

ETHIOPIAN TVET PROGRAM

ANIMAL HEALTH CARE SERVICE LEVEL –III

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**Module Title: Recording and Presenting
Veterinary Data**

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LG #48

LO #1- Record and organize data collection

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Preparing history record sheets
- Recording data in format suitable for analysis and reporting
- Checking data to identify transcription errors and atypical entries
- Rectifying errors in data

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- Prepare history record sheets.
- Record data in format suitable for analysis and reporting
- Check data to identify transcription errors and atypical entries
- Rectify errors in data

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed.
3. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If your performance is satisfactory proceed to the next learning guide.



Information Sheet 1- Preparing history record sheets

1.1. Introduction

The primary objective of any animal health information (AHI) system is to collect, manage and systematically analyze data in order to generate appropriate information for various stakeholders along livestock food value chains. These data may be used to support the decision-making process in relation to diseases prevention, eradication or control, and may support the design, development and management of surveillance programmes. A wide variety of disease drivers (e.g. increased intensification of livestock production, global trade, animal movement and climate change) are facilitating the emergence of new diseases and creating endemic problems. This poses new challenges for the prevention, control and eradication of animal diseases and makes the tasks of AHI systems more complex. Conversely, the evolution and availability of new technologies, such as mobile devices, bioinformatics and geographical information systems, have transformed the development of AHI systems into a dynamic process that is constantly renewed to meet these challenges and the changing needs of users.

Another objectives of an animal health information system (AHI systems) can be used to fulfill several different objectives; in particular, facilitating the identification and notification of animal diseases in accordance with legislation and the priorities of veterinary services. By collecting accurate data, AHI systems support the monitoring and management of emerging and endemic diseases and the development of disease prevention and control measures. The four key objectives of AHI systems are:

1. Supporting official animal disease notification systems
2. Supporting the management of animal health emergency systems
3. Enhancing animal disease surveillance and early warning information systems
4. Supporting risk assessment

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1. Supporting official animal disease notification system

These systems focus on collecting outbreak data for subsequent notification to other information systems, such as the OIE World Animal Health Information System (WAHIS), in line with international obligations.

2. Supporting the management of animal health emergency systems

These systems provide information that facilitates rapid intervention in the event of a disease outbreak. Examples of utilities provided by such systems include:

- enabling online queries to animal identification and registration and traceability systems to identify and retrieve data concerning connections between premises as a result of animal movements;
- facilitating epidemiological inquiries (tracing-back and tracing-forward investigations) in cases of confirmed disease outbreaks;
- defining buffer (e.g. protection and surveillance) zones around outbreaks; and
- Providing a list of premises within such zones using web-based geographical information system (GIS) tools.

3. Enhancing animal disease surveillance and early warning information systems

These systems combine data derived from:

- animal identification and registration systems
- animal traceability systems
- control and surveillance activities (e.g. vaccination data, herds or animals sampled, and laboratory testing results); and
- Other relevant systems, such as those targeting the incidence of human cases of zoonoses or the use of antimicrobials in food-producing animals.

Surveillance and early warning information systems are essential tools for assessing the health status of animal populations; monitoring and improving existing surveillance activities; and supporting decision-makers in planning prevention, control or eradication strategies and framing zoning or compartmentalization policies. Another objective of surveillance systems is assessment of the genetic resistance of animal populations to certain diseases (e.g. related to genetic selection programmes against scrapie).

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Surveillance information systems may also be used to demonstrate the absence of specific diseases in order to acquire disease-free status, in accordance with the requirements of competent institutions.

4. Supporting risk assessment

This involves the collection of a wide range of data to facilitate a number of key actions, including:

- quantifying disease prevalence and incidence
- estimating the probability of spread of infection through the animal trade (disease import risk analysis) and other means (e.g. vector dissemination for vector-borne diseases)
- Identifying the presence of risk factors (summer grazing on common pastures, use of potentially contaminated common feed, etc.) and
- Estimating the magnitude of possible consequences for animal or human (in the case of zoonoses) populations exposed to an infectious agent.

1.2. Input animal health data

One important component of any AHI system is the collection and maintenance of herd health management data, which may be used to benefit diseased animals, as well as the herd as a whole. The EMPRES Global Animal Disease Information System (EMPRES-i) is an example of an AHI system. EMPRES-i is a web-based application that has been designed to support veterinary services and organizations by facilitating the collation, analysis and accessibility of animal disease information. It integrates several data layers, including livestock density and environmental variables from other FAO systems, such as the Global Livestock Production and Health Atlas (GLiPHA), and data on genetic characterization of pathogens, such as those deriving from the Openflu database. Although the Internet has revolutionized the data collection and dissemination process and reduced costs, gathering and analysing data still constitute a major expenditure for any AHI system. In addition, the growth in sophistication of AHI systems has increased the need for hardware and skilled labour, further boosting associated costs. The Animal data types include:

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- clinical and related health data
- data on real-time animal movement
- diagnostic laboratory
- Level of client service which can be provided
- Internal policies, procedures and practices
- Staff levels and structures
- Laboratory and clinical findings
- Vaccination and treatment data
- Herd health management
- Abattoir and AI records
- Owner information
- Disease epidemiological patterns and
- Other indicator or risk-factor data such as climatic and environmental data.

1.2.1. Data on disease cases and outbreaks

The collection of data on the occurrence of animal diseases requires a clear and unambiguous “case definition” for each disease. The OIE Terrestrial animal health code provides case definitions for diseases relevant to international trade. National legislation and regulations may also provide case definitions for many animal diseases, especially in relation to existing surveillance activities. Specific rules and diagnostic protocols have to be defined for case confirmations, taking into account the characteristics of the diagnostic tests. In some cases, a correct case definition may be difficult to obtain, particularly for asymptomatic infections in animals (e.g. emergent diseases such as Influenza A infection in multiple species, Middle East respiratory syndrome or Crimea Congo hemorrhagic fever) or when wildlife is involved. In addition, case definition may be determined by the objectives of the surveillance system. For example, with vector-borne zoonotic diseases (e.g. Rift Valley fever, West Nile or Japanese encephalitis), where the main aim is early detection of any circulating virus for prompt institution of public health protection measures, even the detection of viral genome by RT-PCR on mosquito pools may be included in the case definition.

For each suspected and confirmed case of disease the minimum data elements that must be collected are as follows:

- the disease in question (sometimes identification of the strain or subtype/serotype can be fundamental)





- the location of the disease outbreak (the ID code of premises involved, with related geographic coordinates)
- the species of animals affected (demographic data on infected premises)
- the time and date on which the disease first occurred (date of first clinical signs, date of first suspicion and date of confirmation)
- how the infection was detected and what initially raised suspicion
- the control measures put in place to limit spread of the disease; and
- the results of epidemiological investigations to identify the origin of the infection and any other premises that may have been exposed.

In general, the geographic localization of an outbreak is demarcated by the affected epidemiology unit (farm, premises or village) where one or more cases of the disease have been confirmed. In practice, much of the data to be recorded in the event of an outbreak may be available through an animal identification and registration system. Special situations can be identified. For example, the disease may be detected in a geographical location where animals are brought together from numerous locations (e.g. pastures or villages) or at the abattoir (e.g. contagious bovine pleuropneumonia or bovine tuberculosis). In such situations, an effective AT system and a well-established animal identification and registration system play a crucial role in identifying the premises where the animals originated and, thus, the source of the disease.

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Table 1: Examples of data collection sheet for disease out break

[illegible]

1.2.2. Data and Information on Laboratory results

The results of laboratory investigations are an essential part of any AHI system. Inclusion of these data requires the standardization of all information, including the type of laboratory methods used and the format of results (qualitative versus quantitative values and the definition of “negative” cases). Particular attention should be paid when applying the concept of “sample”. The inclusion of laboratory results could imply the development of an interface between the AHI system and one or more pre-existing laboratory information management systems (LIMS) where laboratory results are stored.

Table 2: Examples of data collection sheet for laboratory

No	Clinical Ref No.	Date	Laboratory case Book						Sample			Date tested	Sample processing		Results		Date of result submission to clinic or Owner
			Owners /District/PA Name	Suspected disease	Date of disease on set	Animal			Collect ion Date	Type	Preserv ative used		Date	Lab. Tech. II sed	Neg.	Pos.	
						Spa	Age	Sex									

1.2.3. Vaccination data

Vaccination is one of the main control measures for many animal diseases. Therefore, the collection of data on vaccination activity may be essential for defining the health status of an animal population. The minimum data that should be recorded is the number of vaccinated animals within a given time period (year, month, week, etc.) and the epidemiological unit of concern (ideally each premises). Nonetheless, information on vaccination may not be sufficient to precisely quantify the proportion of the population immunized, particularly when booster doses are required. Theoretically, only the registration and identification of each individual animal that has been vaccinated would enable accurate calculation of the number of animals that have been correctly immunized. Mass vaccination activities enable veterinary services to enter a large number of premises and crosscheck the identification and movement records of each animal. There is also animal identification and recording schemes linked with specific vaccination programs (e.g. FMD and brucellosis vaccinations).

Table 3: Examples of data collection sheet for vaccination

S N O	Date	Address	Species	Breed	sex	season	vaccine	No of vaccinated animals	remark
1									
2									
3									
4									

1.2.4. Data and Information on Zoonotic Diseases

In the case of zoonoses, the efficacy of veterinary actions can be measured primarily on the basis of their impact on public health. The availability of updated human incidence data for specific zoonoses, including temporal and spatial distribution, is fundamental for evaluating existing control measures and developing new intervention strategies. Information on the demographics (age, gender and profession) of affected people is necessary in order to evaluate the required veterinary action properly. For example, in the case of brucellosis, the profession of a patient can indicate whether the source of infection is restricted to direct contact with infected animals during abortion or parturition (when the great majority of human cases are farmers or veterinarians) or whether a serious food contamination problem may exist. In particular, the ability to measure the returns on investments made for the containment and management of such zoonotic diseases depends on the availability of data and information on:

- the incidence and prevalence of zoonotic diseases by livestock production system (e.g. intensive vs. semi-intensive vs. extensive);
- the use of antibiotics in livestock, disaggregated by production system;
- the incidence and prevalence of zoonotic diseases in humans, by category of people (e.g. farmers vs. market operators vs. consumers);
- the use of antibiotics and antimicrobial resistance in humans, by category of people;
- the reduction in the quantity and value of livestock production due to zoonoses, for example because of death and morbidity in animals; the reduction in labour productivity (zoonotic diseases can affect workforce in any sector of the economy);

and the value of private and public resources used to deal with zoonoses, preventing their allocation for more productive purposes;

- the causes of zoonotic disease emergence and spread, which include inadequate vaccination coverage, inefficient biosecurity and biosafety measures, and lack of advocacy. Causes of AMR, for example, include non-therapeutic usage of antibiotics in animal production. These causes should be the target and focus of policy actions; as investing resources to measure zoonoses and AMR, without information on their root causes, is of little help for decision makers.
- the feasibility – in terms of financial resources and technical competencies – of possible interventions to tackle the root causes of the emergence and spread of zoonoses and of livestock-driven AMR. This information helps identify actionable interventions and estimate their different returns, i.e. to allocate available resources to maximise the benefits for society.

