# EPIDEMIOLOGICAL SURVEILLANCE AND ON-FARM INSPECTIONS: RURAL VETERINARY NETWORK, PUBLIC-PRIVATE SECTOR RELATIONS, TRAINING OF FARMERS AND VETERINARIANS

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***Summary:*** *In the* Terrestrial Animal Health Code*, surveillance is defined as: "The systematic ongoing collection, collation, and analysis of data, and the timely dissemination of information to those who need to know so that action can be taken".*

*A well-functioning disease surveillance system provides information for planning, implementation, monitoring and evaluation of health intervention programmes.*

*The existence of a surveillance system able to provide reliable data is also necessary to document the health status of animal populations in an international trade framework and the import risk assessment process.*

*Crucial elements for a surveillance system are:*

- *organisation pre-requisites (e.g. compliance to the provisions of the* Terrestrial Animal Health Code *on quality and evaluation of Veterinary Services);*
- *proper and up-to-date training of personnel (field services, central structures and laboratory personnel);*
- *proper knowledge of target populations, that implies the existence of an identification system for animals and herds;*
- *proper knowledge of the time and space dynamics of the target population, that implies the existence of a traceability system;*
- *generation of trustable information on the health status of the country's animal populations and of individual animals intended for trade (i.e. trustable certificates), that implies the existence of a system for quality management and possibly 'formalised' quality assurance systems;*
- *scientifically valid and fully documented methods for the analysis of data generated by the surveillance system;*
- *revision procedures aimed at the continuous improvement of the overall system.*

*A questionnaire was sent to all Member Countries of the OIE Regional Commission for Europe for a self-evaluation of their surveillance systems. Thirty countries sent a reply to the questionnaire.*

*Several instances were considered of crucial importance by most of the countries in order to attain effective epidemiological surveillance. These include factors that can facilitate the immediate notification of suspected cases of a disease, such as compensation for farmers or economical sanctions for farmers and veterinarians who do not report on time.*

*Extreme importance is given to the development of the preliminary analysis to identify the main risk factors of each productive system and define priorities for the epidemiological surveillance activities.*

*Finally, ongoing training courses for all stakeholders involved in animal production, including veterinarians and farmers, are absolutely essential to maintain an effective epidemiological surveillance system.*

***Key words:*** Europe – surveillance – network – rural area – training – public service – private sector

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## Introduction

### a. What is surveillance?

In the *Terrestrial Animal Health Code*, in the specific appendix on general guidelines for animal health surveillance, surveillance is defined as: "The systematic ongoing collection, collation, and analysis of data, and the timely dissemination of information to those who need to know so that action can be taken" [14]. A well-functioning disease surveillance system provides information for planning, implementation, monitoring and evaluation of health intervention programmes. The existence of a surveillance system able to provide reliable data is also necessary to document the health status of animal populations in an international trade framework and the import risk assessment process.

Surveillance systems may have several objectives. In general, surveillance is aimed at demonstrating the absence of disease or infection, determining the occurrence or distribution of disease or infection, while also detecting as early as possible exotic or emerging diseases.

The type of surveillance applied depends on the outputs needed to support decision-making. Animal health surveillance is an essential component necessary to detect diseases, monitor disease trends, control endemic and exotic diseases, support claims for freedom from disease or infection, provide data to support the risk analysis process for both animal health and/or public health purposes, and to substantiate the rationale for sanitary measures. Surveillance data underpin the quality of disease status reports and should satisfy information requirements for accurate risk analysis both for international trade and for national decision making [14].

The physical components of a surveillance network system are the following [7]:

- the official veterinary service,
- the official veterinary diagnostic laboratories or any other laboratory approved by the competent authority,
- the approved veterinarian or the official veterinarian responsible for the holding,
- the owner or any other natural or legal person responsible for the holding,
- the herds, and
- a computer database.

A proper running of a surveillance system also requires defined operating procedures for sampling, testing, vaccination, data collection, entry, storage, transfer, processing, analysis, etc.

This means that the design and implementation of a surveillance system is influenced by varying factors, such as the particular objectives or outcomes to be achieved, the processes employed for data and information collection, and, last but not least, the structure of the Veterinary Services. Therefore, uniformity in the structure of surveillance systems is neither achievable nor recommended.

Depending on the objectives, the resources and the available infrastructure, surveillance can be performed in a number of different ways, in particular:

- surveillance may be focussed on a specific pathogen or may be generally aimed at any relevant health problem;
- surveillance may be based on active or passive collection of data;
- data may be collected from the entire population under study or from a sample extracted from the population; in case of sample collection of data, the units for observation may be randomly selected or not.

None of the above-listed options is *a priori* preferable to the other: pathogen specific surveillance (i.e. surveillance systems aimed at the detection of specific pathogens by using serological, bacteriological or other laboratory tools) may be used, for example, to monitor the progress of a control programme, while surveillance of exotic diseases is usually of the non-specific type (e.g. clinical surveillance or abattoir detection of syndromes by post-mortem inspection [9]).

The wide flexibility required in the design and running of a surveillance system is however constrained by some pre-requisites and crucial elements that must be fulfilled by a surveillance system.

These pre-requisites and crucial elements are:

- organisation pre-requisites (e.g. compliance to the provisions of the *Terrestrial Animal Health Code* on quality and evaluation of Veterinary Services);
- proper and up-to-date training of personnel (field services, central structures and laboratory personnel);
- proper knowledge of target populations, that implies the existence of an identification system for animals and herds;
- proper knowledge of the time and space dynamics of the target population, that implies the existence of a traceability system;
- generation of trustable information on the health status of the country's animal populations and of individual animals intended for trade (i.e. trustable certificates), that implies the existence of a system for quality management and possibly 'formalised' quality assurance systems;
- scientifically valid and fully documented methods for the analysis of data generated by the surveillance system;
- revision procedures aimed at the continuous improvement of the overall system.

## b. The questionnaire

A questionnaire on surveillance systems was sent to all Member Countries of the OIE Regional Commission for Europe. Thirty countries sent a reply to the questionnaire. Responding countries were Albania, Armenia, Austria, Azerbaijan, Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, France, Germany, Georgia, Greece, Iceland, Israel, Italy, Latvia, Luxembourg, the Netherlands, Poland, Portugal, Romania, Serbia and Montenegro, Slovakia, Sweden, Switzerland, Ukraine and the United Kingdom.

