Report on the Evaluation of Surveillance Systems Relevant to Zoonotic Diseases in Kenya- 2015: A Basis for Design of an Integrated Human Livestock Surveillance System

Evaluation Report

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Table of Contents

Contents

ABBREVIATIONS

WHO……World Health Organization

FAO……Food and Agriculture Organization

CDC……Centers for Disease Control and Prevention

IHR……International Health Regulations

AHSP ……Animal Health Service Provider

OIE …….World Organization for Animal health

IDSRU……..Integrated Disease Surveillance and Response Unit

VEEU……..Veterinary Epidemiology and Economics Unit

DVS ……Director of Veterinary Services

KWS ……..Kenya Wildlife Services

ARIS2……..Animal Resources Information System 2

AHA……..,…Animal Health Assistant

CBAHW…….…..Community Based Animal Health Worker

CHV…….Community Health Volunteer

MALF……Ministry of Agriculture Livestock and Fisheries

MOH…….....Ministry of Health

NGO…….….Non-Governmental Organization

AU-IBAR……Africa Union-Inter Africa Bureau for Animal Resources

KII……Key Informant Interview

FGD……Focused Group Discussion

ZooLinK……..Zoonoses in Livestock in Kenya

List of tables and figures

1.0. EXECUTIVE SUMMARY

The Zoonoses in Livestock in Kenya (ZooLinK) is a project that seeks to enable Kenya develop an effective surveillance programme for zoonotic diseases (infectious diseases transmissible between animals and human beings). The surveillance programme will be integrated across both human and animal health sectors. To achieve this goal the project will work in close collaboration with Kenyan government departments in responsible for animal and human health. As a prelude to the start of the project, an evaluation of the existing surveillance systems for human and animal health was carried out. The evaluation focused on the national surveillance system and the systems at the western part of Kenya (Busia county, Kakamega county and Bungoma county) where the initial programme will be developed.

In conducting the evaluation the investigators used key informant interviews, focused group discussion participant questionnaires, audio recordings and observation for data collection. Data analysis for the qualitative data focused on generating themes or theory around the responses obtained in the key informants interviews and focused group discussions. Univariate analysis was performed by use of simple proportions in calculation for surveillance system attributes like sensitivity, completeness, PVP and Timeliness for the human health surveillance systems.

The findings of the evaluation revealed that there was poor linkage between animal health surveillance and the human health surveillance systems. None of the systems had surveillance structures dedicated to zoonotic diseases. Most practitioners used clinical signs for diagnosis of diseases with little reference to acceptable case definitions. Laboratory diagnosis in animal health services focused more on suspected notifiable diseases as opposed to being a standard operating procedure for diagnosis. In Human health services the health care facilities that had laboratory within the facility conducted laboratory diagnosis for cases referred by the clinicians. However, some clinicians preferred using clinical signs for diagnosis to avoid the wait or turn-a-round time in the laboratory.

For effective surveillance of zoonoses to be realized it would be advisable to establish surveillance structures specific to zoonoses and the necessary resources allocated to the surveillance activities. In addition, an integrated approach that incorporated both human and animal disease surveillance should be employed in the surveillance of zoonoses.

2.0. INTRODUCTION

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data about a health-related event for use in public health action to reduce morbidity and mortality and to improve health. The functions of Public Health Surveillance include supporting case detection and public health interventions, estimating the impact of a disease or injury, portraying the natural history of a health condition, determining the distribution and spread of illness, generating hypotheses and stimulating research, evaluating prevention and control measures, facilitating planning and outbreak detection (CDC, 2001; WHO, 2006)

Recent global pandemics of emerging and re-emerging diseases like Viral Hemorrhagic Fevers, Respiratory Viruses and others underscore the importance of effective surveillance and response systems world over. Threats of bioterrorism to global health security and economic stability have also revolutionized the role of surveillance among global communities. The International Health Regulations (IHR) 2005 underlines the importance of surveillance systems and requests commitment from all Member States to establish and implement effective surveillance and response systems to detect and contain public health threats of national and international importance (WHO, 2006)

Surveillance for zoonotic diseases in Kenya is conducted in separate departments in various Ministries including Ministry of Health (MOH), Ministry of Agriculture Livestock and Fisheries (MALF) and the Ministry of Kenya Wildlife Services Kenya established a One Health (OH) Office called Zoonotic Disease Unit (ZDU) in 2011 whose mandate is to focus on zoonotic diseases and effectively link human and animal health experts. The ZDU is charged with the mission of establishing and maintaining active collaboration at the animal, human and ecosystem interface towards better prevention and control of zoonotic diseases. The ZDU is a unit that is directly linked and dependent upon the Ministry of Health (MOH) and Ministry of Agriculture, Livestock and Fisheries (MALF) for leadership and financial support (ZDU Kenya, 2012)

There is limited information available on assessment conducted on the existing surveillance platforms to determine if they are adequately meeting the objectives for which they were formed. The Current Surveillance systems do not capture adequate information on zoonotic events and where the information available, the quality is low since Surveillance for zoonoses is largely health facility based in the human sector, participatory surveillance in animal health sector is weak and both sectors receive minimal reports from private practitioners. The existing surveillance systems operate separate databases which are not linked in any way, thereby fragmenting information on zoonotic diseases into several pieces managed by different bodies. Devolution of Animal and Human health services to the counties as per the Kenyan Constitution promulgated in 2010 has brought new dimensions and impact that should be considered in disease monitoring and management systems in both human and livestock sectors. Moreover, a situation analysis to determine the existing opportunities for design and introduction of an integrated surveillance system for zoonotic disease is lacking.

We undertook an evaluation exercise targeting the current surveillance systems in human, livestock and wildlife health services relevant to zoonotic disease surveillance in Kenya with specific focus on three counties in Western Kenya to provide specific recommendations for improvement of zoonotic disease surveillance and suggest opportunities for design and deployment of integrated human-livestock surveillance system

3.0. BACKGROUND AND PURPOSE

3.1 Project background, goals and objectives

The ZooLink project is a project that seeks to focus on surveillance of zoonosis in livestock in Kenya with the initial focus on Western Kenya. The driving force behind the project is the fact that the presence and burden of zoonoses is greatly underestimated in Kenya just like in other developing countries. The risk of zoonoses and other infectious diseases has been increased by the far reaching changes in the agricultural sector, with major changes in livestock production systems like commercialization and intensification in order to satisfy increased demand for livestock products (The FAO-OIE-WHO Collaboration, 2010; ZED Group, 2015)

The goal of ZooLinK is to enable Kenya to develop an effective disease surveillance programme for zoonoses (infectious diseases that are transmissible between human beings and the lower vertebrates and are acquired through contact with animals or their products), which is, by design, integrated across both human and animal health sectors. To achieve this goal the project implementers will work in close collaboration with Kenyan government departments responsible for animal health and human health in western Kenya and the model developed for western Kenya will be used for a national programme (WHO, 2016; ZED Group, 2015)

The major objectives of the project are to estimate the current zoonotic disease and to understand how it will evolve in to the future (ZED Group, 2015)

3.2 Purpose of the evaluation

In order to come up with a surveillance system for the zoonoses the existing system need to be identified and their effectiveness in addressing zoonoses surveillance determined. There is little information available on the evaluation of the existing disease surveillance systems in Kenya. The evaluation exercise was to provide baseline information needed to inform disease surveillance stakeholders on various aspects of the systems currently in use in the country. It also sought to identify the gaps in the system and provide recommendation for improvement.

4.0. EVALUATION METHODS

A descriptive study of the surveillance systems for Human, Livestock and Wildlife Health was undertaken. Multistage Sampling Technique was used at each level of surveillance to select respondents: National (MOH and MALF), County (Busia, Bungoma and Kakamega Counties), Sub County, Health Facility (County Referral Hospitals in Busia, Bungoma and Kakamega) and Community Levels. Within each level, selection of the study sites and subjects was done by simple random sampling technique. Purposeful selection of respondents was applied to sample the surveillance unit heads data managers at national level and the three counties; Busia, Kakamega and Bungoma. These were selected based on their location in the study site where the upcoming project 'Zoonosis in Livestock in Kenya' (ZooLinK) will be implemented.

The comprehensive framework developed by the CDC and detailed in the 'Updated Guidelines for Evaluating Public Health Surveillance Systems' was used in the evaluation (CDC, 2001). The scope of the evaluation included;

- National and County surveillance and reporting systems for zoonotic diseases
- Stakeholder networks (minimal)
- Databases that houses reporting data or reporting systems
- Objectives of the identified systems
- Legal provisions, administrative mechanisms, data collection and reporting structure
- Components of the individual surveillance systems and resource requirements
- Special attributes of the surveillance systems
- Attitudes and perceptions regarding zoonotic disease surveillance
- Effect of devolution on zoonotic disease surveillance and
- Proposals on the design and deployment of an integrated human-livestock surveillance system

Where possible, assessment of the qualitative attributes like sensitivity, predictive value positive (PVP), timeliness and completeness were done by analysis of available data in the surveillance databases and review of records held in other parallel reporting systems e.g. the laboratory records. Qualitative system attributes like usefulness, acceptability, flexibility, simplicity, system integration & interoperability, data security and confidentiality were assessed through informant interviews and questionnaires administered to key people at the national and county levels. Attitudes and perceptions regarding zoonotic disease surveillance, effect of devolution on surveillance and the proposed designs for the integrated surveillance system were assessed by use of focused group discussions.

4.1 Data collection methods

The data collection methods used in the evaluation exercise included Key Informant Interviews, Focused Group Discussions, participant questionnaires and observation. Audio recording was used during the KII and the FGD's.

4.2 Data sources

Data for the evaluation exercises was sourced from health registers, laboratory register, Surveillance reports (weekly, monthly, quarterly, and annual), records, questionnaires, interviews and the discussions with selected groups.

4.3 Description of respondents

At the national level the respondents included officers who were in charge of the day to day operations of the surveillance activities and those responsible for management of the computerized surveillance system. We used KII's to get information from the officers. Among those interviewed included the heads of disease surveillance at the VEEU, KWS, NTD's, IDSR, HMIS, VPH&AP, NPHLS and ZDU.

At the county level the KII was used to get information from the county heads of human health, county heads of veterinary services and the county heads of disease surveillance of Kakamega, Bungoma and Busia. Participant questionnaires were administered to the sub county heads of veterinary services, sub county health information records officers, health facilities in-charges and sub county diseases surveillance officers. The FGD participants were drawn from different cadres in the departments of health and veterinary services at the county level. The participants included the frontline staff in veterinary services like the AHA's, Meat Inspectors, veterinary officers and records officers from the department of veterinary at the county level. Participants from human health services included CHEW's, CHV's, health records officers, nurses, clinical officers

4.4 Data processing technique

For the qualitative data the methods focused on generating themes or theory around the responses obtained in the key informants interviews and focused group discussions. Univariate analysis was performed by use of simple proportions in calculation for surveillance system attributes like sensitivity, completeness, PVP and Timeliness.

4.5 Data limitation

Most of the records obtained from the animal diseases surveillance system focused more on counts and condemnation figures from the slaughter houses and slabs.

5.0. RESULTS - Key Informant Interviews and Observations

5.1 Human Health Disease Surveillance Systems

Ministry of Health (MOH) in Kenya conducts surveillance activities on zoonotic diseases spanning at least 4 different units; Health Management Information System (HMIS), Disease Surveillance and Response Unit (DSRU), Division of National Public Health Laboratory (NPHLS) and the Neglected Tropical Disease Unit (NTDU). All these units run parallel systems of surveillance which are not interlinked, although some data sources are shared in some instances.

5.1.1 DISTRICT HEALTH INFORMATION SOFWARE 2 (DHIS 2)

Health Management Information System Unit (HMIS) is the main unit in MOH under the division of Monitoring & Evaluation, Health Research, Development and Health Informatics that is charged with the responsibility of capturing routine health data in one place, conduct quick analysis and disseminate health data to those who need to know. By the virtue of conducting routine data collection, this unit receives analyses and disseminates some surveillance data which also encompass some priority zoonotic diseases. The unit captures health data on the District Health Information Software (DHIS 2) version 2.2.0 which is freely available online portal where data is entered and accessed by users at lower levels of the health system.

5.1.1.1 Surveillance system Description

HMIS majorly focusses on passive surveillance encompassing a range of human diseases and conditions which are mainly reported through the MOH registers: MOH 705 A & B (Outpatient registers), MOH 505 (IDSR Weekly Epidemic Monitoring Forms). The priority Zoonotic Diseases included under surveillance by HMIS captured in MOH 705 are; Viral Hemorrhagic Fever (Group), Yellow Fever, Plague, Influenza Group, Brucellosis, Salmonellosis (Typhoid fever), Animal bites, Leishmaniasis, Schistosomiasis (Bilharzia). The rest would be lumped under 'All other diseases' which are also reportable in the same registers. The MOH 505 captures data on Anthrax, Dengue, Rabies, Rift Valley Fever, Typhoid, Viral Hemorrhagic Fever (VHF), Sever Acute Respiratory Illness (SARI Clusters), Yellow Fever and 'Others'.

The main objectives of collection of surveillance data through DHIS 2 are to;

- Capture routine data in one place
- Help conduct quick analysis to generate standard ad dynamic reports
- Help disseminate information to health stakeholders

5.1.1.2 Legal Authority/Legislation

Several policies and legislations govern this system of surveillance in Kenya. The Health Information System Policy specifies the what, who and when to report health data. The constitution of Kenya of 2010 specifies the right to information for all citizens. The Kenya

Vision 2030 has health as one of the social pillars and the Kenya Health Policy Framework 2012-2030 specify health information as one of the key pillars of achievement of health goals in Vision 2030. The Kenya Health Sector Strategic Plan of 2012-2018 presents key health sector strategies and priorities among which Health information. The current Health Bill which is still under discussion in parliament specifies health information as a key right. Several other local and international statues are also referred to in the management of Health information by the HMIS

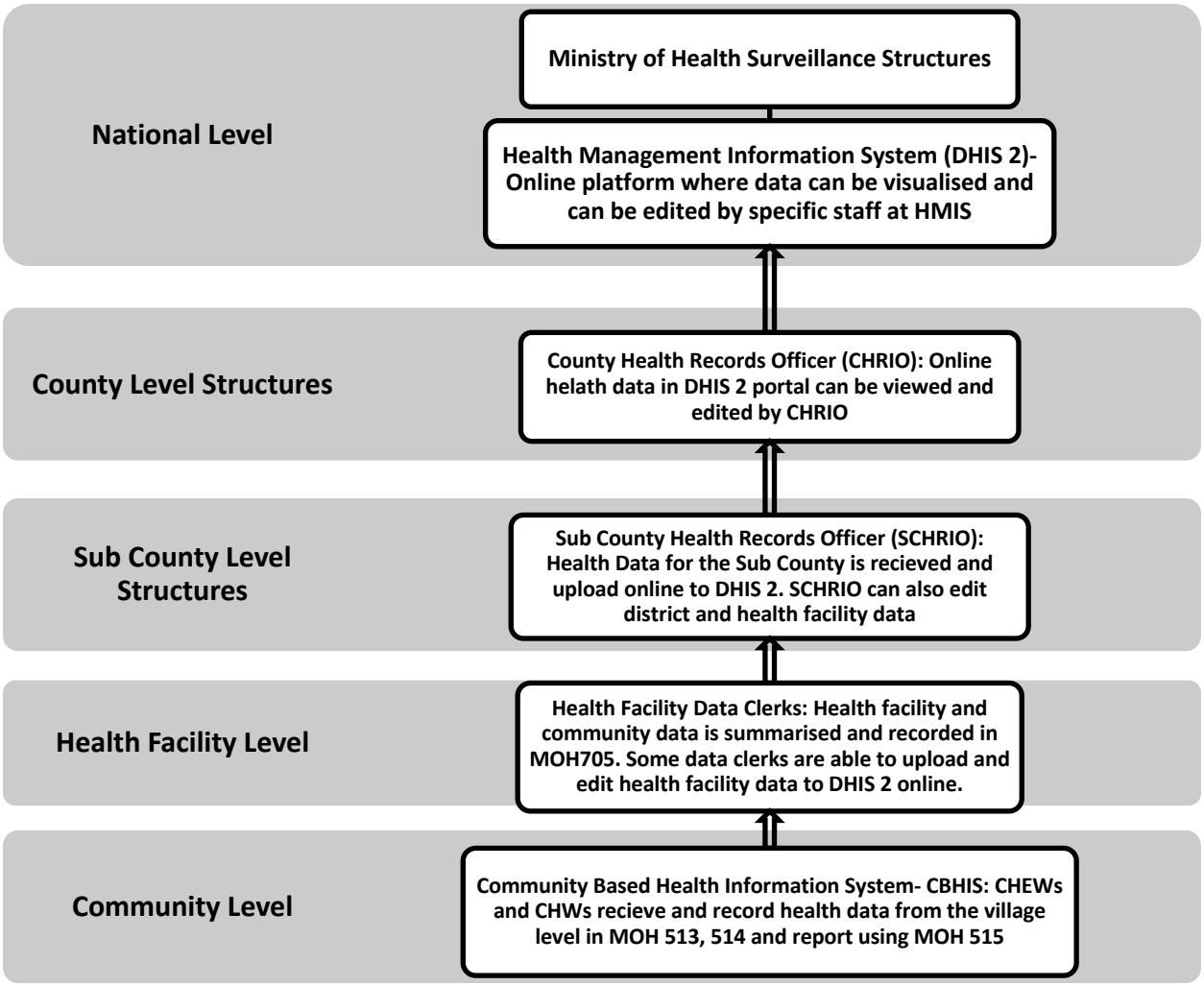
5.1.1.3 Administrative structure

HMIS is organized in 5 levels based on the health administrative structures of MOH as shown below. There are currently plans to include ward level in the structure in line with devolution.

