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Outcomes from a Zoonotic Disease Prioritization workshop using One Health approach in Mozambique, 2018 to 2023

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Abstract

Introduction Around 75% of (re)emerging infections are of zoonotic origins. The risk of zoonotic transmission in Mozambique is high because approximately 81% of the country's labor force is involved with agriculture, which represents a vulnerability for more frequent human-animal interaction and risk of spillover events. A One Health Zoonotic Disease Prioritization (OHZDP) workshop was conducted in Mozambique to facilitate coordination and collaboration within and across sectors to prevent, detect, and respond to zoonotic disease threats. Based on the success of this integrated workshop, the stakeholders developed actions whose results have a great impact on animal welfare, environment and improving public health.

Methods In 2018, representatives from Mozambique's human, animal, and environmental sectors from government, universities, research institutions and partners used US CDC's OHZDP Process to prioritize endemic and emerging zoonotic diseases of greatest national concern and develop recommendations and key interventions needed to advance One Health in Mozambique. After the OHZDP workshop, the Mozambique One Health Secretariat used a theory of change methodology to identify activities for implementation from the recommendations of the OHZDP workshop. Since the OHZDP workshop, the Secretariat has monitored progress of activities annually.

Results Mozambique's priority zoonotic diseases are rabies, zoonotic tuberculosis, salmonellosis, zoonotic avian influenza, trypanosomiasis, brucellosis, and Crimean-Congo hemorrhagic fever. One Health recommendations and interventions to address the priority zoonotic diseases focused on One Health collaboration, communication, and coordination; laboratory; surveillance; preparedness and response; prevention; workforce development; and research. After the OHZDP workshop, Mozambique established One Health coordination mechanisms, developed training courses for surveillance, laboratory diagnosis, outbreak investigation, and preparedness and response for the priority zoonotic diseases, conducted joint research, and developed plans.

Conclusion Prioritization of zoonotic diseases is critical as it facilitated the key One Health players in Mozambique to optimize resources, gain a greater understanding of zoonotic diseases, and implement policies and activities that promote multisectoral, interdisciplinary, and transdisciplinary collaboration across human, animal,

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and environmental sectors to prevent, detect, and respond to public health threats. The success of these activities implemented by the local Government and One Health partners were built from the implementation and momentum from the Mozambique's OHZDP workshop.

Introduction

Zoonotic diseases are diseases that are spread between animals and humans. Six out of ten infectious diseases in people are zoonotic [1]. In low- and middle-income countries (LMICs), close human-animal-environment interactions are frequent, which increases the risk for spillover of emerging or re-emerging zoonotic diseases, or their potential amplification, a serious concern [2].

Given that a significant portion of Mozambique's workforce is engaged with agriculture [3], the country becomes especially susceptible to the impact of zoonotic diseases due to the population having more frequent human-animal interactions (use of animals for work, transportation, and soil preparation for cultivation) leading to potential risk of zoonotic spillover events. Additionally, Mozambique is cyclically affected by tropical cyclones, for example IDAI and Kenneth in 2019, and Freddy in 2023, which increases the risk for zoonotic waterborne disease spillover [4]. Floods can have economic, social, and public health consequences. Environmental conditions after floods put people and animals in direct contact with flooded areas, with the polluted water supply and sewage system creating favorable conditions for development and transmission of waterborne disease [5].

Although the routine disease surveillance system in place in Mozambique mostly captures data from known endemic diseases, such as HIV, tuberculosis, malaria, etc., zoonotic diseases might occur undetected at endemic levels as well. For example, from 2007 to 2015, Mozambique recorded 92,472 dog bite cases and 466 deaths from rabies even though twenty thousand doses of Post-exposure prophylaxis (PEP) for anti-rabies vaccine annually were available [6]. Additionally, the economic impact of commonly occurring endemic zoonotic diseases, such as Rift Valley Fever and zoonotic tuberculosis, remains largely unknown. After IDAI cyclone in 2019, a study was conducted in Sofala province, collected, and tested for leptospirosis a total of 193 samples, of which, 23 (11.9%) tested positive for IgM antibodies according to the 2019 report mission from Instituto Nacional de Saúde- INS. Due to increasing storms as a result of climate change this situation regarding waterborne diseases in Mozambique is likely to only get worse. Africa carries the burden of the continent with the highest incidence of leptospirosis per 100,000 population (95.5 per 100,000), followed by Western Pacific (66.4 per 100,000) and the Americas

