Check for updates

RESEARCH ARTICLE

REVISED Utilization and associated determinants of multi-sectoral approach in zoonotic disease surveillance among animal and human healthcare workers in Nakuru County, Kenya

[version 2; peer review: 2 approved, 1 approved with reservations]

Levi Cheptoyek, Gideon Kikuvi, John Gachohi

P.O. Box 62000-00200, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya

v2 **First published:** 28 May 2024, **4**:103
https://doi.org/10.12688/openreseurope.17583.1
Latest published: 02 Sep 2024, **4**:103
https://doi.org/10.12688/openreseurope.17583.2

Abstract

Background

Zoonoses are naturally transmissible between humans and animals. Globally, they account for more than 60% of human infections, 75% of emerging infections, 2.7 million human deaths, and 10% of the total DALYs lost yearly in Africa. In the last three decades, Kenya has had sporadic outbreaks of zoonoses. To increase the speed of reporting and efficiencies in detection and control, a multi-sectoral collaboration in zoonotic disease surveillance (MZDS) between human and animal health workers is essential. In an effort, Zoonotic disease unit (ZDU) in Kenya has been established at national and county levels.

Methods

A cross sectional study was carried out to determine the level of utilization of multisectoral collaboration and its associated determinants in zoonotic disease surveillance among animal and human healthcare workers in Nakuru County. Quantitative data was gathered from 102 participants and qualitative data from 5 key informants. To test for significant differences, Chi-square and independent t-test were used.

Results

MZDS utilization level was 16% and the factors associated with MZDS

Open Peer Review

Approval Status ✓ ? ✓

	1	2	3
version 2 (revision) 02 Sep 2024	✓ view		✓ view
version 1 28 May 2024	✗ view	? view	

1. **Jolly Musoke**, University of the Free State, Bloemfontein, South Africa
2. **Budi Utomo**, Universitas Airlangga, Surabaya, Indonesia
3. **Nick Wheelhouse**, Edinburgh Napier University, Edinburgh, UK

Any reports and responses or comments on the article can be found at the end of the article.

utilization include; knowing what MZDS entails, education level, sector affiliation, trainings, supportive infrastructure, budget allocation and data storage. Lack of financing and poor coordination are hindrances to MZDS.

Conclusion

There is need to finance MZDS activities, strengthen coordination mechanisms, carry out more sensitization and trainings among animal and human healthcare workers.

Keywords
Multisectoral collaboration in zoonotic disease surveillance

This article is included in the Clinical Medicine gateway.

This article is included in the European & Developing Countries Clinical Trials Partnership (EDCTP) gateway.

Corresponding author: Levi Cheptoyek (cjeplevii@gmail.com)

Author roles: Cheptoyek L: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Kikuvi G**: Funding Acquisition, Methodology, Project Administration, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing; **Gachohi J**: Supervision, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: European & Developing Countries Clinical Trials Partnership (Second EDCTP programme) under the project Strengthening Capacity for Epidemics Preparedness and Response in sub-Saharan Africa (SCEPRESSA) (CSA2020E3129).
The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Copyright: © 2024 Cheptoyek L *et al*. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Cheptoyek L, Kikuvi G and Gachohi J. **Utilization and associated determinants of multi-sectoral approach in zoonotic disease surveillance among animal and human healthcare workers in Nakuru County, Kenya [version 2; peer review: 2 approved, 1 approved with reservations]** Open Research Europe 2024, **4**:103 https://doi.org/10.12688/openreseurope.17583.2

First published: 28 May 2024, **4**:103 https://doi.org/10.12688/openreseurope.17583.1

REVISED **Amendments from Version 1**

Included in the new version is more detail on methodology. It details the study population at subcounty and county levels. To the statistical analysis tools, attached are variables. The new version also outlines more clearly how the level of MZDS utilization was achieved and how inferential statistics were generated.

Any further responses from the reviewers can be found at the end of the article

Introduction

Zoonoses are diseases that are naturally transmissible between humans and animals[1]. Globally, they account for; more than 60% of human infections, about 75% of emerging infections, 2.7 million human deaths yearly, 10% of the total DALYs lost and wildlife is at the spotlight for outbreaks[2–6]. Human health and animal health are inextricably linked and thus multi-sectoral efforts in disease surveillance is required to detect and respond timely to zoonoses so as to reduce their burden[7].

In 2014, WHO and the United States jointly launched the Global Health Security Agenda (GHSA) which aims at building capacity for early detection and effective response to zoonoses through multisectoral collaboration[8]. Some collaborative efforts have been established between universities and research institutions for example Afrique One Consortium in Chad, Ivory Coast, Tanzania, Uganda, and Senegal that fosters OH[9].

In 2012, Kenya established a Zoonotic Disease Unit (ZDU) to provide a multi-sectoral collaborative platform for better coordination of efforts geared towards bridging the gap between human and animal health in priority zoonoses prevention and control[10]. The ZDU unit comprises of a medical epidemiologist deployed from MOH, a veterinary epidemiologist deployed from the Ministry of Agriculture, Livestock and Fisheries (MALF), data analyst and an administrative assistant. In 2013, following devolution, ZDU established county and sub county platforms and surveillance officers in both animal and human health trained[4] and in 2022, OH Strategic Plan for Prevention and Control of Zoonotic diseases in Kenya was launched[11,12].