Table 4: Example of Data collection sheet for zoonotic diseases

SNO	Date	Address	Species	Breed	Age	sex	Sign	Suspected disease	remark
1									
2									
3									
4									

1.2.5. Internal policies, procedures, staff levels and structures

Rules and procedures must also be established for animal health management practices (vaccination, testing, etc.), disease data gathering, data storage and manipulation, and data analysis and reporting. One of the main outcomes of an AHI system is the automatic production of data required by regional or international organizations for the purpose of disease notification. Each outbreak of a notifiable animal disease must be reported to the OIE-WAHIS. Specific sets of data are required by OIE for immediate notification, follow-up reports, and six-monthly and annual reports.

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The specific requirements of WAHIS and its dictionaries, as well as the glossary of the Terrestrial animal health code⁴⁰ (for the description of diseases, species, case, epidemiological unit, outbreak, slaughter/destruction, diagnostic and control methods, etc.), must be taken into consideration when developing an AHI system.

In Ethiopia, good quality data are essential for formulating policies and programmes that support the sustainable development of the livestock sector. Good quality data are essential for formulating policies and programmes that support the sustainable development of the livestock sector. The Ministry of Agriculture and Livestock and the Ministry of Health are in charge of formulating policies and programmes on zoonoses and other diseases. Obviously, they must rely on data and information from multiple sources to be able to formulate sound policies and programmes.

The Livestock Health and Feed Regulatory services of the Ministry of Agriculture and Livestock have access to two data reporting systems. These are the Disease Outbreak and Vaccination Reporting (DOVAR) and the Animal Disease (Appendix 1) Notification and Investigation System (ADNIS) that local authorities use to transmit information on animal diseases to the central government, including type of disease, location, numbers of animals affected. ADNIS is for immediate event-based reporting, while the DOVAR is monthly. At the national level, disease outbreak reporting rate is still below the minimum requirements of the OIE. Under-reporting is particularly high in pastoral and agropastoral settings as livestock disease reporting system is constrained by lack of trained manpower, irregular reporting, poor recording and documentation and poor infrastructures.

1.2.6. Level of client service data and owner information

The assessment study should also identify stakeholders willing to participate in the animal recording system. Their participation will become compulsory in the case of mandatory animal identification and registration, traceability and/or animal health information systems. The primary stakeholders in any animal recording system are the livestock owners or keepers responsible for the identification and registration of animals and the notification of events (e.g. birth, movement and disease occurrence). However,

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depending on the objectives and the animal recording system components, all or some of the following stakeholders may be included:

- livestock keepers or breeders and/or their associations;
- officers of animal health and production departments of the Ministry of Agriculture and/or Livestock and their decentralized offices;
- field veterinarians, livestock extension staff, artificial insemination service providers or authorized field agents;
- laboratory staff for testing disease, feed, milk, etc.;
- livestock market staff;
- hauliers/livestock traders;
- distributors and retailers; and
- Abattoir and processing plant staff. In addition, assessment of the literacy rate among keepers should be extended to some of the above-mentioned stakeholders; for example, market and processing plant staff.

After identifying the stakeholders that will implement or use the animal recording system, the next step is to ascertain their needs. These could include information and/or technical assistance. For example, large-herd owners/keepers may tag their animals themselves, but smallholders that keep only a few animals may refer this task to identification agents. Needs should be assessed through structured personal interviews and/or during a consultation workshop, which should also be used to assess the commitment of stakeholders to establishing an animal recording system in the country. Level of clinical service in Ethiopia is A, B; C and D. D level is a mobile clinic and serves at least two kebeles. A and B are facilitated in terms of materials, laboratory and personnel. There are also different laboratory facilities at national, Regional, zonal up to districts. Diagnostic center is limited at national level. There is one national institute for vaccine production too. Different abattoirs are also present from kebele level. Owner information is recorded on sheet of paper or case book and put for further references.

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Owner (client) record sheet example

Case no. _____

Date: ____/____/____

I. Owner /client personal data:

Owner name _____ Address _____ Kebele _____

Mobile no. _____ Resident _____ phone _____

house no. _____

1.2.7. Abattoir data

Abattoir data includes all activities at lairage, abattoir, and slaughter area at all. It starts from ant mortem examination and ends with post mortem judgment. Data of ant mortems are animal data, owners' data, health status, identification, origin of animals, date and time of ant mortem examination, and judgment given. Post mortem information is findings of post mortem examination of carcass and offal, and types of decision at end of examination.

Table 5: Example of Data collection sheet for ant mortem examination

Data for ant mortem examination
Date
Address of butchers
Species of animal
Breed of animal
Animal identification
Sex of animals
Diagnoses methods
Judgments



Table 6: Example of Data collection sheet for post mortem examination

Data for post mortem examination
Offal and Lesions (liver, lungs, kidneys)
GIT (stomach and intestines) and lesions observed
Carcass problems
Post mortem Judgments

1.2.8. Artificial insemination records

Artificial insemination technicians collect data on artificial insemination, pregnancy diagnosis and calving. They may also register newborn calves and record the parentage. This includes, estrus detected, date and time of insemination, inseminated animal data, address of animal owners and inseminator, and type of semen used.

Table 7: Example of Data collection sheet for Artificial insemination

Date_____
Address of animal owners_____
Species of animal_____
Breed of animal_____
Age_____
Time of estrus_____
Signs of estrus observed_____
Semen (breeding bull)_____
Date of insemination_____
Method used to check pregnancy _____

1.2.9. Disease epidemiological patterns data

Epidemiological data on patterns of disease is essential in animal information system.

Disease in a population depends on three factors.

Individual factors: individual susceptibility (genetic, age, sex, breed, species, etc.) .



Temporal factors: how disease frequencies change over time? Other factors temporally associated with those changes are Climatic influences, season

Spatial factors: where is the disease specially common or rare? The geographical distribution of a disease may indicate an association with local geographical, management or ecological factors. It is the time of occurrence of a disease in a population of animals. Disease does not occur randomly over time but its onset follows one of three temporal patterns.

- sporadic
- endemic
- epidemic and
- pandemic disease

Sporadic disease data

Sporadic disease is cases of disease may occur sporadically, irregularly and in a haphazard fashion. The cases do not seem to be associated with any other identifiable factors nor with each other.

Endemic disease data

It is the usual and constant occurrence of a disease in a population. Cases may occur regularly and virtually at low levels. This implies, other interrelated factors influencing this pattern should happen in a similar regular fashion. In recording endemic occurrence of a disease, we should specify the population affected and the site (location).

Epidemic disease data

Epidemic disease refers to a sudden, unpredictable and unusual increase in the number of cases of a disease in a population beyond the expected endemic (usual) frequency. Disease acquired by many hosts in a given area in a short period of time it is usually indicated by an exponential rise in the number of cases in time and, followed by a subsequent decline in the number of cases as the number of susceptible animals are exhausted.

Pandemic disease data

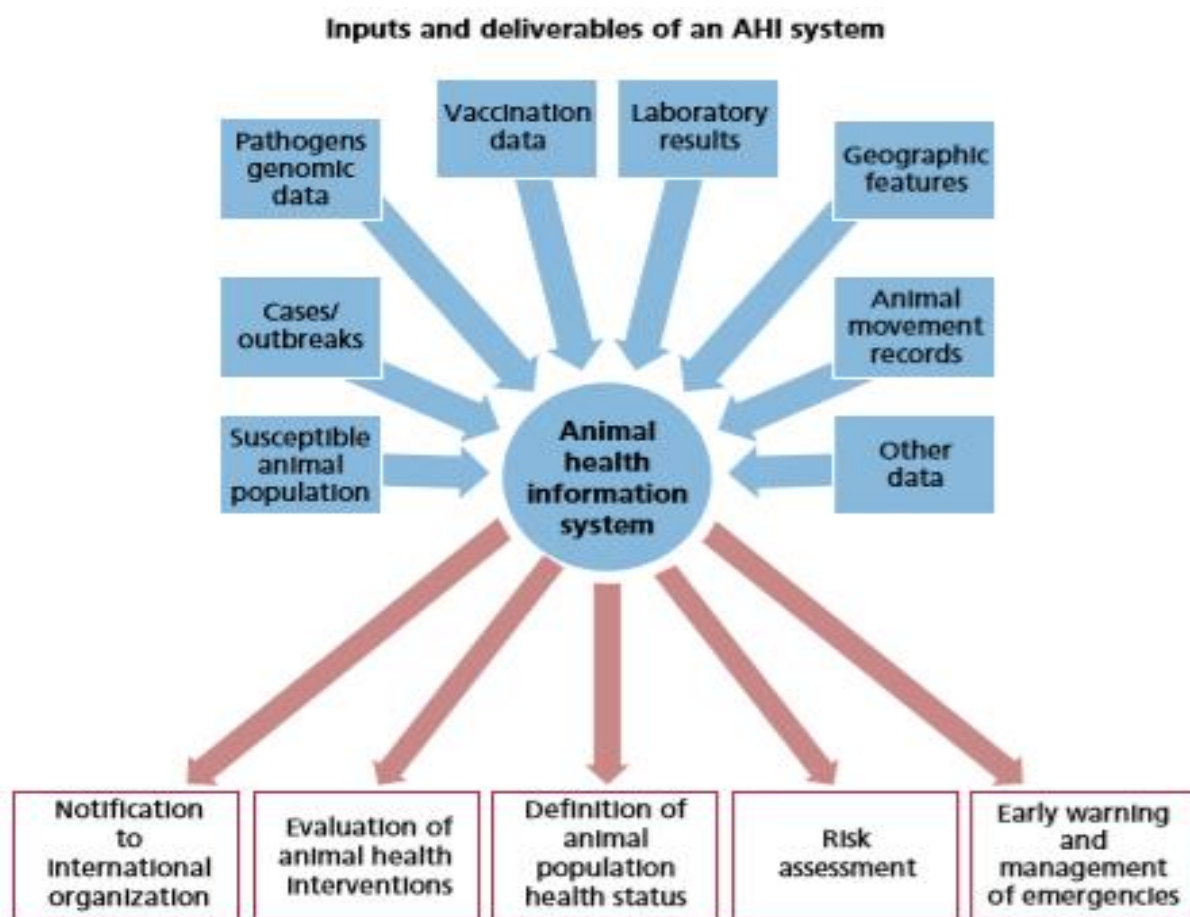
Pandemic disease is a wide spread epidemic that may involve many countries and also affects a large proportion of the population. It is worldwide epidemic. A disease is not a

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pandemic simply because it kills lots of people or animals or occurs in a lot of places, it has to be infectious as well.