## 1. Crucial factors for surveillance

### 1.1. Organisation pre-requisites

The following organisation factors are crucial for a proper running of surveillance systems:

(a) compliance to the provisions of the *Terrestrial Animal Health Code* on quality and evaluation of Veterinary Services;

(b) clearly define the responsibilities of key personnel:

- specify the responsibility, authority and interrelationships of all personnel who manage, perform or verify activities affecting the reliability of the surveillance system;
- have a technical management which has overall responsibility for the technical operations and supervision of the resources needed to ensure the requirements for the surveillance system;

(c) define the organisation and management structure of the surveillance system, its place in the Veterinary Service, and the relationships between surveillance system management, technical operations and support services;

(d) provide adequate supervision of personnel carrying out surveillance activities, including trainees, by persons familiar with methods, procedures and purposes of the surveillance system, and with the assessment of data and information generated by the system;

(e) have arrangements to ensure that their management and personnel are free from any undue internal and external commercial, financial and other pressures and influences that may adversely affect the reliability of the surveillance system;

(f) have policies and procedures to ensure the protection of data and information generated by the surveillance system, including procedures for data transmission;

(g) have managerial and technical personnel with the authority and resources needed to:

- carry out their duties;
- identify the occurrence of deviations from the surveillance system rules or from the procedures for performing surveillance activities.

### 1.2. Proper training of personnel

A basic understanding of epidemiology is critical for epidemiological surveillance, emergency preparedness, outbreak investigations, and prompt decision-making in emergency situations. Different types of training are required:

- for national or sub-national epidemiologists responsible for the planning and monitoring of disease control programmes and the collection and analysis of animal health information;
- for regional or provincial staff responsible for the implementation of disease control programmes, surveys and surveillance activities;
- for local or district veterinary staff responsible for much of the field work involved in disease surveillance.

### 1.3. Proper knowledge of the target populations

According to the *Terrestrial Animal Health Code*, surveillance should be carried out in such a way as to take into account, ideally, all animal species susceptible to a particular infection in a country, zone or compartment. The surveillance activity may cover all individuals in the population or part of them. When surveillance is conducted only on a subpopulation, care should be taken regarding the inferences made from the results.

The existence of an identification and registration system for animals and animal holdings is often crucial for proper action planning [4]. An example of an epidemiological surveillance system based on the identification and registration of bovine animals is the Israel Computerised Animal Health Monitoring System (ICAHMS). The ICAHMS was implemented in 1961, to provide relevant information on health emergencies, facilitate epidemiological investigations and provide information to plan appropriate strategies for animal disease control.

Animal identification and registration is the basis of any traceability system for animals and animal products.

Animals can be identified either individually or as homogeneous groups, depending on the objectives of the system. A range of identification tools can be used in the implementation of a traceability system based on the identification of an animal (e.g. brands, tattoos, ear tags and electronic transponders). However, the identification must be permanent, tamper-proof and cause no harm to the animal. Identifiers should not be reused, and must be easy to apply and read [4].

An animal identification and registration system must identify and archive both animals and holdings or herds. The concept of a holding can be defined differently according to local conditions. For example, in the European Union, 'holding' means "any establishment, construction or, in the case of an open-air farm, any place in which animals are held, kept or handled" [5]. In other farming conditions, pastures, villages, etc. can fit the concept of a holding.

### 1.4. Proper knowledge of the time and space dynamics of the target population

The knowledge of the dynamics of the target population implies the existence of a traceability system. For the purposes of veterinary medicine, the need to trace the origin of animals arises as soon as control programmes for infectious diseases are implemented in a population. In many cases, the success of a control programme is linked to the ability to trace the origin of an infected animal. An early example of traceback is the Market Cattle Identification (MCI) programme first applied in the 1950s in the United States of America [12]. The MCI programme was based on the identification and registration of marketed cattle, which allowed traceback of infection to the herd of origin from animals which gave positive test results at slaughter.

Modern technologies (internet, software for the management of geographical information, etc.) can be applied to build on-line systems to increase the efficacy and efficiency of the management of health emergencies [2].

Globalisation of trade complicates the identification of the origin of the animals traded. Even within the European Union, where a unique registration and traceability system has been adopted, the recent epidemics of bluetongue in Belgium, France, Germany and the Netherlands have shown that IT problems, such as the lack of reciprocal transparency of the national registration systems, may delay the effective traceback of animals originating from infected EU member States.

### 1.5. Existence of a system for quality management

According to the *Terrestrial Animal Health Code*, surveillance systems should incorporate the principles of quality assurance and be subjected to periodic auditing to ensure that all components of the system function and provide verifiable documentation of procedures and basic checks to detect significant deviations from procedures documented in the design.

Formal quality assurance systems are already required for some sub-contractors of the veterinary services. In the European Union, for example, since 11 November 1998, laboratories are no longer able to conduct tests for the official control of food products, unless the criteria set by the European Standards UNI/EN 45000 are met [6]. The requirement for quality assurance systems is progressively expanding to sectors other than food testing.

A debate is ongoing on specific aspects of the application of quality assurance principles to veterinary services ([1], [3], [8], [10], [11], [13]). The main problem is the partially different legal status of the veterinary services in the various countries (inspection bodies, certification bodies, etc.) that implies the adoption of different international norms for the quality assurance of the services delivered.

In all cases, the principles of quality assurance require that the Veterinary Service establishes and maintains procedures to control all documents that form part of its surveillance system, such as regulations, standards, other normative documents, as well as drawings, software, specifications, instructions and manuals. The Veterinary Service should also have written instructions for all relevant surveillance activities. All instructions, standards, manuals and reference data relevant to the work should be kept up to date and readily available to all the personnel involved.

### 1.6. Proper analysis of data

Surveillance data should be analysed using appropriate methodologies and at the appropriate organisational levels, to facilitate effective decision making, whether it be planning interventions or demonstrating status. Methodologies for the analysis of surveillance data should be flexible to deal with the complexity of real-life situations. No single method is applicable in all cases. Different methodologies may be needed to accommodate the relevant pathogens, varying production and surveillance systems and the type and amount of data and information available.

Therefore, the analysis of surveillance data needs to be performed by specialised personnel. Furthermore, consistency in the application of different methodologies is essential, in order to ensure fairness and rationality, consistency in decision making and ease of understanding. In order to gather the necessary specialised personnel and to ensure consistency in the application of methodologies, the analysis of data should be performed at national level rather than at sub-national or regional level and by specialised centers for epidemiology, similar to those implemented, for example, in the United States (Centers for Epidemiology and Animal Health, APHIS, USDA, Ft. Collins, Co.), in Australia (Bureau of Rural Sciences, Canberra), in Canada (Canadian Food Inspection Agency), and in the United Kingdom (Centre for Epidemiology and Risk Analysis of the Veterinary Laboratory Agency).

## 2. Results of the questionnaire

A questionnaire was sent to all Member Countries of the OIE Regional Commission for Europe to collect data and inputs on how the different countries run their epidemiological surveillance activities and identify priorities, in a process of self-evaluation of their surveillance systems. Thirty countries sent a reply to the questionnaire.

Several instances were considered of crucial importance by most countries in order to attain effective epidemiological surveillance.

