the limited knowledge of computer science (translating PDF or HTLM format to EXCEL or text using text mining) or heavy manual work required by the conversion as stated by Humblet et al. (2016). Although raw tabulated data (e.g. EXCEL and TEXT files) are more appropriate for risk assessment, these sources are not often available and sometimes difficult to access (e.g. restricted or paying access) (EFSA, 2020).

Preferred forms of data where Excel and PDF, but as stated by Humblet et al. (2016), the main forms of data they found were PDF and HTLM files. Although raw tabulated data (e.g. EXCEL and TEXT files) are more appropriate for risk assessment, these sources are not often available and sometimes difficult to access (e.g. restricted or paying access) (Bellet et al. 2012).

Data availability and accessibility are crucial for epidemiological analysis. Availability of the data, more than its accessibility, is the main issue for experts and research scientists/assessors. The data format plays a key role in the feasibility and rapidness of data management and analysis. The HTML format allows easier management of data than PDF files because it is more appropriate for data extraction; PDF data are better adapted to consulting only (Bellet et al., 2012). Additional training skills and collaborations though multidisciplinary disciplines could help in overcoming the issues on accessibility to the right form of data and also its availability.

Harmonization of animal health systems, in regard to data collection and accessibility is encouraged, to provide useful and reliable data, both at the national and the international levels for both animal and human health.

Risk assessment plays an important role in in risk of introduction of animal diseases. These are mostly carried out based on available data and an animal health information system is only as good as the data it contains (FAO, 2011; Humblet et al., 2016). However, most of the data required to fully evaluate the extent of a health issue, are generally not available or non-existent. Owing to the lack of relevant data and the very short period of time usually allowed to assess animal health risk on particular topics, many institutions use a qualitative risk method for evaluating animal health risks or crises (Dufour et al., 2011). For this reason, qualitative risk assessment is more in use as reflected in the answers of the respondents. There was no difference between the quantitative and semi-qualitative approach used, which is to be expected, as the semi-qualitative approach could be considered as quantitative.

The risk assessment question following the definition by Dufour et al., (2011) was divided into 3 categories: release assessment (estimation of the likelihood of a hazard being introduced in a particular zone); exposure assessment: estimation of the likelihood of susceptible humans or animals being exposed to the hazards) and consequences assessment: describing the results of the release and exposure of the hazard for humans and animals (health and/or economic consequences). Most of the respondents worked in those 3 categories which combined produce a risk estimation (Dufour et al., 2011). This is consistent with the three most important features they require of a risk analysis platform: a spread assessment, pathways of introduction of a disease up to the border and a quick risk assessment. Further, this corresponds to the fact that scientific panels must often make their assessment over a very short time period, from a couple of days to a few weeks (De Vos et al., 2019; Sharma & Baldock, 1999). Moreover, most commonly, risk assessments are developed to assess the risk for a single disease and risk introduction pathway (De Vos et al., 2019).

As to the perceptions on using animal health platforms or risk analysis tools, the experts survey showed that data accessibility is key, which was also the main issue encountered by the respondents. Difficulties in understanding the page could be due to the fact that a page was not adapted to the respondents' countries' needs and there may have been a language barrier.

The feature that they most looked for was again data accessibility and availability and being able to extract this information and its results. Comments stated that certain platforms do not allow for ease of data downloading (e.g. the data had to be copied from the page and pasted in Excel which is time consuming and prone to errors). The display of the information and its extraction is the main limiting feature

As previously mentioned, experts' location and the one from where they carried out their professional activity both widely affected the efficiency of their interaction with the platform. No assumption on the reason of such a limitation per country could be made from this survey. However, both limited internet connection and knowledge on numerical technologies can be listed. It would benefit future research to compare the functionality of different national health systems. Experts could be asked what the constraints of their own national health systems are and if they know how different it can be from other national systems. Also, they could be asked if they think that standardisation of made efforts can help to improve the effectiveness of such systems. "One Health" is now a goal for the scientific community. However, non-standardised efforts, surveillance systems and collected dataset are still highly limiting.

The user's satisfaction for using platforms remains high suggesting that the platform choice is not only related to the required information. The platform functionality per se also attracts the user. A focus on increasing the platform functionalities and customising its interface can therefore lead to a higher usage. Providing user friendliness remains one of the most important points to be addressed. A suggestion could be to add to the platform a good online training course.

Global animal health information systems were the most mentioned during the survey. The main one was the World Animal Health Information System (WAHIS) (OIE, 2019) which is the global animal health information system operated by the OIE to handle disease notification and reports from member Countries. It is mandatory for members to report disease events from the notifiable diseases list to the OIE through this system. The second one was EMPRES-i (FAO, 2014) developed by FAO and available for public access followed by Pro-MED which is hosted by the International Society for Infectious Disease and is also publicly available. National animal health information systems were also mentioned, but not specified. Although not on a global scale, these are as important as the international ones. Sharma and Baldock, (1999) described them as:" the complete system responsible for handling information about the health of livestock on a country". Therefore, if there were better access to these animal health information systems, it would be very useful for research professionals in non-government institutions who would not normally see these data due to governmental restriction or privacy settings on its access. In addition, animal health information systems should also be used to handle information about non-production domestic animals (such as pets) and wildlife. This question was not asked, but for future works, it would be interesting to know if there is such data and how accessible the information is. This situation though can only be applied in countries where a good surveillance system is in place and data is collected and collated into a computerised system. Not all countries have such infrastructure, which makes professionals rely on global systems, particularly WAHIS.

The preference of platform does not improve the level of satisfaction. This could be because the choice of platform is mostly focused on the information available on it, more than finding the platform extremely good.

5. CONCLUSION

As diseases evolve and change through time, and countries are becoming more efficient at recording disease events, updating systems is the way to move forward. Surveys such as this one give insights of what can be done to improve current animal information systems. This survey provided a general overview of the needs, preferences and constraints that professionals have with current animal information systems or risk analysis tools. From these results, it is clear that for professionals who work in animal and public health, epidemiology and surveillance, animal health systems and risk analysis tools are used in their daily work.