1.2.10. Herd Health management

This includes important information of managements at herd level, not at individual level. This incorporates existing measures used as management of health problems like prevention and control. The same approach used at individual level is also applied here. Periodic evaluation of veterinary actions is essential for reviewing and modifying such actions.



1.3. Veterinary data information Sources

Data can originate from different sources (example: veterinarians, technicians, keepers, and staff of slaughter houses, abattoirs or laboratories, primary sources and secondary sources).

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Information from any source is gathered through:

- Conversation with Colleague
- Conference/Seminar Notes
- Journal
- Google Search
- Conversation with Specialist
- Information Software on Computer
- VIN/Chat Room
- Coursework (Masters/Fellowship/ Certificate/ Diploma)
- Online Database i.e. Pubmed

1.4. Designing the question to prepare questioners data sheet

When drafting questions, you must keep in mind who is responding, whether or not the data are readily available, the response burden (i.e the length and complexity of the questionnaire), the complexity, confidentiality and sensitivity of the data being collected, the reliability of the data (i.e validity of question), whether the interviewer or respondent might find any of the topics embarrassing, and ultimately how the data will be processed (coding and computer entry). Responding to a question usually involves four distinct processes: understanding the question, retrieval of information (from memory or records), thinking and/or making a judgment if the question is at all subjective, and communicating the answer (written or verbal). All aspects must be considered for each question. Once a draft of a question is prepared, ask yourself:

1. Will the respondent understand this question? (The question must be clearly worded in a non-technical manner.)
2. If the question deals with factual information will the respondent know the answer to the question or have to seek out additional information to be able to answer it? (If additional information is required, the respondent might skip the question or fabricate an answer.)
3. Does answering the question involve a subjective decision? (If it does, is there any way to make it less subjective?) If the question deals with opinions or beliefs, it is bound to be subjective in nature. Special care will be required in the design of these questions to ensure they elicit the desired information.
4. Are the possible responses clear with an appropriate method of recording the response?

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Questions can be classified as open (if there are no restrictions on the type of response expected) or closed (if the response has to be selected from a pre-set list of answers).

1.4.1. Open question

In general, open questions (also referred to as open-ended questions) are more often applicable to qualitative than quantitative research because they generate information that might not be applicable for standard statistical analyses. By their nature, open questions allow the respondent to express their opinion. Sometimes we might attach a 'comments' section on a closed question for this purpose.

1.4.2. Closed question

In designing closed questions (also called closed-ended questions), the researcher can choose from a range of possible options. They include: checklist questions (i.e check all options that apply), two-choice/multiple-choice questions, rating scale questions (ie rate the response on a defined scale), and ranking questions (i.e rank the options in order of priority). The advantages of closed questions are that they are generally easier for the respondent to answer (while maintaining consistent responses) and it is easier to code the responses (prior to data entry). However, closed questions are difficult to design and there is always a risk that closed questions might either over simplify an issue or elicit answers where no knowledge or previous opinion exists. Sometimes a closed question might request information in a format that is different from what a respondent usually uses (e.g you might ask for herd average milk production based on litres per cow per day while the producer assesses milk production using average 305-day production values).

Checklist question

A checklist question is similar to a multiple-choice question except that the respondent is asked to check all responses that apply (so they need not be mutually exclusive or jointly exhaustive). They are equivalent to having a series of 'yes/no' questions for each category. Consequently, each option on the list requires a separate variable in the database.

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Two-choice/multiple-choice question

In two-choice/multiple-choice questions it is important to have categories that are mutually exclusive (ie no overlap) and jointly exhaustive (ie cover all possibilities). The addition of a category of 'other - please specify' (semi-open question) as the last choice can ensure that the options are jointly exhaustive. However, if the question has been well designed, there should not be a lot of responders using this option. It is recommended that the list of possible choices not exceed five in face-to-face or telephone-interview questionnaires and 10 in mailed/internet questionnaires. There is some evidence that respondents more frequently choose items at the top of a list. This problem can be avoided by having multiple versions of the questionnaire with varying orders to these questions. However, this adds complexity to the data-coding process. Data derived from a two-choice/multiple-choice question can be stored as a single variable in the database. Multiple-choice question example

1. Type of practice(choose one only)

- a) Mixed
- b) Small animal exclusively
- c) Feline exclusively
- d) Other(please specify)_____

Rating question

Rating questions require the respondent to assign a value based on some pre-defined scale. Responses might be ordinal, such as a Likert scale in which the respondent states their level of agreement with a statement (eg strongly agree, agree, neither agree nor disagree, disagree and strongly disagree) or recorded on a more continuous numerical scale. Rating question example

In your opinion, how severe would the pain be in dogs in the first 12 hours after each of the following surgeries if no post-operative analgesics were given? Estimate the pain on a 10 points scale where 1 equals no pain at all and 10 equals the worst pain imaginable (circle one number).

- | | |
|--------------------------------|---------------------------------|
| 1. Major epidemic surgery | 1 2 3 4 5 6 7 8 9 10 don't know |
| 2. Repair of ruptured cruciate | 1 2 3 4 5 6 7 8 9 10 don't know |
| 3. Abdominal surgery | 1 2 3 4 5 6 7 8 9 10 don't know |



- | | |
|-------------------|---------------------------------|
| 4. Castration | 1 2 3 4 5 6 7 8 9 10 don't know |
| 5. Dental surgery | 1 2 3 4 5 6 7 8 9 10 don't know |

Ranking question

Ranking format questions ask the respondent to order of the possible responses (or a subset of responses) in some form of rank order. They are often difficult for respondents to complete, especially if the list of choices is long because the categories must be kept in their mind at once. In face-to-face interviews, cards with the various responses on them can be prepared and provided to the respondent. This might simplify the ranking process because the respondent only has to choose between a pair of responses at one time (and repeat the process until the cards are in the appropriate rank order).

Ranking question example

Please rank the following as sources of your knowledge of recognition and control of post-operative pain in dogs and cats (1=most important source, 6=least important source).

1. Undergraduate veterinary school_____
2. Post-graduate training_____
3. Journal articles_____
4. Continuing-education lectures/seminars_____
5. Discussion with other veterinary practitioners_____

Wording the question

The wording used in questions has a major impact on the validity of the results from those questions. At all times, bear in mind who the respondent is and what level of technical knowledge they have. For example, 'How many fatal cases of neonatal diarrhea occurred during the time period?' is a poorly worded question if the respondent.

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Animal History Sheet/ format example for questioners

Date_____

Owners Name_____

Pets Name_____

Animal History

Does your pet live in an: Apartment House Backyard Farm

Does your pet go Camping Hunting Lake/Pond

Is your pet on any flea treatment? yes no Type:_____

Has your pet been Heartworm and on prevention? yes no Results:_____

Any other medications and/or supplements? yes no Type:_____

Has your pet ever had a vaccine reaction yes no If yes, when?_____

What brand of food does your pet eat _____ Quantity?_____

Vet Use Only	Normal	Abnormal	Not examined
1. Appearance			
2. BCS			
3. Ears			
4. Eyes			
5. Respiratory System			
6. Oral cavity, teeth			
7. L.N.			

Note_____

**Self-Check -1****Written Test**

Directions: Answer all the questions listed below (20 points).

Test I: Short Answer Questions

1. List down at least ten animal health data that require history record sheet.
2. Write Veterinary data information Sources
3. Write the four key objectives of AHI systems
4. What are methods used to gather Information from its sources?

You can ask your teacher for the correct answers.

Note: Satisfactory rating -10 points

Unsatisfactory - below 10 points



Information Sheet 2- Recording data in format suitable for analysis and reporting

2.1. Organizing data for analysis and reporting

Data that is not organized is referred to as raw data. When data is collected from a survey or designed experiment, they must be organized into a manageable form. The survey data collected from the field should be processed and analyzed as indicated in the research plan. Data processing primarily involves editing, coding, classification and tabulation of data, so that it becomes amenable for data analysis. Implement animal health information recording Veterinarians performing on-farm activities, such as vaccination or sampling, must be equipped with paper forms or electronic devices (smartphones, tablets, etc.) for the registration of all pertinent information regarding their activities (e.g. date of intervention, control programme of concern, type of vaccine used or type of samples taken, tests requested by the laboratory) and the identification codes of animals.

All data must be entered into the animal health information system, regardless of the method used on the farm (i.e. paper or electronic device). As a general rule, the person who performed the veterinary activity that produced the data should enter them into the system, as early as possible. This reduces the risk of errors due to misinterpretation, which increases significantly if the information is entered at a later date. In the case of paper-based registration, once the national animal identification database is in place, it is advisable to use forms that are prefilled with farm and animal identification data. When samples must be taken for laboratory use, the field operators should be equipped with labels preprinted with the animal identification codes to be used for identification of samples. The prefilled forms and labels will often include barcodes to facilitate data registration at the laboratory, thereby avoiding typing errors. In cases where smartphones, laptops or tablets are used on the farm, it may be possible to employ small portable printers for the production of labels. In addition, when animals are electronically identified, transponder readers can be connected with laptops or tablets to register automatically the codes of animals subjected to control activities. One particular aspect of field activities within the framework of an animal health information system is

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the registration of information in the event of suspected or confirmed disease outbreaks. The use of smartphones or tablets on the farm will allow field operators to notify authorities of any issues quickly, and provide veterinary authorities with the required information in a timely manner.

Laboratory information management systems must be fully integrated with the animal health information system. Laboratory results are recorded in the laboratory information management system following specific procedures and using a standard nomenclature for samples and tests. This nomenclature must be compatible with that used in the animal health information system. Laboratories must be equipped with computers, servers for data storage and internet connections. Correct implementation of an animal health information system requires detailed operational procedures for at least the main activities. Periodical evaluation of the effectiveness of these procedures and overall system performance is essential to enable prompt and appropriate corrective action. Development of the IT platform, where all data are collected and integrated, will require significant effort. Planning and implementation of the information system and the related IT platform will involve a multidisciplinary team, comprising contributions from IT specialists and engineers, as well as epidemiologists, GIS experts and so on. Feedback from in-field veterinarians will also be crucial for the development of appropriate data m

2.1.1. Elements of an animal health information system

An AHI system should contain the data gathering, data storage and manipulation.

Data gathering

Most systems are based on the use of reporting forms to record and transmit data to local or national centres for collation via paper, mobile devices, e-mails or the internet. Data are collected using specific reporting forms. A simple reporting form can include:

- Geographical information related to location (latitude/longitude) of premises and/or epidemiological units, and delimitations of administrative units, if these do not exist in the premises register.
- temporal information related to the time at which the information was recorded, and at which any health-related activities (e.g. administration of vaccinations) took place

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- epidemiological information on the species, farming system, number of animals at risk, cases, deaths, etc
- laboratory information, including samples, species, date of collection and date of results; and
- Action and control measures taken.