Multi-sectoral zoonotic disease prioritization with equal engagement from all sectors active in zoonoses surveillance is one of the most cost-effective ways to prevent, detect, and respond to public health threats[13]. In Sub-Saharan Africa, only 14% of the countries have multi-sectoral action plan for zoonoses and 32% have established inter-sectoral zoonotic surveillance systems[14]. The barriers towards effective MZDS are; lack of supportive policies, insufficient funding, conflicting departmental priorities and limited institutional capacities[3,15,16]. Therefore, early disease detection and control at the sources is delayed and risk widespread outbreaks and mortalities in both animals and humans resulting in disruptions in trade, economic losses and strain on public health resources[17].

In the last three decades, Kenya has had sporadic outbreaks of priority zoonoses[4]. In 2007, over 300 people died of RVF with livestock loses of over US$9.3 million[18]. Nakuru county is a hotspot for Anthrax, Rabies and Brucellosis because of its proximity to wild life. Between 2014 and 2017, Anthrax infected 71 people with 2 deaths and over 700 animals died[19]. To detect and control zoonoses at the source, a MZDS is essential[13]. There is however very scanty information on utilization of MSDS in Nakuru County. The aim of this study was to determine the level of utilization of MZDS and its associated factors among animal and human healthcare workers in Nakuru county, Kenya.

Materials and methods

Type and period of study

Analytical cross-sectional study design was used and the study covered the period between August 20, 2023 and October 15, 2023.

Setting of the study

The study was conducted in Nakuru County, a third most popular county and located in Rift valley region of Kenya. It is bordered by; Baringo, Laikipia, Nyandarua, Kajiado, Narok, Bomet and Kericho counties. It has an area of 7,496.5km², a population of 1,603,325[20] and with physical features like; L. Naivasha a home of millions of flamingos, sanctuary to protect Rothschild giraffe and black rhinos, and Nakuru national park. The site is a hotspot for Anthrax, Brucellosis and Rabies[21] and this formed the basis for purposive selection of the study area.

Study population

a. The human healthcare workers who included; county director of public health, county director of medical services, county data analyst, Emergency Operations Center coordinator and public health officers.

b. Animal health workers who included county director of veterinary services and animal health workers at subcounty level.

The public health officers and animal health workers (excluding the county director of veterinary services) served as frontline surveillance officers at subcounty levels. Public health officers were attached to sentinel sites for example public and health facilities including subcounty hospitals, abattoirs and butchers where they captured surveillance data. They also monitored air and water quality as well as the health of the physical environment like managing waste disposal. The animal health workers on the other hand were focal persons for disease surveillance from the animal side. They visited farms and offered extension and treatment services, inspect animals before and after slaughter, as well as receiving any animal related issues from the community.

At county levels were the county directors who included; county director for veterinary services, county director for public health, county director of medical services, county Data analyst and county emergency and operations center officer. This team provided strategic direction for zoonoses preparedness, detection and response at the county government.

Inclusion Criteria. Human and Animal Healthcare workers who consented.

Exclusion Criteria. Animal and human healthcare workers who were not on duty over the period of the study and those who did not consent.

Sampling
A census was conducted.

Data collection and tools
A semi-structured pretested interviewer-administered questionnaire was used to collect quantitative data (demographic, awareness, attitudes and practices) from 102 frontline animal health workers and public health workers who served at sub-county levels. A key informant interview guide was used to collect data on institutional factors (funding, space, priorities, staffing, MZDS plans, political will) from county director of veterinary services, county director of public health, county director of medical services, county data analyst and county emergency and operations center coordinator. Audio tape recording was used to maintain and capture their exact words. The sessions lasted 45–60 minutes. Saturation marked the end of interview sessions. Three research assistants were recruited to administer the questionnaires and conduct the interviews with the participants face to face.

Data processing and analysis
Quantitative data was entered to an excel file, cleaned and exported to R 4.3.1 Software for descriptive and inferential statistical analysis. The descriptive statistics included frequencies and percentages and were presented on tables. Hearing about MZDS and the regularity of carrying out joint data collection, analysis, interpretation and sharing with other sectors formed the basis for inferential statistics. Those who regularly (weekly, monthly or quarterly) carried out joint data collection, analysis, interpretation and sharing with other sectors were termed as, Utilizing MZDS. Utilization level was assessed through the other variables (demographic, awareness, attitudes and practices). Chi-square test was used to determine the association between demographic (age, gender, education, duration in service, sector) variables and utilization of MZDS. Independent t-test was used to measure the association between variables of awareness, attitudes and practices towards MZDS and MZDS utilization. Statistical significance was set at a p-value < 0.05 and 95% confidence interval. Qualitative data was analyzed manually using MS Excel spreadsheets. The transcripts were read again and again and listening to voice recordings repeatedly[22]. This helped to understand the concept and the words, phrases,sentences even sections which were labeled and coded[23]. The concept to be coded depended on whether it was repeated several times, as the code would be so many, similar codes were grouped into categories which were used to generate themes[24]. The themes and categories were the main results of the study.