Not only to obtain data, but also to produce reports, and gather disease information. The overall majority is homogenous in what preferences they have regarding the type of information, and from many different parts of the world. It is essential for animal information systems not only to contain data on incidence and cases but also be more specific regarding risk pathways and spread assessment. The data or information should be i) easily accessible keeping in consideration privacy issues, and accessible from different regions of the world as well as ii) user friendly. Requirements for ease and flexibility of data extraction were highly rated. Standard data formats were preferred as this expedited the work required for risk estimation analyses or simple descriptive report production. This could ease and strengthen analysis done by different professionals, which would improve surveillance and as such impede future animal disease incursions.

Acknowledgments

The authors would like to thank the colleagues who contributed to the development, reviewing (M. Dispas and V. De Waele), implementation and outreach of the survey, as well as all the colleagues around the world who dedicated part of their time to fill in the questionnaire. We would also like to thank the World Organisation for Animal Health (OIE), which agreed to support us in spreading out the survey through their mailing lists. This study was supported by the Federal Public Service of Health, Food Chain and Environment, as part of the MORISKIN research project RT18/2 implemented by Liège University, Hasselt University, Avia-GIS and Sciensano.

Conflict of interest statement

The authors declare no conflict of interest.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical approval

Due to the nature of the study and the low risk exposure of the participants, formal approval from an Ethics Committee was not a requirement at the time of the study.

ORCID

Claude Saegerman*https://orcid.org/0000-0001-9087-7436*

References

Bianchini, J., Humblet, M.F., Cargnel, M., Van Der Stede, Y., Koenen, F., De Clercq, K. & Saegerman, C. (2020). Prioritization of livestock transboundary diseases in Belgium using a multicriteria decision analysis tool based on drivers of emergence. Transboundary Emerging Diseases. 67(1):344-376. doi: 10.1111/tbed.13356.

Linden, A., Licoppe, A., Volpe, R., Paternostre, J., Lesenfants C., Garigliany M., Tignon M., van den Berg T., Desmecht D. & Cay A.B. (2019). Summer 2018: African swine fever virus hits north-western Europe. Transbound Emerg Dis., 66(1), 54-55. doi: 10.1111/tbed.13047.

Beard, P.M. (2016) Lumpy skin disease: a direct threat to Europe. Veterinary Record 178 (22), 557-558. http://dx.doi.org/10.1136/vr.i2800

Sambria, V., Capobianchi, M., Charrelde, R., Fyodorova, M., Gaibanig, P. et al. (2013). West Nile virus in Europe: emergence, epidemiology, diagnosis, treatment, and prevention. Clin Microbiol Infect., 19(8), 699 -704. doi: 10.1111/1469-0691.12211.

OIE (2019). World Animal Health Information System. Available at: http://www.oie.int/wahis_2/public/wahid.php/Wahidhome/Home/. [Accessed 1 April 2020]

FAO (2014). Empres-i: Global Animal Disease Information System. Food and Agriculture Organisation of the United Nations, Rome. Available at: http://empres-i.fao.org/eipws3g/ [accessed 17th March, 2020]

Humblet, M.-F., Vandeputte, S., Albert, A., Gosset, C., Kirschvink, N., Haubruge, Eric Haubruge E., Fecher-Bourgeois F., Pastoret P.-P. & Saegerman, C. (2012). Multidisciplinary and evidence-based method for prioritizing diseases of food-producing animals and zoonoses.*Emerging Infectious Diseases* , 18(4), https://doi.org/10.3201/eid1804.111151

MINTRISK (2015). The Method for INTegrated RISK assessment for infectious diseases in animals allows the risk assessment of vector-borne diseases of livestock and pets. Developed by Wageningen BioVeterinary Research and Wageningen Economic Research. Available at: https://www.wecr.wur.nl/mintrisk/ [accessed 17th March, 2020]

De Vos C.J., Taylor R.A., Simons R.R.L., Roberts H., Hulten C., De Koeijer A.A., Lyytikainen T., Napp S., Boklund A., Petie R., Soren K., Swanenburg M., Comin A., Seppa-Lassila L., Cabral M. & Snary E.L., (2019). Generic approaches for Risk Assessment of Infectious animal Disease introduction (G-RAID). EFSA supporting publication 2019:EN-1743. 87 pp. doi:10.2903/sp.efsa.2019.EN-1743.

SPARE (2010). https://spare-europe.shinyapps.io/app_spare_v2/ [accessed 17th March, 2020]

Morris, R.S. (1991). Information systems for animal health : objectives and components. *Rev. sci. tech. Off. int. Epiz.,* 1991, 10 (1), 13-23.

Lupo C., Wilmart O., Van Huffel X., Dal Pozzo F. & Saegerman C. (2016). Stakeholders' perceptions, attitudes and practices in the food chain. Food Control 66; 158-165.

OIE (2017). WAHIS+, WAHIS is modernising: be a partner in the project. Bulletin, 2 , 24-26. http://dx.doi.org/10.20506/bull.issue.2017.2.2635

OIE (2020). Manual 6, Animal health information systems. In: https://rr-asia.oie.int/wp-content/uploads/2019/09/seacfmd-manual-6.pdf (consulted at 28 June 2020).

FAO (2011). Challenges of animal health information systems and surveillance for animal disease and zoonoses. In: FAO Animal Production and Health. (2011) p. 1-124. Available online at: http://www.fao.org/3/i2415e/i2415e00.htm

Bellet, C., Humblet, M. F., Swanenburg, M., Vandeputte, S., Thebault, A., Gauchard, F., Hendrikx, P., De Vos, C., De Koeijer, A., Saegerman, C., & Sanaa, M. (2012). External Scientific EFSA (2020). Final Report. Paris (France). Specification of data collection on animal diseases to increase the preparedness of the AHAW panel to answer future mandates – CFP/EFSA/AHAW/2010/01. Report No.: EFSA-Q-2010-00903. Sponsored by the European Food Safety Authority. Available at http://www.efsa.europa.eu/fr/supporting/pub/354e.htm.(accessed March 20th , 2020).