Data storage and manipulation

AHI systems should be able to handle a large amount of data and information. Paper-based systems are often inefficient and severely limited in the volume of information they can process. Computerized systems based on database management systems are more efficient, and are recommended, even for use in developing countries, due to their ability to store and effectively manage large amounts of data for processing.

2.2. Format suitable for data analysis and reporting

After collecting from its source, the data should enter in to format which is suitable for analysis and reporting. This simplifies data analysis and reporting. Many of these formats are soft wares like SPSS and Stata in epidemiological data analysis for animal health data.

2.2.1. Distributed field devices for capturing data and receiving information

The available technologies for capturing data at field level may be divided into the following three groups:

1. Collecting data on paper and entering data through connected desktops/laptops.
The central server provides functionalities via web pages, allowing various stakeholders to capture or display information, usually through a web portal that grants personalized privileges and access to specified information;
2. Entering data offline through smartphones or tablets in a local database and periodically synchronizing the local database with the central server; and
3. Enabling data exchange between the central server and other databases through XML files or web services for real-time data exchange; for example, via simple object access protocol (SOAP) or other interoperable technologies.

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1. Collecting data on paper and entering data via desktops/laptops to produce operating reports

In this case, the fieldworker collects data on specified formats and dispatches them to a nearby workstation, where data entry operators enter the data using a web-based application into desktops/laptops connected to the central server. This approach duplicates the work of data entry, and also increases errors, adds to cost and causes delays. However, in many situations, this may be the only possible option. The web-based application provides various user interface (UI) forms to enter and validate data. It could also produce operational reports on desktops/laptops, which need to use appropriate web browsers (e.g. Internet Explorer, Firefox and Chrome).

2. Entering data offline via smartphones or tablets in a local database and synchronizing the local database with the central server periodically

In this case, fieldworkers are provided with smartphones or tablets. The smartphone is embedded with a custom designed client application, a local database and a synchronization middleware. The client application provides UI to enter and validate data and updates the local database. The synchronization middleware synchronizes the local database with the central database via wireless connectivity. The smartphone uses any of the available mobile operating systems (OS), such as Google's Android, Apple's iOS and Microsoft's Windows phone. When smartphones are used, data entry occurs only once, errors are rectified at the source and data updating occurs (locally) without delay. The central database is updated when the device is synchronized a process that can be automated. Unlike the workstation approach, many fieldworkers enter the data using smartphones supplied to them. This means that numerous smartphones will have to be supplied and maintained. In addition, each fieldworker will require a user ID.

3. Data exchange between the central server and other databases through xMI files or data web services (SoAP or equivalent)

The development of a fully integrated system is preferable for countries with minimal prior experience in animal recording. However, most countries already have several single or multipurpose IT systems with corresponding databases in place. In such

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cases, data exchange is possible between these databases and the central server via XML file protocol or real-time technologies such as SOAP. Another option is file transfers, which may be particularly useful for external organizations not capable of implementing a web-based application. In this case, the participating organization enters its data into a specified file and transmits it electronically using internet broadband or virtual private network (VPN) to the central server. An application on the web-based server provides an FTP file service to transfer such data.

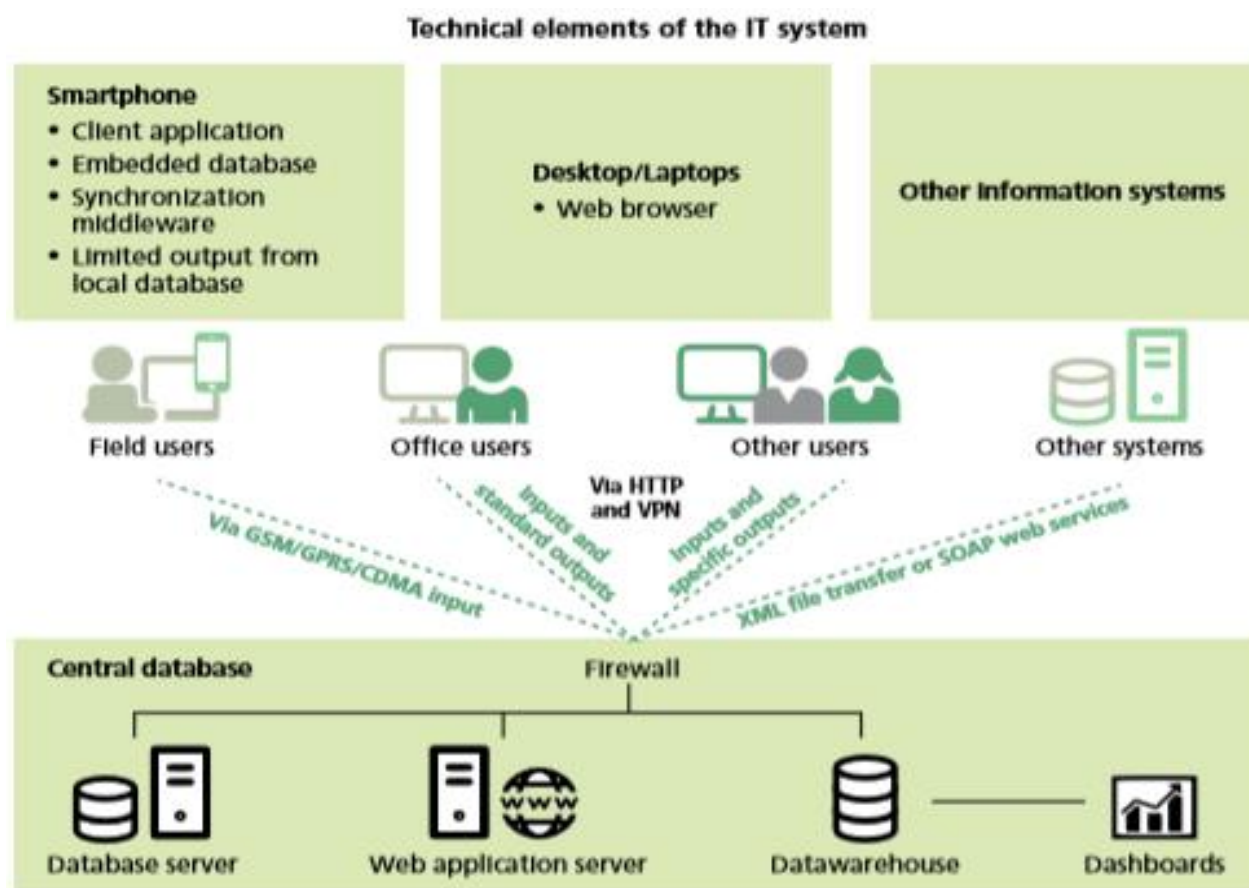


Figure 1: Technical elements of the IT system

2.2.2. Data analysis

Data analysis is required to convert data into information, which is then used to assist animal health decision-making. Data analysis may range from the simple calculation of totals and rates (e.g. mortality, incidence and prevalence) to the determination of complicated statistical associations and the use of epidemiological risk models to

predict the outcomes of interventions. The latter will need to be done by skilled epidemiologists.

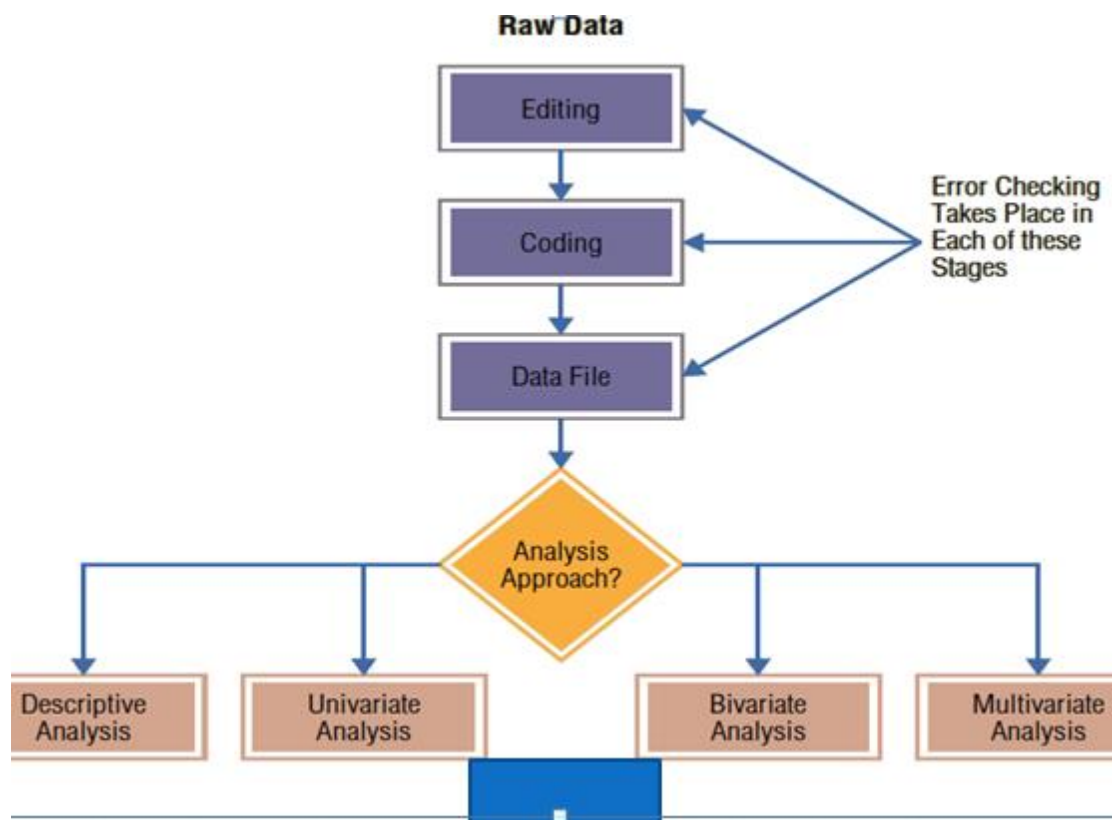


Figure 2: Overview of the Stages of statistical data Analysis

2.2.3. Calculations of data in fractions, rates, proportions and percentages

Fractions having the general form $a / (a + b)$ (where a is the number of animals with the event of interest, and b is the number of animals at risk of but not experiencing that event) are called either rates or proportions. In practical terms rates are fractions, but they usually are multiplied by 100 or 1000, etc., so the result is a number greater than 1. Morbidity and mortality are the two main categories of events for which rates are calculated. Other rates for veterinarians are: Culling, pregnancy, survival to weaning. The mathematical forms that these measures can take includes Count, Proportion, Odd and Rate.

Count

This is a simple enumeration of the number of cases of disease or number of animals affected with a condition in a given population. Because the size of the population is not



taken into consideration, counts of events are of very limited use for epidemiologic research.

