



## Workshop Summary

# One Health Zoonotic Disease Prioritization for Multisectoral Engagement in Tanzania

Dar es Salaam, Tanzania  
March 23–24, 2017



Preparedness & Response  
ONE HEALTH IN ACTION



Photo 1. Large lioness in the Serengeti in Tanzania rests in the savanna.

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Photo 2. Tanzanian girl with a baby sling.

## SUMMARY

The purpose of this two-day workshop was to identify zoonotic diseases of greatest national concern for Tanzania using a One Health approach, with input from representatives of human health, livestock, agriculture, wildlife, environment, research, and higher education sectors. In preparation for the workshop, representatives identified a list of zoonotic diseases relevant for Tanzania. During the workshop, representatives defined the criteria for prioritization and determined questions and weights relevant to each criterion. Tanzania’s priority zoonotic diseases were identified using the One Health Zoonotic Disease Prioritization tool, a semi-quantitative selection tool developed and coordinated by the U.S. Centers for Disease Control and Prevention (CDC).<sup>1,2</sup>

The prioritized zoonotic diseases for Tanzania identified using the One Health Zoonotic Disease Prioritization Process were the following:

- Rabies
- Rift Valley Fever and other viral hemorrhagic fevers (Marburg, Ebola)
- Zoonotic influenza
- Anthrax
- Human African Trypanosomiasis (Sleeping Sickness)
- Brucellosis



**Photo 3. One Health Zoonotic Disease Prioritization Workshop participants from human, animal, and environmental health sectors in Dar Es Salaam, Tanzania.**

**Table 1. Prioritized zoonotic diseases selected in Tanzania during the One Health Zoonotic Disease Prioritization Workshop in March, 2017**

Zoonotic Disease	Causative Agent	Human Disease Burden	Animal Disease Burden	Diagnostics, Treatment, and Prevention
<b>Rabies</b>	Virus	Tanzania is estimated to have 90–400 human rabies deaths annually. <sup>3</sup>	Rabies virus is actively circulating in dogs, which are the main source of exposure for humans.	Effective animal vaccine exists and human vaccines are available. Post-exposure prophylaxis is available but treatment is not. <sup>4</sup>
<b>Rift Valley fever (RVF) and other viral hemorrhagic fevers (Marburg, Ebola)</b>	Viruses	Outbreaks of RVF and other hemorrhagic fevers have been reported in Tanzania and neighboring countries. <sup>5,6</sup> During an outbreak in 2007, RVF claimed 144 lives. <sup>5</sup>	Exact burden is unknown. However, in 2007 alone, 46,600 cows, 56,900 goats, and 32,800 sheep were affected by RVF. <sup>7</sup>	An attenuated vaccine exists for RVF for animals. <sup>8</sup> There are currently no animal vaccines available for Ebola. Human Ebola vaccines are undergoing clinical trials. Treatment for humans is supportive care. <sup>9</sup>
<b>Zoonotic influenza</b>	Viruses	No human cases of highly pathogenic avian influenza have yet been reported in Tanzania.	Tanzania has not experienced an avian influenza outbreak, however, neighboring country, Uganda, did in 2017. <sup>10</sup>	Vaccines for swine influenza viruses available for both animals and humans. <sup>11</sup> Avian influenza vaccines in development. Tanzania, as a SADC member state, has adopted a “no vaccination policy” in poultry. Treatment for humans includes supportive care and antiviral agents. <sup>12</sup>
<b>Anthrax</b>	Bacteria	Exact numbers are unknown but typically there can be 10 human cases of cutaneous and enteric disease per single animal carcass. <sup>13</sup> At least 36 people were exposed to anthrax in the Northern district of Hai in March 2017. <sup>14</sup> Regular cases are reported in areas with livestock/wildlife interface in Ngorongoro.	Anthrax is endemic in Tanzania. <sup>15</sup> Identified hotspot areas are northern Tanzania (Arusha, Kilimanjaro, Manyara), central Tanzania (Dodoma), and Southern Highlands of Tanzania (Iringa). Wildlife in Ngorongoro Conservation Area Authority (NCCA) and Ruaha National are the most severely impacted.	An effective animal vaccine and treatment for humans exists, <sup>13</sup> however, vaccination of animals is not adequately coordinated.
<b>Human African trypanosomiasis (HAT; Sleeping Sickness)</b>	Protozoa	In 2015 there were 2804 cases reported worldwide. <sup>16</sup> In the Urambo District of Tanzania, 143 patients were admitted in 2004 with HAT. <sup>17</sup>	Regionally, trypanosomiasis is prevalent in cattle and some wildlife, and spread by animal and vector movements. <sup>18</sup>	No vaccines are available. Effective prophylactic and curative treatment is available for animals. Effective treatment for humans is available. <sup>19</sup> Insecticide and other effective vector control technology are currently in use.
<b>Brucellosis</b>	Bacteria	Selected areas within Tanzania have an incidence as high as 28.2% positive serology. <sup>20</sup>	Cattle and goats test positive for Brucella within Tanzania. Prevalence ranges from 4–22%. <sup>20</sup>	Vaccines are available for animals and treatment available for humans. <sup>21,22</sup>