(12.5 per 100,000) [7]. The disease is frequent in places with humid and tropical climates, poor sanitation, close contact with animals, heavy rains, and floods, combined with poverty [8]. Global warming, climate change and heavy floods have contributed to the aggravation of the burden of several zoonotic diseases, such as leptospirosis and to the spread of vectors of several zoonotic disease in LMIC [9, 10]. In LMICs, such as Mozambique, the lack of effective surveillance systems, combined with low level of clinical suspicion contributes to the underestimation of their burden and importance and under prioritization [11]. Meanwhile, according to the Joint External Evaluation held in 2016, in Mozambique, the lack of coordination among human, animal, and environmental health sectors, coupled with lack of resources represents major challenges in the country's public health system, leading to a less efficient and ineffective response to public health threats. Having a mutually agreed upon list of priorities across key sectors is crucial for resource allocation and strengthening zoonotic disease surveillance and response systems in the country [12].

Following the JEE conducted in 2016, Mozambique developed the draft National Action Plan for Health Security (NAPHS) [13, 14] to accelerate the strengthening of a country's International Health Regulations core capacities. One of the activities prioritized in the NAPHS was the urgent need to conduct a multisectoral prioritization exercise to identify a list of zoonotic diseases of greatest national concern for Mozambique. In this context, Mozambique conducted in 2018, the One Health Zoonotic Disease Prioritization (OHZDP) workshop to identify a list of priority endemic and emerging zoonotic diseases of major public health concern that should be jointly addressed by human, animal, and environmental health ministries. The current manuscript describes the process and importance of the zoonotic disease prioritization carried out in Mozambique, and how the prioritization of zoonotic diseases has supported advancing One Health after the OHZDP workshop.

Methods

An in-country OHZDP workshop was held April 26–27, 2018, at the Centro Internacional de Conferência Joaquim Chissano in Maputo, Mozambique [15]. The OHZDP Process, a mixed methods approach for prioritization developed by the U.S. Centers for Disease Control and Prevention (US CDC), has been previously

described [16–18]. Participants included experts from the key multisectoral institutions (human health, animal health, and environmental health) in Mozambique, Ministry of Health (MISAU), Ministry of Agriculture and Food Security (MASA), Ministry of Land, Environment and Rural Development (MITADER), and Ministry of Sea, Inland Waters, Fisheries (MIMAIP), to serve as voting members, observers, and facilitators (Table 1). Key decisions including development of criteria, questions to address the criteria, ranking of criteria, and the final selection of zoonotic diseases were made by pre-selected voting members from MISAU, MASA, MITADER, and MIMAIP. Observers provided subject matter expertise and participated in discussions but did not to vote.

Initial zoonotic disease list and literature search

Ahead of the workshop, a country-specific initial list of zoonotic diseases of concern was developed as well as a literature and data review [15]. Diseases that may not have been detected in the country or region at the time of the workshop but had the potential for introduction such as Ebola or Marburg were also considered. The initial list was first generated by thorough desk review based on documents and literature from the human, animal, and environmental health sectors. Subject matter experts from the Ministries, as well as local World Health Organization (WHO) and US CDC staff provided expert opinion on the initial list of diseases for consideration in Mozambique. A database with the list of all documents used for desk search was provided to workshop participants for reference. During the workshop, participants reviewed the initial list of zoonotic diseases and

determined if any additional diseases should be added or removed.

Development of criteria and questions

During the workshop, workshop participants identified five criteria for ranking the zoonotic diseases and then developed one categorical question for each criterion. Voting members separately ranked the relative importance of each criteria, which was then entered in the OHZDP Tool and a group weight for each criteria was calculated, using methods previously described [17, 18].