Proportion

This is a ratio in which the numerator is a sub set of the denominator. For example, if 200 cows are tested for enzootic bovine leukosis (EBL) and 40 of them are positive, the proportion positive is $40/200=0.2$ (or 20%). Prevalence and risk are both proportions. In the prevalence, both the numerator and denominator are measured at a point in time. In the risk, the numerator relates to the number of new cases over a period of time so, although proportions have no units, the time period must be specified for the proportion to make sense.

Odds ratio

This is a ratio in which the numerator is not a subset of the denominator. For example, if there are three still born animals and 120 live births, the odds of stillbirth is $3:120=0.025:1$ or 25 stillbirths to 1,000 live births.

Rate

A rate is a fraction in which the denominator is the number of animal-time units at risk. Example, if there are 30 cases of kennel cough in a 100 dog, kennel over a three-month period, the incidence rate is $30/(100*3)=0.1$ cases per dog-month. Note the 300 dog-months in the denominator. Rates usually are multiplied by 100 or 1000, etc. So the result is a number greater than 1.

Incidence rate

Incidence is the development of new cases of a disease that occur during a specified period of time in previously disease-free or condition-free (“at risk”) individuals. As an example, last year a herd of 121 cattle were tested using the tuberculin test and all tested negative. This year, the same 121 cattle were tested again and 25 tested positive. The cumulative incidence over a period of 12 months would then be calculated as $25/121$ which amounts to 0.21. Hence, interpretation is that an individual animal within this herd had a 21% chance of becoming infected over the 12 month period.

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Prevalence

Prevalence refers to the number of cases of a given disease or attribute that exists in a population at a specified time.

$$\text{Prevalence} = \frac{\text{Number of exististing cases}}{\text{Size of population}}$$

Example

Farm A has 7 cows with mastitis on March 21, 2011. And a total of 4 cases were recorded after March 22 for the year 2011. Population of farm A = 70. Point prevalence of mastitis on March 21 is = .10 or 10%.

Mortality rate

Mortality rate (mortality density), M, is calculated similarly to incidence rate. The numerator comprises the number of deaths. However, since an animal is at risk of dying after onset of disease. Animals that develop disease continue to be included in the denominator until they die

$$M = \frac{\text{number of deaths due to a disease that occur that occur in a population during a particulatr period of time}}{\text{the sum, overall individuals of the length of time at a risk of dyeing}}$$

Death rate

The death rate is the total mortality rate for all diseases rather than one specific disease in a population. Some authors do not distinguish between mortality rate and death rate. Thus, a disease-specific death rate may be encountered. Similarly, a crude mortality rate, referring to deaths from all causes, may be described.

Case fatality (CF)

It is the tendency for a condition to cause the death of affected animals in a specified time is the case fatality (CF). It measures the probability of death in diseased animals, is dimensionless, and can take values between 0 and 1 (or 0-100%). The value of the case fatality depends on the time of observation, which can range from a brief period of hospitalization to several years.

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$$CF = \frac{\text{number of deaths}}{\text{number of diseased animals}}$$

Survival

Survival, S, is the probability of individuals with a specific disease remaining alive for a specified length of time.

$$S = \frac{N - D}{N}$$

Where: D = the number of deaths observed in a specified period of time, and

N = the number of newly diagnosed cases under observation during the same period of time. Survival is the complement of case fatality. Thus, for a given period of observation, the sum of the case fatality and survival should equal 1 (100%). During observation, an animal may die, survive, or be 'censored'. An animal is censored when follow-up ends before death or completion of the full period of observation (e.g., if an animal cannot be traced or the study is terminated).

Attack rates

Attack rates are usually used in outbreak situations where the period of risk is limited and all cases arising from exposure are likely to occur within the risk period. Attack rate is defined as the number of cases divided by the number of individuals exposed. 'Attack risk' would be a more precise way to describe this parameter.

Proportional mortality

As its name implies, proportional mortality is simply the proportion of all deaths that are due to a particular cause for a specified population and time period:

$$\text{Proportional mortality} = \frac{\text{number of deaths from the disease}}{\text{number of deaths from all cases}}$$

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**Self-Check -2****Written Test**

Directions: Answer all the questions listed below (14 points).

Test I: Short Answer Questions

You can ask your teacher for the copy of the correct answers.

1. Define raw data.
2. Write formulas for calculations of the following:
 - a. Prevalence
 - b. Mortality rate
 - c. Incidence rate
 - d. Survival
3. What are the elements of an animal health information system?

Note: Satisfactory rating -7 points

Unsatisfactory - below 7 points

Information Sheet 3- Checking data to identify transcription errors and atypical entries

3.1. Data Verification

Before you start any analyses, you must verify that your data are correct. This can be combined with the following two processes (processing your outcome and predictor variables) because both involve going through all of your variables, one-by-one.

- If you have a very small dataset, you might want to print the entire dataset (make sure it aligns all values for one variable in one column) and review it for obvious errors. However, this is rarely feasible for datasets from epidemiologic studies.
- For continuous variables: determine the number of valid observations and the number of missing values check the maximum and minimum values (or the five smallest and five largest) to make sure they are reasonable (if they are not, find the error, correct it and repeat the process) prepare a histogram of the data to get an idea of the distribution and see if it looks reasonable.
- For categorical variables: determine the number of valid observations and the number of missing values obtain a frequency distribution to see if the counts in each category look reasonable (and to make sure there are no unexpected categories).

3.2. Types and sources of data errors

- Obvious errors made during the data entry
- measurement error during data collection
- sample-to-sample variability while collecting
- the variability of the outcome being measured and
- incomplete questionnaire
- technical omissions
- legibility of handwriting

3.3. Checking questionnaire and data collection sheets

A questionnaire returned from the field may be unacceptable for several reasons:

- Parts of the questionnaire may be incomplete
- The pattern of responses may indicate that the respondent did not understand or follow the instructions

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- The responses show little variance
- One or more pages are missing
- The questionnaire is received after pre-established cutoff date
- The questionnaire is answered by someone who does not qualify for participation

Example: How long have you lived at your current address? 48. What is your age? 32 years. This answer contradicts the earlier response.

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**Self-Check -3****Written Test**

Directions: Answer all the questions listed below and write your answers on space provided on the next page (12 points).

Test I: Write the short answers

1. Write at least three types and sources of data errors.
2. Write at least three reasons for a questionnaire returned from the field not acceptable.

You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating -6 points

Unsatisfactory – below 6 points

Information Sheet 4- Rectifying errors in data

4.1. Ways for verifying data and rectifying mistakes

The following are techniques used to verify and rectify obvious mistakes in data. These are: error checking, data cleaning and data editing.

4.1.1. Error Checking

Verifying the accuracy of data entry and checking for some kinds of obvious errors made during the data entry. Error checking is often accomplished through frequency analysis.

4.1.2. Data cleaning

Data cleaning is process of detecting, diagnosing, and editing faulty data. It is checking written responses for any stray/lost marks.

4.1.3. Data editing

Data editing is changing the value of data shown to be incorrect or the process of checking and adjusting raw data in the completed questionnaires or from other source (laboratory, field) for:

- omissions
- legibility
- consistency and readying them for coding and storage and
- Retrieving

The editing of data is a process of examining the raw data to detect errors and omissions and to correct them, if possible, so as to ensure legibility, completeness, consistency and accuracy. The recorded data must be legible so that it could be coded later. An illegible response may be corrected by getting in touch with people who recorded it or alternatively it may be inferred from other parts of the question. Completeness involves that all the items in the questionnaire must be fully completed. If some questions are not answered, the interviewers may be contacted to find out whether he failed to respond to the question or the respondent refused to answer the question. In case of former, it is quite likely that the interviewer will not remember the

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answer. In such a case the respondent may be contacted again or alternatively this particular piece of data may be treated as missing data. It is very important to check whether or not respondent is consistent in answering the questions. For example there could a respondent claiming that he makes purchases by credit card may not have one. The inaccuracy of the survey data may be due to interviewer bias or cheating. One way of spotting is to look for a common pattern of responses in the instrument of a particular interviewer. Apart from ensuring quality data this will also facilitate in coding and tabulation of data. In fact, the editing involves a careful scrutiny of the completed questionnaires.

Types of Editing

There are two types of data editing.

1. Pre-collection Editing and
2. Post-collection

1. Pre-collection Editing: this is also sub divided into two: Design editing and editing during the pretest stage.

Design editing: questionnaire or format can be edited before data collection (for what information has to be collected) to improve questionnaire format, identifying poor instructions or inappropriate question wording. Editing during the pretest stage can prove the quality of the data collected.

2. Post-collection: is further divided in to field editing and in-house editing.

a. Field Editing

The field editing consists of review of the reporting forms by the investigator for completing or translating what the latter has written in abbreviated form at the time of interviewing the respondent. This form of editing is necessary in view of the writing of individuals, which vary from individual to individual and sometimes difficult for the tabulator to understand. This sort of editing should be done as soon as possible after the interview, as it may be necessary sometimes to recall the memory. While doing so,

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care should be taken so that the investigator does not correct the errors of omission by simply guessing what the respondent would have answered if the question was put to him. Preliminary editing by a field supervisor on the same day as the interview or recording from the laboratory result:

- to catch technical omissions,
- check legibility of handwriting, and
- clarify responses that are logically or conceptually inconsistent

b. In-house editing (Central editing)

Editing performed by a central office staff, Supervisor or advisor, often done more rigorously than field editing. It is also done by preparation for software. Central editing should be carried out when all the forms of schedules have been completed and returned to the headquarters. This type of editing requires that all the forms are thoroughly edited by a single person (editor) in a small field study or a small group of persons in case of a large field study, the editor may correct the obvious errors, such as an entry in a wrong place, entry recorded in daily terms whereas it should have been recorded in weeks/months, etc. Sometimes, inappropriate or missing replies can also be recorded by the editor by reviewing the other information recorded in the schedule. If necessary, the respondent may be contacted for clarification. All the incorrect replies, which are quite obvious, must be deleted from the schedules. The editor should be familiar with the instructions and the codes given to the interviewers while editing. The new (corrected) entry made by the editor should be in some distinctive form and they be initialed by the editor. The date of editing may also be recorded on the schedule for any future references.

Editing solution for missing value

The following are solutions used for editing errors for missing parts:

- Returning to the field: The questionnaires with unsatisfactory responses may be returned to the field, where the interviewers re-contact the respondents.
- Assigning missing values: If returning the questionnaires to the field is not feasible, the editor may assign missing values to unsatisfactory responses.

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- Discarding unsatisfactory respondents/unit of study: In this approach, the respondents with unsatisfactory responses are simply discarded.

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**Self-Check -4****Written Test**

Directions: Answer all the questions listed below and write your answers on space provided on the next page (22 points).