Ethical considerations
Ethical approval and a research permit were attained from: the ethics review board for Jomo Kenyatta University of Agriculture and Technology (JKUAT), Ref: JKU/ISERC/023/0842, JKUAT Board of postgraduate studies, Ref: JKU/2/11/HSH315R-0088/2022, National Council for Science, Technology and Innovation, Ref: NACOSTI/P/23/25534, and Nakuru county. Written informed consent was acquired from the participants. Completed questionnaires were kept under lock and key and accessed by only authorized people. Soft copies and all analyzed data were passworded.

Results
A total of 102 animal and public health surveillance officers who served as frontline surveillance persons, and five (05) key informants were consented and enrolled to the study. The respondents interviewed were 100% of the targeted population.

Demographic characteristics of respondents
From the 102 frontline surveillance workers, majority (65%,N = 66) were males. Most were aged between 51–60 years (36.3%, N = 37). The mean duration in service was 17.41 ±9.86 years. More than forty percent had diploma as their highest education (46.1%, N = 47). And 78.4% (N = 80) were animal health workers while 21.6% (N =22) were public health officers. Other details are on Table 1 below.

Level of utilization of MZDS
Of the 102 participants, 73.5% (N=75) had heard about MZDS, among whom the level of utilization was 16% (N=12/75) and

Table 1. Demographic characteristics for the participants.

Variable	Frequency (N = 102)	Percent (%)
Gender		
Female	36	35.0
Male	66	65.0
Age		
20–30	18	17.6
31–40	29	28.4
41–50	18	17.6
51–60	37	36.3
Time in service		
Mean - 17.41, Minimum – 3, SD = 9.86, Maximum – 34		
Education level		
Certificate	30	29.4
Diploma	47	46.1
Undergraduate	21	20.6
Postgraduate	4	3.9
Sector		
Animal health	80	78.4
Human health	22	21.6

these were participants who frequently carried out joint data collection, analysis, interpretation and sharing with other sectors. The rest 84% (N=63/75) had either never utilized or only utilized it during outbreaks. A higher proportion of females (17.4%, 4/23) were involved in MZDS as compared to males (15.4%, 8/52). Knowing what MZDS entailed according to those who had heard about it had a higher utilization level (28.6%, 8/28) compared to those who did not know (8.5%, 4/47). Individuals with certificate level of education had no utilization (0%, 0/22) just like those with postgraduate (0%, 0/4), those with undergraduate had the highest utilization level of (29.4%, 5/17) followed by those with diploma (21.9%, 7/32). Participants who did not know of any organizational structure required for MZDS had no utilization (0%, 0/22), those who noted that a Subcounty one health committee, community health volunteers and the community had the highest utilization level (30%, 3/10) followed by those who noted that no particular structure is required had utilization level of (20.9, 9/43). Participants who noted that requiring a zoonotic disease outbreak for having a functional MZDS had the highest utilization level (66.7%, 2/3) followed by those who noted that requiring Commitment and participation by all sectors (37.5%, 6/16), then those who noted trained staff (20%, 1/5) and lastly those who noted budget, trained staff and office space (11.5%, 3/26). Respondents with frequent budgetary allocation had the highest utilization level (66.7%, 2/3) followed by those who have never had any budgetary allocation (44.4%, 4/9) and those who have never had any budgetary allocation with the lowest utilization level (9.5%, 6/57). Other utilization level for other variables is shown on the Table 2, below.

Demographic factors associated with utilization of MZDS

Education level (χ =3.889, df = 3, p = 0.026) (χ =3.889, df = 3, p = 0.026) and sector (χ =1.657, df = 3, p = 0.023) were significantly associated with utilization of MZDS. Individuals with diploma and undergraduate education were more likely involved in MZDS as opposed to those with certificate and postgraduate education. Individuals from public health were also more likely involved as opposed to individuals from animal health. All other variables considered in this study are shown on Table 3, below.

Association between awareness, attitude and practices towards MZDS and utilization of MZDS

Utilization of MZDS was associated with being awareness of what it entails (t= 2.269, df = 15.05, p = 0.038). Participants who utilized MZDS had a higher mean score (mean= 0.6825) than those who did not utilize (mean= 0.3333). Agreeing that that sensitization on MZDS by devolved County Zoonotic Disease Unit (ZDU) was adequate (t = 2.466, df = 73, p = 0.016) was significantly associated with utilization of MZDS. Those who had never engaged in joint work had a higher mean score (2.333), which leans towards disagreeing than those who engaged on joint work (1.923). Individuals who had been trained on MZDS had a higher utilization level (t=2.227, df = 3, p = 0.029). Those who believed that infrastructure for MZDS has improved following devolution (t= 4.209, df= 73, p = 0.001) also had a higher utilization level. Having a budget and storing data on MZDS were associated with higher utilization levels. Other factors were not significant as shown on Table 4, below.