A part of these deals with specific economic concerns, such as the necessity to distribute adequate compensation to farmers for the animals killed or the implementation of sanctions for those farmers or veterinarians who do not report suspected cases on time.

Other aspects concern the necessity to hold ongoing training courses for all stakeholders, including veterinarians, farmers, etc.

Several countries, furthermore, attribute extreme importance to preliminary analysis in order to identify the main risk factors for each animal production system and indicate the priorities for epidemiological surveillance activities.

This issue is considered particularly important also because this analysis would provide information on how the different animal production activities develop on the territory, inevitably raising the issue of possibly programming installation modalities for productive facilities in the future. Considering the number of implications, it would be necessary to deal with this in a separate section, as well as with the issue of how the expenses connected to the eradication of the disease should be distributed between the public and private sectors. This is another significant factor for the effectiveness of the epidemiological surveillance system, which can influence the development of the animal production system.

Most countries (57%) rated their surveillance system as ‘good’, while a few non EU countries (3%) classified it as ‘barely acceptable’ (Figure 1).

Except two countries (Iceland and Estonia), all the responding countries had at least one outbreak of at least one of the following diseases during the last 10 years: foot and mouth disease, bluetongue, highly pathogenic avian influenza (HPAI), Newcastle disease, swine vesicular disease, African horse sickness, African swine fever, classical swine fever, contagious bovine pleuropneumonia, vesicular stomatitis, bovine spongiform encephalopathy (BSE). The most frequently experienced disease (79% of countries) was Newcastle disease, followed by HPAI (71%) and BSE (57%) (Figure 2).

Concerning the measures useful to improve the surveillance network, most countries (89%) considered the compensation to livestock owners for the slaughter and destruction of animals during a disease outbreak as very important, and only one country (3.6%) classified it as of minor importance. Three other measures were rated as ‘important’ to ‘very important’ by more than 80% of the responding countries, namely, the adoption of economic sanctions for livestock owners who do not report a disease/suspect case, the withdrawal of public subsidies and allowances for livestock owners who do not report a disease/suspect case, and the adoption of economic sanctions for veterinarians who do not report a disease/suspect case (Figure 3).

Among the activities useful to improve the surveillance network, three were classified as ‘very important’ by 80% or more of the responding countries: the implementation of surveys for the definition of risk factors and subsequent surveillance schedule (79%), the organisation of specialised training courses for public veterinarians (90%) and the organisation of specialised training courses for private veterinarians (83%). Courses for animal owners and veterinary technicians, were considered ‘very important’ by less than 60% of the responding countries (Figure 4).

More than 80% of the responding countries considered the initial training provided to veterinary students in universities regarding epidemiological surveillance to be satisfactory (Figure 5).

Almost all (97%) the responding countries organised refreshing courses for public veterinarians and 80% also for private veterinarians (Figure 6). Nevertheless, only 43% of the countries made compulsory the refreshing courses for private veterinarians (Figure 5). The moderate importance attached to the training courses for non-veterinarians (Figure 4) is confirmed by the lower number of countries organising such courses (Figure 6).

The participation to international inter-laboratory exchange programmes was very variable depending on the disease (Figure 7a), varying from 10% of countries in the cases of lumpy skin disease, Rift Valley fever, peste des petits ruminants and vesicular stomatitis, to a maximum of 90% of countries in the case of highly pathogenic avian influenza.

The ability to analyse epidemiological data generated by the surveillance network was considered at least satisfactory by 90% of the countries (Figure 8), while one country (3.3%) considered it 'barely acceptable' and two countries (6.7%) considered their ability to analyse surveillance data as unsatisfactory.

The total number of veterinarians involved in epidemiological surveillance (Figure 9a) was extremely variable from country to country, from a minimum of 0.02 veterinarians per 100,000 inhabitants to a maximum of 77.7 veterinarians per 100,000.

In general, epidemiological surveillance was not a source of great expenditures for the European countries, varying from a minimum of 0.00000005% to a maximum of 0.1% of GDP (Figure 10).

## Conclusions

Based on the results of the questionnaire, some areas of improvement of surveillance systems in the European countries may be identified. They mainly concern:

- the training of farmers and lay personnel of the veterinary services;
- the training of private veterinarians;
- the formal inclusion of private veterinarians in the surveillance networks and the issuing of obligations concerning the reporting of suspected cases;
- the ability of trained personnel working in specialised centers for epidemiology to analyse surveillance data;
- the compensation to livestock owners for the culling and destruction of animals during a disease outbreak, the adoption of economic sanctions for livestock owners who do not report suspected cases, and the withdrawal of public subsidies and allowances for livestock owners who do not report suspected cases.

## Acknowledgment

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**Figure 1**

**Do you think the surveillance network in your country is adequate for an early detection of the main infectious animal diseases (for example foot and mouth disease (FMD), highly pathogenic avian influenza (HPAI), etc.)?**

