Texila International Journal of Public Health
Volume 7, Issue 4, Dec 2019

Integration of Human and Animal Diseases Surveillance Systems in Uganda: The West Nile Experience

Article by Prosper Behumbiize[1], John Lule[1], Bridget Magoba[1], Brian Ntare[1], Joshua Kawiya[3], Nguma Willy[3], Shivan Asimire[1], David Onyango[1], Monica Amuha[1], Charles Olupot[1], Eric Munyambabazi[1], Ann Okoth[1], Patrick Omiel1, Mohammed Lamorde[5], Fulgentius Baryarama[1], Daniel Ganu[6]

[1]*Health Information systems Programme-Uganda*
[2]*Makerere University Kampala*
[3]*Ministry of Health Public Health Emergence Center*
[4]*Arua District*
[5]*Infectious Diseases Institute (IDI)*
[6]*Texila American University*
E-mail: pbehumbiize@texilaconnect.com

Abstract

Background: *Independent human and animal disease surveillance creates challenges linking zoonotic diseases outbreaks in either populations, while integration improves simultaneous zoonotic disease reporting and response in both populations. This paper evaluates integration within human and animal surveillance systems and challenges of integrating the two, in West Nile, aiming to improve simultaneous zoonotic disease detection in humans and animals.*

Methods: *Cross-sectional data from in-depth interviews on integration of core and support surveillance function of human and animal surveillance systems, collected with an integration assessment tool was analysed on integration levels and gaps within and across the two systems.*

Findings: *Integration was high in human surveillance (0.92); in planning, reporting and outbreak response (1), data processes (0.86), laboratory processes (0.93) and coordination (0.87); but low in animal surveillance (0.56), especially data collection and analysis (0.20). Integration of human varied from animal surveillance systems (0.97 vs. 0.56), especially in data processes (variation of 0.70).*

Conclusions: *Differential integration of core and support surveillance functions between human and animal surveillance systems challenges zoonotic disease surveillance, in data collection, reporting frequency and lack electronic real-time disease notification for anmals diseases. Human IDSR guidelines provide platform to coordinate animal disease reporting and improving zoonotic diseases surveillance.*

Investments focusing on Point-of-Care animal diseases diagnosis, real-time reporting and eIDSR-CBS, reduce delayed animal disease diagnosis. The integration assessment tool is available for adoption to effectively identified integration gaps.

Keywords*: Integrated Disease surveillance systems, human and animal disease surveillance systems, zoonotic disease surveillance, West Nile Region Uganda.*

Introduction

Human and animal surveillance systems are indispensable and essential in public health practice and decision-making. The many parallel and not interconnected human and animal systems create difficulty in sharing, where advancements in information technology should focus on “One Health" for betterment of human and animal health.[1] One Health recognizes the connections between the health humans, animals and the environment and provides collaborative, multisectoral, and trans-disciplinary approaches for zoonotic disease surveillance among local, regional, national, and global stakeholders.[2] One health provides a platform for integration of zoonotic disease surveillance among both animals and humans through the one-health platform.[3] In Uganda human disease surveillance is integrated in addition to providing electronic case-based disease surveillance, while animal disease surveillance is neither as integrated nor electronic.

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

Recently human and animals disease surveillance has been stressed by the Global Health Security Agenda, desiring multilateral and multi-sectoral approaches to strengthen global capacities in preventing, detecting, and responding to human and animal infectious diseases threats.[4] Integration and cross-integration of human and animal surveillance systems require real-time data, exchange of surveillance data and greater cooperation among surveillance stakeholders by focusing on timely and accurate data collection, synthesis and coordination. Early detection, timely reporting and rapid response is a challenge for animal disease surveillance system due to lack of skilled and unskilled personnel, infrastructure and resources.[5]

Uganda is signatory to International Health Regulations (IHR) and demonstrates commitment to meeting IHR core capacities but is yet fully met the required core capacities under the IHR to prevent, detect, and respond to public health emergencies (PHEs).[6] The tremendous advances in information technologies have potential to improve animal health and welfare and have transformed human diseases data and information collection, integration, reporting, analyzing and disseminated to stakeholders.[7] The implementation of Integrated Disease Surveillance and Response (IDSR) for human disease surveillance and reporting systems has greatly improved human disease surveillance and engagement of stakeholders in other countries[8]. However, this degree of integration is still lacking for the animal disease detection and reporting.

The gaps in integration of animal disease surveillance systems in Uganda are not well documented. A recent baseline evaluation of the disease surveillance situation, in six West Nile districts, found differences in prioritisation of human and animal diseases under surveillance in the region, with attempts at integration of human and animal disease surveillance systems.[9] The potential for animals to serve as sentinels for zoonotic diseases in humans or vice versa depends on linkages and contacts between animals and humans living nearby.[10] Early identification of zoonotic diseases through simultaneous monitoring of both human and animal diseases is critical to protect the health of animals and human, with sufficiently flexible and integrated disease surveillance systems to detect diseases in either populations before detectable disease occur.[11]

There is a need to understand whether the human and animal surveillance systems have enough within system integration to allow harmonisation and cross integration of the two systems. This provides the building blocks for harmonisation and integration of animal and human surveillance activities and systems so that the two systems work in concert to concurrently detect and respond to zoonotic disease outbreaks in human and animal populations.

This study aimed at strengthening integration of human and animal surveillance systems for early detection of zoonotic diseases among human and animal populations in Uganda. Specifically, the objectives were to develop a tool for and to assess integration of the core and support animal and human surveillance systems in the West Nile region and to propose strategies of improvement of integration within and across the human and animal surveillance systems.

Methods

Setting: The study was conducted in the 9 districts (Arua, Maracha, Koboko, Yumbe, Moyo, Adjumani, Pakwach, Nebbi and Zombo) of West Nile between August 2018 and January 2019, among key stakeholders in human and animal disease surveillance as key informants.

Study design: The study was cross-sectional evaluating the levels of integration within the human and animal disease surveillance systems and developed proposals for improvement and cross integration of the two systems.

Study Populations and Respondents. The respondents were key stakeholders in human and animal disease surveillance at regional, district and community levels. Purposively, the Regional Surveillance Focal person, the district surveillance focal persons for each district, the district health officer (DHO), the district veterinary officer (DVO) and sub-county veterinary officers (SCVO), were selected because of their key roles in human and animal disease surveillance and response.