Zoonotic disease scoring and ranking

Data collected from the literature review was then used to answer each question for each zoonotic disease. Decision tree analysis was used to determine the ranked zoonotic disease list [15, 17, 18]. The ranked zoonotic disease list was reviewed by participants who then engaged in further discussion to determine Mozambique's final priority zoonotic diseases. After the voting members identified the priority zoonotic diseases for Mozambique, workshop participants discussed the way forward and action plans, aligned with OHZDP methods [16].

Evaluation of the progress after the OHZDP workshop

After the OHZDP workshop, the Mozambique One Health Secretariat coordinated the prioritization of activities to be carried out using the One Health approach to respond to the recommendations from the OHZDP workshop, using a theory of change methodology, previously described (<https://www.theoryofchange.org/>). Each year, the Mozambique One Health Secretariat developed a plan for the implementation of activities. The plans

Table 1 The Mozambique One Health Zoonotic Disease Prioritization Workshop Participating Organizations- Maputo, Mozambique, 2018

Participating Organizations	Abbreviation	Number of participants	Voting Members
Ministry of Health	MISAU	6	3
Ministry of Agriculture and Food Security	MASA	6	3
Ministry of Land, Environment and Rural Development (MITADER)	MITADER	5	3
Ministry of Sea, Inland Waters, Fisheries (MIMAIP)	MIMAIP	3	3
National Institute of Health	INS	7	-
U.S. Centers for Disease Control and Prevention	CDC	6	-
World Health Organization -Mozambique	WHO	2	-
United States Agency for International Development- Mozambique	USAID	1	-
World Organization for Animal Health Mozambique	OIE	1	-
Faculty of Veterinary Medicine- Eduardo Mondlane University	FAVET, UEM	1	-
Biology Science Department – Eduardo Mondlane University	DCB, UEM	1	-
Directorate of Animal Sciences	DCA	2	-
National Museum of Natural History	NMNH	1	-

included in this list had associated funding from the Government of Mozambique and partners. Monitoring of the activities was also conducted annually. Each stakeholder shared the results of each activity allocated to their sectors, through a technical report, with this Mozambique One Health Secretariat. The Mozambique One Health Secretariat has compiled the results together from these reports.

Results

Workshop implementation and Participants

A total of 35 participants (voting members, observers, facilitators, and additional key staff) attended the OHZDP workshop for Mozambique (Table 2). Twelve voting members included individuals from Mozambique's MISAU, MASA, MITADER and MIMAIP. Nine participants served as observers. There were 10 facilitators representing MISAU, MASA, MITADER, and US CDC. Four additional key staff from INS provided support for the workshop.

Initial zoonotic disease list for prioritization

An initial list of 48 zoonotic diseases, shown in Table 3, was considered for prioritization in Mozambique. The initial zoonotic disease list included 21 (44%) viruses, 16 (33%) bacteria, and 11 (23%) parasites.

Development of questions and criteria weights

Participants identified the following five criteria for ranking zoonotic diseases: 1) disease occurrence on a regional and local level, and pandemic or epidemic potential, 2) morbidity and mortality, 3) laboratory diagnostics and epidemiological surveillance capacity, 4) availability of resources and mechanisms for collaboration, prevention, treatment, and eradication of the disease, and 5) social-economic and environmental impact. The categorical questions associated with each criterion are listed in Table 2.

Ranked zoonotic disease list

The OHZDP ranked list of all 48 zoonotic diseases can be found in Table 3.

Priority zoonotic diseases

Seven zoonotic diseases were selected and prioritized for multisectoral, One Health engagement by human, animal, and environmental health agencies in Mozambique. The seven priority zoonotic diseases for Mozambique are rabies, zoonotic tuberculosis, salmonellosis,

zoonotic avian influenza, trypanosomiasis, brucellosis, and Crimean-Congo hemorrhagic fever (Table 4).