5.1.1.4 Description of the major components of DHIS 2

The total population under surveillance (from which health data on priority zoonotic diseases is collected) is the whole population of Kenya (>45 million). Data is collected and sent passively on daily basis (e.g. maternal deaths), weekly (e.g Integrated Disease Surveillance and Response data), Monthly (for most other indicators including MOH 705) and quarterly (on staff returns, financial returns etc).The system collects data which is either aggregated data (e.g Counts of cases of brucellosis in a month), case-based data (e.g HIV cohort based data/follow up data) and annual data (e.g population projections) for the various units.

The major sources of the data collected under DHIS 2 is routine health data generated at the community or health facility data and captured in primary health registers enumerated with Ministry of Health numbers e.g MOH 105, 513,514 etc which are later summarized and aggregated into MOH summary/reporting tools e.g. MOH 705 A & B, MOH 515 etc. Data that feeds into these registers is generated from outpatient and inpatient departments, laboratories, and immunization clinics among others. Baseline data is provided by national census or survey data.



Data is transferred via a hybrid system: Manual transfer through hard copy reports which are prepared and handed over to the Sub County Health Records Officer (SCHRIO) who in turn files the copies and electronically directly through Electronic Medical Records Systems in some health facilities and via DHIS 2 for some facilities.
Data which has been uploaded into DHIS 2 is stored electronically and backed up daily to cloud and online repositories. The main server for the system is located at the University of Nairobi but the backups are located in other different locations.

Data analysis is routine and is expected to be carried out at all the 5 levels by officers working at those levels for example the Community Health Volunteers (CHVs), Community Health Extension Workers (CHEWS), Data clerks, SCHRIO and CHRIO among other users. Any other user with login credentials can also log in and access data at any of these levels and visualize, download and analyze the data. Data analysis is mainly done monthly, quarterly or annually for consumption by various users at different levels, depending on need and ability. There is no specific data analysis software but the system has online data analysis tools e.g. dashboard

tables, pivot tables, data visualizers, GIS, event visualizers and standard reports based on fixed templates.

Following data analysis, dissemination to stakeholders is done at all levels also based on need. The HMIS unit prepares and shares trends reports with national level stakeholders periodically and the unit also prepares and disseminates quarterly bulletins which are shared with various stakeholders at all levels.

5.1.1.5 Resources needed to operate the system

DHIS 2 is majorly funded by Health Ministry and health partners like USAID/APHIA Info, World Bank and DANIDA. Personnel supported by the Health Ministry are deployed at the national level to support DHIS 2 as per the table below;

	Cadre	No Present (Technical)	Requirement/optimum
1	Epidemiologists	1	3
2	Demographers	0	2
3	Statisticians	0	4
4	Health Information Managers	3	8
5	Public Health Specialists	1	4
6	ICT Specialists	0	4
7	Data Clerks	0	12
	Total	**5**	**37**

In terms of physical infrastructure, the HMIS unit has an office space, few computers for the officers, a computer server, have a shared means of transport, electricity and internet. Stationery is provided for the unit based on availability of a budget for the same. The following grid provides a summary of the other direct costs incurred in HMIS to maintain DHIS 2;

	Vote	Estimated Cost	Frequency	Total
1	Initial Training	12,000,000	1	12,000,000
2	Refresher/Follow up training	5,000,000	1	5,000,000
3	Mail/Courier	0	-	0
4	Transport	30,000	12	360,000

5	Internet	8,000	12	96,000
6	Electricity	Shared	-	-
7	Airtime	0(Not allocated)	-	0
8	Stationery	Shared		
9	System Maintenance	2,000,000	1	2,000,000
10	Server fees	36,000	1	36,000
	Total			

5.1.1.6 Digital/Computerized surveillance tools

DHIS 2 is an online digital platform that lets you manage aggregate data with a flexible data model. It was developed by the University of Oslo and is a free/open source software that can enable the user to set up data elements data entry forms, validation rules, indicators and reports in order to create a fully-fledged system for data management. DHIS 2 2 has advanced features for data visualization, like GIS, charts, pivot tables and dashboards which lets the user explore and bring meaning to health data. It is currently used to store and aggregate health data for Kenya and is managed by MOH staff in collaboration with partners from APHIA Info and University of Nairobi. The online is fully operational more than 99% of the time and availability is affected by local network connection.

5.1.1.7 DHIS 2 System Attributes

Data Quality: DHIS 2 has varied system quality checks in place to ensure that the system is working optimally. This system can enable the users to capture aggregate data on a variety of devices and also allows users to enter, use and access data both online and offline. During network downtime, the data entered is captured locally in the browser and can then be uploaded to the online server when connectivity is back. The system can enable users to generate unique data entry forms based on data model and need, define auto-calculated fields inside the forms, enable and employ logical validation rules and system checks and also set minimum and maximum values to improve data quality. The system has capabilities to flag off out of range data and pin point areas with suspicious data or inconsistent data by employing data marks and means e.g. a case of anthrax or polio reported in DHIS 2 is able to trigger and generate a system flag.

System integration and interoperability: DHIS 2 is able to integrate with other computerized systems. It has great capabilities for data exchange and comes with its own format for meta-data and data exchange. Most parts of the system can be accessed through the extensive REST-based web API, making it synchronize with third party clients like Android applications, web portals

and other information systems including the newly deployed m-SOS system. It is even possible to set up scheduled integration jobs in order to periodically import and synchronize with data from other open source systems. Unfortunately, most of these capabilities have not been fully exploited in the DHIS 2 version in current use in Kenya.

Data Security: Security of stored data in DHIS2 is ensured through a compound layer of safety features. All users of DHIS2 have credentials and user rights that are assigned at different levels and with varied levels of capabilities so as to improve safety. Only registered users with emails are able to view data which has been uploaded and only users with varied levels of user rights and authorizations are able to key in new data and even edit data sets in DHIS2. Additionally, the data in this system is encrypted so as to improve online safety and integrity.

Confidentiality: DHIS2 in its current form ensures confidentiality by capturing only health events as opposed to patients. The system is able to be configured to code and hide any piece of information that may compromise confidentiality of patients online. The consent to capture and display health data in DHIS is one that is implied in the various health policies and statutes like the Kenya Constitution 2010 and Kenya Health Information System Policy among others.

Timeliness and Completeness: DHIS2 is relatively timely and complete, but this varies from dataset to dataset, county to county, month to month or between different years. The grid below provides a snapshot of timeliness and completeness over time, calculated on the basis of complete dataset registrations received by the 15th day of the month;

% Completeness and Timeliness for the year 2014 (Jan-Dec), Outpatient Summary <5 years

Region	Actual Reports	Expected Reports	Completeness%	Reports on Time	Timeliness %
Bungoma	1621	1884	**86.0**	1505	**79.9**
Busia	979	1068	**91.7**	865	**61.0**
Kakamega	2499	2808	**89.0**	2047	**72.9**
Kenya	75908	89760	**84.6**	67255	**74.9**

% Completeness and Timeliness for Q3 2015 (July-Sept 2015), Outpatient Summary >5 years

Region	Actual Reports	Expected Reports	Completeness%	Reports on Time	Timeliness %
Bungoma	448	471	**95.1**	423	**89.8**
Busia	258	270	**95.6**	238	**88.1**

Kakamega	680	705	**96.5**	645	**91.5**
Kenya	20646	22359	**92.3**	18653	**83.4**

% Completeness and Timeliness for 2012, Outpatient Summary <5 years

Region	Actual Reports	Expected Reports	Completeness%	Reports on Time	Timeliness %
Bungoma	1435	1884	**76.2**	1391	**73.8**
Busia	860	1068	**80.5**	771	**72.2**
Kakamega	2129	2808	**75.8**	1964	**69.9**
Kenya	67338	89760	**75.0**	59813	**66.6**

% Completeness and Timeliness for Q3 2012 (July-Sept 2012), Outpatient Summary >5 years

Region	Actual Reports	Expected Reports	Completeness%	Reports on Time	Timeliness %
Bungoma	364	471	**77.3**	363	**77.1**
Busia	225	270	**83.3**	220	**81.5**
Kakamega	544	705	**77.2**	537	**76.2**
Kenya	17414	22359	**77.9**	16139	**72.2**

Usefulness/Acceptability: DHIS2 is useful to the users. The system is able to provide estimates of the magnitude of morbidity and mortality related to the health events under surveillance e.g. users are able to compute the total number of cases of a disease or the mortality rates in the population. Depending on periods of data entry, the system is also able to depict trends that may signal changes in the occurrence of disease, injury or adverse or protective exposure in the population under surveillance including detection of epidemics. Through analysis of such trends, users are also able to assess the effect of prevention and control programs. DHIS2 has a dedicated research unit that periodically translates the information obtained from the data to research. This has in instances lead to change in practice or improved behavioral, social and policy environment. DHIS2 indicators are always employed as a measure of true performance in health sector indicators. Acceptability of DHIS2 is very high, judging from the high participation rate of different units and agencies in reporting through this system.

Simplicity: DHIS2 system is quite simple in its design and user friendly. With little teaching, users are able to mine data in formats that are convenient and understandable to them. DHIS 2 allows users to explore and understand data through great visualization features. It can enable

one to get the complete overview through the pivot table feature, spot trends in data with charting and visualize geographical data aspects using the GIS functionality. These analytics are so easy to use that anyone can take advantage of it.

The system is based on simple and intuitive principles and enables one to create analysis from live data in seconds. DHIS 2 is completely web-based, making it simple to share your analysis with colleagues and stakeholders. The reporting structure is simplified as in most cases data flows from the health facility to the sub-County then online and is available to everyone to view while in some cases data is entered straight at the point of generation (Health facility level). This is quite a simple design which avoids all the bureaucracies in long reporting formats. Case definitions are available and are straight forward.

Flexibility/Adaptability/Scalability: DHIS2 is extremely dynamic and flexible. With devolution of health services, it has been possible to restructure the administrative units from the previous 8 provinces to 47 counties seamlessly, and even to use a hybrid of the two. There are plans underway to introduce a new administrative unit (Wards) into the system in line with the new governing structures. DHIS 2 you can have thousands of concurrent users and hundreds of millions of data records using only a single, standard web-server.

DHIS 2 is currently being used as national health information systems in a large number of countries and has thousands of days in production leading up to a high-performing and mature system. The only setback to this feature is somewhat restrictive policies in the silo approach adopted by various government units involved in surveillance. DHIS 2 is also able to provide a range of mobile solutions based on short message system (SMS), plain HTML and Java for feature phones, and a high-end Web-based solution with offline support for smartphones. This is what has enable the HMIS unit to recently launch the m-SOS product which is a mobile based SMS reporting system being piloted in Kenya.

Sensitivity and Predictive Value Positive: On a monthly basis (aggregate reporting), users are able to analyze health data to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate. However, this capability is limited to weekly, monthly, quarterly or annually depending on the frequency of data entry. As such the system may not be sensitive in picking up acute outbreaks of diseases that may need urgent interventions.

On a case based reporting level, sensitivity (Sn) and predictive value positive (PVP) was measured by calculating average proportion of cases of 3 zoonotic diseases (Brucellosis, Salmonellosis, and Bacillary Dysentery) detected by DHIS2 compared to the number actually tested in the laboratory against the standard case definition of these conditions. Sn and PVP was found to be low across board for the selected common zoonotic diseases for the month of April 2015 against the convention laboratory tests in use as shown in the tables below:

Calculation of Sensitivity and Predictive Value Positive for Brucella Surveillance through DHIS2 reporting, Busia County Referral Hospital Data April 2015

Detected by DHIS	**Brucella Present (Rapid Serology by X-Pert Test[R])**		**Total**
	Yes	**No**	
Yes	1	3	4
No	28	30	58
Total	29	33	62

Sn = 1/ (1+28)*100 = **3.45%**

PVP = 1/ (1+3)*100 = **25%**

Calculation of Sensitivity and Predictive Value Positive for Salmonella Surveillance through DHIS2 reporting, Bungoma County Referral Hospital Data April 2015

Detected by DHIS	**Salmonella Present (Rapid Serology by Antigen Strong Step[R])**		**Total**
	Yes	**No**	
Yes	100	74	174
No	271	235	506
Total	371	309	680

Sn = 100/ (100+271)*100 = **26.95%**

PVP = 100/ (100+74)*100 = **57.47%**

Calculation of Sensitivity and Predictive Value Positive for Bacillary Dysentery Surveillance through DHIS2 reporting, Busia County Referral Hospital Data April 2015

Detected by DHIS	**Bacillary Dysentery Present (Stool Microscopy)**		**Total**
	Yes	**No**	
Yes	1	4	5
No	69	72	141

Total	70	76	146

Sn = 1/ (1+69)*100 = **1.43%**

PVP = 1/ (1+4)*100 = **20%**

5.1.2 INTEGRATED DISEASE SURVEILLANCE AND RESPONSE (IDSR)

Kenya adopted the IDSR strategy in 1998, conducted a surveillance and response capacity assessment in 2000 and began implementation in 2002. In line with the International Health Regulations of 2005, IDSR promotes rational use of resources by integrating and streamlining common surveillance activities of disease detection, reporting, analysis and interpretation, action/response feedback. IDSR also promotes rational use of resources by integrating and streamlining common surveillance activities. IDSR is a comprehensive strategy for capturing health information of communicable disease for prevention and control by linking community, health facility, sub-county, county and national levels. The MOH in Kenya undertakes integrated Diseases surveillance through the following platforms;

- *electronic IDSR (eIDSR)*- launched in 2012,this is a web based system that captures surveillance information from the health facility level upwards. Currently, over 5000 health facilities are reporting on this platform using smart phones and computers.
- *Mobile SMS Based Disease Outbreak Alert System (mSOS)* - this is an outbreak alert system currently being piloted to be rolled out in future. Reporting is based on mobile phone SMS. This system was developed by Strathmore University in collaboration with JICA and the MOH.
- *DHIS2*

eIDSR is housed in the Division of Disease Surveillance and Epidemic Response (DSRU) in the Department of Preventive and Promotive Health.

5.1.2.1 eIDSR System Description

The major focus of eIDSR is passive human surveillance activities around communicable diseases in four categories i.e. Epidemic prone diseases, diseases targeted for eradication, diseases/events of public health importance and diseases or vents of international concern. The list of diseases under surveillance includes the following priority zoonotic diseases: Athrax, Dengue, Plague, Rabies, Typhoid, viral Hemorrhagic Fevers, Yellow Fever and Cluster of SARI which are reported weekly in MOH 505 and Animal bites, Brucellosis, Leishmaniasis, Schistosomiasis and Salmonellosis which are reported monthly in MOH 504.