Sampling and sample selection: The study was conducted in all the 9 districts of the West Nile region (Arua, Maracha, Koboko, Yumbe, Moyo, Adjumani, Pakwach, Nebbi and Zombo. A total of 44 key informants were provided in-depth interviews, including; one at the regional level (RSFP), 23 were

at district (5 DHO, 9 DSFP and 9 DVO), and 20 were at sub-county level (sub-county veterinary officers (SCVO).

Study methods: The study was conducted in phases using quantitative methods to collect data and document the integration of the core and support functions for surveillance within the system. Initially, a tool to assess integration of the core and support functions of surveillance was developed, adopted from the FAO SET tool and the MEASURE evaluation tool for Routine Data Quality Assessment (RDQA).[1] From the tool a checklist was developed for data collection during in-depth interviews. Thereafter literature on surveillance systems was conducted followed by collection of qualitative data using face-to-face key informant interviews.

Measurements: For this study integration was defined as joint multi-disease surveillance of selected priority diseases or conditions linking communities, health facility (for human) or animal care facilities (for animals), districts and national level.

Criterion for integration of the surveillance systems

Table 1. Levels and criterion that was assessed for integration

Level of integration	Criteria
Policy and planning	1. Existence of a national policies and strategies addressing integrated surveillance a. Presence of staff for surveillance b. Existence of identified focal points for surveillance 2. Existence of guidelines addressing integrated surveillance a. List of diseases prioritized for surveillance b. Case definitions c. Epidemiology thresholds 3. Existence of guidelines for training service providers in IDSR a. Training curriculum b. Trained service providers in IDSR 4. Existence of agreements among the institutions involved in surveillance
Data collection and analysis level	1. Interoperability at data collection level a. Existence of integration of data collection tools b. Existence of activation mechanisms of human surveillance based on signals from animal/human surveillance c. Other interoperability mechanisms at data collection level 2. Interoperability mechanisms at data analysis, aggregation and reporting a. Presence of DB exchange, merging or other mechanisms to facilitate joint analysis b. Performance of joint or integrated data analysis for different diseases or among different surveillance sectors c. Other interoperability mechanisms at data analysis
Reporting and dissemination	1. Existence of channels of communication and reporting of disease outbreaks a.Defined channels of communication b. Mechanisms for communication 2. Reporting of disease information 3. Existence of joint result dissemination mechanisms (e.g. bulletins, reports, papers, media reports, websites)
Coordination	1. Existence of a coordination mechanisms among institutions involved in surveillance
Disease diagnosis and laboratory services	1. On-site diagnosis of diseases a.Case definitions b. outbreak thresholds 2. Laboratory diagnosis a.Point of care laboratory services b. Functional district laboratory services

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

	c. Functional regional laboratory services d. Functional national laboratory services
Response during disease outbreak	1. Reporting channels during disease outbreaks

Data collection: Data was collected from documents reviews and key informant interviews. The documents that were reviewed included; IDSR guidelines, the One Health strategy and memorandum of understanding between key One Health stakeholders, tools for data collection and other literature related to disease integration. Qualitative data was carried out through face-to-face in-depth interviews using a checklist as the key informant guide. The themes that were addressed during the KII are shown in Table 1 above.

Ethical Consideration: The Ministry of Health of Uganda through the Public Health emergency operating Centre (PHEOC) and One Health technical Working group gave approval to conduct this study. The study was determined not to be human subjects' research because the primary purpose was to evaluate the feasibility of integration of human and animal disease surveillance which is one of the priorities of the One Health strategy. Permission was also received from the districts of the West Nile region from the District Health Officers. The participants of the qualitative interviews were involved in the interviews after informed consent was obtained.

Findings

There are several stakeholders engaged in human and animal diseases surveillance in West Nile Region including those fully engaged in general disease surveillance activities and those engaged in specific disease surveillance or supporting disease surveillance activities (Table 2). Those engaged fully in surveillance include MoH and United Nations High Commission for Refugees (UNHCR) and those engaged in disease specific surveillance activities include; Uganda Virus research Institute (UVRI), Infectious disease Institute (IDI), HISP-Uganda, WHO and AFENET. Medicines' Sans Frontiers (MSF), Save the Children, UNICEF and AMREF support surveillance services especially during outbreaks.

Table 2. Partners engaged in human and animal disease surveillance in the West Nile region within the health facilities, district and refugee communities

Stakeholder	**Major activities related to refugees**	**Major activities related to disease surveillance**
General disease surveillance		
Ministry of Health	Ministry of health through the health sub-district, from the region, districts administration, district health units and within the community through the VHTs. MoH provides the structures through which disease surveillance, reporting and response in done.	• Supports disease surveillance, disease detection, reporting and response at national level. • Provides structures from the headquarters to the community VHT that support disease surveillance. • Provides staff for disease surveillance, health units and guidelines and surveillance systems for disease surveillance and detection and reporting systems.
Local district	The local government plays a key role in disease surveillance in West Nile region. The local government support disease surveillance as part of the district has the DHO, the district surveillance focal person, the district Biostatistician and the HMIS Officer. These are primarily responsible for the weekly and	• The DHO's office provides the administrative structures and the infrastructure for human disease surveillance. Surveillance staff supported disease surveillance including the DHO, DSFP and Biostatistician), health facilities and composes the district rapid response team (DRRT).