Institutional factors associated with utilization of MZDS

Results from the qualitative data indicated that there was no; proper organizational structure, budgetary allocation and infrastructure for MZDS. One key informant argued that "… *multisectoral collaboration has no separate resources, departments use their own routine resources e.g., staff, vehicles, computers, emails and budget"*. On organizational structure, there were no goals, workplans or policy frameworks on MZDS. one interviewee reported that *"… there is no well-defined organization structure, however, the directors of the two departments take the lead"*. On political support, MZDS was still more technical and political support was very low. On suggestions on how to improve MZDS, there is need to provide a budgetary allocation and capacity building. *One argued that "… there is need for proper budgetary allocation and support for technical group"*.

Discussion

The Level of MZDS among animal and human health care workers in Nakuru County

The level of MZDS was 16%, which is low in a zoonotic prone area. The rate reported in other sub-Saharan countries with multisectoral collaborations is 32%[14] which is higher compared to findings of our study. However, Munyua *et al.,* 2019, noted that MZDS in Kenya are generally low due to limited funding and competing priorities. This study further identified other factors like awareness, education level, sensitization and trainings, sector where participants belong and data storage as other factors were associated with the low utilization. Given that MZDS is key for early zoonotic disease detection and response and that the overall utilization level is less than twenty percent, the initiative should be addressed much more seriously by all sectors to enhance timely sharing of zoonotic information[25].

Demographic characteristics associated with MZDS

Nakuru county animal and health staff benefit from the Field Epidemiology Training Program (FETP) which is a postgraduate training and it's likely that it was a motivation for higher utilization amongst those with undergrade training. Human health workers were more likely to involved in collaboration which deviates from the previously reported evidence by 26 who noted that animal health workers were twice more likely to collaborate compared to human health workers. The deviation may be because trainings on collaboration were born from COVID-19 outbreak and the lead team was human health. Human health has partners like Africa Medical Research Foundation (AMREF), CDC who fund their workplans. Since animal health workers are directly in contact with animals, there is great need to bridge the gaps of their MZDS under-utilization.

Table 2. Level of utilization of MZDS.

Variable		Level of Utilization of MZDS	
		Utilized (16%, N = 12)	Didn't utilize (84%, N = 63)
Demographic Characteristics			
Age	20–30	1 (12.5%)	7 (87.5%)
	31–40	4 (18.2%)	18 (81.8%)
	41–50	4 (26.7%)	11 (73.3%)
	51–60	3 (10.0%)	27 (90.0%)
Sector	Animal health	5 (9.4%)	48 (90.6%)
	Public health	7 (31.8%)	15 (68.2%)
Awareness on MZDS			
Respondents who had heard about of (MZDS)		12 (16%)	63 (84%)
Respondents who listed the five priority-zoonotic diseases	Correct	2 (25%)	6 (75%)
	Incorrect	10 (14.9%)	57 (85.1%)
Ranking priority zoonoses in-terms of severity, epidemic & socio-economic burden	Correct	1 (33.3%)	2 (66.7%)
	Incorrect	1 (15.3%)	61 (84.7%
Attitudes			
MZDS is important for early disease detection & response	Agree	12 (16%)	63 (84%)
I am an important actor for MZDS	Agree	12 (16.2%)	62 (83.8%)
	Neutral	0 (0)	1 (100%)
Sensitization on MZDS by devolved	Agree	6 (50%)	6 (50%)
County ZDU is adequate	Neutral	4 (8.5%)	43 (91.5%)
	Don't Agree	2 (12.5%)	14 (87.5%)
With initiation of MZDS, infrastructures for zoonoses surveillance has improved	Agree	10 (41.7%)	14 (58.3%)
	Neutral	2 (6.1%)	31 (93.9%)
	Don't Agree	0 (0)	18 (100%)
Results and information on MZDS is adequately shared to all sectors	Agree	6 (37.5)	10(62.5%)
	Neutral	3 (7%)	40 (93%)
	Don't Agree	3 (18.8%)	13 (81.3%)
Practice			
Proportion of Respondents who received information on MZDS	Never	1 (12.5%)	7 (87.5%)
	Rarely	5 (11.4%)	39 (88.6%)
	Frequently	6 (26.1%)	17 (73.9%)
Participation in any training on MZDS	Never	3 (15.8%)	16 (84.2%)
	Rarely	4 (8.2%)	45 (91.8%)
	Frequently	5 (71.4%)	2 (28.6%)
Regularity of storing data and information on MZDS in your sub-county (N = 51)	Never	0 (0)	14 (100%)
	Rarely	4 (8.9%)	41 (91.1%)
	Frequently	8 (50%)	8 (50%)
Proportion of respondents who notify a health counterpart in the sub-county	Frequently	12 (17.1%)	58 (82.9%)
	Rarely	0 (0)	5 (100%)
Community involvement in zoonoses surveillance activities.	Never	0 (0)	4 (100%)
	Rarely	1 (11.1%)	8 (88.9%)
	Frequently	11 (17.7%)	51 (82.3%)

Table 3. Association between demographic variables and utilization of MZDS.