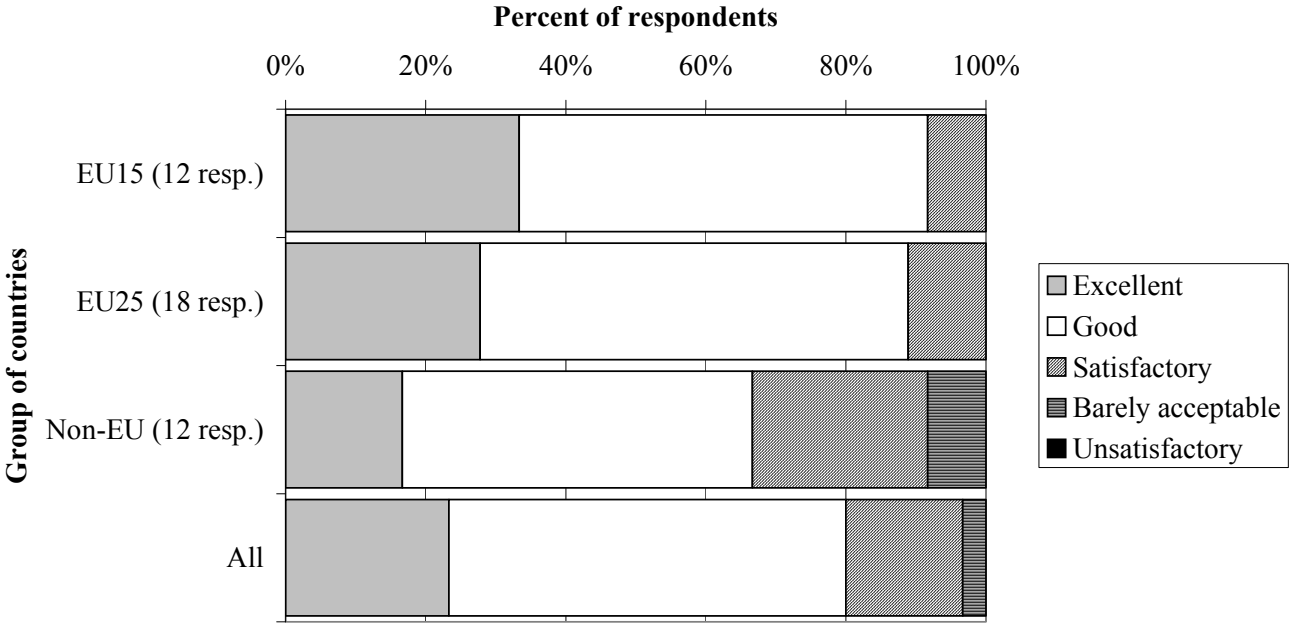
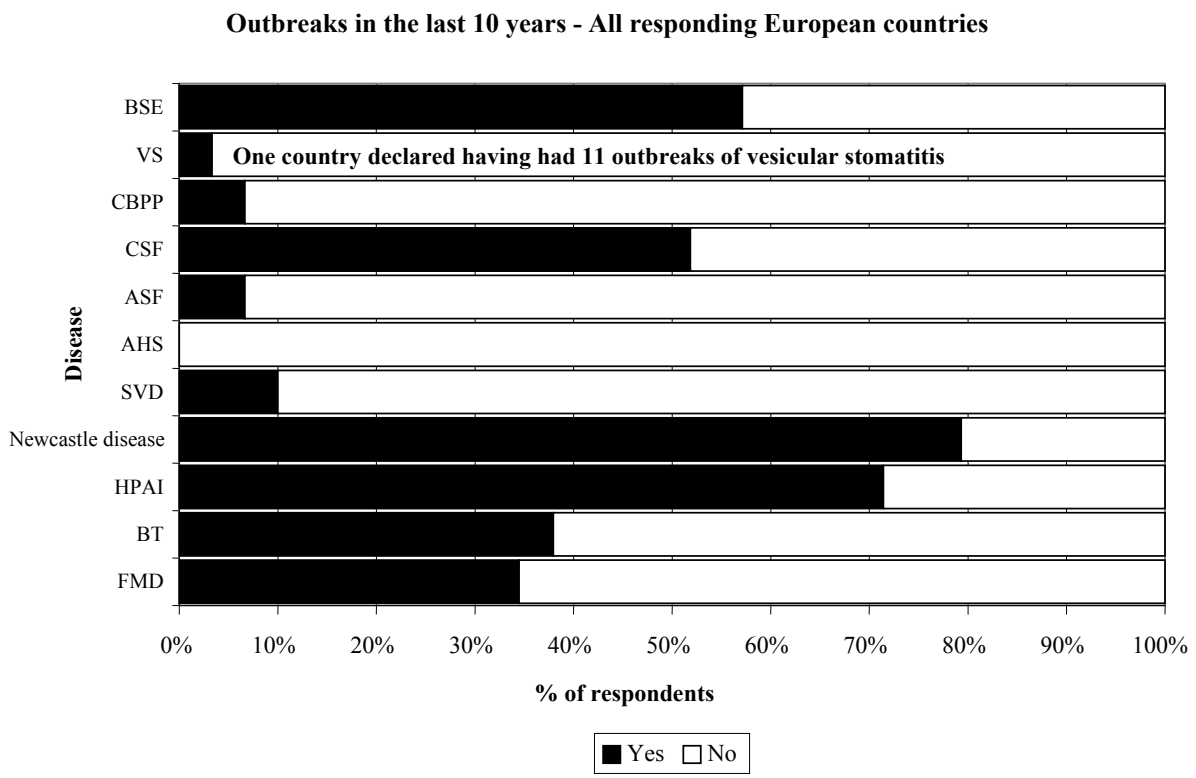