	monthly reporting. Surveillance information is collected from the community through the VHT system to the health units and finally to the district.	• For animal disease surveillance the local government provides staff including the DVO, the sub-county veterinary officers, animal scouts and may include the farmers, livestock sellers and the private animal health practitioners
Health Units:	The health units are at the centre of disease detection, investigation, diagnosis and management as well as providing weekly reports and getting feedback. They play a key role in case management, specimen collection and transportation as well as performing rapid diagnostic services.	• Specifically provides case investigations, case detection, case management, specimen collection, packaging, transportation and performance of basic diagnostic tests. • Specimen transportation primarily relies on the HUB specimen transport system. • Provide storage for both human and animal specimens for transportation through the specimen hub.
United Nations High Commission of refugees (UNHCR):	UNHCR implements at the regional, district levels and within the refugee camps. At the regional level, district and community level. UNHCR engages in disease surveillance within the refugee settlements, camps and health facilities through Medical Teams International (MTI). UNHCR also provides technical support to district health facilities. UNHCR supports Moyo district to do disease surveillance among animals coming with the refugees in addition to supporting animal disease surveillance by providing resources for laboratory equipment.	• Supports MTI in disease surveillance and provides staff that provide technical support to health facilities and supports VHT within the community for disease surveillance. The staff compile weekly disease surveillance reporting (to UNHCR). • UNHCR also supports sub-county veterinary officers in surveillance of diseases among animals brought in by the refugees.
Specific activities conducted for disease surveillance		
Medical teams International (MTI)	MTI is the main UNHCR implementing partner who supports health services delivery at health facility and community levels. Similarly, MTI provides disease surveillance services and refugee entry points.	Provides the technical support for disease surveillance within the health facilities located within or near the refugee camps and settlements. Compiles the weekly reports for UNHCR
Infectious disease Institute (IDI);	IDI is currently the PEPFAR implementing partner in West Nile and primarily supports HIV programs in addition to supporting the implementation of one-health in the districts. Major activities have been revitalization of the animal laboratory and transportation system of specimens to NADEC, Supports the District Rapid Response Team (DRRT), UNHCR (MTI, MSF, RMF, IRC), WHO	• Supports the one-health program in the region. • Revitalized the Animal laboratory in Arua. • Supports the DRRT and provides capacity building and support supervision to the district and health facilities surveillance focal persons. • IDI is piloting animal disease surveillance data collection and registration within the region

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

	(PPEs, vehicles and capacity building).	
HISP-Uganda	HISP Uganda piloted the implementation of e-IDSR in the region and was supported by GHSA through IDI	• Training of surveillance officers in e-IDSR and provided mentorship and support supervision to the DSFP and HF surveillance focal persons and staff in e-IDSR. • Exploring the requirements for integration of human and the animal disease surveillance systems
Uganda Virus Research Institute (UVRI)	Supports regional plague surveillance and investigation of Rift Valley Fever (RVF) through the Arua field station. Supports active disease surveillance in addition to providing laboratory services for testing samples. Extends it services to UVRI in Entebbe where it provides testing of specimens for VHF, Measles, RVF and other diseases.	• The field station in Arua provides surveillance for Plague and Rift Valley Fever (RVF). • Provides laboratory support for VHF, Measles, Polio and other diseases.
WHO	Provides support to the region mainly during disease outbreaks. Supports training of staff and provision of software for disease surveillance.	• Support weekly Surveillance and facilitates sample transportation to CPHL. • Is actively supporting surveillance for AFP in Koboko district
AFENET	Supports training of service providers. Regional Offices fund the Surveillance Focal Person and Performance Review Meetings	• Training in IDSR and supporting some staff and IDSR • Supports surveillance performance review meetings in the region
Medicines' Sans Frontiers (MSF)	Supports the medical response especially during disease outbreaks and sample transportations	Supports the medical response and specimen transportation during disease outbreaks within the region.
Save the Children	Facilitate transportation of samples to CPHL and training of staff	• Supports sample transportation and • Supports training of health facility and veterinary staff in disease surveillance.
UNICEF and AMREF	UNICEF and AMREF are the primary implementers within the refugee areas in the refugee health outposts. They supporting case detection and effect referrals to health facilities. They also provide capacity building support by training VHT and health staff in IDSR.	• Supports case detection during disease outbreaks and • Supports training of district staff in IDSR.

The West Nile, the region has human (17) and animal diseases (23) that are prioritised for surveillance, of which 8 (zoonotic) are included in the lists of both human and animal diseases prioritised for surveillance (Table 3). While the human side relies on the national IDSR guidelines for case definitions of diseases, the animal side has regional working definitions for some zoonotic diseases among animal hosts for Anthrax, Brucellosis, Rabies and highly pathogenic Avian Influenza (Table 4).

Table 3. Animal and human diseases that are prioritized for surveillance in the West Nile region

Animal diseases	Human diseases
Swine Fever	Acute Flaccid Paralysis (AFP)
Anthrax*	Anthrax*
Avian influenza	Adverse events following immunisation (AEFI)
Rabies*	Animal bites (Suspected rabies)*
Cholera	Cholera
Contagious bovine pleuropneumonia	Bacterial meningitis
Diamond disease	Dysentery
Foot and mouth disease	Guinea Worm
Fowl cholera	Malaria
Fowl Pox	Maternal and peri-natal deaths
Fowl typhoid	Measles
Plague*	Plague*
Tuberculosis	Presumptive Multi drug Resistance (MDR) TB
Gumboro	Neonatal Tetanus
Trypanosomiasis*	Trypanosomiasis*
Ebola Heamorrhagic Fever*	Ebola Heamorrhagic Fever*
Crimean Congo Haemorrhagic Fever*	Crimean Congo Haemorrhagic Fever*
Marburg*	Marburg*
New Castle disease	Severe Acute Respiratory Infection
Brucellosis*	Brucellosis*
Rift Valley Fever	
African Bovine fever	

* Diseases that are under surveillance by both the human and animal surveillance systems obtained from KII from DVOs, DHOs and DSFP

Table 1. Case definitions for some zoonotic diseases in animal hosts*

Disease	Suspected case	Confirmed case
Anthrax	• Cliical : Sudden death of animals • Carcass oosing un-clotted tarry blood through mouth, nose or anus • Absence of rigor mortis, and • Post-mortem : Rapid bloating of carcasses • In pigs, carnivores and primates: Local edema and swelling of face and neck. • In endemic areas: All sudden death of animals is regarded as anthrax unless proven otherwise.	Detection of Bacillus anthracis • In smears, • Rapid test or • Bacterial isolation
Brucellosis	Clinical presentation in animals is not very specific clinical signs: • In female: Abortion of one or number of animals and • In males: Swollen testis, • Other signs: Any or all the following signs; • swollen joints, • Births of weak foetuses and retained afterbirths Suspected Brucellosis in all abortions, especially multiple abortions (i.e., abortion storms) occur in herd or flock.	Laboratory testing crucial for confirmation • RBT and confirmation based on positive ELISA