Variable	Utilized MZDS (16%)	Didn't utilize MZDS (84%)	Chi-square value	Df	p-value
Gender					
Female (n=23)	4(17.4%)	19 (82.6%)			
Male (n=52)	8 (15.4%)	44 (84.6%)	0.997	1	0.318
Age					
20-30	1 (12.5%)	7 (87.5%)			
31-40	4 (18.2%)	18 (81.8%)			
41-50	4 (26.7%)	11 (73.3%)			
51-60	3 (10.0%)	27 (90.0%)	2.200	3	0.520
Education level					
Certificate	0 (0)	22 (100%)			
Diploma	7 (21.9%)	25 (78.1%)			
Undergraduate	5 (29.4%)	12 (70.6%)			
Postgraduate	0 (0)	4 (100%)	3.986	3	0.026
Sector					
Animal health	5 (9.4%)	48 (90.6%)			
Public health	7 (31.8%)	15 (68.2%)	1.657	1	0.026
Time spent in service	16.08	19.81	1.206	73	0.232

Awareness, attitude and practice factors associated with MZDS

Knowing what MZDS entails was associated with higher utilization however, less than a half of those who knew what MZDS entails utilized it. This might be explained by the fact that was no budgetary allocation for collaboration activities at the county and so no accountability. Sensitization on MZDS by devolved County ZDU was found to be adequate and associated with higher utilization of MZDS. Those who had ever trained in MZDS were more likely to utilize MZDS and Infrastructure for MZDS had improved following devolution. 27 noted that awareness of health and veterinary departments was very key for MZDS. 15 also reported that knowledge attained from trainings had significant effect on utilization of MZDS. Nakuru county has partners like AMREF and ZDU which occasionally offer trainings and sensitization to the animal and healthcare workers in Nakuru county with focus on bi-sectoral collaboration at sub-county level using Community Event-Based Surveillance System (CEBs)[28]. With only 10% frequently receiving trainings and the rest either never or only been trained once in the last three years, it is possible to increase individual participations in MZDS by stepping up trainings. Data storage by participants was associated with MZDS as well as budget allocation. This could be explained by the fact that trainings and sensitizations provide an avenue for participants to store data and having a budget facilitates accomplishing routine MZDS activities.

Institutional factors for MZDS

There is no financing for MZDS and as reported by 16, Kenya's challenges for MZDS are insufficient funding and competing priorities. Sectors in cooperate MZDS activities along their sector workplans and since there is no particular budget and accountability, less can be devoted to MZDS. There were no MZDS goals, workplans and organizational structure and this is in line with the findings of 26 who reported lack of plans and networks by institutions are limiting inter-sectoral collaborations. There also exists more of informal communications between sectors for example, visits, phone calls are predominantly used for information sharing. These findings agree with 25 who noted that lack of effective coordination and commitment to OH preparedness and response efforts, lack of an agreed mechanism for sharing information across sectors and partners were key hindrances to MZDS.

Limitations

Being a cross-sectional study, the association from the subset analysis cannot be assumed to mean cause-effect relationship

Table 4. Association between awareness, attitudes and practices towards MZDS and utilization of MZDS.

Variable	Utilized MZDS (16%)	Didn't utilize MZDS (84%)	t-test	Df	p-value
Awareness					
Organizational structure of MSDS at subcounty?					
Correct	3 (4.0%)	7 (9.3%)			
Incorrect	9 (12.0%)	56 (74.7%)	-1.017	3.132	0.327
Respondents who correctly listed the five priority zoonotic diseases in Kenya					
Correct	2 (25%)	6 (75%)			
Incorrect	10 (14.9%)	57 (85.1%)	-0.728	3	0.469
Ranking priority zoonoses in-terms of severity, epidemic potential & socio-economic burden					
Correct	1 (33.3%)	2 (66.7%)			
Incorrect	11 (15.3%)	61 (84.7%)	-0.829	3	0.410
Requirements for MZDS to be functional					
Correct	12 (16%)	60 (80%)			
Incorrect	0 (0%)	3 (4.0%)	-1.762	2	0.083
Attitude					
I am an important actor in Multisectoral approach					
Agree	12 (16.2%)	62 (83.8%)			
Neutral	0 (0)	1 (100%)	0.434	73	0.666
Multisectoral approach has easily been implemented in my area of work.					
Agree	7 (29.2%)	17 (70.8%)			
Neutral	3 (7.3%)	38 (92.7%)			
Don't Agree	2 (20%)	8 (80%)	1.342	73	0.184
Information on MZDS is adequately shared to all sectors					
Agree	6 (37.5%)	10 (62.5%)			
Neutral	3 (7%)	40 (93%)			
Don't Agree	3 (18.8%)	13 (81.3%)	1.448	73	0.152
Practices					
Proportion of Respondents who received information on MZDS					
Never	1 (12.5%)	7 (87.5%)			
Rarely	5 (11.4%)	39 (88.6%)			
Frequently	6 (26.1%)	17 (73.9%)	-1.339	3	0.185
Regularity of storing data and information on MZDS					
Never	0 (0)	14 (100%)			
Rarely	4 (8.9%)	41 (91.1%)			
Frequently	8 (50%)	8 (50%)	-4.211	3	0.001
Budget for MZDS in the subcounty					
Never	6 (8.0%)	57 (76.0%)			
Rarely	4 (5.3%)	5 (6.7%)			
Frequently	2 (2.7%)	1 (1.3%)	-2.422	11.9	0.032

but rather an indicator of factors that are commonly identified with the comparative sub-groups. Another limitation, no confirmation was done whether indeed the respondents utilized the MZDZ, thus totally relying respondents' sincerity.