**Figure 2**

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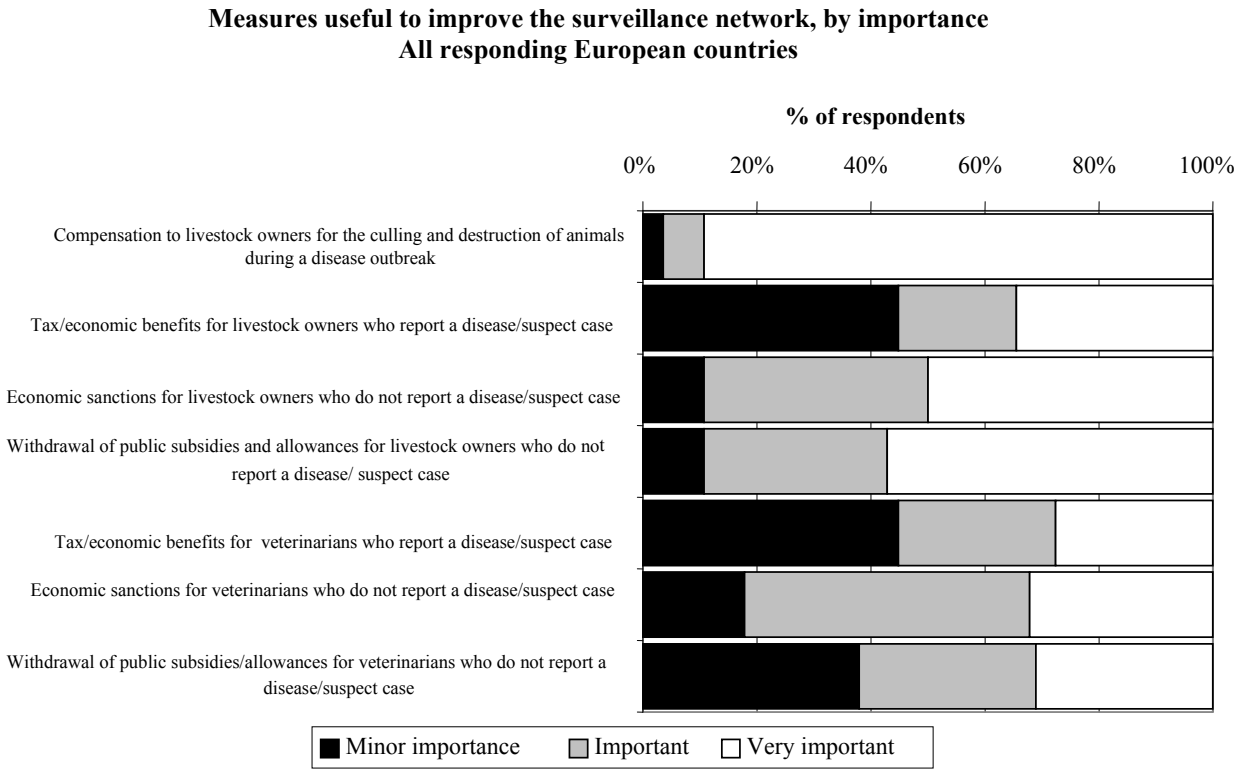
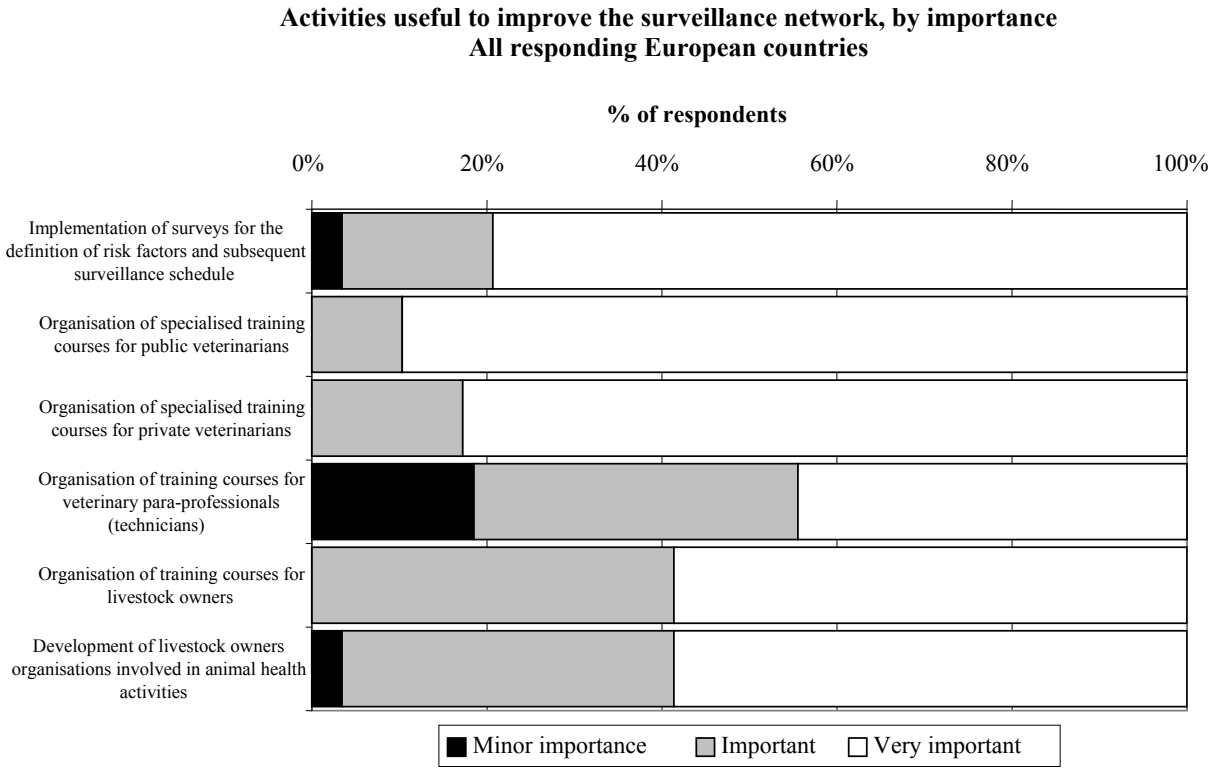


**Figure 4**

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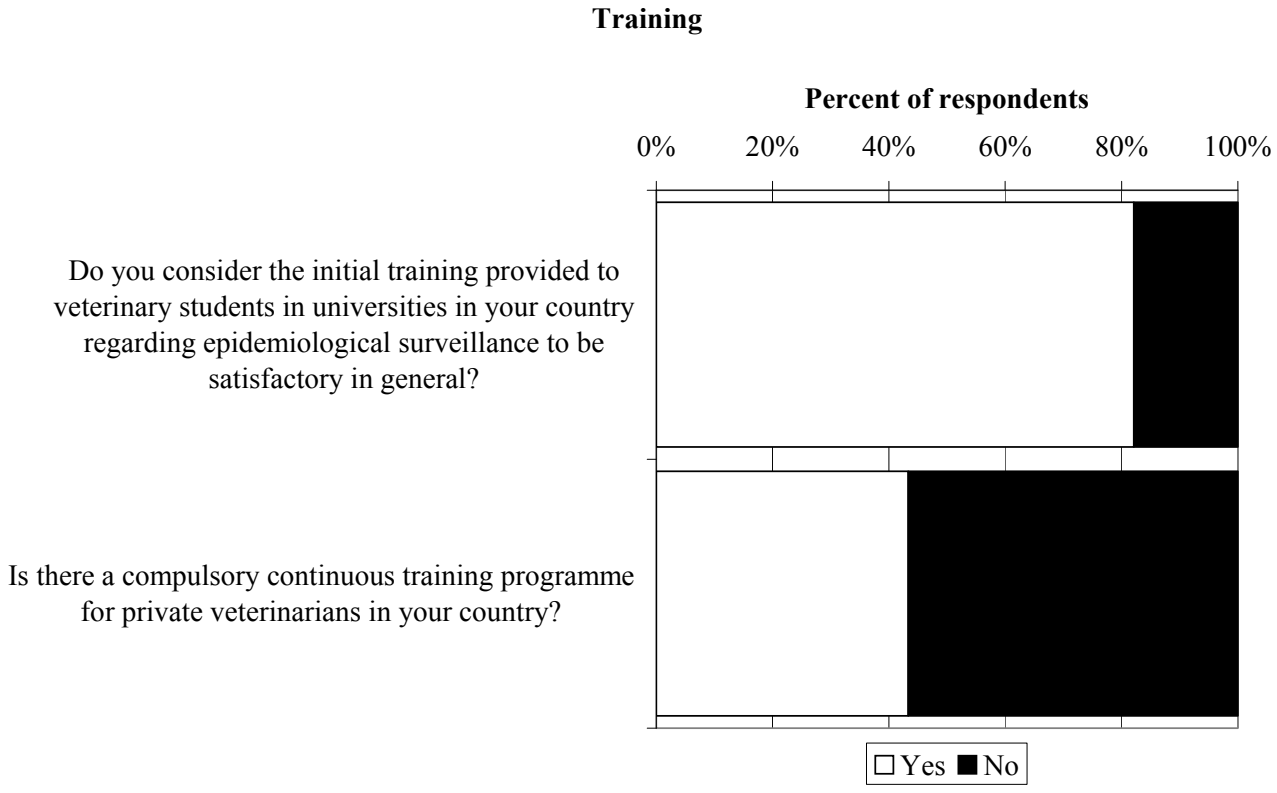