According to the OHZDP ranked list, Babesiosis and Echinococcosis/hydatidosis had a higher normalized final score than Trypanosomiasis, Brucellosis and Crimean Congo Hemorrhagic Fever. However, the 12 voting members decided to prioritize brucellosis and Crimean Congo Hemorrhagic Fever higher, because using the consensus and experience of the voting members, these diseases constitute a major problem for public health and for Crimean Congo Hemorrhagic Fever, being a hemorrhagic virus, prioritization of this disease would lead to strengthening of capacity to respond to other viral hemorrhagic fevers in Mozambique.

Next steps and action plans

To facilitate multisectoral, One Health collaboration and effectively address the impact of the priority zoonotic diseases, workshop participants recommended the following next steps: 1) to establish One Health Coordination Mechanisms; 2) to develop a national strategic plan for One Health and zoonotic disease surveillance manual using a One Health approach to jointly address the seven prioritized zoonotic diseases; 3) to train technicians in zoonotic disease diagnosis in humans and animals through national and international partnerships; 4) to develop training courses for human, animal, and environmental health sectors using a One Health approach in order to enable joint outbreak investigation and response of zoonotic diseases; 5) to develop a mechanism to share existing and future plans with appropriate ministries using a One Health approach; 6) to build workforce capacity by approving curricula for continuing training in zoonotic diseases under the One Health approach; 7) to review the priority zoonotic disease list every 5 years depending to the in-country members in order to address new emerging zoonotic disease threats and incorporate knowledge acquired through enhanced surveillance and laboratory diagnostics.

One of the recommendations from the OHZDP Workshop was the establishment of a One Health Unit/Center in Mozambique that must include staff from human, animal, and environmental health sectors in Mozambique. This was important because it would facilitate the implementation of prevention and control strategies for the prioritized zoonotic diseases. One of the activities of this unit would be the development of a One Health National Strategic Plan to address zoonotic diseases, Antimicrobial Resistance (AMR) and food safety. Such a unit would enhance inter-sectoral linkages, facilitate efficient utilization of scarce resources,

Table 2 Criteria, Criterion Weights, Questions, and Answer Choices Selected by Workshop Participants

Criteria	Criterion Weight	Question	Answer Choices
Disease occurrence on a regional and local level, and pandemic or epidemic potential	0.32	Does the disease occur in Mozambique or neighboring countries in humans or animals, and is there evidence of sustained human-to-human transmission (pandemic potential)?	<p>a. Occurs locally or in neighboring countries, and there is evidence of sustained human-to-human transmission—3</p> <p>b. Occurs locally or in neighboring countries, and there is no evidence of sustained human-to-human transmission—2</p> <p>c. Does not occur locally or in neighboring countries, but there is evidence of sustained human-to-human transmission—1</p> <p>d. Does not occur locally or in neighboring countries, and there is no evidence of sustained human-to-human transmission—0</p>
Morbidity and mortality	0.28	What are the morbidity and mortality rates of the disease in humans?	<p>a. CFR (Case fatality rate) \geq 10%—4</p> <p>b. Long-term disability (Yes) and CFR < 10%—3</p> <p>c. Long-term disability (No) and CFR < 10%—2</p> <p>d. Long-term disability (Yes) and CFR is zero—1</p> <p>e. Long-term disability (No) and CFR is zero—0</p>
Capacity of laboratory diagnostics and epidemiological surveillance	0.14	Does laboratory capacity and/or epidemiological surveillance exist for the human health and/or animal health sector in Mozambique?	<p>a. Both laboratory and surveillance capacity exists for humans and animals—2</p> <p>b. Some form of laboratory or surveillance capacity exists for humans or animals—1</p> <p>c. No laboratory or surveillance capacity exists for neither humans or animals—0</p>
Availability of resources and mechanisms for collaboration, prevention, treatment, and eradication of disease	0.13	Is there a response plan for the disease in Mozambique and is there a vaccine or treatment available in the country?	<p>a. A response plan exists in at least one sector in country and a vaccine and/or treatment is available in country for at least one sector—2</p> <p>b. A response plan exists in at least one sector in country or a vaccine or treatment is available in country for at least sector -1</p> <p>c. No response plan exists in country and no vaccine or treatment is available in country—0</p>
Social, economic, and environmental impact of the disease	0.10	Is the disease on the OIE reportable disease list?	<p>a. Yes—1</p> <p>b. No—0</p>