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

Rabies	Animal or person presenting with • Acute neurological syndrome (encephalitis) dominated by forms of hyperactivity (furious rabies) or • Paralytic syndromes (dumb rabies) • Progressing towards coma and death, usually from respiratory failure, • Within 7-10 days after first symptom if no intensive care is given.	Case where the samples obtained and the various tests carried out indicate positivity for the disease
Highly pathogenic Avian Influenza	• Sudden and massive death of flock • Severe depression and droopiness • Ruffled feathers • Sudden drop in egg production • Soft-shelled eggs • Cyanosis (purplish-blue coloring) of wattles and comb • Edema and swelling of head, eyelids, comb, wattles, and hocks • Respiratory distress, discharge from nostrils, sometimes blood-tinged • In coordination, loss of ability to walk and stand • Profuse diarrhea • Pin-point hemorrhages (most easily seen on the feet and shanks) • Oedema (swelling) of the head, congestion and necrosis of internal organs e.g. pancreas, liver and the kidneys • Haemorrhages on the inner lining of proventriculus and intestines, follicles and abdominal fat	Bird or flock where samples collected tested positive for AI antibodies, whole virus or its genetic material through:- • Group specific antibody in serum samples can be detected by ELISA • Detection of viral antigen in tissue impression smears by using immunofluorescence assay • Reverse Transcriptase PCR (RT-PCR) • Virus culture –Standard cell culture method

* Case definitions for some zoonotic diseases among animal hosts obtained from KII with one DVO from the West Nile region

Integration of disease surveillance in the west nile region

Overall the overall the scores for integration within the human surveillance system 0.92, with maximum scores for planning, reporting and response during disease outbreak, followed by data processes (0.86), laboratory processes (0.93) and coordination (0.87). (Table 5 and Figure 1). The overall scores for the animal disease surveillance system were low, 0.56 and in the individual surveillance functions; reporting and management of specimens (0.67), coordination (0.67), planning (0.63), laboratory processes (0.60) and least the data processes (0.26), and (Table 5 and Figure 1). The system performed least with integration (0.26), data collection and analysis (0.20) (Table 5). Low scores were also realised in integration of activation of surveillance mechanisms, based on data analysis and reporting (0.30). The score for disease diagnosis and laboratory services was low (scoring 0.60), with low on-site disease diagnosis (score of 0.3), point-of-care laboratory services (0), functional laboratory services at district (0.67) and national level, regional laboratory services (0.0.67) and national laboratory services scoring 1 (Table 5).

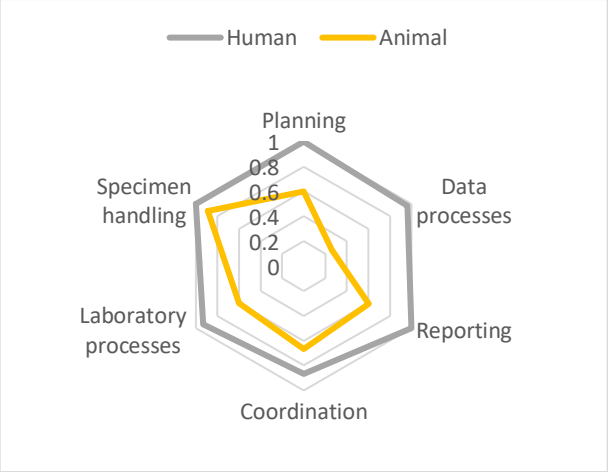

Figure 11. Overall scores for integration of processes for human and animal disease surveillance systems

Table 5. Scores for levels of integration across the different processes for human and animal disease surveillance

Level of integration	**Human**	**Animal**	**Difference**
Planning			
1. Existence of a national policies and strategies addressing integrated surveillance			
a. Presence of staff for surveillance	1	1	0.00
b. Existence of identified focal points for surveillance	1	0.67	0.33
2. Existence of guidelines addressing integrated surveillance	1	1	0.00
a. List of diseases prioritised for surveillance	1	0.33	0.67
b. Case definitions	1	0.33	0.67
c. Epidemiology thresholds	1	0.33	0.67
3. Existence of guidelines for training service providers in IDSR	1	0.67	0.33
a. Training curriculum	1	0.67	0.33
b. Trained service providers in IDSR	1	0.67	0.33
4. Existence of agreements among the institutions involved in surveillance	1	0.67	0.33
Score-Policies and planning	1	0.63	0.37
Data collection and analysis level			
1. Interoperability at data collection level			
a. Existence of integration of data collection tools at all levels of surveillance			
i.Community data collection	1	0	1.00
i.Routine care data collection	1	0	1.00
i.Case-based surveillance	1	0	1.00
v.Weekly data aggregation and reporting	1	0	1.00
v.Monthly data aggregation and reporting	1	1	0.00
Score	1	0.2	0.80
b. Existence of activation mechanisms of human surveillance based on signals from animal/human surveillance			
2. Interoperability mechanisms at data	1	1	0.33	0.33	0.00

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

analysis, aggregation and reporting					
a. Presence of DB exchange, merging or other mechanisms to facilitate joint analysis	1	1	0.33	0.33	0.00
b. Performance of joint or integrated data analysis for different diseases or among different surveillance sectors	1	1	0.33	0.33	0.00
c. Other interoperability mechanisms at data analysis	1	1	0.33	0.33	0.00
Scores	4.00	4.00	0.33	0.33	0.00
Score-Data collection and analysis level	19.00	7.00	0.70	0.26	0.44
Reporting and dissemination					
1. Existence of channels of communication and reporting of disease outbreaks					
a. Defined channels of communication					
Presence of hierarchy of communication	3	3	1	1	0.00
Presence of clear channels of communication	3	3	1	1	0.00
Scores	6	6	1	1	0.00
B. Mechanisms of communication					
Messaging (sms)	3	2	1	0.67	0.33
Hard copy paper reporting	3	3	1	1	0.00
Telephones	3	3	1	1	0.00
e-communication	3	1	1	0.33	0.67
Newsletters and bulletins	3	1	1	0.33	0.67
Meetings	3	1	1.00	0.33	0.67
Scores	18	11	1.00	0.61	0.39
Frequency of reporting					
Immediately	3	2	1	0.67	0.33
Weekly reporting	3	0	1	0	1.00
Monthly reporting	3	3	1	1	0.00
Quarterly	3	1	1	0.33	0.67
Scores	12	6	1.00	0.50	0.50
3. Existence of joint result dissemination mechanisms (e.g. bulletins, reports, papers, media reports, websites)					
Service delivery point	3	2	1	0.67	0.33
District	3	3	1	1.00	0.00
Regional	3	0	1	0.00	1.00
National	3	1	1	0.33	0.67