The main objectives of collection of surveillance data through eIDSR are to;

- Strengthen capacity for effective surveillance

- Integrate disease surveillance systems for efficiency
- Improve use of surveillance information for decision making
- Improve laboratory involvement in epidemic detection and confirmation
- Increase involvement of clinicians in surveillance
- Improve surveillance information flow in all levels of the health care system
- Emphasize community participation in surveillance (detection and response)
- Trigger epidemiological investigations in detection, investigation and reporting of public health problems, and in the implementation of effective public health interventions
- Fulfill international health obligations

5.1.2.2 Legal Authority/Legislation

Surveillance under eIDSR is manly guided by National Health Policy and the National IDSR technical guidelines. International statutes like the WHO policy on IDSR Strategy and the International Health regulations are also specify ways to prevent provide public health response to the international spread of diseases to avoid unnecessary interference with international traffic.

5.1.2.3 Administrative Structure

Surveillance under eIDSR is organized in 4 levels from the health facility level to the national level as shown below:

5.1.2.4 Description of the major components of eIDSR

The total population under surveillance (from which health data on priority zoonotic diseases is collected) is the whole population of Kenya (>45 million). Data is collection and reporting is done passively on;

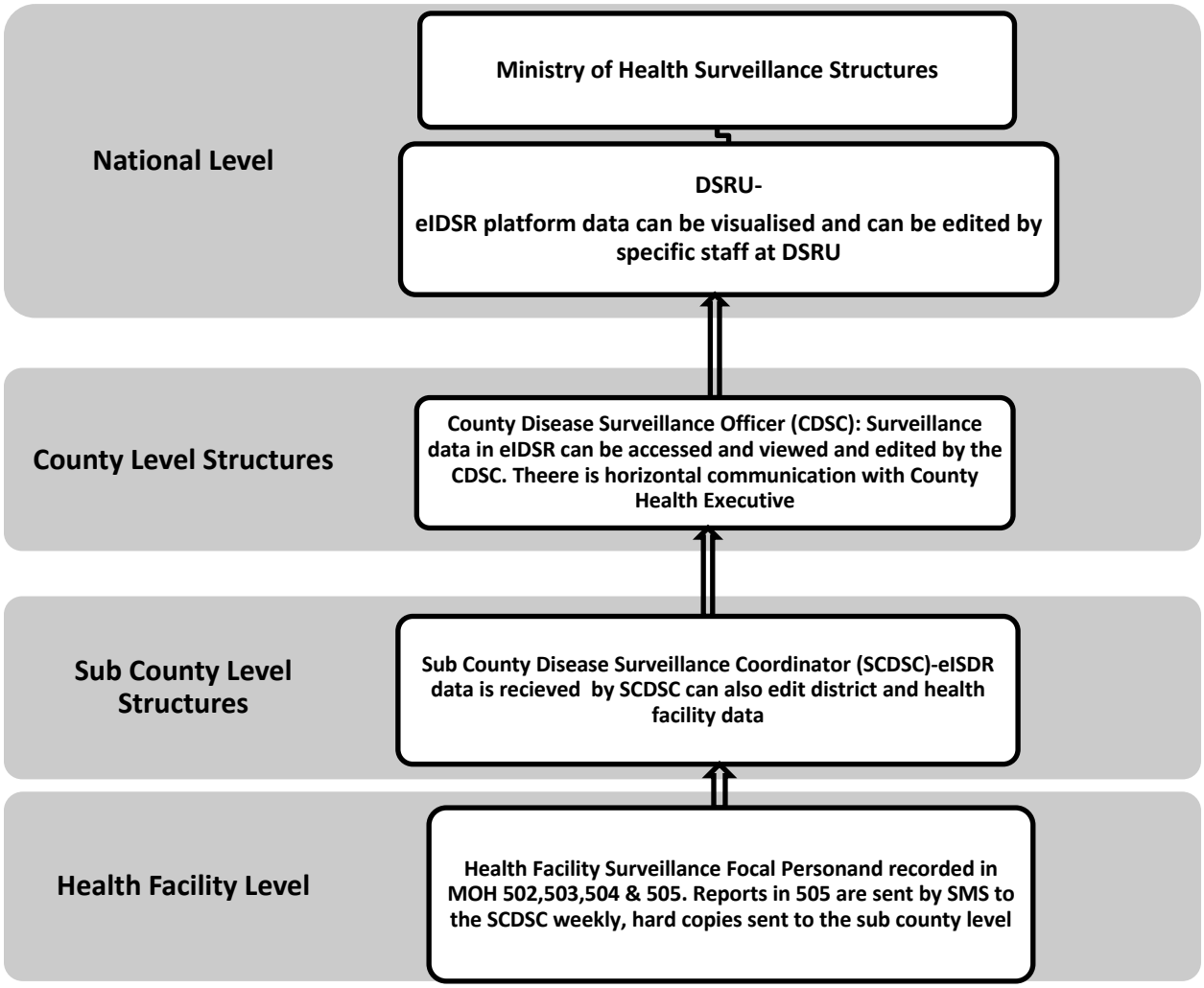
- immediate case based reporting in MOH 502 (Case based report form),
- weekly basis in MOH 505 (IDSR Weekly Epidemic Monitoring Form),
- Monthly in MOH 504 (Monthly Surveillance report form)

eIDSR currently collects data aggregated data (e.g Counts of cases of brucellosis in a month), case-based data (e.g. line listing for polio or measles case) depending on the disease in question.

The major sources of the data collected under eIDSR is routine health data from the health facility data and captured in primary health registers enumerated with Ministry of Health numbers e.g MOH 105, 502 & 503 and later aggregated into summary tools MOH 504 & 505. Data that feeds into these registers is generated from outpatient and inpatient departments, laboratories, and immunization clinics among others.

Data is transferred via a hybrid system: Manual transfer through hard copy reports which are prepared and handed over to the Sub County Disease Surveillance coordinator (SCDSC) who in turn files the copies and electronically directly through Short Message System (SMS) from mobile phone devices/smart phones held by health facility surveillance focal persons.

Once surveillance data has been sent by SMS and hard copies of MOH 505 to the sub-county



level, the SCDSC transcribes this data and uploads it online to the eIDSR on a weekly basis. Monthly data is uploaded by the SCHRIO alongside other reports. Data is stored electronically in servers located at the National AIDS and STI Control Program (NASCOP) offices in Nairobi. Data is backed up in real time through cloud online system.

Routinely, eIDSR data is expected to be analyzed weekly by the CDSC at the county level and the SCDSC at the sub-county level or any other officers conducting monitoring and evaluation. The DSRU publishes a bulletin (Weekly Epidemiological Bulletin) on a standard template and this report is hared widely among stakeholders through email. Ad hoc analysis is also possible on a monthly, quarterly and annual basis as may be needed. Parallel analysis of DHIS2 data is also conducted at the national level for comparison basis as a means of data validation.

5.1.2.5 Resources needed to operate eIDSR

Personnel: eIDSR is mainly funded by health partners (WHO, JICA, CDC, Clinton Foundation) and the government of Kenya. The MOH has currently deployed 4 staff to support eIDSR at the national level (ICT support, Data, Epidemiologist and Administrative support). In each of the 47 counties, there is a County Disease Surveillance Coordinator (CDSC) working at the county level and Sub County Coordinators working at the sub county levels. In each health facility, there is a focal person (surveillance officer) responsible for surveillance work within the facility. The CHEWs and the CHVs perform surveillance roles in the community.

Physical Infrastructure: The national eIDSR has an office space/desk equipped with a computer, 20 mobile phones, shared computer server housed at NASCOP, 3 vehicles for transport, supply of stationery, electricity and internet connectivity. The vehicles are shared across various departments and the internet connectivity is poor and erratic.

Financing of eIDSR: It was not possible to get information on the direct costs involved in running of eIDSR during the interview.

A full description of the eIDSR and its SOPs are available in IDSR technical guidelines and DSRU Strategic Plan.

5.1.2.6 Digital/Computerized surveillance tools

The whole eIDSR system is fully computerized nationwide. Surveillance focal persons at lower level health facilities are able to send surveillance data through mobile phone SMS on weekly basis to the SCDSC who in turn consolidates the reports for the sub-county and uploads the data to the eIDSR platform. Thereafter, the data is available online nationally on a weekly basis.

Technically, eIDSR is managed by MOH staff at DSRU in conjunction with staff deployed by health partners e.g. Clinton Foundation. The eIDSR platform was developed by a contractor who was funded by JICA but is currently maintained by MOH staff in conjunction with other partner staff. The system is expected to be fully available and operational at all times but due to poor internet connectivity and erratic supply of electricity, it operates optimally about 75% of the time.

5.1.2.7 Surveillance System Attributes

Data Quality: eIDSR has in place varied quality checks to ensure optimal performance. Routinely, data validation exercises are carried out on the system to ensure the data that is captured is of good quality. Validation is done by checking for and cleaning out of range entries and data inconsistencies across board and also by comparison of data in eIDSR with other parallel reporting systems like DHIS2. Secondly, the eIDSR system is configured to generate prompts whenever an extraordinary or out of range data is keyed in. The prompts are generated both at the point of data entry and the national level. Staff who handle eIDSR are also trained regularly to ensure they are competent enough on system operations.

System Integration and interoperability: The eIDSR system is not integrated with any other parallel surveillance system. The system as it is structured is not able to integrate with other computerized systems (not interoperable). There is a strong push by the department to have fully integrated surveillance systems. There is need to carry out a thorough assessment on the role of e-surveillance in one health and harmonize existing policies on surveillance to enable integration.

Data Security: Several safety features have been put in place to ensure the data captured in eIDSR is secure. Users of the system are issued with passwords which keep being updated. This restricted viewing is also enhanced by enabling users to have different levels of user capabilities once they are able to log onto the system. The server is protected with internet fire-walls meeting international standards and is located in a physically secure building with restricted entry. All electronic data is backed up with hard copies which are filed at the sub county levels. Electronic data is also backed up regularly through cloud computing to several other locations to protect against data loss.

Confidentiality: Restricted viewing of eIDSR data through issuing users with passwords ensures that only authorized individuals have access to the data. The system mainly captures aggregate data that is used for reporting and a s such patient identifiers are excluded from the data sets. It is therefore not possible to link a particular case with an individual in the population. For case based reports e.g. MOH 502, unique identifiers are used to conceal the patient identity.

Timeliness: The eIDSR system is not timely enough to detect acute outbreaks in the community. There usually a delay between the reporting levels and at times this leads to missing of cases. Therefore, the system cannot detect diseases or conditions in a timely way to permit accurate diagnosis or identification, prevention or treatment and handling of contacts. However, immediate reporting through MOH 502 and 503 can help the lower levels of health care system to pick out outbreaks and the community level.

Usefulness: eIDSR is useful as it is able to provide estimates of the magnitude of morbidity and mortality related to the health event under surveillance. It can also detect trends that signal changes in the occurrence of disease and help detect potential epidemics e.g. increased diarrhea cases or malaria cases reported signaling an outbreak. The change in trends of reporting can also be used to assess the effect of prevention and control measures as is the case with measles or polio eradication program. Data from eIDSR is also able to stimulate research around the disease conditions under surveillance.

Simplicity: eIDSR system is simple and user friendly. With only a modest training, users are able to access the system, upload data and access simple analysis of trends without difficulties.

Flexibility/Adaptability/Scalability: The system is flexible enough and is easily adaptable. This was the case when health was devolved and structures for governance changed from the former provincial system to county system. It was easy to create data around the new administrative

units without problems and reporting was unaffected. The eIDSR platform is a multi-user platform and this enables it to be adapted to the needs of different users. The system is also highly scalable and can be extended to be used in new areas with only minimal adjustments and resources.

5.1.3 LABORATORY SURVEILLANCE: THE NATIONAL PUBLIC HEALTH LABORATORIES (NPHLS)

5.1.3.1 Surveillance System Details

NPHLS carries out routine surveillance covering the following;

- Food handlers surveillance
- Water quality surveillance
- Laboratory Management Information System/LMIS (Reporting system)

The first these areas of surveillance are not structured into organized systems but LMIS is a structured laboratory reporting system, mainly for laboratory workload and commodity reporting. All are passive and also involve a few zoonotic diseases among other conditions; Listeriosis, Diphylobothrium Latum, Escherichia Coli, Salmonellosis, Dengue, Brucellosis (Culture), Anthrax, Anti-microbial resistance, Campylobacteriosis, Avian Influenza and any other test that may be from time to time requested.

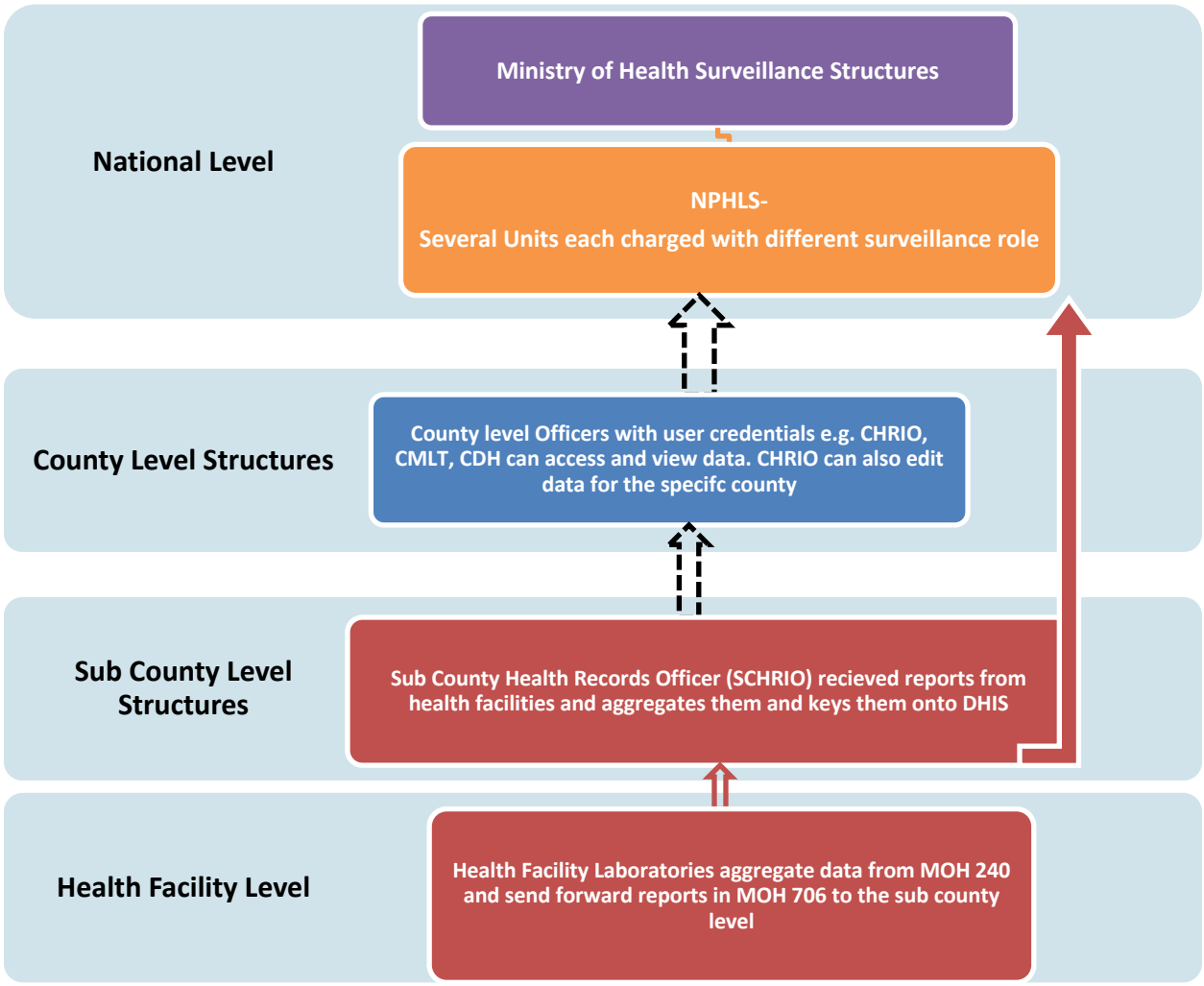
The main objectives of this surveillance are to;

- identify the organisms,
- to detect changes in sensitivity patterns of micro-organisms
- to support other health programs e.g. hospitals, food export companies, pharmacies

5.1.3.2 Administrative structure and Legal Authority

NPHLS derives its surveillance mandate from the National Health Policy which stipulates the roles of the laboratory in surveillance. The NPHLS is a division under the department of preventive and promotive health services and has several units under it; Reference Laboratories,

TB/HIV reference laboratories, Biosafety unit, Parasitology unit, Microbiology unit, National blood transfusion services unit, Quality Assurance Unit and Monitoring and Evaluation Unit. Each unit carries out different surveillance roles depending on need. There are 6 regional reference laboratories in the country. All laboratories based in health facilities report through DHIS2 to the national level.