## INTRODUCTION

Zoonotic diseases are diseases that spread between animals and people. Most known human infectious diseases and up to three-quarters of newly emerging infections originate from animals.<sup>23</sup> Tanzania is on the east coast of Africa along the Indian Ocean. It is bordered by Kenya and Uganda to the north, Rwanda, Burundi, and Democratic Republic of Congo to the west; and Zambia, Malawi, and Mozambique to the south. It is located in East Africa between longitude 29° and 41° East and latitude 1° and 12° South, covering an area of 947,600 sq km.<sup>24</sup>

The country is in a zone where seven of Africa's biogeographic regions converge. Tanzania has a high level of biodiversity given its location with dry East African savannas, coupled with high altitude ranges, including the highest point in Africa, Mt. Kilimanjaro.<sup>25</sup> The current population of Tanzania is estimated at nearly 54 million, as Tanzania has one of the highest birth rates in the world with more than 43.74% of the population being under the age of 15.<sup>25</sup> Approximately two-thirds of the population lives in rural areas.<sup>25</sup>

Tanzania is one of the 12 megadiverse countries of the world, and the nation's biological diversity has important economic, technological, and social implications.<sup>26</sup> The extensive national parks, the Eastern Arc Mountains, wetlands, coastal forests, and the marine and fresh water systems make Tanzania one of the world's greatest reservoirs of biodiversity; Tanzania is home to at least 14,500 known and confirmed flora and fauna species and is among 15 countries globally with the highest number of endemic as well as threatened species.<sup>26</sup> Tanzania is also home to 86 endemic species of amphibians, 85 endemic species of reptiles, 34 endemic bird species, 31 endemic species of mammals including eight species of primates, 40% of the world's wild coffee varieties, and about 80% of the famous African violet flowers.<sup>26-28</sup> It is a custodian of world heritage in the form of game reserves and national parks.<sup>26</sup> The country, home to about 20% of Africa's large mammals, hosts six



out of the 25 globally known biodiversity hotspots and has designated about 40% of its total surface area to forest, wildlife, and marine protected areas.<sup>26</sup> Most of the ecosystems, be they terrestrial or aquatic, are deteriorating with decreasing capacity to provide essential services while a significant number of species are on the decline and some of them are on the brink of extinction, including animals such as black rhinoceros (*Diceros bicornis*), the African wild dog (*Lycaon pictus*), the common chimpanzee (*Pan troglodytes*), the African elephant (*Loxodonta africana*), and the cheetah (*Acinonyx jubatus*), as well as plant species such as Mninga (*Pterocarpus angolensis*) and Jackleberry (*Dalbergiamelanoxylon*).<sup>26</sup> Ecosystems such as forests, wetlands, and drylands are transformed and, in some cases, irreversibly degraded.

The agriculture sector, including livestock and fisheries, contributes approximately 30% of Tanzania's GDP and accounts for over 65% of total employment and over 85% of the total export earnings.<sup>25, 29</sup> The subsector of livestock production contributes to national food supply, converts rangelands resources into products suitable for human consumption, is a source of cash incomes, and provides draught power, transport, and manure as fertilizer for crop farming activities and potential energy sources through biogas technologies for