Scores	12	6	1	0.5	0.50
Score-Reporting and dissemination	48	29	1	0.60	0.40
Coordination and communication					
Existence of a coordination mechanisms among institutions involved in surveillance					
Community level	1	3	0.33	1.00	-0.67
Health facility level	3	1	1.00	0.33	0.67
District level	3	3	1.00	1.00	0.00
Regional level	3	1	1.00	0.33	0.67
Central	3	2	1.00	0.67	0.33
Scores	13	10	0.87	0.67	0.20
Disease diagnosis and laboratory services					
Diagnosis of diseases					
On-site diagnosis of diseases	3	1	1.00	0.33	0.67
Laboratory diagnosis					0.00
Point of care laboratory services	3	0	1.00	0.00	1.00
Functional district laboratory services	3	2	1.00	0.67	0.33
Functional regional laboratory services	2	3	0.67	1.00	-0.33
Functional national laboratory services	3	3	1.00	1.00	0.00
Scores	14	9	0.93	0.60	0.33
Response during disease outbreak					
Reporting channels during disease outbreaks					
Ops for handling specimens during suspected outbreak	3	2	1	0.67	0.33
Clear channels of handling specimens	3	3	1	1	0.00
Clear channels of reporting results	3	3	1	1	0.00
Outbreak response	9	8	1	0.89	0.11
Overall score	133	82	0.92	0.57	0.35

Variations in scores for integration of between the human and animal disease surveillance systems: The two surveillance systems had variable scores on almost all the core and support functions for surveillance, with the human overall score of 0.97 while the animal overall score was 0.56). The aps was highest with data processes (a gap of 0.70), planning and reporting (each with a gap of 0.4), laboratory processes (a gap of 0.33), coordination (a gap of 0.2), but was least pronounced at responses for specimen handling (with a gap of 0.11).

Variations in integration for specific surveillance activities of human and animal disease surveillance systems: Differences in integration across the human and animal surveillance systems were apparent and variable for surveillance activities at almost all levels of surveillance (figures 2 to 9). These are observing in planning surveillance especially with case definitions, lists of priority diseases, epidemiologic thresholds, followed by training guidelines and trained but are less so for staffing for surveillance (Figure 2).

The gaps in data processes are a result of data collection for routine care, case-based data collection, weekly data collection and aggregation, stakeholder engagement in data analysis (Figure 3). The data

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

collection process is further reflected in data collection tools where there are wide gaps in the tools for case-based and weekly data collection (Figure 4). Similarly, there are gaps at surveillance information dissemination mainly at regional, national and points of services delivery (Figure 5).