National Level
Ministry of Health Surveillance Structures
NPHLS-
Several Units each charged with different surveillance role
County Level Structures
County level Officers with user credentials e.g. CHRIO, CMLT, CDH can access and view data. CHRIO can also edit data for the specifc county
Sub County Level Structures
Sub County Health Records Officer (SCHRIO) recieved reports from health facilities and aggregates them and keys them onto DHIS
Health Facility Level
Health Facility Laboratories aggregate data from MOH 240 and send forward reports in MOH 706 to the sub county level

5.1.3.3 Major Components of Laboratory Surveillance

NPHLS carries out surveillance for all the 47 counties, although currently, 3 counties have not been reporting. Data is collected and reported on a monthly basis from lower laboratories in health facilities. For food handlers and water surveillance, reporting is on a need basis. Reporting is based on both the counts (aggregate data) and case based data.

Data is collected in MOH 204 register and then is aggregated in MOH 706 which is used for reporting. Hard copy data is sent to the sub county levels where the Sub County Health Records Officer (SCHRIO) or the Sub County Medical Laboratory Technologist (SCMLT) keys in the data to DHIS2. Data is then available online electronically through DHIS2. The county or national level officers with user credentials can access, view or even edit some of the data online. Data is analyzed by the Monitoring & Evaluation Department monthly or quarterly by use of various software e.g. Microsoft Excel, SPSS and shared to stakeholders who include ministry of health departments and health partners through emails, meetings, reports or bulletins.

5.1.3.4 Resources needed to Operate Surveillance at NPHLS

NPHLS receives funding for surveillance from donors including World Bank, CDC and other health partners. The Ministry of Health also funds surveillance activities in the laboratory although this is quite limited. In terms of personnel, there are no specific staff deployed to carry out surveillance in the units but the officers conduct surveillance among other duties they perform. There is no fully fledged surveillance unit or resources dedicated specifically for surveillance in the unit. The unit spends and estimated 6-10 million Kenya shillings annually on surveillance related activities. Because there is no unit purely to surveillance at NPHLS, there are no surveillance SOPS and no digital/computerized system dedicated to surveillance.

5.1.3.5 Surveillance System Attributes

Both water and food handler's surveillance roles are not organized and therefore, their attributes were not evaluated. However, for the components reported through DHIS2, the attributes are same as DHIS2.

5.1.4 SURVEILLANCE FOR ZOONOTIC DISEASES AT THE COUNTY LEVEL IN THE MINISTRY OF HEALTH

5.1.4.1 Level of Assessment

This assessment was carried out in 3 counties in Western Kenya: Busia, Bungoma and Kakamega Counties. Key informant interviews were administered to 4 respondents deployed at the county level: 2 County Health Directors and 2 County Disease Surveillance Coordinators.

5.1.4.2 Surveillance System Details

The major focus of surveillance identified in the four counties was human surveillance activities. All respondents identified eIDSR as the major system of surveillance in use at the counties. In Bungoma County, DHIS2 was also identified as an additional system of surveillance. All respondents agreed that the identified surveillance systems covered zoonotic diseases. All the

respondents were able to identify common priority zoonotic disease under surveillance by eIDSR: Yellow Fever, Leptospirosis, Plague, Human African Trypanosomiasis, Ebola, Brucellosis, Anthrax, Salmonellosis and Rabies. However, other diseases included by some respondents included Schistosomiasis (50% of the respondents), Taeniosis (25%), Cryptococosis (25%), Marburg (25%), Aspergilosis (25%) and Rift Valley Fever (25%).

5.1.4.3 Objectives of the identified surveillance system

Varied responses were gotten on the objectives of the surveillance system identified (eIDSR). Some of the identified objectives included:

- To detect disease outbreak
- To monitor trends of diseases
- To initiate early outbreak response
- To monitor Disease Control interventions
- To build human resource capacity
- To collect health data
- To communicate health information to stakeholders

5.1.4.4 Legal Authority/Legislation

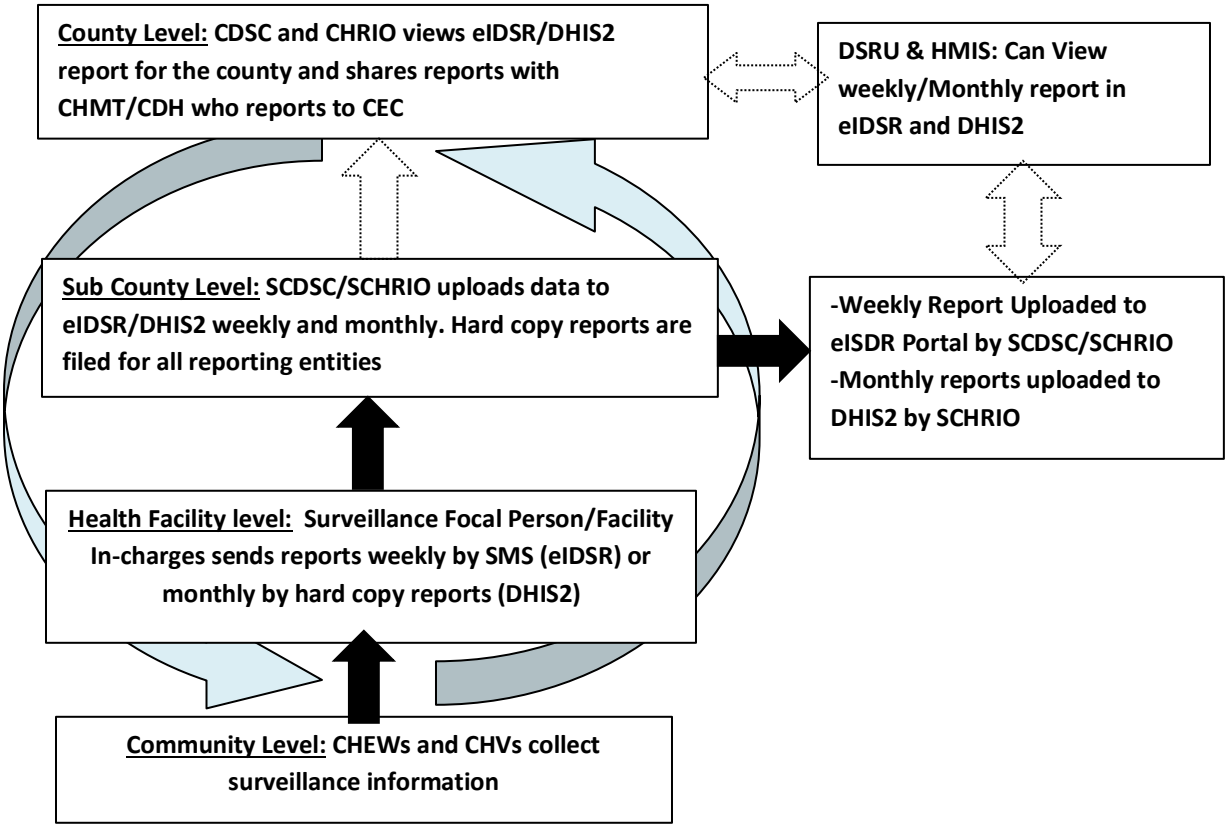
All respondents identified the Public health Act Cap 242 and the International Health Regulations of 2005 as the important laws governing surveillance in these counties. However, the following statutes/laws were also identified by the respondents;

- Kenya Constitution 2010
- Kenya Health Bill (Pending)
- County Health Bills (Pending)
- Meat Control Act Cap 356
- Food Drugs and Chemical substances Act Cap 254

5.1.4.5 Administrative Structure

The basic structure or surveillance was similar across all the tree counties. The basic unit of data collection was at the health facility and community levels wherein the health facility staff CHEWs and CHVs played a key role in data collection. Data is transmitted to the sub County level where the surveillance officer (SCDSC) uploads the data onto the eIDSR platform and also keeps a hard copy of the reports. This report is then available to be viewed nationally by the DSRU and at the county by the CDSC. The County Surveillance Coordinator (CDSC) shares

these reports with the County Director of Health (CDH) who in turn shares the information with the County Executive Committee Member for Health (CEC Health). In Kakamega County, the organogram is longer due to the inclusion of department of promotive health and county public health officer.



5.1.4.6 Description of the major Components of Surveillance at the County Level

For all the 3 counties, the population under surveillance is the entire population of the county. In all the cases, data is collected weekly for eISDR and monthly for DHIS2. There are also diseases that are reported on immediate basis e.g. Acute Flaccid Paralysis (AFP). Reporting is either cases based (e.g. measles, AFP) or aggregate, depending on the condition. The source of data is the primary registers in the outpatient (MOH 705A & B), inpatient, laboratory (MOH 706) and Maternal and Child Health (MCH) Clinics.

Data is transferred to the next level electronically via SMS (eIDSR) or manually via hard copy forms which are filed at the Sub County level. Data storage is by both electronic databases and manually by hard copy reports. In the three counties, data is analyzed regularly on weekly, monthly, quarterly, annually or on ad hoc basis as per the data needs. Various officers are responsible for data analysis, but key is the health records officers and the surveillance officers. There is no specific format of analysis, and simple counts and proportions are computed manually or in Microsoft Excel on agreed set of indicators.

Information on surveillance is shared with stakeholders in all the three counties. Sharing is through written reports, dissemination meetings (Monthly/Quarterly reviews) and the weekly epidemiological bulletin published by the DSRU.

5.1.4.7 Resources needed for Surveillance at the county level

There is currently no structured funding mechanism for surveillance at the three counties. Where available, erratic funding mainly from county governments and WHO were reported by the counties. Other health partners mainly funded programs where they have interest for example; Aphia Plus funded cholera prevention sensitization in Kakamega County.

In terms of human resources, all the three counties had one surveillance officer each, deployed at the county level (CDSC). The same was replicated across board for all the sub counties. However, there were cases where some sub Counties had no surveillance coordinators and were covered by officers from neighboring sub counties. Public health Officers previously deployed to Locations level have been redefined to cover Wards under the devolved health care system in Busia and Bungoma counties but this was not the case in Kakamega County.

There were variations as to the type of physical infrastructure available in the counties for surveillance. Only Kakamega County had an office allocated for surveillance activities while only Bungoma County had a computer dedicated for surveillance work. All counties were found to have mobile phones supplied to sub county surveillance officers to support surveillance work. In all the three counties, shared transport means, electricity and stationery were available for surveillance activities. Bungoma and Busia Counties reported no access to internet for surveillance officers.

5.1.4.8 Availability of Physical Infrastructure for Surveillance in Counties

Physical Infrastructure	**Kakamega County**	**Busia County**	**Bungoma County**
Office Space	*Yes*	*No*	*No*
Computers	*No*	*No*	*Yes*
Mobile Phones	*Yes*	*Yes*	*Yes*
Transport	*Shared*	*Shared*	*Shared*
Stationery	*Shared*	*Shared*	*Shared*
Electricity	*Shared*	*Shared*	*Shared*
Internet	*Yes*	*No*	*No*

There was a wide disparity in terms of funds availed for surveillance in the previous financial year. Kakamega County had Ksh 5 million allocated for surveillance in the previous financial

year. Bungoma County had a budget of approximately 1.3 million Kenya shillings. Busia County had a total budget is Ksh. 300,000 for surveillance activities.

5.1.4.9 Annual Budgets for Surveillance Activities, 2013-2014 financial

Vote	Kakamega County	Busia County	Bungoma County
Training		*Not Funded*	*Not Funded*
Mail/Courier	*Not Funded*	*Not Funded*	*54,000*
Transport			*1,200,000*
Internet		*Not Funded*	*36,000*
Electricity	*Shared budget*	*Not Funded*	*Shared Budget*
Airtime		*Not Funded*	*Shared Budget*
Stationery		*Not Funded*	*Not Funded*
System Maintenance	*Not Funded*	*Not Funded*	*Not Funded*
Other		*Lunches*	*NA*
Overall Total	***5,000,000***	***300,000***	***1,290,000***

5.1.4.10 Digital/Computerized Surveillance tools

All the three counties had access to both the electronic and manual IDSR technical guidelines. All the counties could access the eIDSR database >50% of the times and poor internet connectivity was cited as the main reason for unavailability of eISDR.

5.1.4.11 Surveillance system Attributes

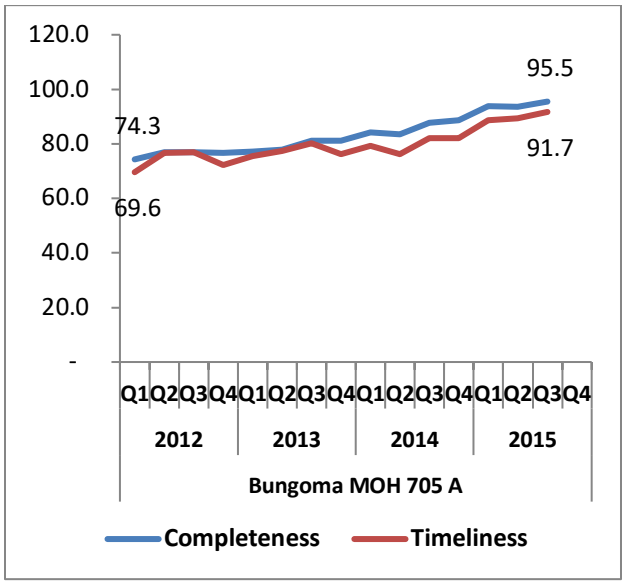
Data Quality: The system quality checks put in place by the counties to ensure data is of high quality were varied. In Kakamega and Busia Counties, data quality audits and support supervision were cited to be key in ensuring data quality. Additionally, Kakamega County cited monthly data review meetings where county and sub county data would be interrogated and revised accordingly. In Bungoma County, data sharing, use of 'revise' options by data officers and comparison with national data from the weekly epidemiological bulletin were cited as some of the ways to ensure data quality.

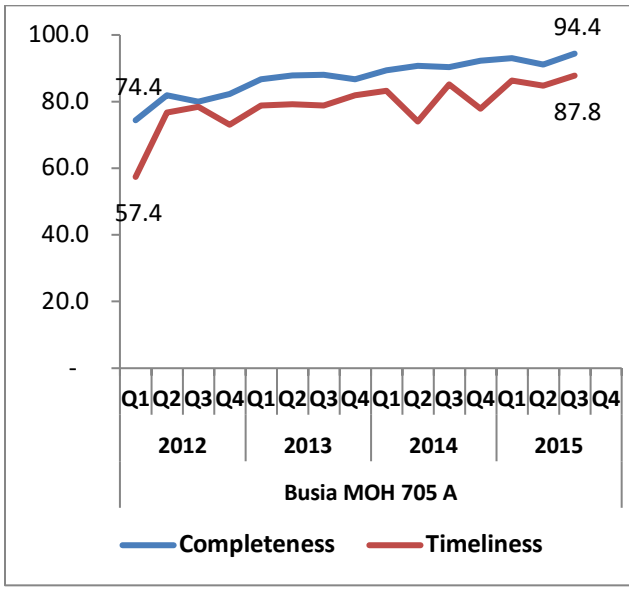
System Integration and Interoperability: All the respondents felt that the current systems for surveillance are not integrated and are not interoperable. However, all the respondents welcomed the idea to integrate.

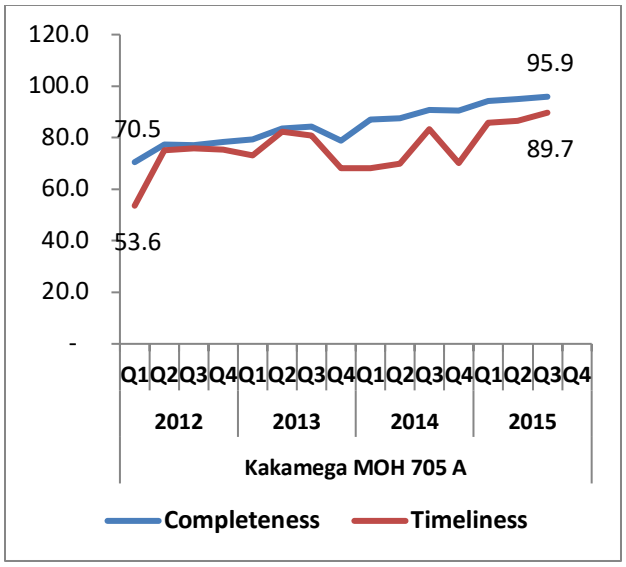
Data Security: Manual data backup and restricted access to data through password protected data bases, user credentials and physical restrictions like locked offices were cited by all counties as the main means of ensuring surveillance data remains secure. In Kakamega County, surveillance data is also afforded by surveillance officers through use of electronic back up of surveillance data in computer hard drives.