Conclusion

MZDS should be a major issue of concern in sub-Saharan Africa for early disease detection. Zoonoses can aggravate fast causing a myriad of sequels, and hence the need for early detection, timely response and control. From this study, there is a low level of MZDS in Nakuru County. The factors associated with utilization of MZDS included; sector, education level, data storage, sensitization and trainings as well as lack of proper coordination, organizational and financing mechanisms.

Recommendations

The National government and the county government of Nakuru need to pay more attention towards MZDS activities through financing MZDS activities, sensitization and training staff. There is also need to provide physical infrastructure like mobility means, office space and its infrastructure as well as provide information and communication technology for MZDS.

Data availability

Dryad: Data from: Multisectoral approach in zoonotic disease surveillance, https://doi.org/10.5061/dryad.g1jwstqzm[29].

This project contains the following underlying data:

- MZDSCodes.csv
- MZDZ2.csv

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

Acknowledgments

Peter Ngugi, animal health staff-Nakuru county and James Maino, University of Eldoret guided data collection and quantitative data analysis respectively.

References

1. Keesing F, Ostfeld RS: **Impacts of biodiversity and biodiversity loss on zoonotic diseases.** *Proc Natl Acad Sci U S A.* 2021; **118**(17): e2023540118.
PubMed Abstract | Publisher Full Text | Free Full Text

2. Rahman MT, Sobur MA, Islam MS, *et al.*: **Zoonotic diseases: etiology, impact, and control.** *Microorganisms.* 2020; **8**(9): 1405.
PubMed Abstract | Publisher Full Text | Free Full Text

3. Munyua PM, Njenga MK, Osoro EM, *et al.*: **Successes and challenges of the One Health approach in Kenya over the last decade.** *BMC Public Health.* 2019; **19**(Suppl 3): 465.
PubMed Abstract | Publisher Full Text | Free Full Text

4. Mackenzie JS, Jeggo M: **The One Health approach—why is it so important?** *Trop Med Infect Dis.* 2019; **4**(2): 88.
PubMed Abstract | Publisher Full Text | Free Full Text

5. Gebreyes WA, Dupouy-Camet J, Newport MJ, *et al.*: **The Global One Health paradigm: challenges and opportunities for tackling infectious diseases at the human, animal, and environment interface in low-resource settings.** *PLoS Negl Trop Dis.* 2014; **8**(11): e3257.
PubMed Abstract | Publisher Full Text | Free Full Text

6. Grace D, Gilbert J, Randolph T, *et al.*: **The multiple burdens of zoonotic disease and an ecohealth approach to their assessment.** *Trop Anim Health Prod.* 2012; **44 Suppl 1**: S67–73.
PubMed Abstract | Publisher Full Text

7. Asante J, Noreddin A, El Zowalaty ME: **Systematic review of important bacterial zoonoses in Africa in the last decade in light of the 'One Health' concept.** *Pathogens.* 2019; **8**(2): 50.
PubMed Abstract | Publisher Full Text | Free Full Text

8. Wolicki SB, Nuzzo JB, Blazes DL, *et al.*: **Public health surveillance: at the core of the Global Health Security Agenda.** *Health Secur.* 2016; **14**(3): 185–188.
PubMed Abstract | Publisher Full Text | Free Full Text

9. Rwego IB, Babalobi OO, Musotsi P, *et al.*: **One Health capacity building in sub-Saharan Africa.** *Infect Ecol Epidemiol.* 2016; **6**(1): 34032.
PubMed Abstract | Publisher Full Text | Free Full Text

10. Mbabu M, Njeru I, File S, *et al.*: **Establishing a One Health office in Kenya.** *Pan Afr Med J.* 2014; **19**: 106.
PubMed Abstract | Publisher Full Text | Free Full Text

11. Nguyen-Viet H, Lam S, Nguyen-Mai H, *et al.*: **Decades of emerging infectious disease, food safety, and Antimicrobial Resistance response in Vietnam: the role of One Health.** *One Health.* 2022; **14**: 100361.
PubMed Abstract | Publisher Full Text | Free Full Text

12. Wendt A, Kreienbrock L, Campe A: **Zoonotic disease surveillance--inventory of systems integrating human and animal disease information.** *Zoonoses Public Health.* 2015; **62**(1): 61–74.
PubMed Abstract | Publisher Full Text