Humblet, M.-F., Vandeputte, S., Mignot, C., Bellet, C., De Koeijer, A., Swanenburg, M., Afonso, A., Sanaa, M. & Saegerman, C. (2016). How to Assess Data Availability, Accessibility and Format for Risk Analysis? Transboundary and Emerging Diseases 63(2016) e173-e189 doi:10.1111/tbed.12328.

Dufour, B., Plee, L., Moutou, F., Boisseleau, D., Chartier, C., Durand, B., Ganiere, J.P., Guillotin, J., Lancelot, R., Saegerman, C., Thebault, A., Hattenberger, A.M., & Toma, B. (2011). A qualitative risk assessment methodology for scientific expert panels, *Rev. sci. tech. Off. int. Epiz.,* 1991, 10 (1), 13-23

Sharma, P. & Baldock, C. (1999). *Understanding animal health in Southeast Asia: Advances in the Collection, Management and Use of Animal Health Information* . Australian Centre for International Agricultural Research, Canberra, Australia, p. 3. Available at: http://aciar.gov.au/files/node/479/mn58-chapters1-6.pdf [accessed 27th March, 2020].

Figure caption

Figure 1. Map showing country of where the experts carry their professional activities (N=132)*

Legend: * 132 respondents answered specified the country.

Figure 2. Picture depicting the keywords which respondents considered best described their area of expertise

Figure 3 . Degree of usefulness according to the respondents of type of information found in animal health systems. In decreasing order by extremely useful (N= 213)

Legend: (A) Prevention measures; (B) Efficiency of currently available control measures; (C) Cases/incidence information; (D) Zoonotic potential; (E) Evolution/spread of the disease during time (days, weeks, months); (F) Mapping display of cases; (G) Vector information; (H) Etiologic agent; (I) Diagnostic methods; (J) Host; (K) Disease information (e.g. Factsheet); (L) Regulations which are in place currently regarding a specific disease; (M) Methodologies for risk analysis which have been described so far; (N) Produce risk estimation; (O) Pathogenesis of the disease; and (P) Treatment.

Figure 4 . Type of data used or needed by the respondents (N= 213)

Legend: Descriptive epidemiology: data on morbidity, mortality, spatio-temporal distribution, demography of hosts. Analytical epidemiology: factors of disease introduction, surveillance network, risk analysis.

Figure 5. Type of data sources needed and used for the respondents daily work (N=213)

Legend: Data source (A) Scientific literature (i.e. published papers in peer reviewed journals, (B) International/national databases, such as those from the OIE, WHO. EUROSTAST, FAOSTATS, EFSA, ECDC, (C) National agencies (data comes from the member states' national institution, (D) laboratories databases, (E) expert opinion, (F) Questionnaires.

Figure 6 . Hurdle(s) and constraints in obtaining data on animal health (N=213)

Legend: Data accessibility: Physical conditions in which users can obtain data (e.g. where to go, how to order, delivery time). Data availability: degree to which data can instantly accessed.

Figure 7. Forms of preferred data (N=367)

Figure 8. Types of approach, what they work on and primary objective of the risk assessments done by the respondents

Type of risk assessment approach used (N=150)

Legend: Qualitative: An assessment where the output on the likelihood of the outcome or the magnitude of the consequences are expressed in qualitative terms such as high, medium, low or negligible. Quantitative: An assessment where the outputs of the risk assessment are expressed numerically.

Type of risk assessment they work on (N=150

Legend: Release assessment: estimation of the likelihood of a hazard being introduced in a particular zone. Exposure assessment: estimation of the likelihood of susceptible humans or animals being exposed to the hazard. Consequence assessment: Describing the results of the release and exposure to the hazard for humans and animals (health and/or economic consequences).

Primary objectives of the risk assessment (N=150)

Legend : (A) Risk assessment and preparedness in areas involving origin and spread of animal diseases, including zoonoses (B) Provide stakeholders with relevant information and expert advice on issues related to disease preparedness and surveillance of animal diseases and zoonoses (C) Identify key questions for targeted research (D) Provide veterinary diagnostic laboratory services for zoonotic, epizootic and other animal notifiable diseases (E) Evaluate the need for action to support policy changes (F) Identify plausible future scenarios to be prepared to future animal incursions.

Figure 9. Features which are important for the respondents (N=150) to obtain when using a risk analysis platform/tool

Legend. (A) Spread assessment; (B) Pathways of introduction of a disease until the border; (C) produce a quick risk assessment; (D) Produce a report using the system; (E) Produce a risk assessment detailed for a single disease; (F) Produce a risk assessment for two diseases for comparison.

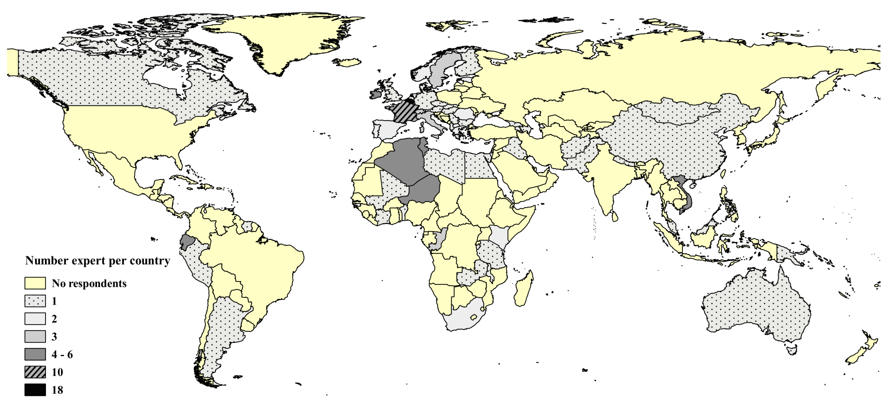
Figure 10. Main issues encountered when using animal health platforms or risk analysis tools by if they find these user friendly or not (N responses = 397)