Confidentiality: Kakamega county reported use of restricted access to data through password login and lack of patient identifiers on the captured data as the main ways of ensuring surveillance data is confidential.

Completeness and Timeliness: In all the three counties, there has been a steady rise in both completeness and timeliness of reporting, based on complete data sets for MOH 705 A and B.







Usefulness and Acceptability: All participants interviewed agreed that the current systems for surveillance in counties are both useful as they can detect diseases or events under surveillance in a timely way to permit accurate diagnosis, prevention and treatment. These systems are also able to; provide estimates of the magnitude of morbidity or mortality related to the health event detect trends that may signal changes in occurrence of disease allow assessment of prevention and control measures, lead to improved clinical, behavioral and social environment and also stimulate public health research. These two systems of surveillance are also highly acceptable as they have been adopted by all levels of health care and completeness and timeliness of reporting are both high. However, in Kakamega County, the respondents felt that the systems are not useful for all disease conditions. They felt the systems are weak for zoonotic diseases due to low reporting and lack of sensitization of health workers on reporting of zoonotic diseases.

Simplicity: All the respondents felt that the systems of surveillance are adequately simple.

Flexibility/Adaptability/Scalability: The systems of surveillance in use are flexible and easily adaptable. The respondents felt that with advent of devolution, the systems were able to adapt to the changing information needs (e.g. reporting structure, increase in levels of reporting, change of sub county/county boundaries etc.) with little addition of time, personnel, or allocated funds. Newer disease conditions can also be added to the system with little changes to the structure. The reporting formats are also standard and can be easily adapted to integrate other sets of information. However, 1/3 of the respondents felt that the systems have not fully adapted to devolution. This is because they felt there is still disconnect between the expectation of the county executive team and the ability of the technical team in surveillance. They also felt that the flow of funds meant for surveillance has been hampered by devolution which has affected activities like sample transport, training and lack of technical capacity to handle surveillance.

5.2 Animal Health Disease Surveillance Systems

5.2.1 National Level

At the national level, three assessment sites were evaluated using Key Informant Interviews and observation. The sites included the Veterinary Epidemiology and Economics Unit (VEEU), Veterinary Public Health and Animal Products (VPH&AP), Zoonotic Disease Unit (ZDU) and the Kenya Wildlife Services (KWS)

5.2.1.1 VETERINARY EPIDEMIOLOGY AND ECONOMICS UNIT

5.2.1.1.1 Surveillance system details

The main focus at the VEEU was livestock surveillance activities targeting animal diseases. The unit performed passive and active surveillance. The passive system involved receipt of reports from animal health practitioners, livestock owners, abattoirs and livestock markets. However, the passive surveillance is faced with challenges of underreporting and to get additional data the units undertakes active surveillance by conducting outbreak investigation, use of diagnostic techniques and data from the laboratories.

Among the zoonotic diseases the unit cover included Rift Valley Fever (RVF), Leptospirosis, Trypanosomiasis, Hydatidosis, Anthrax, Brucellosis, Taeniosis, Cryptococcosis, Rabies, Cysticercosis and Middle East Respiratory Syndrome-Corona Virus (MERS-Cov)

The main objectives of the system were identified as;

1. Know diseases present and their distribution in the country
2. Early detection and action
3. To inform Policy
4. To protect human beings from zoonosis

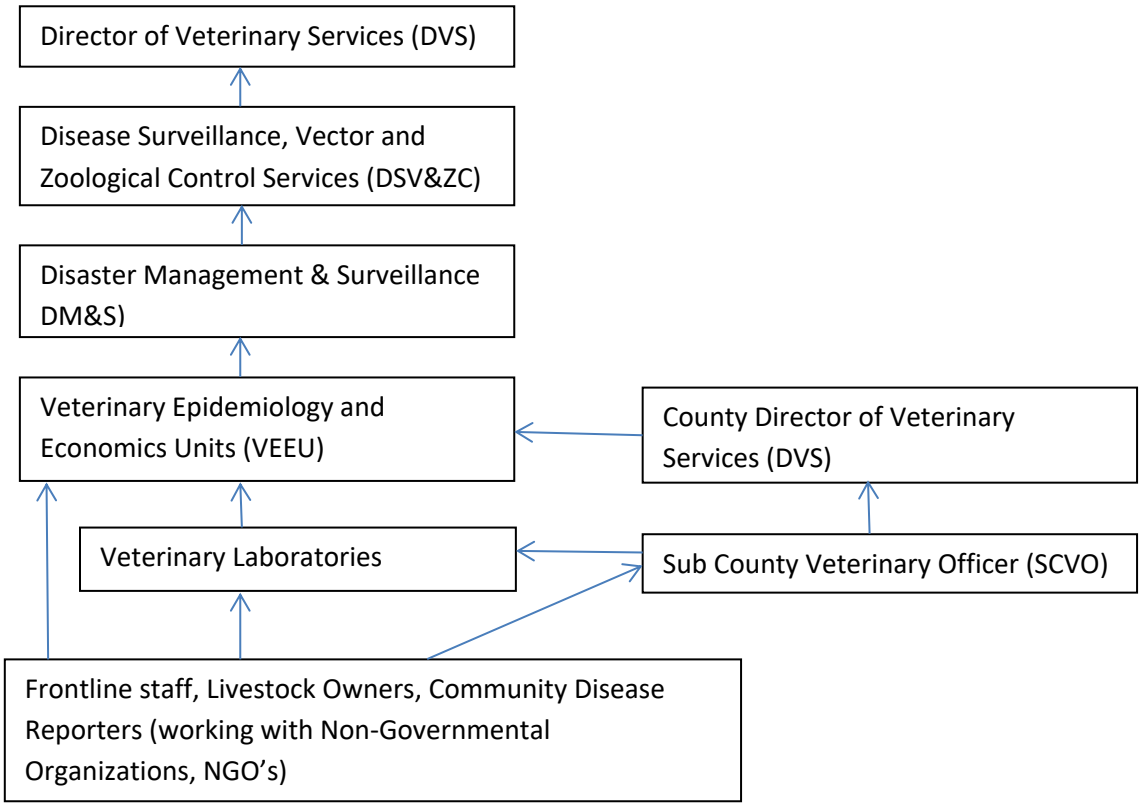
The legal authority to engage in disease surveillance was derived from the Animal Diseases Act (cap 364 of the Laws of Kenya), World Organization for Animal health (OIE) manuals and codes,

The administrative structure of the surveillance system was described as starting from the community where community disease reporters (formerly called Community Based Animal Health Workers, CBAHW's in some areas) and livestock owners giving information to the frontline staff made of Animal Health Assistants (AHA's). The AHA's then forward the information to the Sub County Veterinary Officer (SCVO) based at the sub county level. The SCVO collates the data and send the reports to the Count Director of Veterinary Services (CDVS) at the county level. The CDVS aggregates the data which is then forwarded to the head of VEEU. The head of VEEU reports to the head of Disaster Management and Surveillance (DM&S) who then reports to the head of Disease Surveillance, Vectors and Zoological Control Services (DSV&ZCS). The head of DSV&ZCS reports to the Director of Veterinary Services

(DVS) who is the Country Chief Veterinarian. The DVS reports to the OIE on a regular basis and notifies OIE of occurrence of diseases or event that affects international trade.

Disease surveillance activities are supported by veterinary laboratories in the country. There is a central veterinary laboratory (CVL) that is located at the veterinary division headquarters in Kabete, Kenya. The activities of the CVL are augmented by regional veterinary investigation laboratories (RVIL) located at different parts of the country. The veterinary laboratory services are operated by the national government and receive samples from both public and government veterinary service providers. Results from the RVIL are shared with the individuals who requested the tests and the CVL. In some instances farmers (especially poultry farmers) take samples to the laboratories without going through the veterinary service providers.

Figure 1: Organogram for disease reporting, VEEU, 2015



The population under surveillance was the whole national herd. Passive system collected data all the time while active system collected data periodically. Some of the diseases were under active surveillance like RVF which had sentinel herds in high risk areas of Machakos, Naivasha, Uasin Gishu and Taveta with activities being funded by the DVS. Sentinel Surveillance in Garissa and Ijara stopped due to withdrawal of support by donors (FAO). Data collected from the sentinel herds included sampling to detect Immunoglobulin M (IgM) and IgG, Prevalence, Zero reporting

from farms, and markets where observation is made and officers have to ascertain that the disease is absent

Data Source for the system included farmers, Animal Health Service Providers (AHSP's), Non-Governmental Organizations (NGO's) especially in the Arid and Semi-Arid Land (ASAL's)

The methods of data transfer included use of forms like the Notifiable Disease 1(ND1), Electronic mails (E-mails), Mobile phones and Telephone. The Digital Pen Technology (DPT) was being used in 24.1% (70/290) of the sub counties in the country.

Data sent to the VEEU by E-mail was being stored in database in desktop computer while that from DPT was stored in a computer server at the national veterinary services headquarters in Kabete, Kenya. Data collected by use of Epi-collect was stored in the cloud server

Analysis of the data was being done by staff members in the unit. The data was screened monthly and quarterly data analysis done using Ms excel®

Dissemination of the analyzed data was being done every 3 months (Quarterly) to the county heads (CDVS) using quarterly bulletins. Quarterly bulletins were shared via e-mails. It was expected that the county heads would disseminate to the sub counties and other lower levels of the system.

The activities of the unit were being funded from the allocations from the DVS kitty. The number of staff members at the unit was 8. The ideal number of staff who specifically charged with surveillance activities was estimated to be 15 at the national level and 47 at the county level. It was noted that specialized staff are needed to handle various aspects data. The unit was focusing more on epidemiology and less on economic aspect of its mandate. It was noted that staff to handle economic aspects of disease surveillance were lacking.

The status of infrastructure/equipment at the unit was as tabulated below;

Status	**Equipment**	**Remarks**
Adequate	Office space, computer server, GPS gadgets, Digital Pens	Digital pens at national level only
Inadequate	Vehicle (2 grounded), stationery	
Absent	PDA, phones, internet	Use of personal internet modems

The estimated cost of surveillance activities was as below

Item	**Estimated cost per year, Kes**	**Remarks**
Training	3,000,000.00	Use for workshops on technical issues
Transport	300,000,00	
Airtime	60,000	Per person. Given to some cadres

Stationery	50,000.00	
System maintenance	1,000,000.00	Backstopping,
TOTAL	**4,410,000.00**	

There were document that described the contingency plans and disease control strategies for some diseases like RVF contingency plan, Rabies eradication strategy. The documents were available both in electronic and paper forms.

The digital or computerized surveillance tools that were in use at the unit included;

1. Epi-Collect – mobile phone technology: No special infrastructure needed, use of personal mobile phones (android enabled). Involves development of Module (questionnaire) that is uploaded in the android phone. Information transmitted real-time and data stored in the cloud. Being used in some parts of the country where it was piloted during training. Not properly rolled out. No infrastructure available
2. Digital Pen Technology: Has a digitized form, digitized pen and digitized phone. Uses a server based in South Africa. Web-based and real time data transmission. About 70 sub counties expected to be using but less than 10 sub counties are using it. Developed by support from FAO. The technology is a Forms processing and mobile phone technology that uses a battery-operated writing instrument that allows the user to digitally capture a handwritten note or drawing. The digital pens are wireless and use Bluetooth technology to send the captured notes or drawings directly to a server through a cell phone. The technology aids in real-time data collection, transmission and processing.
3. ARIS II: Animal Resources and Information System II is a comprehensive open source software application with unique features. Data transmission is through a web based system using a web-based questionnaire. It has an offline mode that can be used in areas with poor internet connectivity. The system is capable of providing real time information gathering and sharing. It also has the advantage of customization to country specification and needs. The system allows data validation and sharing. The system uses a modular approach which covers aspects of animal health, animal production, capacity (infrastructure and human) and trade and marketing. The Server hosted at AU_IBAR. Once uploaded, data can be viewed by authorized Government officers and AU_IBAR. It is not effectively used by the animal health service providers due to inadequate resources for its operation.
4. Notifiable disease reporting through Ms Excel® Spreadsheet templates that are filled at the sub county level and then forwarded to the VEEU in Kabete

Computerized systems operated at less than 50%

5.2.1.1.2 Surveillance system attributes

The quality checks put in place to ensure system performed optimally included validation of reports before uploading or forwarding to higher levels, making calls to confirm information provided and backstopping,

Integration with other systems: the system was not integrated to other surveillance systems. There was need to integrate the various aspects of the system so that single output is generated from the various systems.

Data security: to ensure data security, the system used pass words, allowed limited access to those authorized and employed the use of lockable cabinets to store files.

Confidentiality: for anyone outside the unit to access data in the system the authority from the DVS must be sought.

The system was not able to detect diseases or adverse exposures of public health importance in a timely manner, especially after the devolution of animal health services to the county governments.

The system was not able to estimate the magnitude of morbidity and mortality related to the health-related event under surveillance. This was due to the fact that the reports received from the field was not representative of the national herd

The system was able to detect trends that signal changes in the occurrence of diseases including detection of epidemics or outbreaks

The system was able to permit assessment of the effect of prevention and control programs

The system could lead to improved clinical, behavioral, policy or environment practices

The system was able to stimulate research intended to lead to prevention and control

The aspect of the system that was identified to be unnecessarily complicated was the presence of many data collection tools that were not harmonized leading to slow uptake and sustenance. The changes that could make the system easier to implement would be harmonization of the tools, development of a strategic plan for electronic reporting and development of Standard Operating Procedures (SOP's) for each system

The system was slow in adapting to changes like the devolution of veterinary services to the counties. The slow adaptation was attributed to the lack of acceptable effective system, the impediment from the county government administration and use of devolution as an excuse not to report to the national level.

The elements that were identified to be making the system not adapt included absence of proper networking of the systems and lack of effective network with regional laboratories

5.2.1.2 VETERINARY PUBLIC HEALTH & ANIMAL PRODUCTS DIVISION

Assessment site Veterinary public health and animal products division based at the national level.

5.2.1.2.1 Surveillance system details

The major surveillance focus was on foodborne diseases at the slaughter houses. There are different categories of slaughter houses based on the operations and infrastructure; export and local slaughter houses. There are meat inspectors in each slaughter facility. Animals come into the slaughter facilities by use of movement permits that indicate where the animal has come from and the history of movement of the animals. The origin of the animals must be without any on-going disease outbreak. The animals are held in slaughterhouse lairages for ante-mortem inspection. After slaughter, postmortem is done. During postmortem disease conditions can be determined by observation but incase diagnosis is not possible by observation, and then samples are taken to the laboratory for further analysis. Monthly reports are written by the meat inspectors detailing the lesions and diseases detected. Reports from the slaughter house are forwarded to the Sub County and County level. Collated county reports are then forwarded to the Director of veterinary services, through the head of veterinary public health

Among the zoonotic diseases that the division focuses on include echinococcosis, anthrax (noted in the lairages), brucellosis, Rabies (at ante mortem), Bovine TB, Cysticercosis, Schistosomiasis, Dermatophylosis,

It was noted that some animals presented for slaughter had marks and discolorations at injection sites pointing to a possibility of animals being brought to the slaughter facilities before observing the withdrawal periods of the administered drugs. This could lead to consumption of animal products with drug residues.

The main objective of the system was determined to be public health and animal health.

The legal authority to perform surveillance was derived from the Animal Disease Act, Meat Control act, Public Health act, Rabies act, OIE codes, codex alimentarius commission standards, World Trade Organization's (WTO's) Sanitary and Phytosanitary agreements and Veterinary Surgeons and Veterinary Para-professionals act (VSVP). The VSVP act ensures that every veterinarian and Para veterinarian reports veterinary incidence to the DVS they come across.