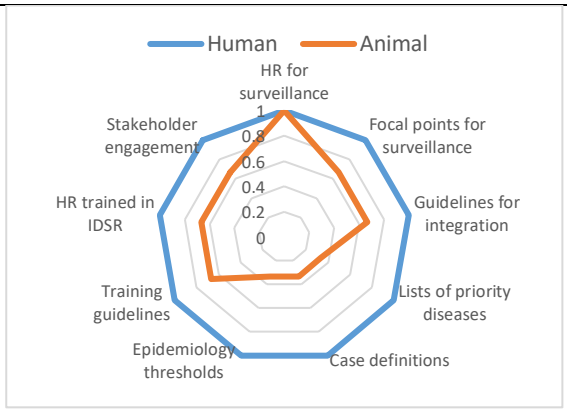

Figure 2. Gaps in planning

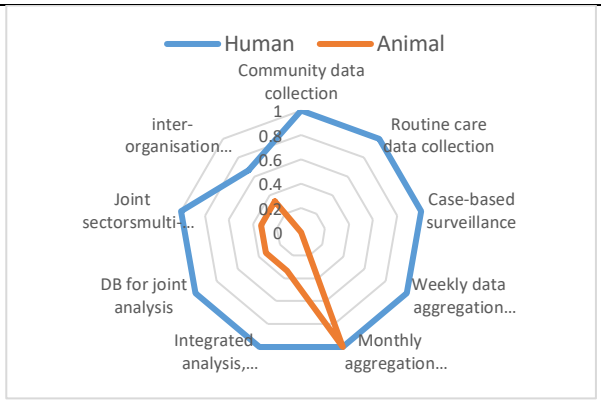

Figure 3. Gaps in data processes

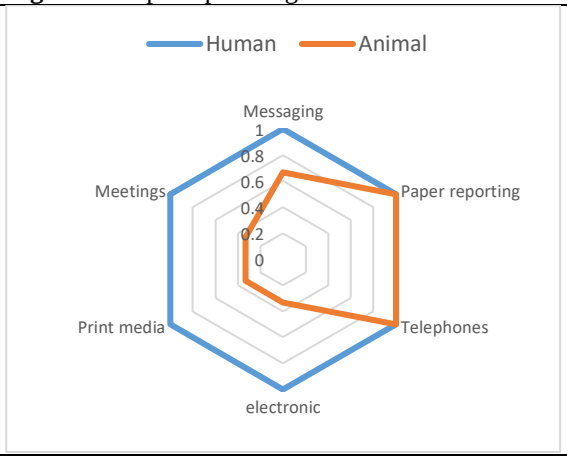

Figure 3. Gaps in communication

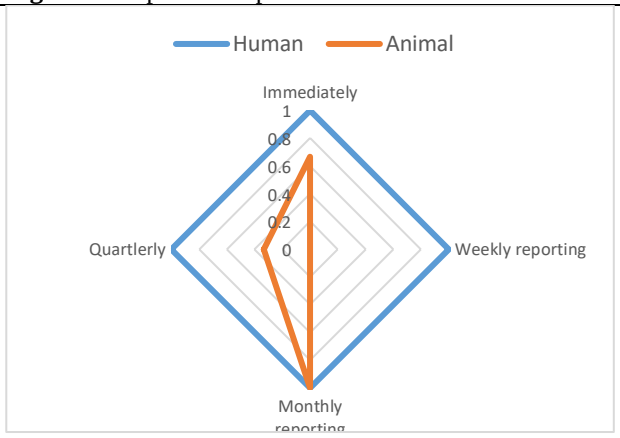

Figure 4. Gaps in periodicity of reporting

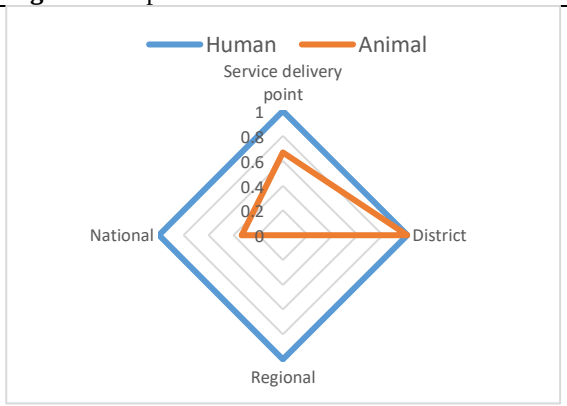

Figure 5. Gaps in surveillance data dissemination

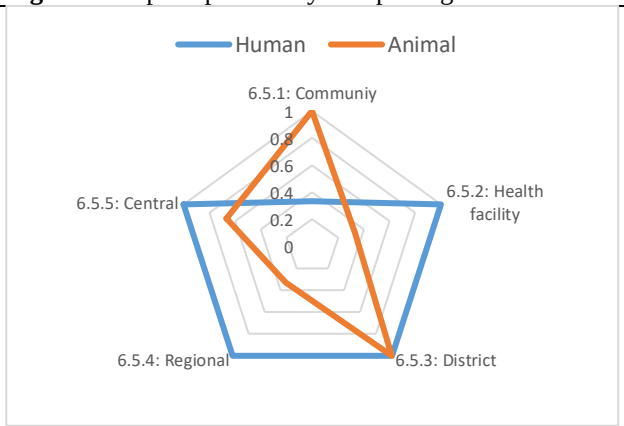

Figure 6. Gaps in coordination

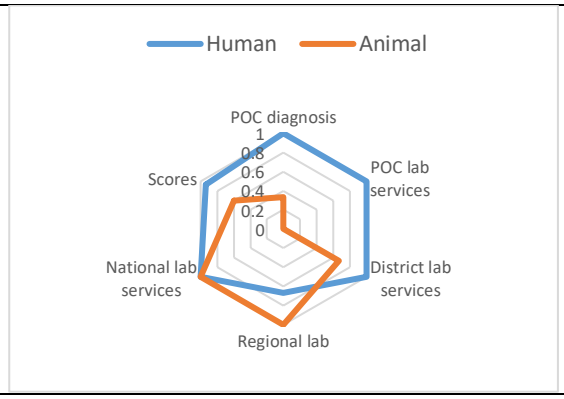

Figure 7. Gaps in diagnosis and lab investigations

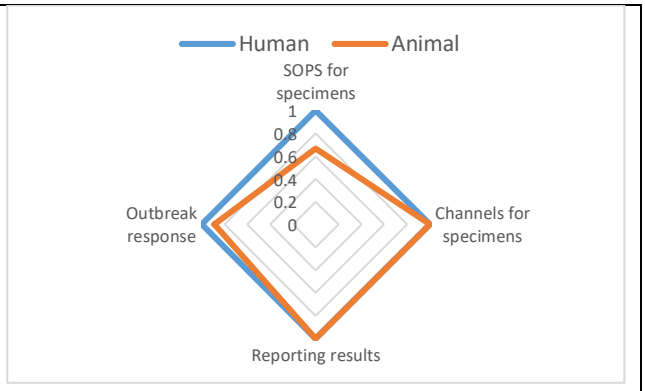

Figure 8. Gaps in Specimen handling during disease outbreak

The gaps in communication channels were evident in use of messaging, electronic and web-based technology use, print media communication and dissemination meetings (Figure 4). Coordination had gaps at regional and health facility level and even at the central level (Figure 5).

Flow of information and communication among stakeholders engaged in surveillance in the West Nile region

At the community level the animal surveillance system primarily relies on both the untrained (animal farmers, livestock traders, abattoir attendants and butchers), and trained personnel (community animal scouts, sub-county veterinary officers and private veterinary practitioners, veterinary drug shop owners, DVO and the DRRT) to identify and can provide information on diseased animals. Similarly, veterinary staff at animal breeding centres and the private animal health practitioners are other sources of information on animal diseases and so are the wild life rangers (Figure 10).

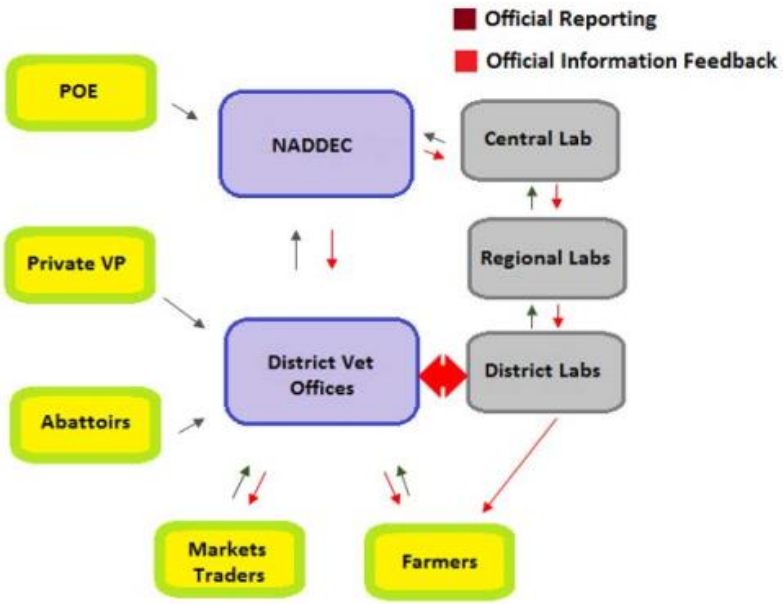

Figure 10. Communication channels and feedback within the animal surveillance system

The human disease surveillance relies on organised health facilities for collecting information on human diseases, (VHTs, health facility staff, the DSFP, the DHO, the district bio-statistician and DRRT that provide information on human disease outbreaks (Figure11).