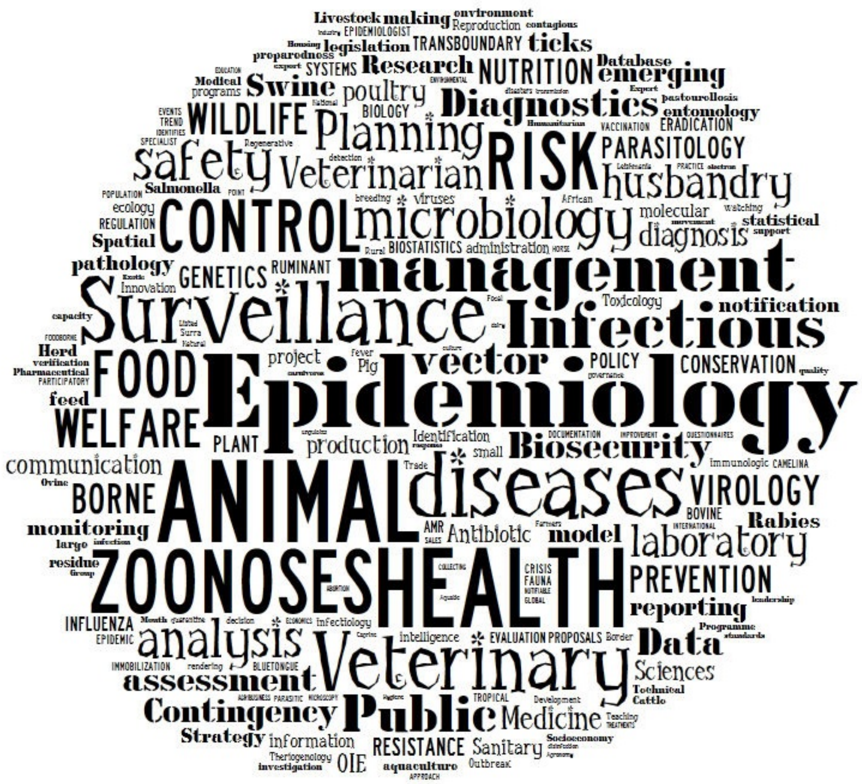
Figure 11. What is the percentage of importance of the features they look for in an animal health system (N=198)

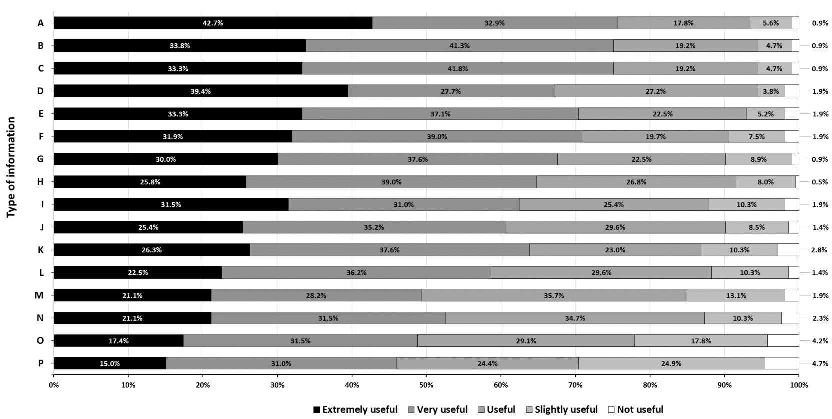
Legend: (A) Data accessibility and availability; (B) Extraction of information; (C) Extraction of results/information; (D) Display of information; (E) User friendly; (F) The way the results are displayed; (G) Easy to find during web search; (H) Risk assessment methodologies; (I) Easy contact for help, queries and other information; (J) Access software and information while off campus/work space; (K) Publications regarding the tool used; (L) Login fewer times with fewer user accounts and passwords; (M) Be able to customise the interface and functionality that you use.

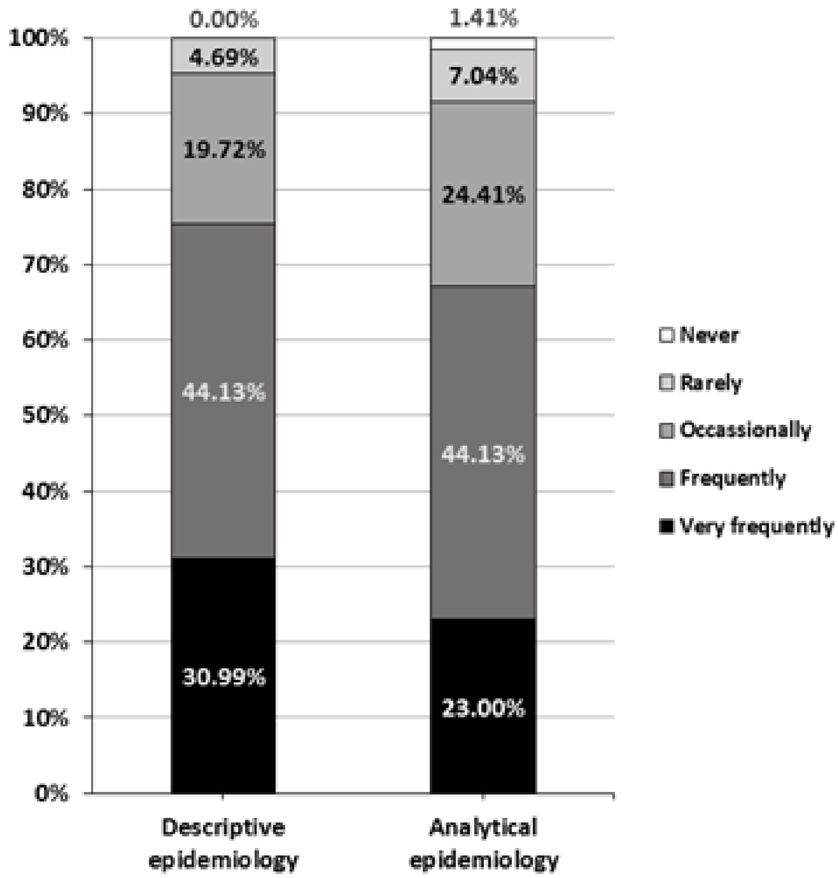
Figure 12. Boxplots of the percentage of satisfaction by degree of platform usage, most used, used and least used platform