13. Salyer SJ, Silver R, Simone K, *et al.*: **Prioritizing zoonoses for global health capacity building—themes from One Health zoonotic disease workshops in 7 countries, 2014–2016.** *Emerg Infect Dis.* 2017; **23**(13): S55–S64.
PubMed Abstract | Publisher Full Text | Free Full Text

14. Elton L, Haider N, Kock R, *et al.*: **Zoonotic disease preparedness in sub-Saharan African countries.** *One Health Outlook.* 2021; **3**(1): 5.
PubMed Abstract | Publisher Full Text | Free Full Text

15. Asaaga FA, Young JC, Oommen MA, *et al.*: **Operationalising the "One Health" approach in India: facilitators of and barriers to effective cross-sector convergence for zoonoses prevention and control.** *BMC Public Health.* 2021; **21**(1): 1517.
PubMed Abstract | Publisher Full Text | Free Full Text

16. Mwangi DK: **Institutional one health and animal-human health connections in Nthongoni, Eastern Kenya.** *Health Place.* 2022; **77**: 102818.
PubMed Abstract | Publisher Full Text

17. Belay ED, Kile JC, Hall AJ, *et al.*: **Zoonotic disease programs for enhancing global health security.** *Emerg Infect Dis.* 2017; **23**(13): S65–S70.
PubMed Abstract | Publisher Full Text | Free Full Text

18. Owange NO: **Occurrence of rift valley fever and associated risk factors in cattle in Ijara District, Kenya.** (Doctoral dissertation, University of Nairobi), 2014.

19. Kenya National Bureau of Statistics (KNBS): **The 2009 Kenya population and housing census.** 2010.
Reference Source

20. Muturi M, Gachohi J, Mwatondo A, *et al.*: **Recurrent anthrax outbreaks in humans, livestock, and wildlife in the same locality, Kenya, 2014-2017.** *Am J Trop Med Hyg.* 2018; **99**(4): 833–839.
PubMed Abstract | Publisher Full Text | Free Full Text

21. Idubor OI, Kobayashi M, Ndegwa L, *et al.*: **Improving detection and response to respiratory events - Kenya, April 2016-April 2020.** *MMWR Morb Mortal Wkly Rep.* 2020; **69**(18): 540–544.
PubMed Abstract | Publisher Full Text | Free Full Text

22. O'Connor H, Gibson N: **A step-by-step guide to qualitative analysis.** *Pimatisiwin: A Journal of Aboriginal & Indigenous Community Health.* 2003.

23. de Casterlé BD, Gastmans C, Bryon E, *et al.*: **QUAGOL: a guide for qualitative data analysis.** *Int J Nurs Stud.* 2012; **49**(3): 360–371.
PubMed Abstract | Publisher Full Text

24. Mezmir EA: **Qualitative data analysis: an overview of data reduction, data display, and interpretation.** *Research on Humanities and Social Sciences.* 2020; **10**(21): 15.
Publisher Full Text

25. Roka ZG, Githuku J, Obonyo M, *et al.*: **Strengthening health systems in Africa: a case study of the Kenya field epidemiology training program for local frontline health workers.** *Public Health Rev.* 2017; **38**(1): 23.
PubMed Abstract | Publisher Full Text | Free Full Text

26. Kayunze KA, Kiwara A, Lyamuya E, *et al.*: **Practice of One Health approaches: bridges and barriers in Tanzania.** *Onderstepoort J Vet Res.* 2014; **81**(2): E1–8.
PubMed Abstract | Publisher Full Text

27. Rama RE: **Factors affecting multisectoral collaboration response to rift valley feveroutbreak in Kongwa district.** (Doctoral dissertation, Muhimbili University of Health and Allied Sciences), 2013.
Reference Source

28. Griffith EF, Kipkemoi JR, Robbins AH, *et al.*: **A One Health framework for integrated service delivery in Turkana County, Kenya.** *Pastoralism.* 2020; **10**(1): 7.
Publisher Full Text

29. Cheptoyek L: **Data from: multisectoral approach in zoonotic disease surveillance.** [Dataset]. Dryad. 2024.
http://www.doi.org/10.5061/dryad.g1jwstqzm

Open Peer Review

Current Peer Review Status: ✔ ? ✔

Version 2

Reviewer Report 29 November 2024

https://doi.org/10.21956/openreseurope.19948.r47268

© **2024 Wheelhouse N.** This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

✔ **Nick Wheelhouse**
Edinburgh Napier University, Edinburgh, Scotland, UK

The article reports on the utilization of multi-sectoral collaboration in zoonotic disease surveillance among animal and human healthcare workers in Nakuru County, The paper does provide some key insight into potential issues around training and MZDZ awareness within the participants. This is a a limited study focusing on key frontline workers and the population is relatively small but the work has been carried out and presented in a solid fashion and there are important take home messages. Previous reviewers highlighted a number of issues in previous drafts but these appear to have been adequately addressed.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and does the work have academic merit?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Zoonoses, Veterinary microbiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 23 September 2024

https://doi.org/10.21956/openreseurope.19948.r43893

© 2024 Musoke J. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Jolly Musoke
University of the Free State, Bloemfontein, Free State, South Africa

I have reviewed the revision.
I am happy with the amendments.
Please proceed and accept.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and does the work have academic merit?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Zoonoses, Medical Microbiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 08 August 2024

https://doi.org/10.21956/openreseurope.18999.r41564

© **2024 Utomo B.** This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

?