Table 3 Zoonotic disease ranks associated raw scores and normalized final scores for the 48 zoonotic diseases selected for prioritization in Mozambique using the One Health Zoonotic Disease Prioritization Tool

Rank	Disease	Raw Score	Normalized Final Score
1	Rabies	0.89	1.00
2	Zoonotic Tuberculosis	0.89	1.00
3	Salmonellosis	0.82	0.92
4	Zoonotic Avian Influenza	0.82	0.92
5	Trypanosomiasis	0.81	0.91
6	Brucellosis	0.81	0.91
7	Crimean Congo Hemorrhagic Fever	0.78	0.88
8	Babesiosis	0.82	0.92
9	Cysticercosis	0.81	0.91
10	Echinococcosis/hydatidosis	0.82	0.92
11	Plague	0.75	0.84
12	Anthrax	0.75	0.84
13	Nipah	0.71	0.80
14	Schistosomiasis	0.71	0.80
15	Yellow Fever	0.71	0.80
16	Leptospirosis	0.71	0.80
17	West Nile Virus	0.68	0.76
18	Rift Valley Fever	0.68	0.76
19	Q-Fever	0.68	0.76
20	Leishmaniasis	0.67	0.76
21	Colibacillosis	0.64	0.72
22	Listeriosis	0.64	0.72
23	Toxoplasmosis	0.64	0.72
24	Trachoma	0.60	0.68
25	Hantavirus	0.57	0.64
26	Campylobacteriosis	0.57	0.64
27	Swine erysipelas	0.57	0.64
28	Zoonotic Swine Influenza	0.57	0.64
29	Onchocerciasis	0.57	0.64
30	Lyme Disease	0.50	0.56
31	Trichinellosis	0.50	0.56
32	Pasteurellosis	0.50	0.56
33	Middle East Respiratory Syndrome (MERS)	0.50	0.56
34	Severe Acute Respiratory Syndrome (SARS)	0.46	0.52
35	Ebola	0.46	0.52
36	Glanders	0.46	0.51
37	Tularemia	0.46	0.51
38	Lassa Fever	0.39	0.44
39	Japanese Encephalitis Virus	0.39	0.43
40	Western Equine Encephalomyelitis	0.39	0.43
41	Eastern Equine Encephalomyelitis	0.39	0.43
42	Variant Creutzfeldt-Jakob disease	0.39	0.43
43	Old World Screwworm	0.38	0.43

Table 3 (continued)

Rank	Disease	Raw Score	Normalized Final Score
44	Avian chlamydiosis	0.35	0.39
45	Marburg	0.35	0.39
46	Venezuelan Equine Encephalitis	0.31	0.35
47	New World Screwworm	0.31	0.35
48	Camelpox	0.10	0.11

Table 4 Selected priority zoonotic diseases from the One Health Zoonotic Disease Prioritization Workshop for Mozambique, 2018

Disease	Final Ranking
Rabies	1
Zoonotic Tuberculosis	2
Salmonellosis	3
Zoonotic Avian Influenza	4
Trypanosomiasis	5
Brucellosis	6
Crimean Congo Hemorrhagic Fever	7

and capitalize on various sectors capabilities to improve prevention and control of zoonotic diseases.

Successes implemented after the OHZDP workshop

1) *Establishment of One Health Coordination Mechanisms*

Mozambique is in an advanced stage for the establishment of One Health Platform that will be composed by members from MoH, MASA, MITADER, MIMAIP, FAVET, DCA, FAMED and collaborators. Currently, there is a One Health Secretariat that is composed by human, animal, and environmental health professionals, researchers, civil society, and health partners. This group is composed by several technical groups: 1) Zoonotic, (re)emerging, and neglected diseases; 2) Antimicrobial Resistance; 3) Food Security; and 4) Water, Hygiene and Sanitation; The One Health Secretariat holds monthly coordination meetings.