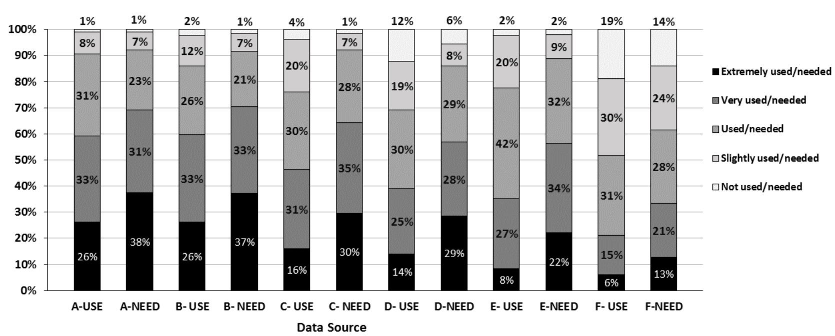
Legend: Most used (N=147); Intermediate use (N=128); Least used (N= 94). The dashed line represents the median of the score distribution between the different experts; the solid lines below and above each rectangle represent, respectively, the first and the third quartiles; adjacent lines to the whiskers represent the limits of the 95% confidence interval; small circles represent outside values.

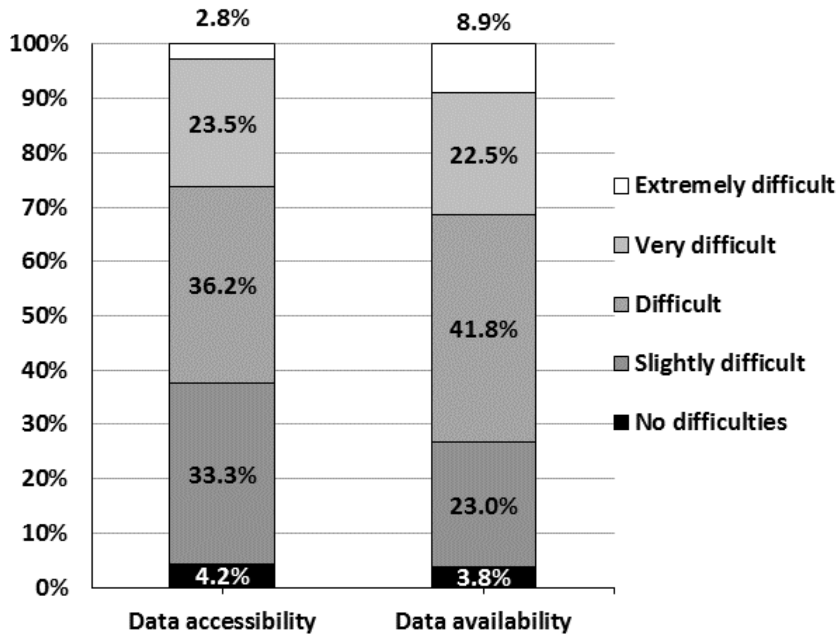



Epidemiology
ANIMAL
HEALTH
ZOONOSES
diseases
Veterinary
Surveillance
Infectious
management
CONTROL
microbiology
RISK
Planning
Diagnostics
Veterinarian
safety
husbandry
Public
FOOD
WELFARE
vector
Biosecurity
analysis
assessment
Contingency
Medicine
laboratory
VIROLOGY
PREVENTION
reporting
Data
Research
NUTRITION
emerging
WILDLIFE
Swine
poultry
PARASITOLOGY
diagnosis
molecular
statistical
GENETICS
RUMINANT
pathology
Spatial
ecology
Salmonella
communication
BORNE
monitoring
model
Rabies
Antibiotic
INFLUENZA
Sciences
Strategy
information
RESISTANCE
Sanitary
OIE
aquaculture
Outbreak
CONSERVATION
POLICY
notification
Toxicology
production
Identification
PLANT
legislation
TRANSBOUNDARY
ticks
Livestock
making
environment
Reproduction
EPIDEMIOLOGIST
SYSTEMS
Database
entomology
ERADICATION
BIOLOGY
BIOSTATISTICS
administration
Herd
feed
CRISIS
FAUNA
EVALUATION
PROPOSALS
intelligence
Cattle
Technical
Teaching
Socioeconomy
Theriogenology
investigation
BLUETONGUE
rendering
IMMOBILIZATION
EPIDEMIC
project
Pig
fever