Administratively the system has Animal Health Assistants (AHA's) who are the meat inspectors at the slaughter facilities. The Meat Inspectors report to the veterinary officer in charge of hygiene at the slaughter house level or to the SCVO. The SCVO reports to the CDVS office where data is collated before transmission to the head of VPH&AP's. The staff at the export slaughter houses report directly to the head of Veterinary Public Health in the VPH&AP division.

The type of data collected include sex of the animal, pregnancy state, disease and conditions

Data transfer from the slaughter house to CDVS is by paper and from the CDVS to the head of VPH&AP through paper or electronically. Data storage is by filing for paper based data and soft copies in desk top computer or compact discs. No data analysis is done but the division does interpretation of the data received. The reports are shared with the stakeholders on quarterly and annual basis through written reports and in meetings or training sessions for the meat inspectors.

Resources for use at the local slaughter houses at the county level are provided by the county government while resources for the export slaughterhouses are provided by the DVS through the Veterinary Services Development Fund (VSDF).

The personnel present at the division was as tabulated below;

Officers	Number in post	Optimum number
Meat Inspectors	33	43
Veterinary Officers	5	10
Officers at head office	6	6

Most of the resources were shared with no specific ones allocated to surveillance activities. Due to that, the actual cost of performing surveillance activities could not be determined.

5.2.1.2.2 Surveillance system attributes

The system is not integrated with other system but share information with other divisions like the laboratories and the VEEU. Data stored in the system is secured with passwords and lockable cabinets. The delay in transmission of data from the slaughter facilities to the national level was identified as a complication to the system. Inadequate resources like ICT equipment and personnel contributed to the system not being able to adapt to changes

5.2.1.3 ZOONOTIC DISEASE UNIT (ZDU)

The ZDU was formed in 2011 through an MOU between the Ministry of Health and the Ministry of Agriculture, Livestock and Fisheries. Its mission is to establish and maintain active collaboration at the animal, human, and ecosystem interface towards better prevention and control of zoonotic diseases. It envisions a country with reduced burden of zoonotic diseases and better able to respond to epidemics of emerging and re-emerging infectious diseases.

5.2.1.3.1 Description of the Surveillance System

ZDU has a surveillance system which focuses on human and livestock surveillance activities. It was described as a "Pilot Zoonotic Surveillance System". It started in July 2014, piloted in ten (10) selected Counties. The surveillance focuses on 5 zoonotic diseases namely Rift Valley Fever, Human African Trypanosomiasis, Brucellosis, Anthrax, Rabies/Dog bites

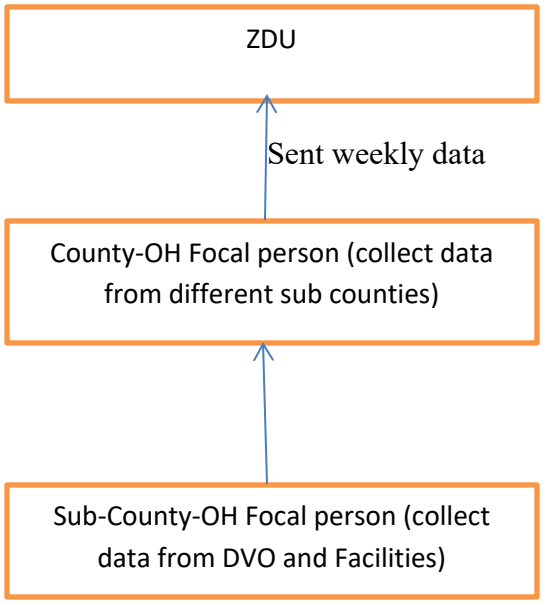
The main objective of the surveillance system is;

- To capture data on priority zoonosis which is missing in main surveillance systems

- Map high risk areas
- Inform targeted surveillance
- Guide interventions

There is no legal authority/Legislation governing this surveillance system but is guided by the MOU between both ministries. Inferences are made to existing regulations e.g. Animal Disease Act, The Public Health Act. ZDU

The administrative organization and location of the surveillance system is as described below;



5.2.1.3.2 Components of the Surveillance System

The population under surveillance is the 10 selected counties of Kakamega,Siaya,Kajiado,Kiambu,Nakuru,Laikipia,Machakos,Garissa,Kajiado,Kisumu and Baringo.The data is collected weekly and the information collected is counts of human cases alive or dead and counts of animals as well as the species. The sources of data for human include; Laboratory and health facility OPD. For livestock data sources are; farmers, abattoirs and laboratory. Data is transferred and stored electronically. Data collected is analyzed by the ZDU staff (this has been done only once) and they use Microsoft excel for simple analysis of the counts. The results are disseminated to stakeholders through meetings e.g. World Bank.

There is a computerized surveillance tool, managed by the ministry staff which is operational 75% of the time in a month. There are no quality checks in this system and it does not integrate

with other existing surveillance systems. Data is secured using a password, data is de identified and shared among staff only.

5.2.1.3.3 Resources needed to operate the surveillance system

The ZDU main source of funding is the General Operations Kit from the two main ministries. Other funding sources include partners and donors.

Personnel

Level	No. Present(technical)	Optimum
National	0	1
County	1	1
Sub-County	1	1
Health Facility	0	1

Infrastructure

The infrastructure available is shared and includes; office space, computers, phones, computer server, Transport, stationary, electricity, internet and airtime. This is not available at the County level.

Other Direct costs

Category	Cost USD	Frequency
Trainings	48,000	Annual
Mail/Courier	0	Use existing system
Transport	2,000	Twice a year
Internet	600	Annual
Electricity	150	Monthly
Airtime	500	Monthly
Stationary	120	Monthly
System maintenance		

5.2.1.3.4 Surveillance System Attributes

Attribute	Response(yes/no/ don't know)	Remarks
Timeliness(Detect public health events and diseases in a timely way)	No	This is what the system aims to achieve in the future
Estimate magnitude of health related events	No	Aiming at that.
Detect changes in trends, patterns e.g. in outbreaks	Yes	For the regularly reported diseases.
Help in assessment of prevention and control measures	No	It could but currently it cannot
Lead to improved clinical, social, policy and environmental practices (usefulness)	No	Eventually, it will do so.
Stimulate Research	Yes	e.g. When the cases reported show an increase(outbreaks)
Simplicity	Yes	With training anyone can use the system

Adaptation to devolution

The System has shown that it can be able to adapt to the effects of devolution of animal and human health services to the counties since it is being developed and rolled out post devolution. The only challenge cited is that, it cannot go to the community level since it is computerized and requires internet to operate and the Information Communication Technology (ICT) infrastructure is either absent or not well developed.

5.2.1.4 KENYA WILDLIFE SERVICES

5.2.1.4.1 Surveillance System Details

The major surveillance activity focused on wild animal disease surveillance

The system known as Wildlife Surveillance was made of mostly passive disease surveillance with more focus on mortality and morbidity episodes

Active surveillance was project or research based, collaborative or internally organized by the KWS on need basis.

It was noted that there was no structured organizational system for surveillance.

The zoonotic diseases covered by the system included;

Anthrax - had caused most deaths of wild animals, had trade and Public Health importance.

Rabies – affected carnivores (feline and canidae families), is of Public Health importance, it was noted that efforts were being put in prevention in dog population around wildlife areas in order to prevent spread to wild animals

Rift Valley Fever – its role in wildlife not well documented, deaths were recorded during the 2007/2008 outbreak

Bovine Tuberculosis – It was noted that the disease is of importance because of its history of endemicity in some areas where it affects buffaloes. The fear of spread to carnivores (especially lions that are currently endangered) that feed on buffaloes made surveillance of the disease a priority

Human African Trypanosomiasis – There were reports of isolated cases

Sarcopsis – It was reported that it affected especially large cats (cheetahs), endemic in some parks (Mara)

Yellow Fever – Was considered to be of public health importance and thought to be originating from the non-human primates.

Influenza (Avian) – The department fills zero reports in cases of bird deaths to rule out possible cases in the wild birds.

Q-fever was put under surveillance on need basis: Q-fever

The main objectives of the surveillance activities at KWS were identified;

1. Early warning (both ways) - monitor spillovers of diseases from domesticated animals to wild animals and from wild animals to domestic animals.

2. To understand current status diseases affecting wild animals.
3. To monitor health status of wildlife

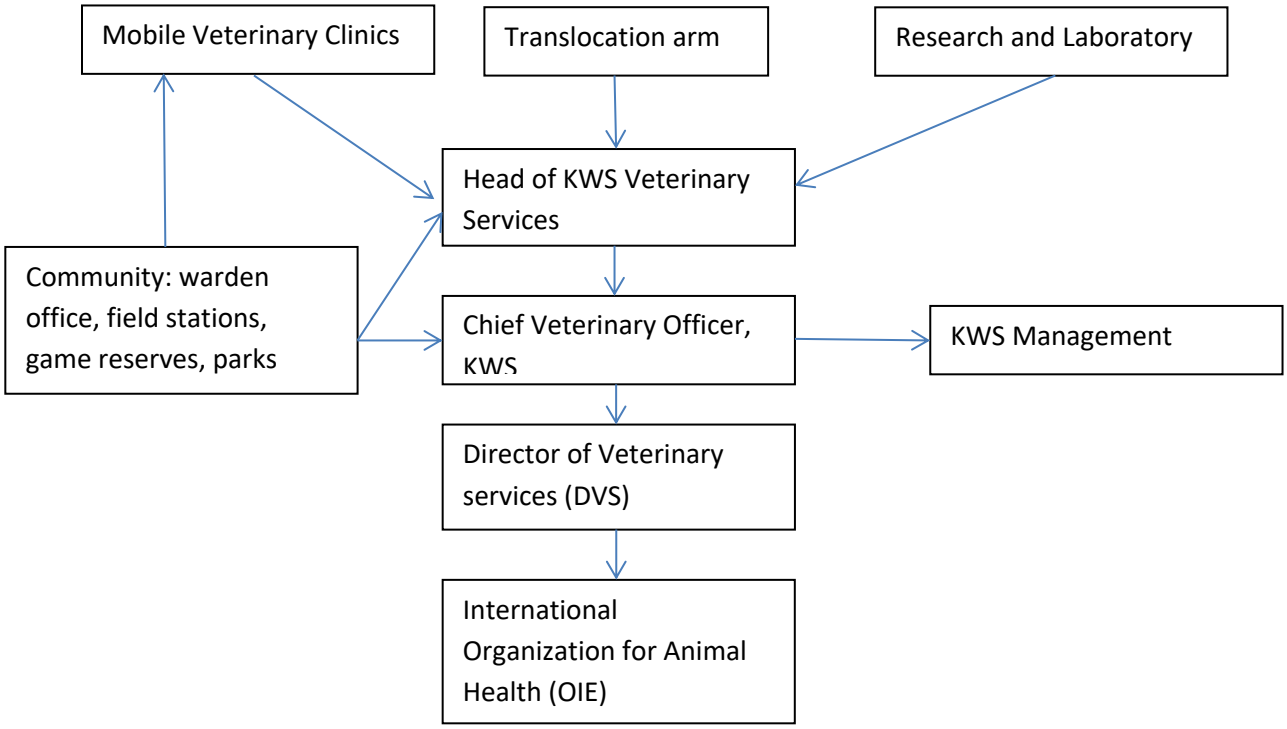
5.2.1.4.2 Legal Authority for surveillance activities

There was no specific legal statute for surveillance of disease of wild animals. However, the KWS anchored its surveillance activities on the provision of the animal diseases act (cap 364 of the laws of Kenya) and OIE guidelines on disease reporting. It was noted that surveillance exercises were anchored on disease management activities.

5.2.1.4.3 Organogram

The administrative organization was divided into departments as clinical intervention, capture and translocation, outbreak investigation, disease surveillance and monitoring, veterinary research, laboratory services. All the departments contributed to the surveillance activities. The service had 6 mobile veterinary units

Figure 3: Organizational structure for disease reporting, KWS, 2015



Data from the mobile veterinary units, translocation arm, research and lab are forwarded to head of KWS veterinary services who collates the data and forward to the KWS Chief Veterinary Officer. The Chief veterinary Officer send reports to the Director of Veterinary Services on a regular basis. The DVS then send reports to the OIE. In some instances where the disease or event affects international trade (trade-sensitive diseases), KWS chief vet officer can report directly to OIE.

There were 6 veterinary officers manning 8 regions. The regions were; Tsavo, southern, mountain, eastern, central rift, western, northern, coast. Few wildlife challenges were experience in Western Kenya, and as such no veterinarian is attached to the region. The Western region was being supported by the veterinarian in Mara (southern) or Nanyuki (Mountain). In areas without veterinarians a team is assembled from the KWS headquarter to handle issues in those areas. Standby team is always present ready for deployment in case the need arises.

Information flow in areas without veterinarian is through the area warden who gets information from the community and forwards it to the KWS headquarters. The community members notices unusual occurrence, notifies the warden or the head office. Information is verified by the warden or the head office. The head office takes appropriate action. The community can also report to a veterinarian near the area.

5.2.1.4.4 Components of the Surveillance system

The population under surveillance was the wild animals in the country. Data collection is done continuously, collated on a quarterly basis then forwarded to the DVS twice per year. The type of data generated included mortality, morbidity, species affected, location of the animals, clinical cases attended to, biometric information of the animals. The sources of data were field activities, laboratory (Central Veterinary Laboratory, Government chemist, S. Africa) results. The data from the field is entered into computer and transferred electronically to a computer data base located at the KWS headquarters where it is stored.

5.2.1.4.5 Data analysis and dissemination

It was reported that data analysis is done by a senior veterinary officer every quarter using Microsoft Excel®. Advanced analysis is done in project based activities. The analyzed data was disseminated quarterly, half yearly and annually to stakeholders who included the KWS Management (Field and Office headquarters), donors, collaborators (research institutions), private and community conservancy management and the general public through the corporate communication department.

5.2.1.4.6 Resources needed to operate the system

The funds for surveillance activities got from the KWS, Donors, and collaborators. It was noted that there was no personnel dedicated to surveillance activities and there were no County-based personnel.

Most resources are shared. None specific to surveillance, Budget fluctuates

5.2.1.4.7 Documents for surveillance activities

There was a Standard Operating Procedure (SOP) for surveillance activities. The document detailed the flow of information for the community to the headquarters.

5.2.1.4.8 Computerized Disease Surveillance Tools

It was noted that there was no computerized tools for surveillance and no electronic template for data collection.

5.2.1.4.9 Integration

The system was not integrated to any other systems but there was a lot of willingness to integrate with other systems to enable information sharing among various stakeholders.

5.2.1.4.10 Surveillance system attributes

The system was able to provide estimates of the magnitude of health-related events, detect trends, permit assessment of effect of prevention and control programs, lead to improved practice and stimulate research.

It was noted that the passive nature of disease surveillance led to complications in the system.

Lack of integration of wildlife surveillance into domestic and human diseases surveillance system had made the system not to adapt to changes.

5.2.2 County level

At the county level, data collection was done by use of Key Informant Interviews (KII's), Focused Group Discussions (FGD's) and Observations. The counties that were evaluated include Busia, Kakamega and Bungoma.

5.2.2.1 BUNGOMA

a. Key Informant Interviews

The interviews were conducted with the county director of Veterinary Services at the county veterinary office.

Assessment Site: County Veterinary Services, County of Bungoma

5.2.2.1.1 Surveillance System Details

The system focused on surveillance of diseases of domesticated animals in Bungoma County

The county undertakes passive diseases surveillance in slaughter houses, auction rings, market (on market days) and active disease surveillance targeting Trypanosomiasis and its vectors the Tse Tse Flies. The tools used for data collection and transmission included the Notifiable Disease form (ND1) for notifiable diseases, LB1 form for laboratory diagnosis, PP1 for slaughter house, Zero report for Avian Influenza, rinderpest and other notifiable diseases. The county had the gadgets for Digital Pen Technology (DPT) but they were not being used.

The zoonotic diseases that were under surveillances in the county included Rift Valley Fever (RVF), Trypanosomiasis (*T brucei*, *T. gambianse, T. congolenses*), Brucellosis, Anthrax, Rabies (follow up on dog bites referred from hospitals), Cysticercosis (at Post Mortem at slaughter

points), Salmonellosis (clinical diagnosis, routine screening for *S. gallinarium, S pullorum*), Avian Influenza

The objectives of the surveillance system included;

1. Disease prevention
2. Creating awareness
3. Improve diagnosis

There were no legislations specific to surveillance activities in the county. The veterinary services relied on the national legislations. Among the legislation used in surveillance activities included the Animal Diseases Act (cap 364 of the Laws of Kenya), the Meat Control Act (cap 356 of the Laws of Kenya), and the Rabies Act (cap 365 of the Laws of Kenya).