Budi Utomo
Universitas Airlangga, Surabaya, East Java, Indonesia

The writing is clear and incorporates recent literature, though some references are over ten years old. The study design is appropriate, and the work has practical merit. A mixed-methods approach is recommended: quantitative for general respondents and qualitative for key informants, such as community leaders and district health officials.

However, the details of the method and data analysis are unclear, particularly regarding which variables use the 2-sample t-test and which use the chi-square test, making it difficult to replicate this research; especially in the aspect of information retrieval in key persons, there is no specific characteristic information.

Your sentence is mostly clear, but here's a slightly refined version for clarity:
"Corrections are needed both methodologically and in statistical studies to ensure that the findings can be easily understood, especially by those who are experts in statistics and research methodology."

A conclusion can be considered valid if it meets the methodological requirements and adheres to statistical standards.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and does the work have academic merit?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: My area of expertise encompasses methodological, statistical, and medical epidemiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 23 July 2024

https://doi.org/10.21956/openreseurope.18999.r41561

© 2024 Musoke J. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Jolly Musoke
University of the Free State, Bloemfontein, Free State, South Africa

The article aims to report on the utilization of MZDS among animal and human healthcare workers in Nakuru County, Kenya. My main concern with the article is that the interviewed participants do not represent all key stakeholders of the MZDS. In my opinion, including medical officers, veterinary officers, and policymakers would have provided a more comprehensive representation rather than focusing solely on the “frontline workers”. It was unclear to me if the heads of veterinary services, public health, and medical services were included, as participants as stated in the data collection and tools section. The terms "public health" and "human healthcare workers" were used interchangeably, though they have different meanings. Please clarify which officers were included.
Language editing is required, particularly under the results subsection "level of utilization of MZDS," as it was confusing to understand. The structure and flow of information need to be revisited. The results presented in tables are duplicated, with and without statistical analysis. I recommend presenting the results only once, with statistical analysis included, i.e., exclude Table 1 and Table 2.
In text the authors reference using numbers may I suggest the use of the names of the referenced work rather than numbers.
Unfortunately, the findings of this study add limited new knowledge to the literature, hence my opinion to not index the article.

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and does the work have academic merit?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Zoonoses, Medical Microbiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 23 Aug 2024

Levi Cheptoyek

Thank you very much for taking time to review my work. It is a honor. I actually had to revist my methodology and together with my working team (supervisors) made it more clearer. May you kindly accept the responses to the comments. **Why not include medical officers and policy makers:**

1. Medical workers: Public health officers were attached to health facilities where clinicians like medical and clinical officers work. As the clinicians did clinical work, the surveillance focal persons looked through all the medical records and collected all the relevant information for reporting. For example, information on dog bites may not be brought to the attention of medical officers yet recorded by nurses in the outpatient department registers. So not much was lost by not including clinicians as surveillance focal persons provided all the information even up to the community levels.
2. Policy makers: On institutional factors, the main focus was on political will. This was captured from the key informants who included; county head of veterinary services, county head of public health, county director of medical services, county Data analyst and county emergency and operations center officer. For example, all the directors noted that there was low political will in allocating funds on multisectoral approach on zoonotic disease surveillance. Among the reasons for hesitance was competing priorities. Probably future research should unearth other factors for the hesitance.

Clarification on the terms "public health" and "human healthcare workers" that were used interchangeably, though they have different meanings. The human healthcare workers implied from the research topic referred to officers who were from the health sector. They included; county director of public health, county data analyst, county director of medical services, emergency operations center coordinator and public health officers.

The study population has been made more clear. **Language editing is required, particularly under the results subsection "level of utilization of MZDS," as it was confusing to understand.** The language has been edited further. More detail on data collection, tools and how analysis was done has been clarified and there is now a flow with the reuslts presented. **The structure and flow of information need to be revisited. The results presented in tables are duplicated, with and without statistical analysis.** The tables provide more detail not explained in the text. The team felt that the little text would help in interpreting what is contained in the tables. Statistical analysis was done for all the study variables. **In text the authors reference using numbers may I suggest the use of the names of the referenced work rather than numbers:** Open Research Journal prefer use of hyper-linked numbers in referencing. **Unfortunately, the findings of this study add limited new knowledge to the literature, hence my opinion to not index the article:** The government of Kenya established a zoonotic disease unit at the national level and cascaded the approach to county and subcounty levels. Studies available provide very limited information on the level of utilization of multisectoral approach by frontline staff whose duties has surveillance as one of their deliverables. There is very scanty information on individual level factors associated with utilization. The existing information focusses more on stating institutional factors hindering utilization. The team therefore believes that there is a thing to learn and build on from this study hence worthy indexing.

Competing Interests: None