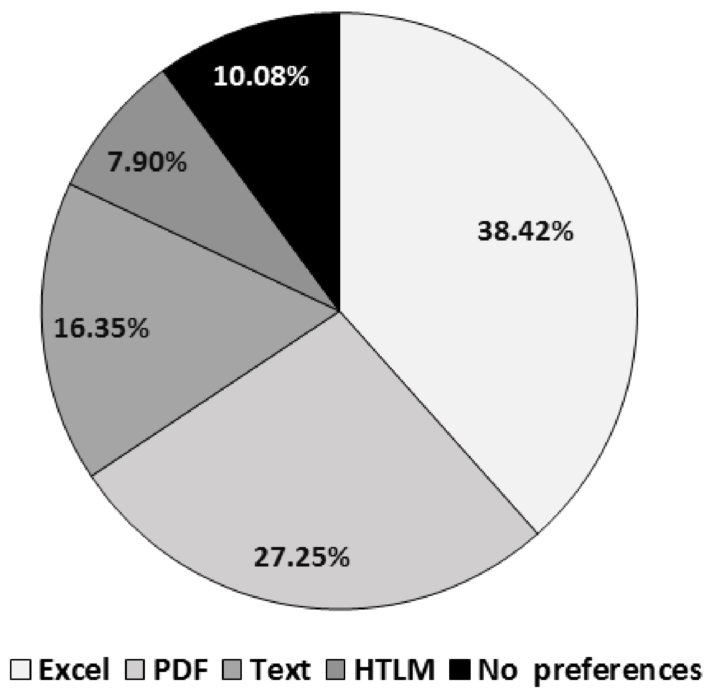

Type of information
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
42.7% 32.9% 17.8% 5.6% 0.9%
33.8% 41.3% 19.2% 4.7% 0.9%
33.3% 41.8% 19.2% 4.7% 0.9%
39.4% 27.7% 27.2% 3.8% 1.9%
33.3% 37.1% 22.5% 5.2% 1.9%
31.9% 39.0% 19.7% 7.5% 1.9%
30.0% 37.6% 22.5% 8.9% 0.9%
25.8% 39.0% 26.8% 8.0% 0.5%
31.5% 31.0% 25.4% 10.3% 1.9%
25.4% 35.2% 29.6% 8.5% 1.4%
26.3% 37.6% 23.0% 10.3% 2.8%
22.5% 36.2% 29.6% 10.3% 1.4%
21.1% 28.2% 35.7% 13.1% 1.9%
21.1% 31.5% 34.7% 10.3% 2.3%
17.4% 31.5% 29.1% 17.8% 4.2%
15.0% 31.0% 24.4% 24.9% 4.7%
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Extremely useful
Very useful
Useful
Slightly useful
Not useful


0.00%
1.41%
4.69%
7.04%
19.72%
24.41%
44.13%
44.13%
30.99%
23.00%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Never
Rarely
Occassionally
Frequently
Very frequently
Descriptive epidemiology
Analytical epidemiology

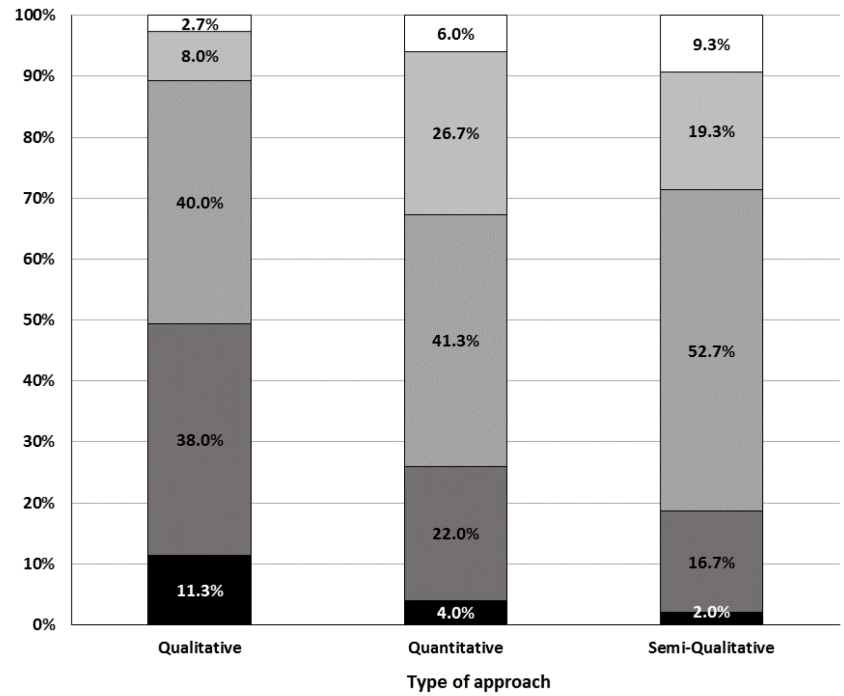

Extremely used/needed
Very used/needed
Used/needed
Slightly used/needed
Not used/needed
A-USE
A-NEED
B- USE
B- NEED
C- USE
C- NEED
D- USE
D-NEED
E- USE
E-NEED
F- USE
F-NEED
Data Source
1%
1%
2%
1%
4%
1%
12%
6%
2%
2%
19%
14%
8%
7%
12%
7%
20%
7%
19%
8%
20%
9%
30%
24%
31%
23%
26%
21%
30%
28%
30%
29%
42%
32%
31%
28%
33%
31%
33%
33%
31%
35%
25%
28%
27%
34%
15%
21%
26%
38%
26%
37%
16%
30%
14%
29%
8%
22%
6%
13%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%