The structure of the system involved the community where the farmers and the administration forwarded information to the private Animal Health Service Providers (AHSP's) and the Animal Health Assistants (AHA) employed by the government as frontline staff in diseases surveillance and management. The AHA's and AHSP's then forward the information to the Sub County Veterinary Officers (SCVO) based at the Sub Counties, the second level of the county administration. The SCVO forwards information to the County Director of Veterinary Services (CDVS) and the Director of Veterinary Services (DVS). There was no unit within the system dealing with disease surveillance.

The population under surveillance included livestock (bovine, avian, caprine) in the county, dogs and cats. The interaction of dogs with wolves during breeding season posed a challenge of possibility of transmission of diseases from the wild animals to the domestic animals. Cases of bites from bats and rats had been reported calling. A lot of attention was being given to livestock and little on non-livestock animals like cats, dogs

Data was being collected on a daily basis continuously with increased data collection during unexpected events like flooding. The data collected included results of observation from mouthing from a representative sample of the herd, zero reports, counts, numbers affected, numbers exposed, location, origin of the animals. Information was being generated by the frontline staff (AHA's) at auction rings, farmers in the market, private AHSP's by use of monthly reports, emergencies reported through phone, in person, orally or text message.

The data was being transferred verbally by phone calls and meeting face to face at community level, use of note books by staff at markets and auction rings, documentation at Sub County by use of registers and reports. It was reported that not much information was being received from the private AHSP's, and that coupled with the tendency of meat inspectors preferring not to provide animal health services led to inadequate information on disease surveillance.

Information was being stored in paper form in files and cabinets, and the electronic form in desk top computer.

Analysis of the data was being done on monthly basis by the SCVO and the CDVS. The analysis focused on counts, economic loss from condemnations in meat inspection, condemnation figures, and disease conditions seen in the slaughter houses

The analyzed data was being disseminated by the SCVO using monthly and annual reports to the CDVS and the DVS. Dissemination to the community took place during public meetings.

Most of the resources used for surveillance activities were got from the county government. It was reported that most non-governmental sponsorships supported livestock production activities with little on disease management activities. There were no resources set aside specifically for surveillance activities as the resources were shared with other animal health activities.

There was no document describing the surveillance system.

5.2.2.1.2 Digital/Computerized Surveillance System

There was no functional computerized system for data collection and dissemination.

5.2.2.1.3 Surveillance System Attributes

The quality checks put in place included physical verification, visits and training of disease committees. The system was neither integrated nor connected to other surveillance systems; however the county veterinary officers were willing to allow their system to be integrated to other disease surveillance systems.

To ensure data security, the system had files locked in cabinets and only relevant officers had access to the data.

The system was able to detect diseases but not in a timely manner. The system was able to provide estimates of the magnitude of morbidity and mortality, detect trends that signal the changes in the occurrence of diseases, permit assessment of the effect of prevention and control programs. It could lead to improved practices like the reports on many cases of Human African Trypanosomiasis (HAT) that led to increased control measures like use of nets, tse tse targets, and movement restrictions. The system was also able to stimulate research like the season or trends in dog bites had led to studies on the dog ecology and population control.

The complications that were identified in the system included bureaucracy at the community level that led to farmers getting disillusioned in case their issues are not addressed to their satisfaction. The lack of effective diagnostic tools had led to apathy in reporting of cases from the community especially in cases of deliberate poisoning of foraging animals. It was reported that there was a feeling among the community members that nothing will be done even if they reported cases to the authorities leading to disappointments and missing of cases or vital reports.

Among the changes that were proposed to improve on surveillance included the reduction of red tape, empowerment of regional laboratories and equipping of the local laboratories to detect cases.

It was noted that the system was not able to adapt to changes like devolution of veterinary services to the county due to slow pace of surveillance activities, non-functional equipment, and use of non-standardized documents contrary to the requirements by the national and international organizations, and emergencies not being addressed in a timely manner.

5.2.2.2 KAKAMEGA

Assessment site: Veterinary Services, County of Kakamega

5.2.2.2.1 Surveillance System Details

The major surveillance activity was on diseases of livestock and other domestic animals. The county was using the Animal Resources Information System (ARIS) and Digital Pen Technology though not effectively. Other surveillance activities included meat inspection services where finding were being reported on a monthly basis.

The zoonotic diseases that the county focused on included Anthrax, RVF, Leptospirosis, Listeriosis, Hydatidosis, Brucellosis, Anthrax, Taeniosis, rabies, Cysticercosis (Capacity for detection of Cysticercosis was very low and relied on visual or ante-mortem or post-mortem inspection.

The main objectives of the system were identified included;

1. Control diseases situation in good time to reduce loses,
2. Protect animals, humans and environment

The legal authority to perform surveillance activities was derived for the national legislation like the Anima Diseases Act (cap 364), The Meat Control Act (cap 356), the Rabies Act (cap 365), and the Public Health Act (cap 242), the International Organization for Animal Health (OIE) regulations contained in the aquatic and Terrestrial codes. It was noted that there were no county-specific laws on surveillance.

Structurally, the system involved the Sub County Veterinary Officer (SCVO) who receives information from the meat inspectors, Animal Health Assistants (AHA's), field workers in livestock markets, farm visits, home visits, stock routes, slaughter points). The data is collated by the SCVO who then forwards the reports to the County Director of Veterinary Services (CDVS). The CDVS then key in information from the various SCVO's into a report that is sent to Director of Veterinary Services through the Technical Team at the National level. It was noted that there was no structure of reporting to the county government, but information was being shared with the relevant county government officials whenever there were threats to human life from diseases in order to request for funds to handle the situation.

The population under surveillance in the county included cattle (approximately 320000), sheep and goats (approximately 250,000), poultry (approximately 1,000,000), dogs (approximately 50,000) and pigs (approximately 10,000). Data was being collected on a daily basis and reports compiled on a monthly basis. Information from the filed officers was aggregated and no data analysis done. The sources of data included animal owners and trained personnel working at slaughter points and markets. Data transfer was through paper. The paper-based data is entered into a computer at the county level and stored in the desk top computer. The information from the CDVS is shared with the DVS who then disseminate the information to the lower levels in the system. However, it was reported that the system was not working well.

There was no allocation of funds for surveillance activities by the county government surveillance and no personnel dedicated to do disease surveillance activities. It was reported that there was a shortage of staff leading to Meat Inspectors doubling as frontline officers in the livestock market. The county had 32 AHA's, 10 Veterinary officers serving 13 sub counties and 40 private Animal Health Service Providers (AHSP's). The CDVS had a desktop computer and 2 phones for use in the delivery of veterinary services. Most resources were being shared with other veterinary service activities. The county had no means of transport dedicated to disease surveillance activities.

No document explaining the disease surveillance system was available.

5.2.2.2.2 Surveillance System Attributes

There was no computerized system of data handling in the county. However, the officers had some equipment for use in the ARIS. The ARIS was not being used in the county due to lack of effective infrastructure at the county and national level.

The system was not integrated with other systems, but there was willingness to integrate with the systems in wildlife health, human health, animal health and environment health.

To ensure the ARIS performed optimally, the information fed into the system from the field had to be reviewed, sieved and corrected at sub county level then sent to the county level within the system. The county level forwarded the data to the national level within the system. The Lower level could not access or review what the higher level reviewed. The higher level then gave feedback to other lower levels in form of a report or bulletin. The system allowed traceability through geographic location information provided within the system.

Accessibility to the platform was restricted to the known users who could access the system using passwords to guarantee data security.

The ARIS could detect diseases and exposures of public health importance but not in a timely manner. The system could not detect trends that signal changes in the occurrence of disease. However, the system could provide estimates of morbidity and mortality related to the health-related event under surveillance by using counts and analysis at the national level. The system

could not permit assessment of the effect of prevention and control programs since it was in use for a short period and had inadequate infrastructure. The system was able to stimulate research and influence practices

The complication that were identified in the system included the fact that the Digital Pen Technology (DPT) needed digitized pen, digitized phone and digitized form; the three had to in good working condition for the system to operate. In addition, most users needed to understand how to use the equipment but had configuration challenges. To avoid the complications, it was noted that the system needed to be programmed to use one integrated tool and not different components.

The system had not been able to adapt to changes due to inadequate infrastructure. The components required maintenance (charging), needed the digitized paper, digitized pen. All the components needed to be working properly for the system to be effective.

Other factors that were identified to impede operation of the system included inadequate or irregular funds, lack of reporting tools, political interference (politician prefer eye-catching activities and disregard other programs that do not give political mileage; surveillance is not eye-catching to the politicians leading to negative effect on surveillance)

5.2.2.3 BUSIA

Assessment site: county level, Busia County

5.2.2.3.1 Surveillance system details

The system focused on livestock disease surveillance with occasional surveillance on wildlife diseases. The activities included general screening of animals for Trypanosomiasis, collection of blood samples for analysis in the local, regional and national laboratories. There was a referral system in the laboratory surveillance with suspected cases of rabies, African swine fever (ASF) and brucellosis being referred to the regional laboratory in Eldoret or the national laboratory at Kabete, Nairobi. The forms filled included the Zero report for Avian Influenza

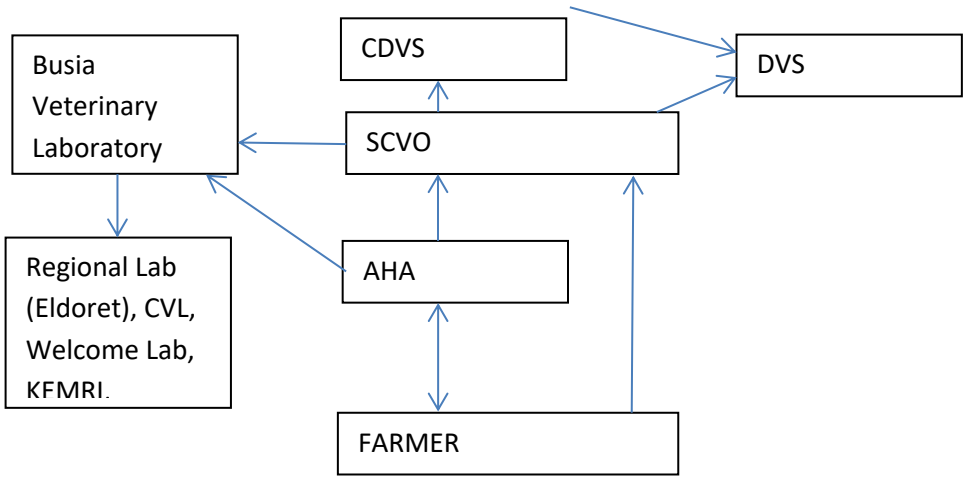
Among the zoonotic diseases that the system handled included Rift Valley Fever (RVF), Leptospirosis, trypanosomiasis, Echinococcosis, rickettsiosis, rabies, brucellosis, anthrax, e. coli, salmonellosis(poultry), Taeniosis, Leishmaniosis, Bovine TB, Cysticercosis, Schistosomiasis, Dermatophylosis and Aspergilosis

The main objective of the system was identified Detection and Identification of the prevailing disease conditions. The legal authority that the system relied on included Animal Diseases act, rabies act. It was noted that most the provisions were not being implemented.

Reporting lines were described as; a farmer reports to the nearest Animal Health Assistant (AHA) in the field, who then visits the farm to do investigation and take the necessary samples to the laboratory. Cases like the notifiable diseases that require the attention of the Sub County Veterinary Officer (SCVO) are reported to SCVO who then forms a team to handle the cases.

The SCVO could also visit the affected farms. Samples obtained from the field are taken to the relevant laboratories like Central Veterinary Laboratory (CVL) in Kabete, Welcome-Trust laboratory and Kenya Medical Research Institute (KEMRI) laboratory. Samples are transferred to the laboratory accompanied with LB1 forms. The transfer of samples and the LB 1 forms by the SCVO is done without necessarily passing through the County Director of Veterinary Services (CDVS) office. Results from the laboratory are transmitted to the SCVO who files a report to be forwarded to the CDVS. The SCVO reports to the CDVS and the Director of Veterinary Services (DVS) at the national level. Declaration of quarantine is done upon receipt of the laboratory results. Only confirmed results are shared with the affected farmers or individuals through the officers who initiated the investigations. Any cases that are to be involving human beings like cases of *T. brucei*, are reported to KEMRI for further investigation

Figure 4 Data flow at the county level, Busia County, 2015



The population under surveillance was reported to be all the animals in the county. The data was being collected on daily basis. The type information collected included herd population, morbidity, animal ownership, vaccination status of animals, movement of animals, reasons for animal movement. Data sources included farmers, herdsmen, local elders, records, and officers in the field, neighbours, vaccination certificates and branding marks. Transfer of data was being done through monthly reports and laboratory forms. Data was stored in hard (paper) copies in files. Electronic form of data was being stored in desk top computer. Data analysis was not being done. Dissemination of data was being done on need basis to the stakeholders and users of surveillance system like the AHA's. Dissemination to community was done through the local administration officers, meetings and schools. Dissemination to the partners or donors is done through meetings and reports.

Funding of surveillance activities was being done by the county government though it was reported to be inconsistent. Other sources of funding included ILRI and other researchers. The number of staff working at the county level was reported to be six in post and the figure of 35

was reported to be the ideal in order to have officer at the ward level. There were seven officers manning livestock markets and auction rings in the seven sub counties. There was no specific infrastructure set aside for surveillance activities. Most of the resources were shared with other disease management activities in the county.

Document describing the disease surveillance system was not available.

The county veterinary services had no computerized system of data handling and processing

5.2.2.3.2 Surveillance system attributes

There was information sharing with other laboratories but no integrated system of surveillance with other surveillance systems. To ensure data security the system allowed information in the desk top computer to be accessed by persons with the relevant passwords. The system was able to detect diseases in a timely manner, provide estimates of morbidity and mortality, detect trends and permit assessment of the effect of prevention and control programs. It could also lead to improved practices and stimulate research. No part of the system was identified as unnecessarily complicated though political interference was reported to be hampering disease surveillance activities.

The system was not able to adapt to changes and new challenges due to lack of protocols to be followed and unequal treatment of officers. Lack of continuity of surveillance activities was also identified as a hindrance to adaptation to challenges.

6.0. RESULTS - Focused Group Discussions

All the participants in the FGD's understood what the discussion was all about and there was consensus that the evaluation of disease surveillance systems in Kenya was a noble idea since it was expected to;

1. identify what is in existence
2. do a reality check of the systems, compare notes and rectify where necessary
3. check if the systems are up-to-date
4. estimate how people are affected by diseases
5. evaluate disease trends
6. determine how far we have come and where we are going with surveillance
7. identify problems facing the systems and measures to address them
8. Identify the gaps in the system.

The following themes came out of the FGD's conducted in the counties of Busia, Bungoma and Kakamega

6.1 Surveillance system description

Majority of the participants were able to describe the surveillance systems in their areas of operation. The Animal Health Practitioners performed surveillance activities during ante mortem and post-mortem inspections at slaughter houses, during farm visits, during inspection of stock routes and when issuing movement permits at livestock markets and livestock auction rings. The documents that the veterinary staff used included PP1 forms in the slaughter houses, ND1 and Zero reports for notifiable disease, condemnation certificates that indicate what caused the condemnation, LB1 forms used in the laboratory.

The Human Health Practitioners used the District Health Information System (DHIS) for data transfer within the system. The tools used in information transfer included registers (MOH 514), referral books (MOH 100) used by Community Health Volunteers, House Hold registers (MOH 513) used by CHV's, service delivery log book (MOH514), Summary by Community Health Extension Workers (MOH 515), Community chalk board (MOH 516) and monthly report form (MOH 708)

A few of the participants could identify the name of the systems they were using. Some participants from the human health sector were able to identify and describe the DHIS and the IDSR systems used in the surveillance of diseases in the ministry of health.