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

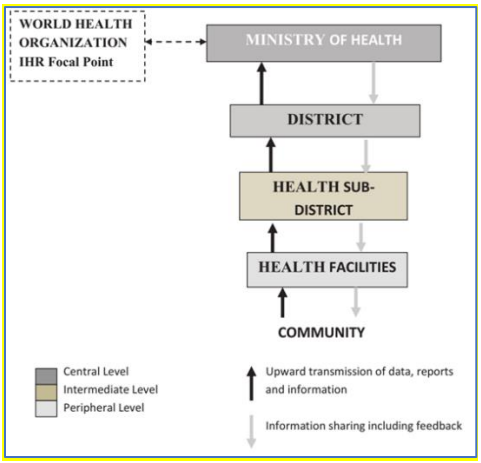

Figure 11. Information flow within the human IDSR system

Source: Uganda national IDSR guidelines

Information flow in the human and animal disease surveillance systems: Within the human surveillance system information flows from the community (VHTs and community leaders), through health facilities (In-charges, HFSFP, laboratory staff and HMIS focal persons), to the district (DHO, DSFP, District biostatistician and the DRRT). This information is finally communicated to MoH, PHEOC and national laboratories (CPHL and UVRI) (Figure 12). Feedback goes to the district and the health facilities and through e-IDSR, where the DSFP and HFSFP have access to the android and web-based e-IDSR platform. In the animal system information flows from the farmer to the Sub-County veterinary officer, the District Veterinary Officer (DVO), who then informs the Commissioner for Animal Health at MAAIF. The commissioner liaises with National Animal Disease Diagnostics and Epidemiology Centre (NADDEC).

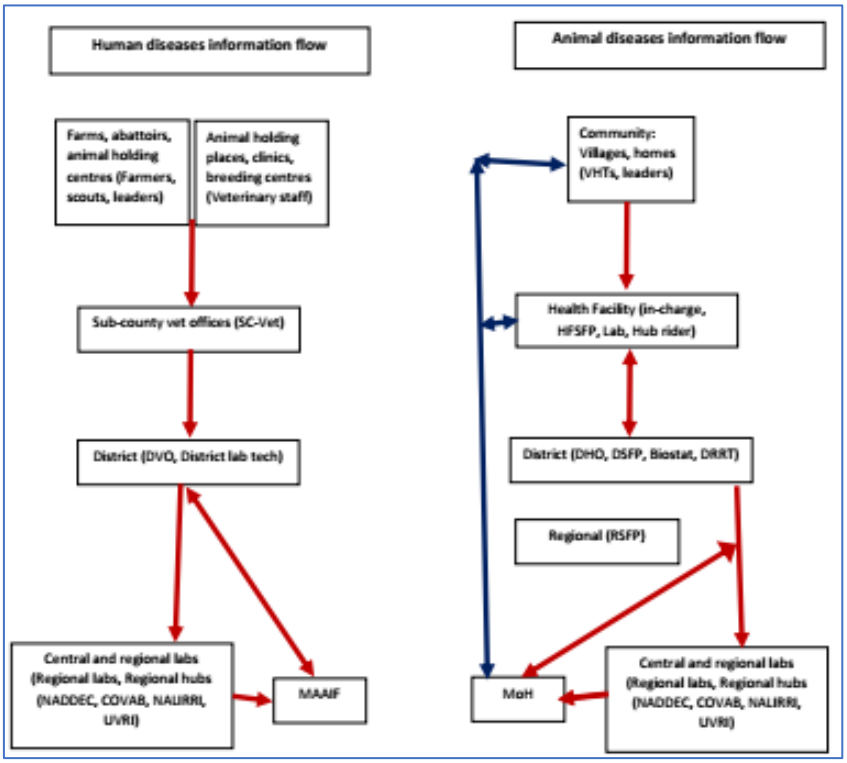

Figure 9. Information flow described during KII with human and animal disease surveillance experts in the West Nile region

Conclusion

This study showed that development and integration of the core and support functions for surveillance within the human disease surveillance systems is more advanced than the animal surveillance system in the West Nile region. The limited development of the animal system does not allow integration of the two systems for concurrent zoonotic disease surveillance. This calls for fast tracking the development of guidelines for animal and zoonotic disease surveillance to be able to provide guidance on surveillance for zoonotic and non-zoonotic animal disease within the animal hosts. The human IDSR guidelines provide an example that can be used to develop and integrate the animal surveillance system. IDSR guidelines also provide guidance on surveillance for both zoonotic and non-zoonotic disease among human hosts.

The collection of animal disease surveillance data and the reporting of surveillance information are too infrequent to enable timely detection of zoonotic diseases in animal hosts. This is further complicated by the existence of many sources of animal disease data including that from the wild life. Mechanisms for collecting animal disease data from all sources of animal care and providing channels of communication that will capture animal disease data from all these sources are needed. These mechanisms will include development of data collection and reporting tools, and creation of a common platform for gathering, aggregating and reporting animal disease data in a timely manner.

The lack of a platform for analysis and sharing animal health data and the lack of communication between animal health care sites and health facilities for human health care, proves to be a challenge in having animal care sites and human health facilities as sentinel sites for zoonotic disease detection. Animal disease surveillance stakeholders need to provide a platform where animal disease data is shared with all surveillance stakeholders.

Effective, coordinated and collaborative detection and reporting of zoonotic disease occurrence in either animal or human populations calls for coordination and collaboration between the points of care for the humans and the animals. Human and animal disease surveillance stakeholders need to develop strategies and mechanisms for coordinating human and animal disease detection and reporting.