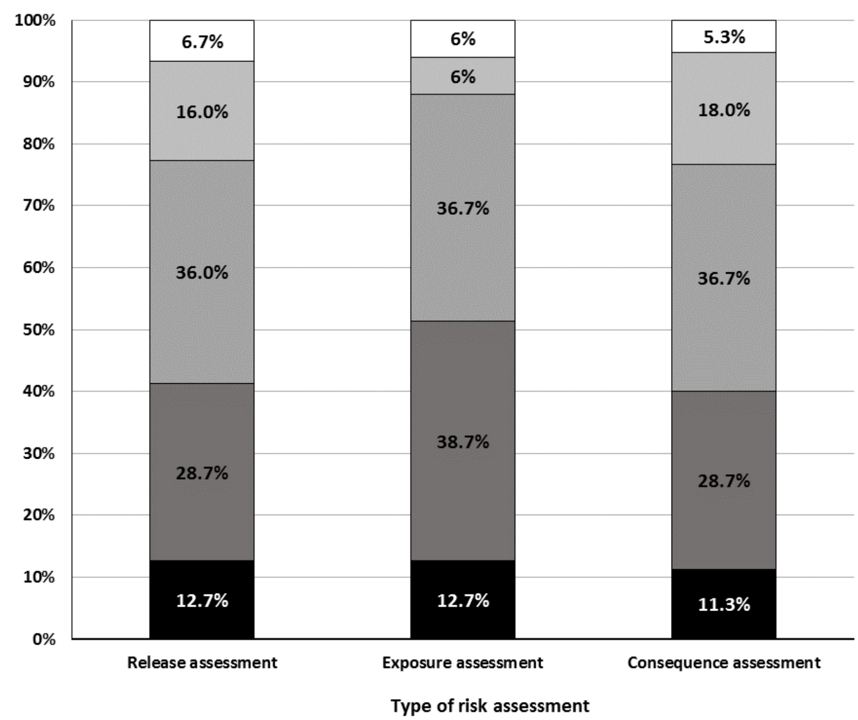
2.8%
8.9%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
23.5%
36.2%
33.3%
4.2%
22.5%
41.8%
23.0%
3.8%
Extremely difficult
Very difficult
Difficult
Slightly difficult
No difficulties
Data accessibility
Data availability



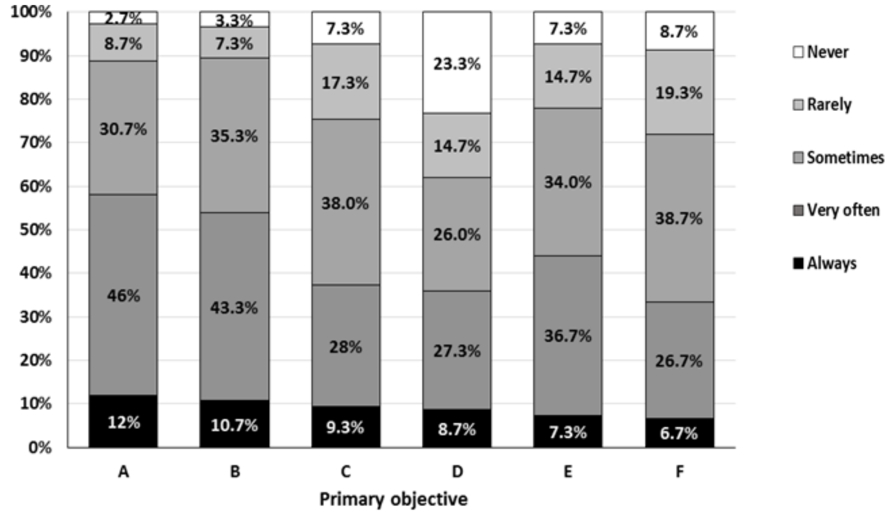
10.08%
7.90%
38.42%
16.35%
27.25%
Excel PDF Text HTLM No preferences



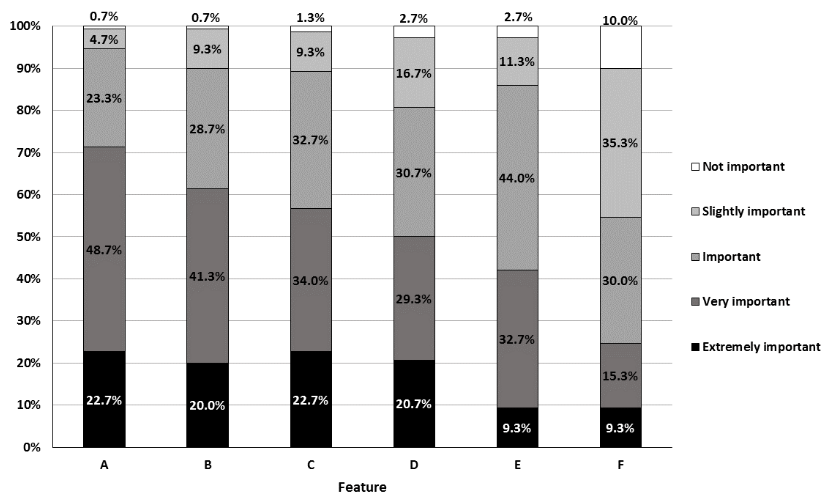
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2.7%
8.0%
40.0%
38.0%
11.3%
6.0%
26.7%
41.3%
22.0%
4.0%
9.3%
19.3%
52.7%
16.7%
2.0%
Qualitative
Quantitative
Semi-Qualitative
Type of approach



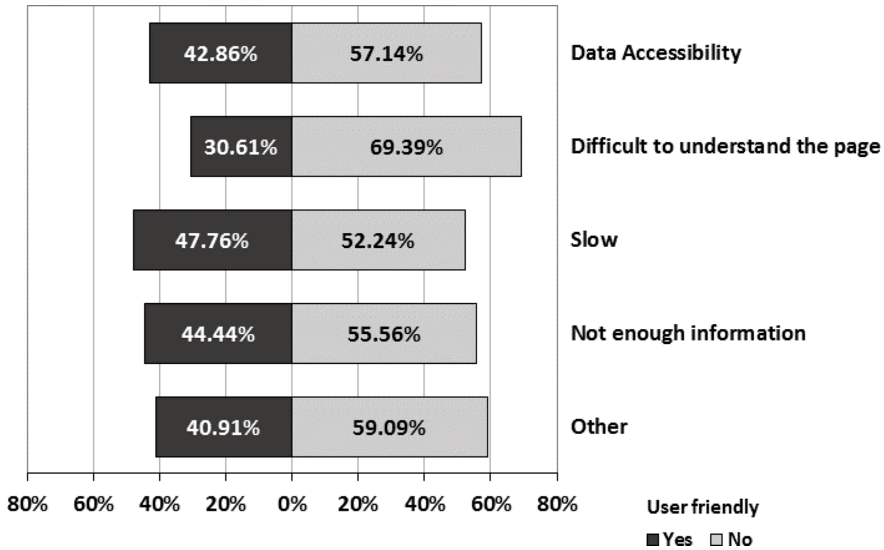
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
6.7%
16.0%
36.0%
28.7%
12.7%
6%
6%
36.7%
38.7%
12.7%
5.3%
18.0%
36.7%
28.7%
11.3%
Release assessment
Exposure assessment
Consequence assessment
Type of risk assessment