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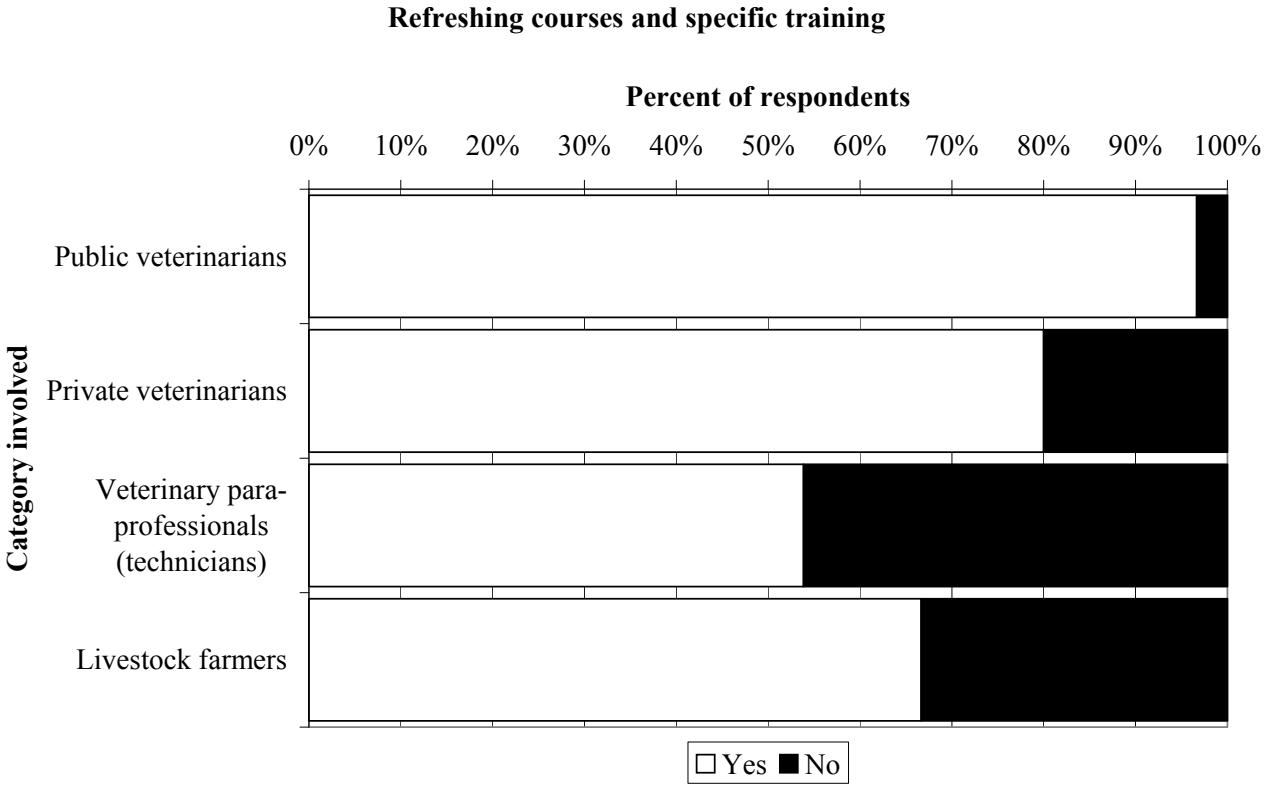