Examples of activities organized by this One Health coordination mechanisms are: 1) Joint campaigns rabies awareness and response to outbreaks; 2) Joint celebration of World Rabies Day and World One Health Day (<https://www.ins.gov.mz/dia-mundial-de-saude-unica-celebrada-com-acoes-de-sensibilizacao/>); 3) Joint response to rabies, leishmaniasis, avian influenza outbreaks; 4) Joint training for public health professionals

(<https://www.ins.gov.mz/residentes-em-saude-publica-capacitados-em-materia-sobre-one-health/>).

- 2) *Development of the National Strategic Plan for One Health and Zoonotic Disease Surveillance using a One Health approach;*

Mozambique has developed an initial draft of a One Health Strategic Plan titled “Mozambique One Health Strategic Plan, 2024-2029”. This strategic plan will guide the Government of Mozambique in strengthening the national capacity to prevent, detect, and respond to zoonotic diseases, Antimicrobial Resistance, Food security, Water Hygiene and Sanitation. The draft is under review by the relevant ministries and stakeholders.

- 3) *Development of the training courses focusing on the priority zoonotic diseases for surveillance, laboratory testing, outbreak investigation and response of zoonotic diseases using a One Health approach targeting professionals from human, animal, and environmental health sectors*

A One Health curriculum was developed with the objective of creating capacity in human, animal, and environmental health professionals, as well as training undergraduate and graduate students from biomedical, social, and anthropological sciences in the field of adverse event management using the One Health approach. The module for this course was developed with the support of Brazilian specialists. This curriculum is being facilitated annually and, in addition to human, animal and environmental health professionals, it is aimed at master’s students in Field Epidemiology and public health residents [19].

- 4) *Development of One Health net-mapping process in Mozambique*

The One Health net-mapping is aimed at identifying and mapping out key stakeholders that will influence the integration and effective implementation of One Health-related policies, as well as defining their relationships within the ecosystem.

The process helps to determine what actors are involved in each network, how they are linked, as well as how influential they are. Determining such fundamental issues within a complex multidisciplinary network such as One Health paves way for strategic engagement and action.

- 5) *Conducting joint zoonotic disease outbreak investigation*

During the response to the two cyclones that hit Mozambique in 2019, the One Health Technical Working group that was brought together during the OHZDP workshop worked together to respond to zoonotic disease threats using a One Health approach. Surveillance and diagnosis of zoonotic dis-

eases requires a One Health approach. Through these joint investigations, the different sectors shared data and information with each other in real-time to help inform response activities.

- 6) *Development of Strategic Plan for a Priority Zoonotic Disease*

Following the recommendation from the OHZDP workshop, the multisectoral, One Health team supported the development of an integrated strategic plan for rabies prevention and control. One of the main activities in this plan was to update the human and animal health professionals (focal points for rabies control) to improve their understanding of the bite case management system to improve rabies surveillance and intersectoral communication using WHO protocols to improve access and quality of post exposure prophylaxis for people as well implementing massive canine vaccination campaign.

Discussion

The objective of the OHZDP workshop was to strengthen multisectoral, One Health collaborations by jointly identifying the top zoonotic diseases that are most important for human and animal health in Mozambique. The outcome was a list of priority zoonotic diseases that animal, human and environmental health sectors in Mozambique, international organizations, and other donor agencies can support for strengthening surveillance in humans and animals, enhancing laboratory capacity, developing prevention and control strategies, and conducting joint outbreak investigations; establishment of One Health Coordination Mechanisms; development of the National Strategic Plan for One Health and Zoonotic Disease Surveillance; development of the training modules for human, animal and environmental sectors; conducting joint zoonotic disease outbreak investigations.