Test I: Write the short answers

1. Write the three techniques used to verify and rectify obvious mistakes in data.
2. Write the two types of data editing.

Test II: Choose the best answer

1. -----is process of detecting, diagnosing, and editing faulty data.
A. Data cleaning B. data editing C. error checking D. Coding
2. Which one of the following is not an editing solution for missing value of data?
A. Taking unsatisfactory respondents as it is B. Returning to the field
C. Assigning missing values D. All
3. The type of editing carried out when all the forms of schedules have been completed and returned to the headquarters is.
A. Field editing B. Central editing C. Pretest editing D. All

You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating 11points

Unsatisfactory – below 11 points



LG #49	LO #2- Present data in tables, charts and graphs
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Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Presenting data in tables and charts • Recognizing and reporting data This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to: • Present data in tables and charts • Recognize and report data
Learning Instructions:

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1. Read the specific objectives of this Learning Guide.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed.
3. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If your performance is satisfactory proceed to the next learning guide.

Information Sheet 1- Presenting data in tables and charts

1.1. Organizing and displaying data

When data is collected from a survey or designed experiment, they must be organized into a manageable form. Before presentation, data should be coded, entered to computer, checked for error. Data that is not organized is referred to as raw data. The processing of data can either be in the form of tables or in the form of graphs.

1.1.1. Coding data

Coding is the process of assigning some symbols (either) alphabetical or numerals or (both) to the answers so that the responses can be recorded into a limited number of classes or categories. The process of identifying and classifying each data value or answer with a numerical score. Data will be coded on paper or in computer. The numerical score or symbol is called a code, and serves as a rule for interpreting, classifying, and recording data. Identifying responses with codes is necessary if data is to be processed by computer. The coding is necessary for the efficient analysis of data. The coding decisions should usually be taken at the designing stage of the questionnaire itself so that the likely responses to questions are pre-coded. This simplifies computer tabulation of the data for further analysis. It may be noted that any errors in coding should be eliminated altogether or at least be reduced to the minimum possible level.

Coding for an open-ended question is more tedious than the closed ended question. For a closed ended or structured question, the coding scheme is very simple and designed prior to the field work. For example, consider the following question.

What is your animals' sex?

M a l e | | **F e m a l e** | |

We may assign a code of '0' to male and '1' to female animal. These codes may be specified prior to the field work and if the codes are written on all questions of a questionnaire, it is said to be wholly precoded. The same approach could also be used

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for coding numeric data that either are not be coded into categories or have had their relevant categories specified.

Coding of open-ended questions is a more complex task as the verbatim responses of the respondents are recorded by the interviewer. In what categories should these responses be put to? The researcher may select at random 60-70 of the responses to a question and list them. After examining the list, a decision is taken to what categories are appropriate to summarize the data and the coding scheme for categorized data as discussed above is used. A word of caution-that while classifying the data into various categories we should keep provision for "any other" to include responses which may not fall into our designated categories. It may be kept in mind that the response categories must be mutually exclusive and collectively exhaustive.

Table 8: Examples of coding on coding sheets for different variables

No	Variable name	Category definition (code)
1	Weight	<1 kg= 3 1-1.5 kg=1 >1.5 kg=2
2	Sex	Female=0 Male=1
3	Age	adult=0 young =1
5	Breed	Local=1 Hybrid=0
6	Cestode	Positive=1 Negative=0

Note that data collector can use his/her own code.

Table 9: Example of un coded data on Microsoft Excel

Code	Breed	sex	Weight	Age	Origin	Health status	Diarrhea	Cestode	Nematode	GI helminth
1	Local	Female	<1kg	Adult	Ambo	Clinically	Present	Positive	Positive	Positive
2	Local	Female	<1kg	Young	Ambo	Clinically	Present	Positive	Positive	Positive
3	Local	Female	<1kg	Young	Ambo	Clinically	Present	Positive	Positive	Positive
4	Local	Female	1-1.5 kg	Adult	Ambo	Clinically	Present	Positive	Negative	Positive
5	Local	Male	>1.5 kg	Adult	Ambo	Clinically	Present	Positive	Positive	Positive
6	Local	Male	1-1.5 kg	Adult	Ambo	Clinically	Present	Positive	Positive	Positive
7	Local	Male	>1.5 kg	Adult	Ambo	Clinically	Present	Positive	Positive	Positive
8	Local	Female	<1kg	Adult	Ambo	Clinically	Present	Positive	Positive	Positive
9	Local	Female	1-1.5 kg	Adult	Ambo	Clinically	Present	Positive	Positive	Positive
10	Hybrid	Female	1-1.5 kg	Adult	Ambo	Clinically	Present	Negative	Negative	Positive

Table 10: Example of coded data on Microsoft Excel (coded only for Cestode from Table 2 above)

Code	Breed	sex	Weight	Age	Origin	Health status	Diarrhea Status	Cestode
1	1	0	3	0	1	0	1	1
2	1	0	3	1	1	0	1	1
3	1	0	3	1	1	0	1	1
4	1	0	1	0	1	0	1	1
5	1	1	2	0	1	0	1	1
6	1	1	1	0	1	0	1	1
7	1	1	2	0	1	0	1	1
8	1	0	3	0	1	0	1	1
9	1	0	1	0	1	0	1	1
10	0	0	1	0	1	0	1	0



1.1.2. Data Entry

Data entry is the step comes after coding. It is the transfer of codes from questionnaires (or coding sheets) to a computer (soft wares like SPSS and Stata) in epidemiological data analysis for animal health data.

1.2. Ways to organize data

- Tables
- Diagram/Scheme
- Charts
- Graphs/Plots
- Map

1.2.1. Tables as Data Presentation Devices

Statistical data can be presented in the form of tables and graphs. In the tabular form, the classification of data is made with reference to time or some other variables. The graphs are used as a visual form of presentation of data. The tabulation is used for summarization and condensation of data. It aids in analysis of relationships, trends and other summarization of the given data. The tabulation may be simple or complex. Simple tabulation results in one-way tables, which can be used to answer questions related to one characteristic of the data. The complex tabulation usually results in two way tables, which give information about two interrelated characteristics of the data; three way tables which give information about three interrelated characteristics of data; and still higher order tables, which supply information about several interrelated characteristics of data.

Function of tables and figures

- To summarize data and results of analysis
- To give a better (and quicker, shorter) overview than just text (passages)
- Easier and quicker to compare (groups of) results
- Data in a (big) table can sometimes better be presented as figure

Following are the important characteristics of a table:

1. Every table should have a clear and concise title to make it understandable without reference to the text. This title should always be just above the body of the table.

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2. Every table should be given a distinct number to facilitate easy reference.
3. Every table should have captions (column headings) and stubs (row headings) and they should be clear and brief
4. The units of measurements used must always be indicated.
5. Source or sources from where the data in the table have been obtained must be indicated at the bottom of the table.
6. Explanatory footnotes, if any, concerning the table should be given beneath the table alongwith reference symbol.
7. The columns in the tables may be numbered to facilitate reference.
8. Abbreviations should be used to the minimum possible extent.
9. The tables should be logical, clear, accurate and as simple as possible.
10. The arrangement of the data categories in a table may be a chronological, geographical, alphabetical or according to magnitude to facilitate comparison.
11. Finally, the table must suit the needs and requirements of the research study.

Table 11: Frequency and Relative Frequency Table

<i>Number of Cars</i>	<i>Tally</i>	<i>Frequency</i>	<i>Relative Frequency</i>
0		4	$4/50 = 0.08$
1		13	$13/50 = 0.26$
2		22	0.44
3		7	0.14
4		3	0.06
5		1	0.02

Important criteria for tables and figures

- Should be clear and interpretable without reading the text
- Refer to each table and figure in the text. Examples:
 - ✓ Group A is significantly larger than group B (Table 1).
 - ✓ Figure 1 shows
 - ✓is shown in Table 1



- Abbreviation is allowed for figure:
- Depending on journal, both 'Fig. 1' and 'Figure 1' are used while the word 'Table' is usually not abbreviated
- Table legends given on the top,
- figure legends underneath
- In manuscripts, tables and figures are usually added
 - ✓ on separate pages after the body of the paper.
- A period (.) and space are used in the legend after the table number. In some journals a colon (:) or just nothing is used.
- Measurement units are specified in column headings if row items are similar.
- Three demarcation lines are used to separate the four table parts.
- Most journals do not accept vertical lines.
- Footnotes are used to clarify some points in the table (or to indicate significances).

1.2.2. Graphical Presentation of Data (Data by charts)

This is Presentation of data by graphs, charts, drawings, schemes, pictures, etc. Several types of graphs or charts are used to present statistical data. Of them; the following are commonly used: bar chart, two dimensional diagrams, pictograms, pie charts and arithmetic chart or line chart. Regarding figures, note that

- there are many types:
 - ✓ Graphs, charts, drawings, schemes, pictures, etc.
- use period (.) and space after the figure number
- units should be given on axis where appropriate
- various kinds of additional information possible
 - ✓ Like: Error bars, sample sizes, significances, etc.

Polygon

Polygon is graph of a frequency distribution. Good for showing and comparing two or more distributions on the same set of axes. It is line graph (rather than a bar graph).

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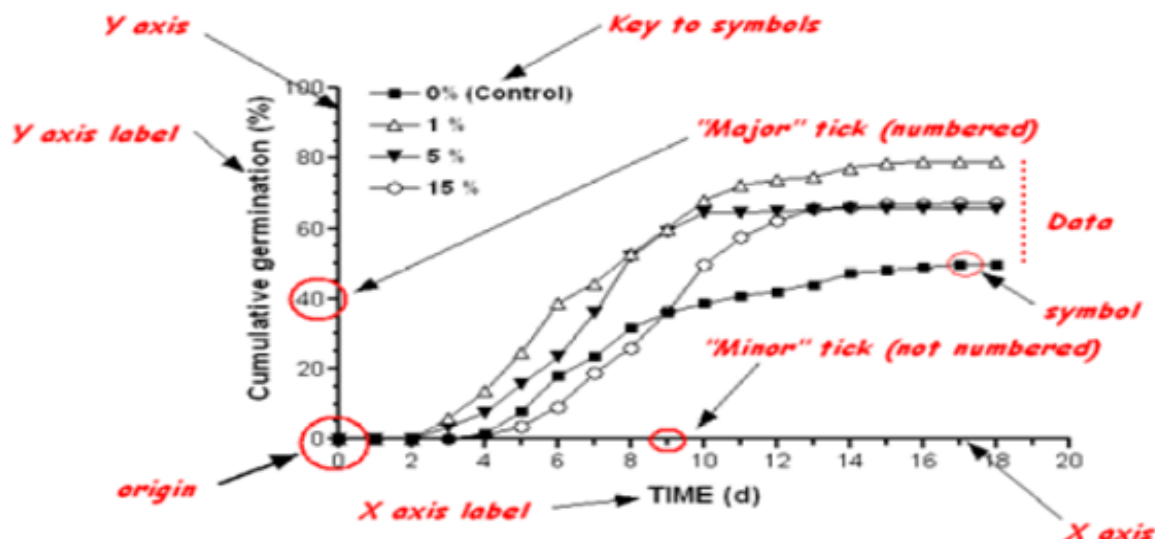


Figure 3: Scientific figure Polygon

Bar graph

It is a bar graph is constructed by labeling each category of data on either the horizontal or vertical axis or the frequency or relative frequency of the category on the other axis.