**Figure 7a**

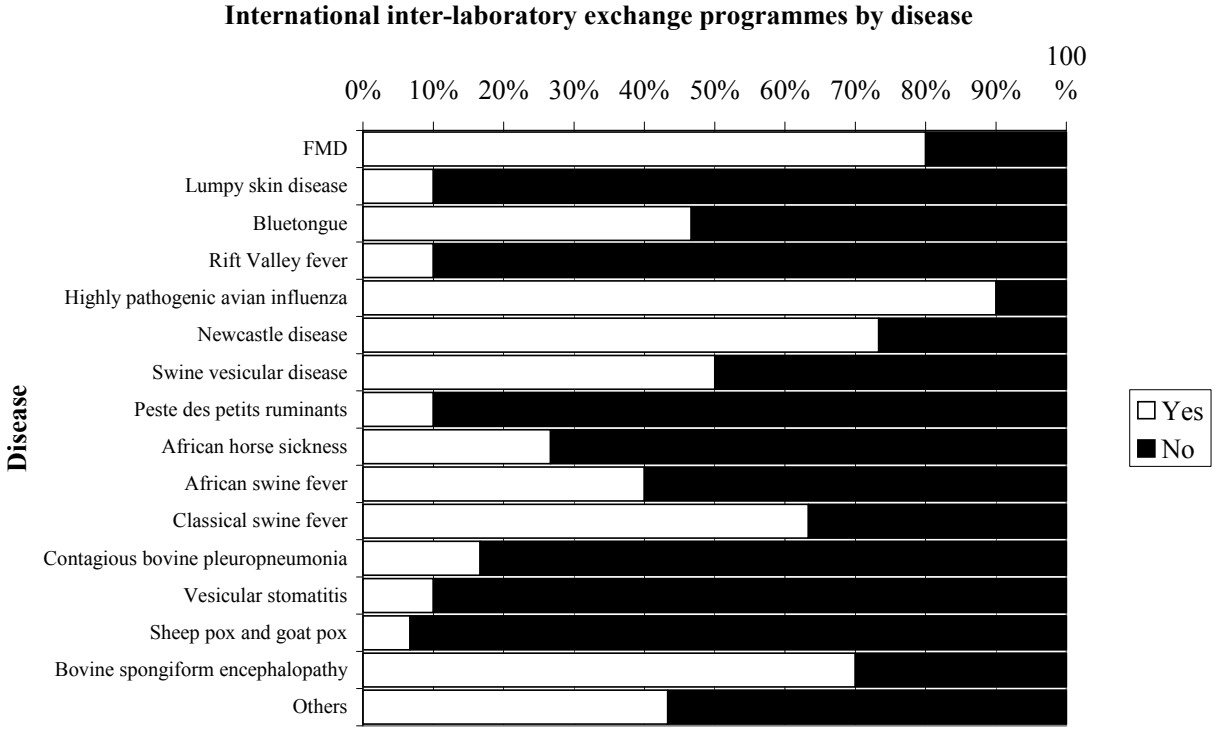

**Figure 7b**

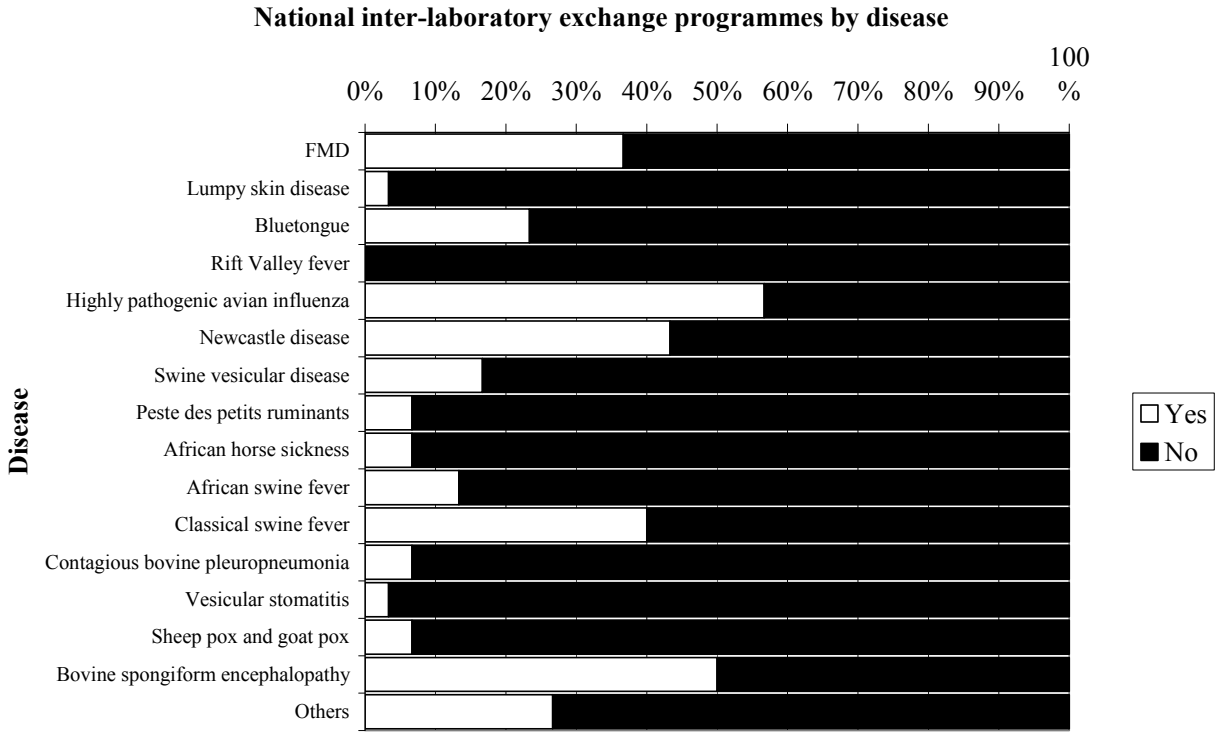


**Figure 8**

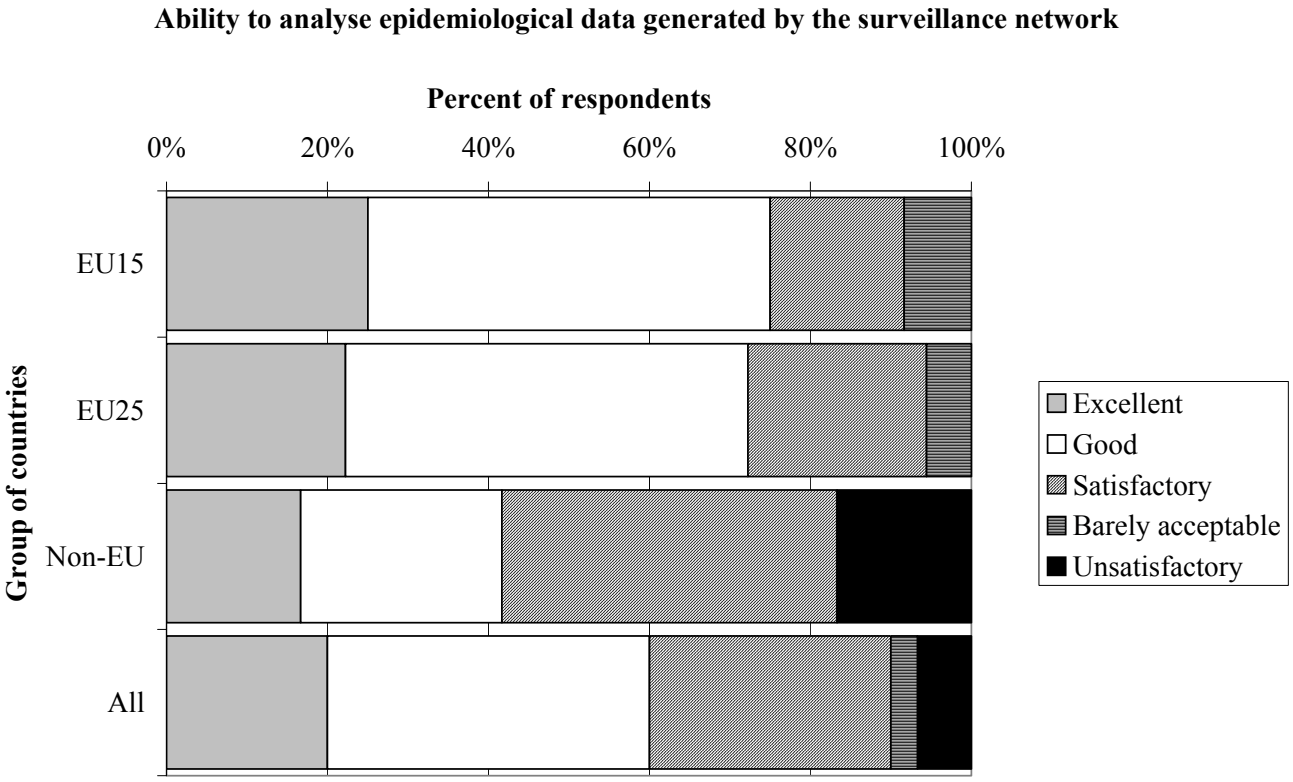