Bringing animal disease surveillance to the same level as the human surveillance system will provide a platform to progress to integration of the two systems. The One Health platform, MAAIF and other stakeholders will need to prioritise the development and integration of the animal surveillance system to the level of the human surveillance system. For the final integration of the human and animal surveillance systems to simultaneously detect and respond to zoonotic disease detection in both humans and animals will require harmonisation of the core and support functions of the two surveillance systems. MoH, MAAIF and OHA using the existing structures within the OHA platform need to develop joint guidelines for combined surveillance of human and animal diseases.

The existence of eIDSR-CBS in the human surveillance system has revolutionised case-based human disease surveillance. For effective integration of the human and animal disease surveillance systems with the aim of using human disease surveillance and animal disease surveillance sites as sentinel sites for real-time human and animal disease detection stakeholders need to invest resources in including the animal surveillance system in e-IDSR. The example set by the West Nile region in using eIDSR-CBS for animal disease reporting is an example of the feasibility of concurrent reporting of human and animal diseases using one platform. This has also been exhibited with the specimen transportation within the specimen transportation hub system. Human and animal specimens are transported to the regional and central laboratories using the same riders and buses.

The human surveillance system has access to laboratory services at the POC, while the animal surveillance system relies on poorly equipped district laboratories, distant regional or central laboratories for confirmation of animal disease. Effective real-time diagnosis of animal diseases will require provision of POC diagnostic and laboratory services for animal disease to reduce the delay in diagnosing animal diseases.

Integration of laboratories within the health facilities for conducting animal disease tests can support early diagnosis of animal disease and will utilisation of rapid diagnostic test kits, where available, to enable POC testing and diagnosis of animal diseases. Effective integration of the two systems will require reducing the time for confirmation of animal diseases as it is the case for some human diseases.

DOI: 10.21522/TIJPH.2013.07.04.Art005
ISSN: 2520-3134

The West Nile region has set the pace for integrating the human and animal disease surveillance systems, through development of local lists of diseases prioritised for human and animal disease surveillance, the joint training of human and animal health staff in IDSR and e-IDSR and the cross communication and utilisation of e-IDSR for human and animal disease reporting. These efforts need to be strengthened through development of national guidelines and providing resources to support development of these guidelines. The presence of multiple stakeholders engaged in surveillance in the region provides a good start in mobilising resources to support these efforts at the regional and national levels.

This study also evaluated the integration of the core and support function for surveillance within the human and animal surveillance systems. This study has not evaluated the effectiveness of implementation of the two surveillance systems. Integration of the two surveillance systems may require studies to assess the effectiveness and implementation of the two systems before and after improvement of the animal system as well as the effectiveness of the integrated system.

Recommendations

This study explored the levels of integration of the human and animal disease surveillance systems and made suggestions for improvement within the animal surveillance system. Future research will be needed to assess the development of the core and support functions within the animal surveillance system and monitor progress of development and integration on the system.

Research will also be required to establish the cross integration of the animal and human surveillance systems at two stages. At baseline to inform the processes of development and integration of the two systems and later to monitor the changes in integration as the integration processes are implemented. Disease surveillance implementation and integration may be different in the different regions of the country. Future research is needed to determine the uniformity and differences in the integration of surveillance activities within the different regions and districts of Uganda.

The tool used in the assessment of integration in this study was adopted and modified from the SET tool and the MEASURE DQA evaluation tool. The use of this tool may need to be further validated by other studies. However, similar to the SET tool, it has provided a basis for assessing the level of integration within the surveillance systems. Surveillance stakeholders will need to adopt this tool and to regularly use this tool to assess the progress in the integration of the animal system and the integrating the human and animal disease surveillance system.

Acknowledgements

This was partly supported by funds from the Centers for Disease Control and Prevention through Infectious Disease Institute as an Implementing Partner sub-contracting HISP Uganda to Implement eIDSR-CBS in West Nile Region Uganda. The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Ministry of Health Uganda.

I wish to thank my colleagues at HISP Uganda and MoH Uganda for taking part in the implementation of the project. Specifically wish to acknowledge the following: John Lule, Bridget Magoba, Brian Ntare, Monica Amuha, Shivan Asimire, Carol Kyozira, Patrick Omiel, Charles Olupot, David Onyango and Fulgentius Baryarama. Additionally, I thank the Ministry of Health Uganda, PHEOC and districts in the West Nile Region for the great contributions to the success of the project.

Reference

[1]. Fred Goldstein, Barbara Vidal, and Marie D. Kitzis: Integrated Human-Animal Disease Surveillance; Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 11, No. 9, September 2005.

[2]. Fred Goldstein, Barbara Vidal, and Marie D. Kitzis: Integrated Human-Animal Disease Surveillance; Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 11, No. 9, September 2005.

[3]. Joint External Evaluation of IHR Core Capacities of the republic of Uganda. Mission report: June 26-30, 2017.

[4]. https://www.ghsagenda.org/

[5]. Animal disease surveillance in resource poor settings: the case of Uganda. Available from: https://www.researchgate.net/publication/272021364_Animal_disease_surveillance_in_resource_poor_settings_the_case_of_Uganda [accessed Oct 09 2018].
[6]. WHO technical review meeting of the joint external evaluation (JEE) tool and process: 19-21 April 2017, Geneva, Switzerland: Meeting report. http://www.who.int/ihr/publications/WHO-WHE-CPI-2017.53/en/
[7]. Tammy R. Beckham and Lindsey K. The Use of Information Technology in Animal Health Management, Disease Reporting, Surveillance, and Emergency Response: 83rd General Session world organisation for animal health. Paris 24-29the May 2015.
[8]. Integrated Human-Animal Disease Surveillance: letter to the Editor: Emerging Infectious Diseases • www.cdc.gov/eid Vol. 11, No. 9, September 2005
[9]. Report of the baseline needs assessment of establishment of e-IDSR in West Nile region-Uganda: March 2018.
[10]. Peter Rabinowitz and Lisa Conti. Links Among Human Health, Animal Health, and Ecosystem Health;
[11]. Annu. Rev. Public Health 2013.34:189-204. Downloaded from www.annualreviews.org
[12]. Mary J. R. Gilchrist, Ph.D.; Surveillance and Management of Zoonotic Disease Outbreaks: Public health laboratory surveillance. https://www.nap.edu/read/10338/chapter/6
[13]. http://www.fao.org/ag/againfo/programmes/en/empres/tools_SET.html