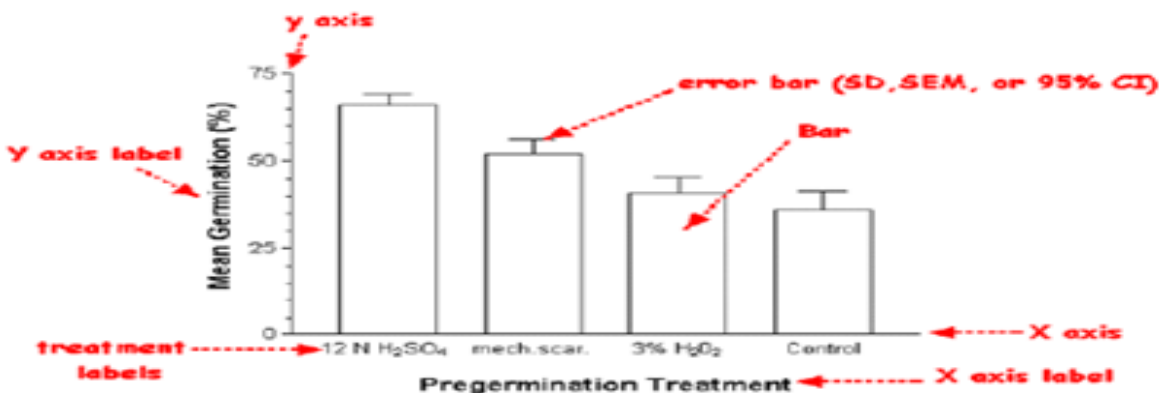


Figure 4: Scientific figure Bar

Histogram

Graph of the frequency distribution of a continuous variable. Though a histogram looks like a bar graph, it differs by the fact that all the bars are adjoining.

Example: Epidemic Curve - a histogram of disease cases during an outbreak or

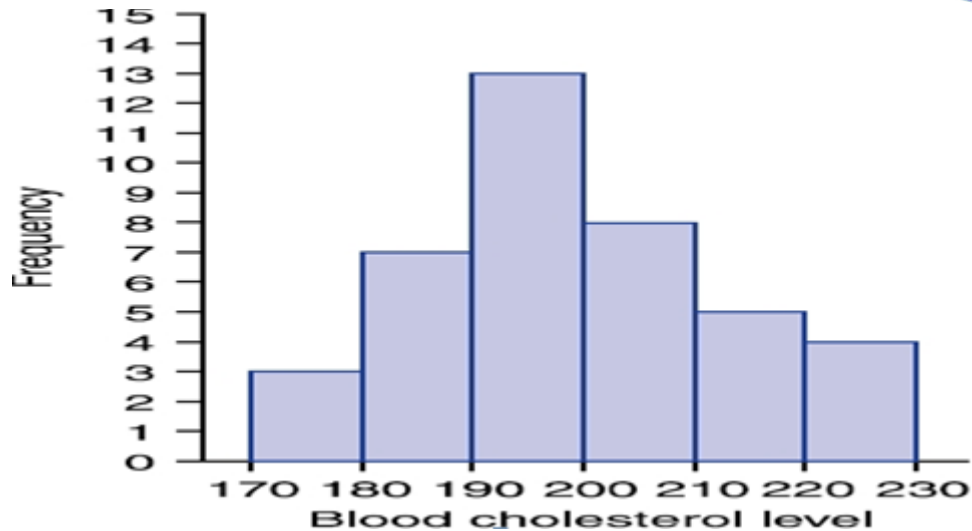


Figure 5: Histogram

Scatter plots

Used for plotting the relationship between two continuous variables. It is an effective way to see a relationship in data is to display the information as a scatter plot. It shows how two variables are related to each other by showing how closely the data points fit to a line.

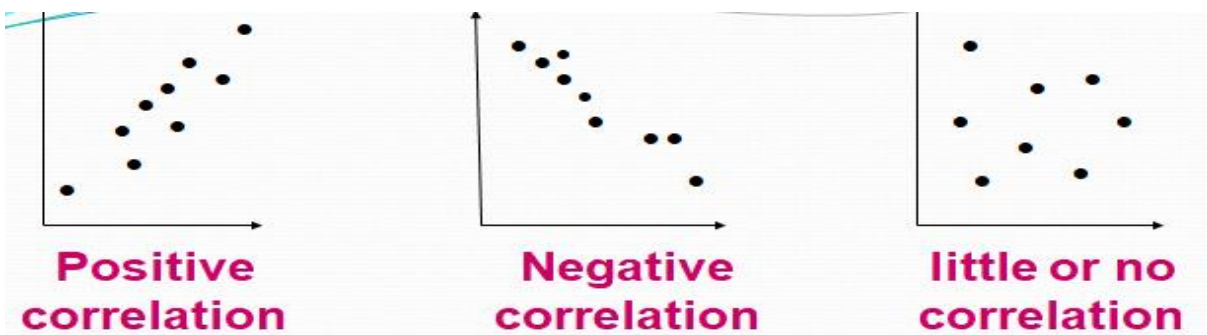


Figure 6: Scatter plots

Pictograms

In this form of presentation, data are represented by a picture. For example, population figures are presented by the picture of a human being, production figures of, say motorbikes, is presented by the picture of a motorbike, cattle population by a picture of cattle and so on. The following figure presents a pictograph showing the students on roll at the school/university level for the year 1996-97 and 1997-98.

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Figure 7: The students on roll at the school/university stage

Pie Chart

In a pie chart, different segments of a circle represent percentage contribution of various components to the total. It brings out the relative importance of various components of data. For drawing a pie chart, we construct a circle of any diameter and then the circle is broken into a desired number of segments, angle 3600 representing 100 percent. Percent is used as unit.

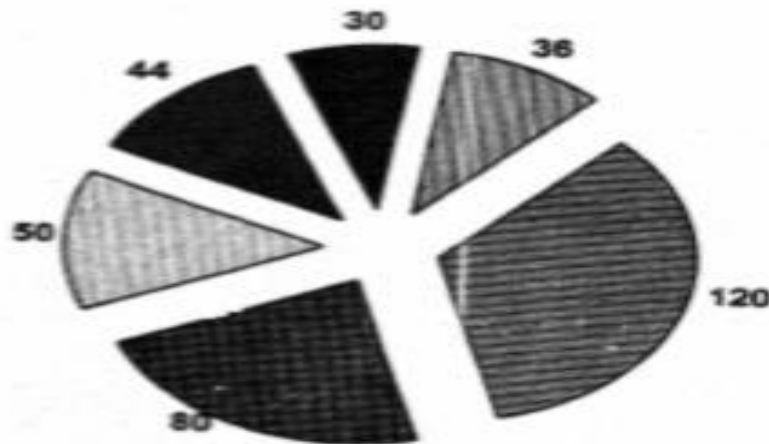


Figure 8: Pie Chart



Self-Check -1	Written Test
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Directions: Answer all the questions listed below (8points).

Test I: Choose the best answer

1. _____ is the process of assigning some symbols (either) alphabetical or numerals or (both) to the answers so that the responses can be recorded into a limited number of classes or categories.

A. Coding B. Data entry C. Analysis D. None

2. Which comes first when organizing data?

A. coding B. analysis C. Collection D. Data entry

Test II: Short Answer Questions (6points)

1. Write ways to organize data.
2. List advantages of using tables and figures for presentation of data.

You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating -4 points

Unsatisfactory - below 4 points

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Information Sheet 2- Recognizing and reporting data

1.1. Introduction to data flow

Veterinarians, technicians, farmers and other stakeholders, working on farms or at slaughterhouses, abattoirs or laboratories may all produce in-field data. This makes data flow a critical aspect of AHI systems. The restricted access of specific users to sensitive data needs to be taken into account when establishing the flow of disease data in an AHI system. Disease data need to be recorded and integrated following a logical sequence of steps leading up to validation and integration in the database prior to dissemination.

1.2. Reporting collected data and analyzed data (outputs)

Once data have been analyzed, the results must be made available to those involved in decision-making. The information has value at many different levels. Potential users include livestock owners, owner groups and cooperatives, as well as industry bodies, private veterinary services, agricultural product manufacturers, legislators, university and research organizations, trading partners, regional or international organizations, and local, provincial and national government veterinary authorities. Information dissemination can follow different channels and formats. Traditionally, periodical reports describing the results of data analyses are used to illustrate the main outcomes to policy-makers, other stakeholders and the general public. Today, data dissemination occurs increasingly via online utilities; for example, based on web-GIS solutions or interactive online reporting and charting systems.

Key considerations for the development of an animal health information system

A well-designed, functional AHI system should be based on clear rules and procedures. These must specify the responsibilities and duties of the different institutions and actors (public and private) involved, in order to establish an effective and efficient data quality verification system. As a general rule, those who generate the data should be responsible for their validation (as these stakeholders will possess all the necessary information to undertake the validation). The organizational structure of the institutions

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involved must be respected when data flows (inputs and outputs) are developed. Particular attention should be paid to these matters in cases where the information system has to collect and manage data deriving from several competent authorities. It is crucial to ensure that the system respects data ownership and confidentiality, and that all data are stored securely. In many countries, the execution of preventive actions (e.g. vaccination) is often assigned to private veterinarians or community animal health workers. As such, they play a crucial role in disease detection. To improve their ability to recognize clinical signs of disease, these veterinary practitioners should receive training and be targeted by communication campaigns.

Abattoirs and animal markets may also enter relevant epidemiological data into AHI systems. In many instances, these premises represent the sole feasible sampling point for monitoring programmes. Likewise, in some countries, laboratories represent the main centre for data collection and storage. Accordingly, LIMS function as a primary source of data for any AHI system. This is especially relevant when a widespread informatics infrastructure is not in place. Careful integration of animal health information systems is also essential to avoid multiple entries of the same data. This involves standardizing both data and procedures, and requires significant effort. With regard to standardization and the establishment of common dictionaries, it is also necessary to implement a common coding system (to track the source and type of data). This represents a significant challenge for any institution. The complexity of these systems and the need for practicable, flexible and easy-to-use tools, poses particular difficulties for developers.