**Figure 9a**

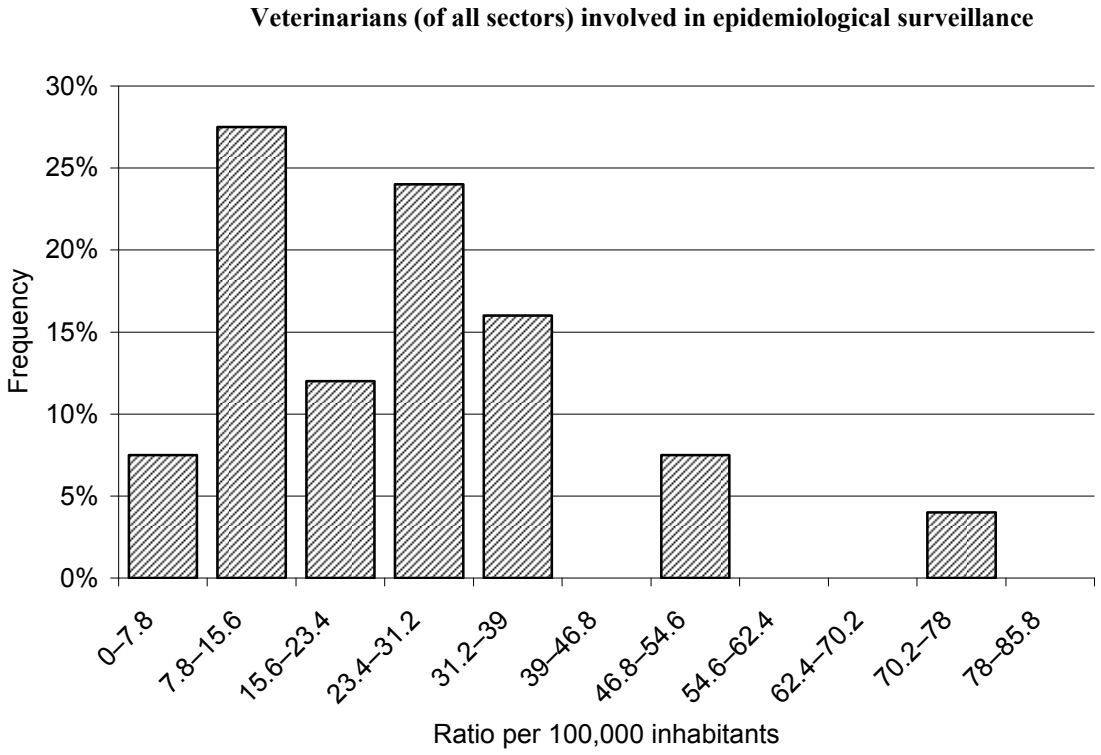


**Figure 9b**

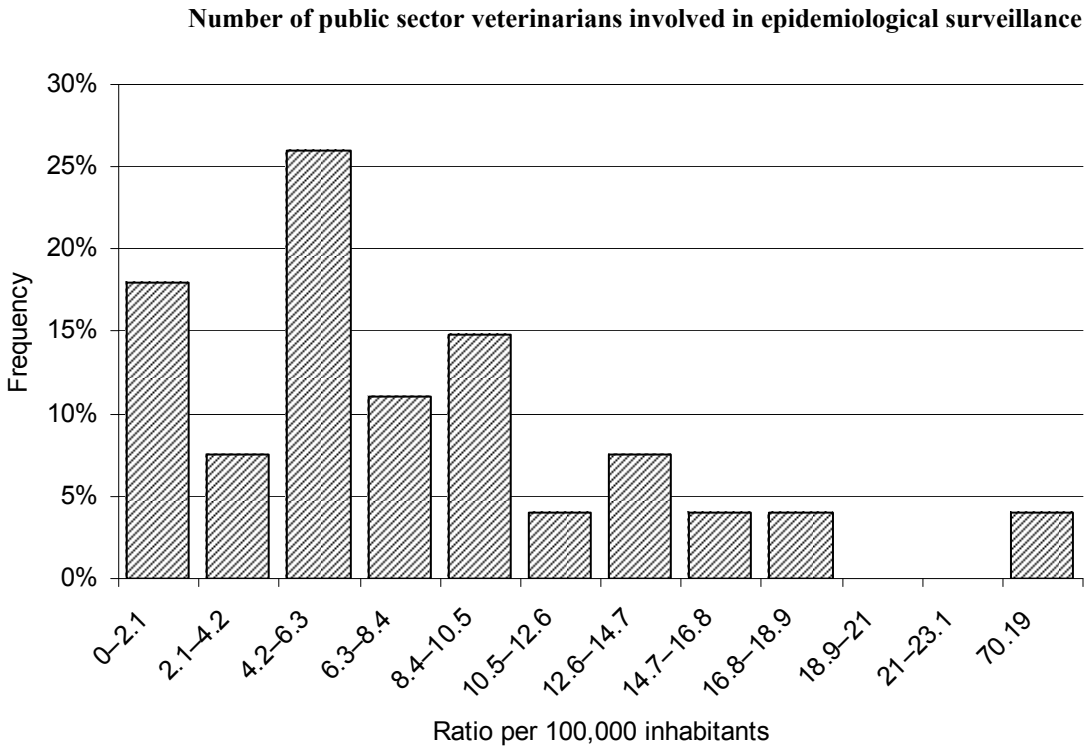

**Figure 9c**

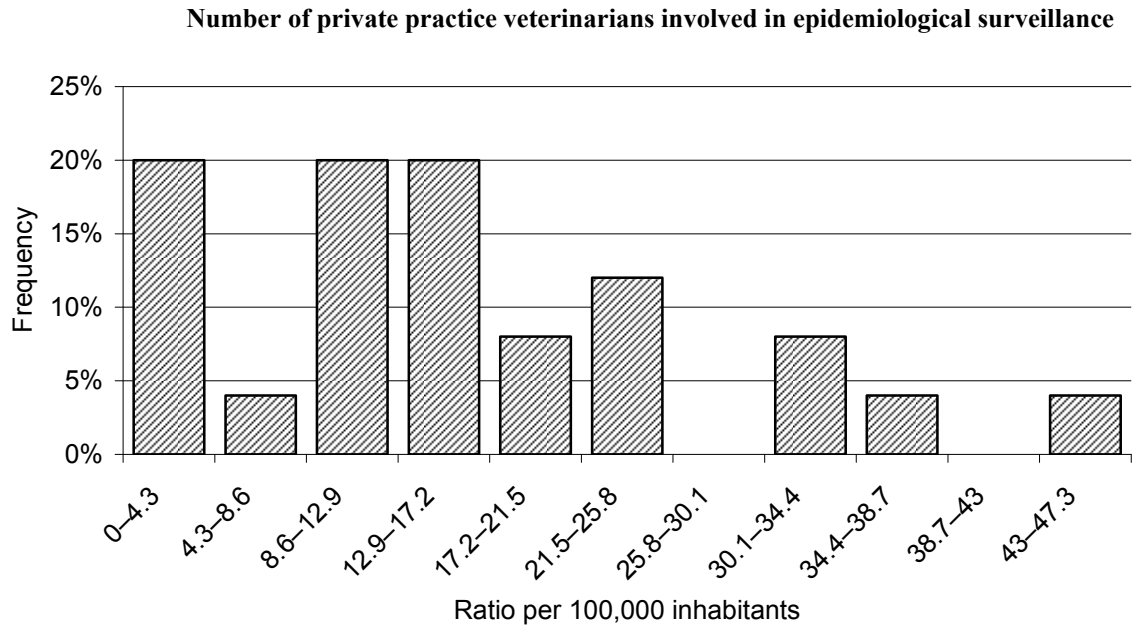


**Figure 10**