Among the list of seven priority zoonotic diseases, two zoonotic diseases are vaccine-preventable diseases (rabies, and brucellosis). To prevent and control these diseases, vaccine interventions should be available for animals, which would require sustained One Health collaboration. Appropriate interventions have brought rabies under control in numerous countries [20, 21]. These successes in addressing zoonoses can be disseminated to many in LMIC with appropriate investment in resources. For example, a cross-sectional study conducted between 2016 and 2018 about knowledge, attitudes, practices (KAP) and control of rabies among community households and health practitioners at the human-wildlife interface in Limpopo National Park, Massingir District, Mozambique showed that the most frequent reason for non-vaccination was lack of information of a campaign (62.1%), followed by absence during

a campaign (10.1%) and not being aware of the need to vaccinate (9.5%; $P=1.000$) [22].

The OHZDP workshop served as a catalyst for the implementation of One Health activities in Mozambique. Additionally, other countries and regions that have utilized the OHZDP Process have also implemented recommended next steps after conducting their OHZDP workshop, including formalizing One Health coordination mechanisms, conducting regional and sub-national OHZDP workshops, development of strategic plans, incorporation of priority zoonotic diseases into surveillance systems, and development of plans and activities for priority zoonotic diseases.

There were several limitations when conducting the prioritization, which included the lack of data available for zoonotic diseases and the subjectivity that may occur during the scoring process when data gaps occur. First, the decision tree analysis requires metric measurements of disease occurrence, which were lacking for a number of diseases or were only available from limited studies that may not be representative of the entire country. In addition, some of the disease metrics such as prevalence, classification of diseases, and case fatality rates could not adequately evaluate all the diseases being prioritized. In cases where disease data were unavailable, experts provided estimates based on data from the region or from diseases closest in epidemiology to those being examined, hence introducing potential bias. Use of multiple groups in assigning scores from expert opinion partly mitigated subjective bias that is inherent in the scoring process. Secondly, it has been recognized that disease metrics such as DALYS that have been generated with data largely from the developed world could underestimate the public health burden of neglected endemic zoonotic diseases. Finally, the epidemiology of certain diseases in Mozambique could have resulted in overestimation of true burden in the country resulting in high ranking of these diseases. Additionally, while the Mozambique One Health Secretariat receives annual reports for the monitoring of the implementation of activities, a formal impact evaluation has not yet been conducted to objectively measure the progress and impact. However, this is something that is being considered in the future to be able to measure One Health progress in Mozambique.

Conclusions

Prioritization of zoonotic diseases is critical as it facilitated the key players in One Health approach in Mozambique to optimize the resources, to greater understand the zoonotic diseases and implement the policies promoting multisectoral, interdisciplinary, and transdisciplinary collaboration across human, animal, and environmental sectors at country level to prevent, detect, and respond to public

health threats. The OHZDP process helped the country to prioritize the zoonotic disease of greatest national concern and focusing on national capacity, surveillance, outbreak response, and prevention activities on zoonotic disease. The OHZDP process also supports progress and serves as a catalyst, specifically for the zoonotic disease indicators, on strengthening a national laboratory capacity, surveillance, and joint outbreak response plans and strategies for priority endemic/(re)emerging zoonotic diseases with evidence of multisectoral coordinator mechanism.

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Disclaimers

The findings and conclusions in this report are those of the authors and do not represent the views of the U.S. Centers for Disease Control and Prevention.

Authors' contributions

IC, AT, SA, OI, AM, GG, NO, NS, KV, and EG conceptualized the manuscript. IC, AT, SA, VM, PM, JO, IN, GG, NO, NS, KV, LM, SI, SA, AC, and EG significantly contributed to the OHZDP workshop and/or manuscript. All authors (IC, AT, VM, OI, PM, IN, SI, JO, AM, VA, SA, AG, GG, NO, NS, KV, FR, LM, SA, AC and EG) reviewed and approved the final manuscript.

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Availability of data and materials

A final workshop report for the One Health Zoonotic Disease Prioritization for Mozambique can be found at www.cdc.gov/onehealth/what-we-do/zoonotic-disease-prioritization/completed-workshops.html. Additional information may be made available to researchers who submit a proposal to the corresponding author.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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