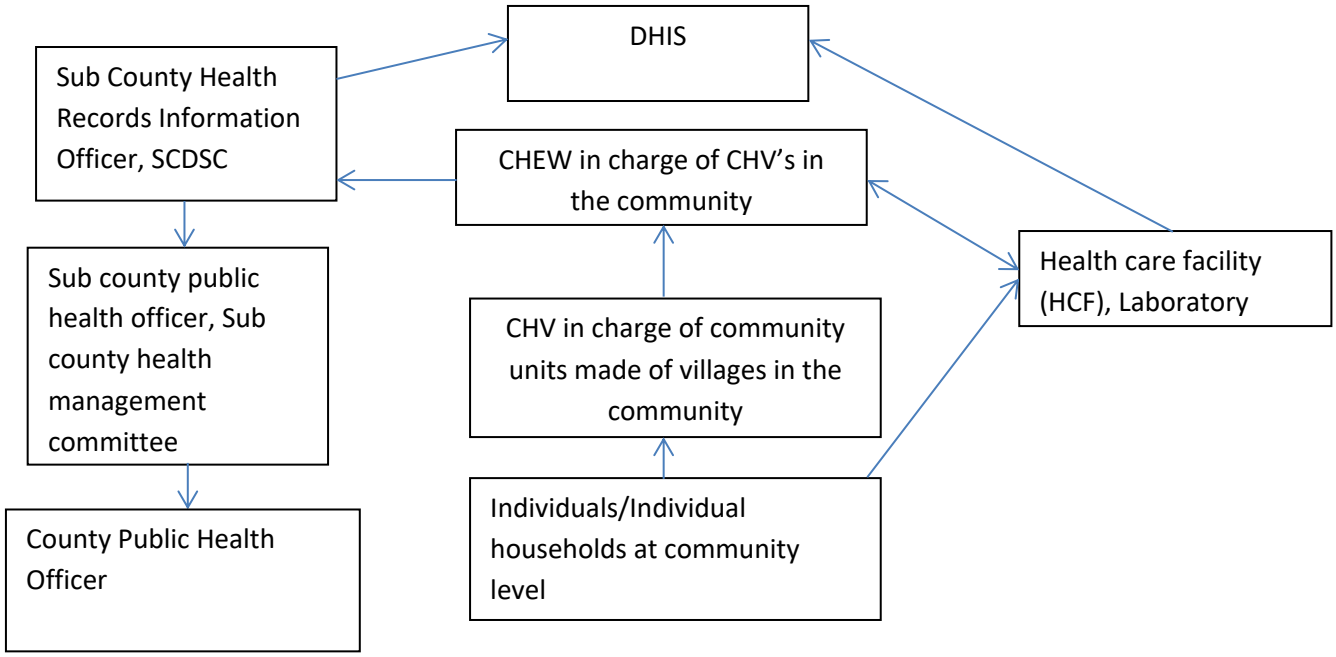
The participants knew the uses of surveillance systems with majority identifying the following as uses of surveillance systems;

1. Monitor trends of disease occurrences
2. Quality Assurance
3. Disease prevention and control
4. Prompt reporting of epidemics
5. Determine the burden of diseases
6. Create awareness, knowledge and research opportunities
7. Data collection and dissemination
8. Source for funding
9. Decision making and planning
10. Evaluation of control strategies

Information flow within the human health disease surveillance system was described as starting at the individual household level then to the community unit made of several households. Individuals report to village elders and administration officers at the community level. Some individuals report directly to the nearest health care facility (HCF). At the community level the CHV collects information from the village (households) that is then forwarded to the CHEW. The CHV uses form MOH 513 (household register) and the CHEW uses form MOH 517 (summary tool) at the community level. The CHEW and CHV works in collaboration with the Community Health Committee (CHC). Each CHV is in charge of several community units while

the CHEW is in charge of several CHV's and is attached to a health care facility. The CHEW forwards the filled MOH 517 to in-charge of the health care facility. Data from the community and the facilities are collected and forwarded to the Sub County Health Record Officer at the county level by the CHEW's on weekly basis using form MOH 505. The SCHRO then collates the information from various CHEW's then enters it into the DHIS. Data from sub county level health facilities normally contain laboratory confirmed diagnoses which accompany the report that is entered into the DHIS. The sub county level facilities have access to the DHIS and can enter data into the DHIS and access information in the DHIS without going through the SCHRO. Data is entered into the DHIS on a weekly basis. Information in the DHIS can be viewed online by anyone with right of access to the system.

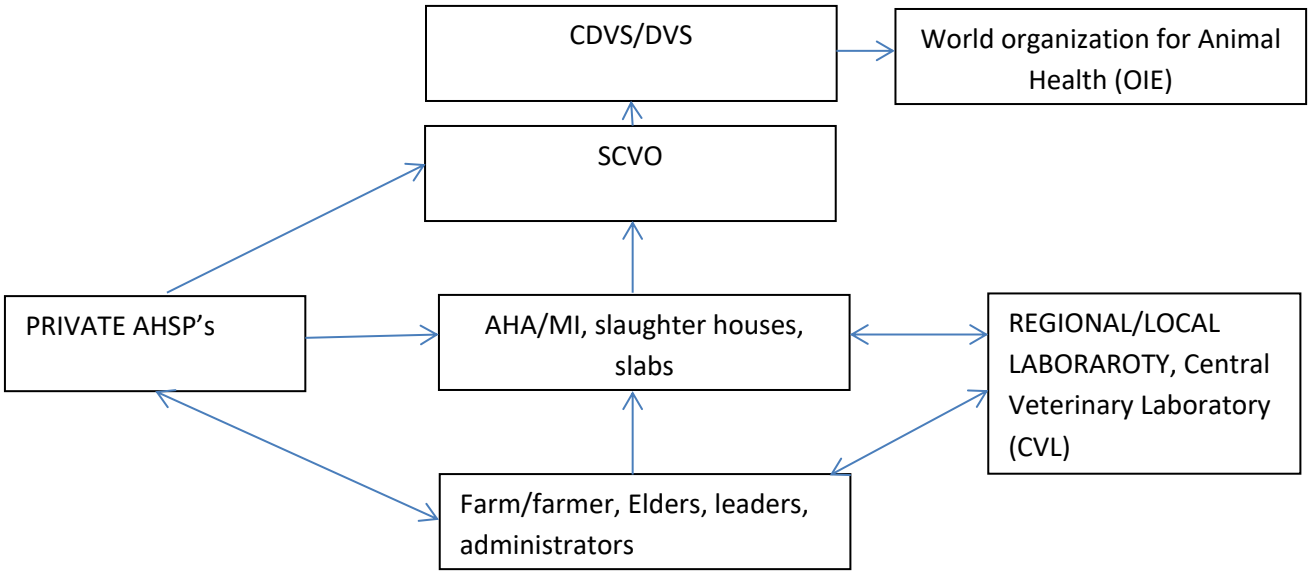
Figure 5: Information flow at the county level human health services, 2015



In the Animal Disease Surveillance system, the participants described the flow of information to be starting at the Farm level where individual farmers report cases to the Animal Health Assistants (AHA's) and Meat Inspectors (MI) employed by the Government. The AHA's also visit farms to do disease surveillance. Cases reported to the AHA are recorded in the rumour registers, and then investigations including visits to affected area are conducted to confirm the existence of the reported disease. In the absence of the AHA's the farmers report to the private animal health service providers (PAHSP's), the local administration, local laboratories or the Sub County Veterinary Officer (SCVO). It was expected that the PAHSP's should be reporting to the AHA's then the AHA's to the SCVO and the SCVO reporting to the County Director of Veterinary Services (CDVS) and the national Director of Veterinary Services (DVS) on a regular basis but there was consensus among the participants that most of the PAHSP's do not report cases they do encounter to the government officers as expected. The dis-connect between the

PAHSP's and the government officers was attributed to inadequate number of officers in the field and lack of commitment from the PAHSP's. Some participants stated that some farmers report cases to unqualified Animal Health Service Providers (AHSP's) who do not report the cases to the AHA's or SCVO.

Figure 6: Information flow at the county level, Western Kenya 2015



All the participants were able to identify the point at which they operated within the surveillance systems. However, there was consensus that the number of personnel involved in disease surveillance was inadequate since some of the surveillance officers were covering large areas with other performing additional duties in addition to surveillance activities. For example some Animal Health Assistants work as meat inspectors and as disease surveillance officers in the livestock markets and auction rings. The AHA/MI finds it hard to perform both duties at the same time since meat inspection takes place in the morning and so is the livestock sale and auction!

6.2 Zoonotic diseases

The participants were able to define the zoonoses as diseases transmissible between human beings and animals or lower vertebrates. However, it was observed that some human health practitioners defined zoonotic disease as those diseases transmitted from animals to human beings while some animal health practitioners defined zoonotic diseases as those diseases transmitted form human being to animals. This pointed to lack of clear understanding of what zoonotic diseases are or one sector shifting blame to the other sector!

Among the diseases the participants had encountered in the areas of operation included brucellosis, Hydatidosis, Tuberculosis (Avian and Bovine), Rabies, Cysticercosis, Taeniosis, Salmonellosis and Anthrax.

Less than half of participants were able to define case definition as a set of criteria used to classify diseases. Most of the participants referred to case definition as clinical signs or behavioral changes used in disease identification. Very few of the participants could give case definitions of the zoonotic diseases identified during the FGD's. In addition, most participants reported that there were no charts or information at their areas of operations that provided case definitions and Standard Operating Procedures (SOP's) for the identified zoonotic diseases.

The discussants were in agreement that there was neither specific surveillance system nor specific surveillance tools for zoonotic diseases at the counties and that the existing tools used in disease surveillance did not cater for zoonotic diseases adequately.

6.3 Interaction and information Sharing

Information generated from the system is shared with stakeholder at various levels of the surveillance systems. The stakeholders that were identified by the Human health practitioners included patients, local administration, the media, District Surveillance Committees, community focal persons and community members.

Among the stakeholders identified by the animal health practitioners include farmers, Veterinary officers, community members, butcher-men and traders.

The methods used in interacting with stakeholders include one-on-one, meetings, trainings, phone calls, barazas (public meetings), field days, demonstration, visits, poster (Information, education, communication), dialogue days, health education, social media (whatsapp), comcare(futuristic) and M-Learning (supported by AMREF).

Participants reported that they give feedback to the other stakeholders and there was feedback from the users of the surveillance systems too. An example was given by the participants from the animal health where a case of a notifiable disease is reported to the AHA who then reports to the SCVO. The SCVO then facilitates investigations and then shares the result of the investigation with the AHA and the affected community and declares quarantine incase investigations confirm the existence of the notifiable disease in the area. The community is then mobilized to take part in control measures like vaccination campaign. In the human health services the community health committees (CHC) organizes meeting for the community units meet regularly (every three months) at the community level where information sharing happens. The CHC sets aside days for planning the agenda for the community and days for interaction with community called community action days when the communities also give feedback to the surveillance officers.

6.4 Integrated Disease Surveillance System

Majority of the participants did not understand what integrated disease surveillance system entailed. However, some participants, especially those from the human health were able to relate the integrated system with the Integrated Disease Surveillance and Response Unit housed in the Ministry of Health. The participants described integrated disease surveillance system as joining

or merging the different systems involved in disease surveillance and making them work collectively.

All the participants were in support of integrating the animal and human disease surveillance systems. Among the reasons given for support of integrated disease surveillance system include reduction of wastage of resources used in parallel systems, ease of access to information, sharing of resources, ease of planning, and influence policy on training and preventive services

Several structures for disease reporting were proposed. Most of the participants proposed that the community be involved comprehensively in disease surveillance activities and information flow should start at the community level (households, villages, sub location). It was proposed that the existing structures like the Community Health Committees (CHC's) within the human health surveillance system be re-structured to incorporate the animal disease surveillance system. The CHC is made of CHV's, CHEW's, and the local administrators (village elders, chiefs, ward administrators). The participants were in agreement that health management teams could be formed at the health facility level, sub county level and the county level. The health management committee was proposed to have key stakeholders in the animal and human health services.

Participants were in agreement that disease reporting tools for zoonotic diseases should be harmonized so that they incorporate both animal and human disease surveillance.

6.5 Effect of devolution of services to the county government

There were mixed feeling on the effect of devolution of animal and human services to the counties. Some participants considered it a good idea but sabotaged by poor implementation and political interference. Those who considered it a bad idea said that the county governments were not competent in provision of the services as they were known to compromise on the acceptable standards.

It was generally agreed that human and animal disease surveillance systems were worse after the devolution compared to the pre-devolution time. The reasons given for worse scenario included lack of disease reporting tools, lack commodities for in the laboratories, lack of proper reporting structures especially in the animal disease surveillance, poor response to disease outbreaks and emergency situations, lack of incentives and motivation, political interference and lack of harmonized data collection tools.

The participants were in agreement that there was no effective collaboration between the county government and the national government. Unlike previously when the staff used to get disease reporting tools in good time, the tools were unavailable in most parts of the counties evaluated pointing to lack of coordination between the national and county government since it is the national government that produces the reporting tools. The absence of effective collaboration had led to some county governments designing their own disease surveillance tools in contravention of the existing national and international law. This was noted by the animal health participants in the discussion.

When asked what recommendations they would give in order to improve disease surveillance in the counties, most participants recommended that devolution of animal and human health services be reversed. Other recommendations included facilitation of surveillance activities by provision of working tools in a timely manner, transport availability, avoidance of political interference, increase the number of personnel for surveillance activities, capacity building, coordination of animal and human disease surveillance activities, proper coordination between county and national government, motivation and incentives for personnel.

7.0. DISCUSSION OF THE RESULTS

The animal disease surveillance system had inadequate infrastructure both at the national and at the county level. The roll out of the computerized disease surveillance system was hampered by inadequate personnel and equipment. The disjointed way in which the digital system was implemented with several methods being tried at more-or-less the same time could have led to confusion in the system with some parts of the county using one system and the other parts using different system. Collating the data from different parts of the country was found to be hampered by the slow pace of data transmission to the national level. The delays lead to lack of timely response to potential epidemics. In addition, analysis of the disjointed data may lead to unreliable information being shared with the stakeholders since the analysis would not be representative of the actual situation at the national or county level.

Cases of under-reporting in the animal disease surveillance system could be attributed to the existence of unqualified animal health service providers who fail to report cases to government officers for fear of victimization by the government officers for engaging in veterinary practice in contravention of the Veterinary Surgeons and Veterinary Paraprofessional (VSVP) act. The lack of reporting by the unqualified AHSP's led to loss of vital data and underreporting at the community level thus leading to misrepresentation of the correct disease situation in the counties and at the national level. It would be advisable for the players in the animal disease surveillance system to use the approach in the human health system where the community is involved in surveillance activities through community committees.

Due to lack of closer laboratory services for the animal health service providers, majority of the service providers use clinical signs to make diagnosis. This coupled with lack of appropriate case definitions, lead to cases of misdiagnosis and generation of unreliable data. In addition, it was observed that most of the levels of animal health service provision lacked proper records on disease surveillance.

It was not possible to get costs that were specific to the surveillance activities since the resources used in surveillance were shared with other disease management activities. Preparation of budgets that are specific to disease surveillance is of importance for planning purposes and resource mobilization. The players in the animal disease surveillance should come up a breakdown of cost of surveillance at the county and the national levels.

From the results obtained it was evident that data on animal disease surveillance was scanty and the reporting system is not well coordinated right from the community level thus leading to inadequacy of the data.

The human health disease surveillance was well organized both at the county level and at the national level. The use of computerized system of reporting at the sub county level and at the health facility level meant that information sharing was real-time and easily accessible to those with right of access. The organization at the community level involving the community health committees, community health volunteers and the community health extension workers ensured that the data collected was comprehensive and inclusive.

There was minimal collaboration between animal health services and the human health service providers at the different level of disease surveillance due to absence of designated forums for collaboration between the service providers. However, it was noted that collaborations are normally heightened during emergency situations.

8.0. CONCLUSION AND RECOMMENDATIONS

None of the surveillance systems evaluated catered for zoonotic diseases adequately. There was no clear-cut resource allocation for surveillance activities both at the national and county levels. From results obtained in the evaluation exercise it was evident that there were no effective structures for sharing of information on disease surveillance between the animal and human disease surveillance at the national and at the county level. The human health disease surveillance was well structured at all the levels of information flow.

The use of standard case definition and laboratory diagnosis was minimal leading to generation of data that may not be factual.

It is therefore recommended that effective structures be established at all levels of disease surveillance with incorporation of the various systems into an integrated system that covers both animal and human disease surveillance. A lot can be borrowed from the existing systems in the human health.

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