A collaborative approach involving management experts and veterinary professionals is, therefore, crucial. For the above-mentioned reasons, it is advisable to adopt a progressive and incremental approach when developing an AHI system, starting with the basic functionalities (e.g. notification and registration of disease cases) and progressively adding new ones. An AHI system should be integrated gradually with other existing systems (e.g. integration with a LIMS could start with the exchange of simple data files). The integration of two or more pre-existing information systems

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developed for different purposes requires complex analysis of the data generation process and revision of data management procedures.

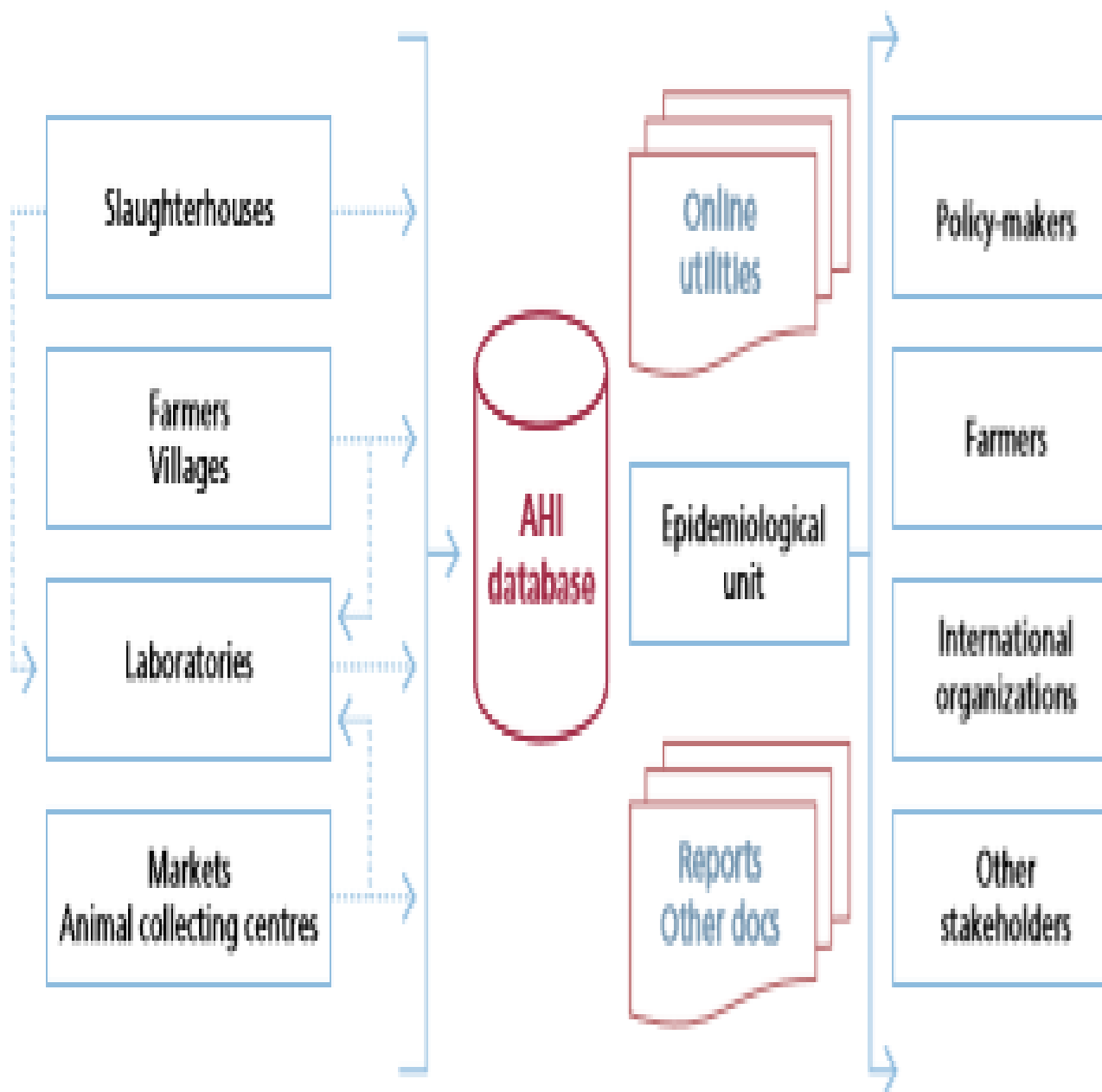


Figure 9: Main data flow in an AHI System

**Self-Check -2****Written Test**

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions

1. What are the Key considerations for the development of an animal health information system?
2. List the main data flow in an AHI system by sketching its skeleton.

You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating -5 points

Unsatisfactory - below 5 points



LG #50	LO #3- Store and retrieve data
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Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • filing and storing data • Maintaining enterprise confidentiality standards This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • file and store data • Maintain enterprise confidentiality standards
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them. 4. Accomplish the “Self-checks” which are placed following all information sheets. 5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks). 6. If you earned a satisfactory evaluation proceed to “Operation sheets

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Information Sheet 1- Filing and storing data

1.1. Filing data

Filing data is giving name for the data and put it for future use. Most of the time filing is performed on computer Microsoft excels. Each file is individually filed. Filing helps for proper handling of the data and for easy access to data. The process of filing data is used to manage data in proper means. File name is given and the filed data should be stored. The data can be filed on data collection sheet too. Technique of filing is to the data collector.

It is important to establish a permanent storage system for all original data collection sheets (survey forms, data-collection forms etc) that makes it easy to retrieve individual sheets if they are needed during the analysis. If animals (or groups of animals) in the study have identification numbers, this makes a convenient way to store (and later retrieve) individual files. Some things to consider when dealing with the file are as follows.

- Do not remove originals from this file. If you need to take a specific sheet for use at another location, make a photocopy of the sheet.
- Never ship the original to another location without first making copies of all forms. (You don't want to lose your whole study because the post office or courier loses your package).
- Set up a system for recording the insertion of data collection sheets into the file so that you know how many remain to be collected before further work begins. •
- Once all of the forms have been collected, before you do anything else, scan through all sheets to get an impression for their completeness. If there are omissions in the data-collection sheet (ie forgetting to complete the last page of a questionnaire), returning to the data source to complete these data will more likely be successful if it is done soon after data were initially collected rather than weeks or months later (after data analysis has begun).

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Table 12: data filing example on Microsoft excel

coding information											
breed	1=local	Age	1=young	Sex	1=female	Animal source	1=Ambo	Health status	1=apparently healthy	Diarrhoeal status	1= present
	2=hybrid		2=adult		2=male		2=Direinchini		2= Clinically sick		2= Absent
							3=Holeta				

1.2. Storing data

AHI systems should be able to handle a large amount of data and information. Paper-based systems are often inefficient and severely limited in the volume of information they can process. Computerized systems based on database management systems are more efficient, and are recommended, even for use in developing countries, due to their ability to store and effectively manage large amounts of data for processing.

1.2.1. Central infrastructure to store data and provide web-based services

The main resources required include a database server to host data, a separate server to host web-based applications and synchronization services, and high-speed internet access. The central infrastructure should also have well-secured data backup and recovery services. Generating complex reports and graphs often consumes many resources. Therefore, it is advisable to have an additional data warehouse server that stores data in specified formats that allow the production of specific reports and graphs required by users, if defined in the functional requirements. For security purposes, the data stored at the data centre should be duplicated at a second site located over 30 km from the principal site. If a fire or other event should destroy the main data centre, the second site should allow the system to be restarted with a minimum loss of data, and a minimum period of unavailability. The frequency of data backup and the time to restart, known as the recovery point objective (RPO) and the recovery time objective (RTO), respectively, should be defined by the project owner, and are typically less than 2 hours (RPO) and 4 hours (RTO). The company responsible for hosting the data must commit to guaranteeing the RPO and RTO.



Self-Check -1	Written Test
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Directions: Answer all the questions listed below and write your answers on space provided on the next page (8 points).

Test I: Short Answer Questions

1. What are the main resources required for central infrastructure to store data and provide web-based services?
2. _____ is giving name for the data and put it for future use.

You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating -4 points

Unsatisfactory – below 4 points

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Information Sheet 2- Maintaining enterprise confidentiality standards

2.1. Maintaining the confidentiality of data

For many years, the Animal National Animal Health Monitoring System (NAHMS) has served as the primary source for national level statistical data on animal health and management. As a unit within Veterinary Services (VS) program, NAHMS conducts national commodity studies, develops study designs for epidemiologic investigations, and examines issues of interest through analysis of statistical data. NAHMS studies generate statistically valid data used to analyze the health of various animal species and commodity groups in the United States. These data and corresponding analyses are used by VS to develop regulatory policy, to promote trade, and to inform industry and the general public.

When conducting a study, NAHMS often asks producers to voluntarily provide sensitive information about their management practices, animal health, and other operational issues related to on-farm production. These producers are understandably concerned about the confidentiality of the data collected since responses linked to an individual operation could have unintended consequences. Assuring producers that any information shared when participating in a NAHMS study will remain absolutely confidential is vital to encouraging voluntary participation and maintaining high response rates.

As a recognized statistical unit, NAHMS now has the ability to gather data from producers and perform studies that focus on a wider range of issues, such as:

- Collecting regionalization/zoning/compartimentalization data that will be used to provide vital information on the mitigation of international trade restrictions
- Performing anonymous sampling to address sensitive issues such as antimicrobial resistance in which regulatory action and trace backs are not required. This sampling will provide voluntary response data on prevalence, distribution, and risk factors that are difficult to obtain without strong confidentiality protections.

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- Informing program and policy development using nationally representative statistical information
- Identifying appropriate disease-control strategies and assistance in regional disease control efforts through rapidly deployed emergency epidemiologic investigations
- Partnering with second-party data providers to advance issues of mutual interest.

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**Self-Check -2****Written Test**

Directions: Answer all the questions listed below and write your answers on space provided on the next page (4 points).

Test I: choose the best answer

1. Now the time, NAHMS has the ability to gather data from producers and perform studies that focus on a wider range of issue, list down these issues.

You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating -2 points

Unsatisfactory - below 2 points



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Appendix

1. LIST OF ANIMAL DISEASES REPORTED BY LOCAL AUTHORITIES TO THE DOVAR SYSTEM

African horse sickness, African swine fever, anaplasmosis, anthrax, babesiosis, black quarter, brucellosis, camel pox, canine distemper, contagious bovine pleuropneumonia, contagious echtyma, contagious caprine pleuropneumonia, dourine, echinococcosis, equine herpes virus, ehrlichiosis (cowdriosis), foot and mouth disease, fowl cholera, fowl typhoid, gumboro, haemosepticemia, highly pathogenic avian influenza, infection coryza, lumpy skin disease, lymphangitis, maedi visna, malignant cattle fever, Marek's disease, Newcastle disease, pest des petits ruminants, Pullorum disease, rabies, Rift Valley fever, sheep and goat pox, streptothricosis, trypanosomiasis, and tuberculosis.

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