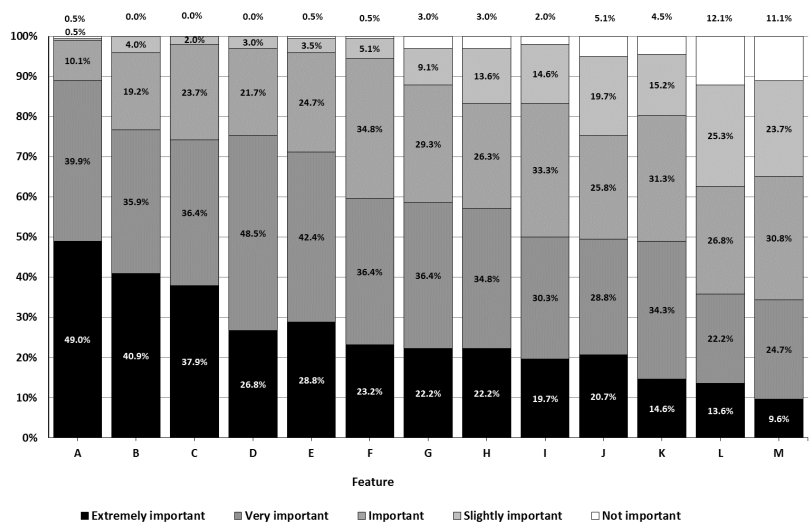


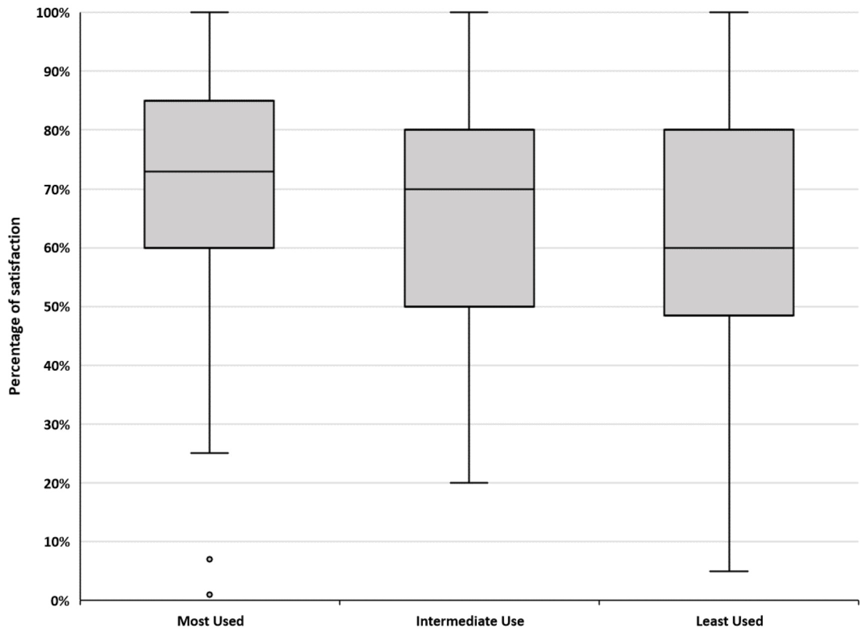
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2.7%
8.7%
30.7%
46%
12%
3.3%
7.3%
35.3%
43.3%
10.7%
7.3%
17.3%
38.0%
28%
9.3%
23.3%
14.7%
26.0%
27.3%
8.7%
7.3%
14.7%
34.0%
36.7%
7.3%
8.7%
19.3%
38.7%
26.7%
6.7%
A
B
C
D
E
F
Primary objective
Never
Rarely
Sometimes
Very often
Always



100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.7%
4.7%
23.3%
48.7%
22.7%
0.7%
9.3%
28.7%
41.3%
20.0%
1.3%
9.3%
32.7%
34.0%
22.7%
2.7%
16.7%
30.7%
29.3%
20.7%
2.7%
11.3%
44.0%
32.7%
9.3%
10.0%
35.3%
30.0%
15.3%
9.3%
A
B
C
D
E
F
Feature
Not important
Slightly important
Important
Very important
Extremely important


42.86%
57.14%
Data Accessibility
30.61%
69.39%
Difficult to understand the page
47.76%
52.24%
Slow
44.44%
55.56%
Not enough information
40.91%
59.09%
Other
80%
60%
40%
20%
0%
20%
40%
60%
80%
User friendly
Yes
No


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
A
B
C
D
E
F
G
H
I
J
K
L
M
Feature
Extremely important
Very important
Important
Slightly important
Not important
0.5%
0.5%
10.1%
39.9%
49.0%
0.0%
4.0%
19.2%
35.9%
40.9%
0.0%
2.0%
23.7%
36.4%
37.9%
0.0%
3.0%
21.7%
48.5%
26.8%
0.5%
3.5%
24.7%
42.4%
28.8%
0.5%
5.1%
34.8%
36.4%
23.2%
3.0%
9.1%
29.3%
36.4%
22.2%
3.0%
13.6%
26.3%
34.8%
22.2%
2.0%
14.6%
33.3%
30.3%
19.7%
5.1%
19.7%
25.8%
28.8%
20.7%
4.5%
15.2%
31.3%
34.3%
14.6%
12.1%
25.3%
26.8%
22.2%
13.6%
11.1%
23.7%
30.8%
24.7%
9.6%


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage of satisfaction
Most Used
Intermediate Use
Least Used