rural electrification and/or cooking fuel.<sup>30,31</sup> Tanzania has the third largest livestock population on the African continent comprising 25.8 million cattle, which includes 3.9 million oxen, 99% of which are indigenous breeds, complemented by around 17 million goats, 5.6 million sheep, 2.1 million pigs, and over 40.8 million chickens.<sup>31,32</sup> About 40% of farmers keep livestock (4.5 million operators), with ownership patterns dominated by chickens (36.6% of all households), goats (18.2%), cattle (16.1%), and sheep (6.9%).<sup>32–36</sup> Traditional breeds and processes dominate the Tanzanian livestock sector. Tanzania shorthorn Zebu is the most widespread cattle breed in the nation. Agropastoralist households account for 80% of livestock production, pastoral communities 14%, and the remaining 6% comes from the commercial ranches and dairy sector.<sup>30</sup> Sheep and goats are widely distributed and adapted to many agro-ecological zones. Most livestock in Tanzania are produced in extensive production and smallholder systems where they mix freely with wildlife. The context in Tanzania, characterized by rich biodiversity coexisting side by side with livestock and humans especially in the rural areas, provides a perfect setting for the emergence and spread of zoonotic diseases.

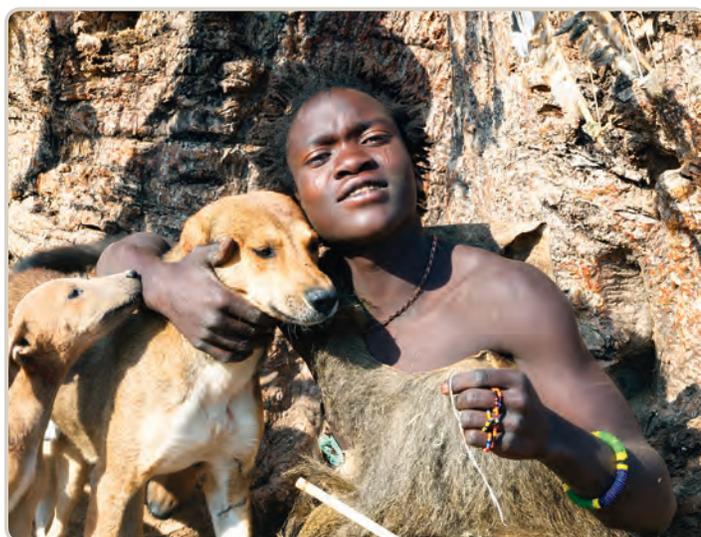


**Photo 4. Herd of giraffes on the rim of the Ngorongoro Crater. The giraffe is the national animal of Tanzania.**

One Health is a multisectoral, transdisciplinary approach to confronting the threat of infectious diseases, including zoonotic diseases. Tanzania's 5-year *One Health Strategic Plan (2015–2020)* is the country's first national One Health strategic plan to be developed using a multisectoral approach and has drawn expertise from various sectors reflecting shared commitment to enhanced collaboration among human, animal, and wildlife health sectors to reduce the burden of zoonotic diseases. In 2015, the Permanent Secretary (PS) Prime Minister's Office (PMO) responsible for Policy and Coordination (PC) signed the strategic plan, which was developed and reviewed by stakeholders in 2014. The coordination of the development of this plan was done by the PMO. The plan is a whole-of-government guiding document aimed at summarizing operations and activities among various stakeholders. It also aims to create and maintain active collaboration between the sectors for the prevention and control of zoonotic diseases to ensure that there is timely preparedness and a consistent and coordinated response should a zoonotic event occur. To achieve this, the plan proposed the establishment of a "One Health Coordination Unit (now referred to as the One Health Coordination Desk)," which will continue to evolve, enhance, and refocus One Health programs to meet existing and impending challenges. To support the unit, a One Health Steering Committee comprising permanent secretaries of participating ministries under the PS PC and four technical working groups (TWGs) were created, including Training, Advocacy and Communication; Research and Development; Surveillance; and, Preparedness and Response.

Zoonotic diseases that occur in large numbers primarily impact Tanzanian society in the following ways:

- Threaten the health of animals resulting in illness, loss of productivity, and death, and thus the livelihood of a large segment of the population who depend on livestock as a major source of income.



**Photo 5. Hadzabe (or Hadza) young bushman with dogs.**

- Threaten local and national economic stability through loss of animals, tourism, trade bans, and quarantine.
- Threaten the health of people with the ability to cause a large number of illnesses and deaths, which is associated with significant social instability and economic losses.

Zoonotic disease prioritization was identified by national representatives in Tanzania as the first step toward addressing the public health challenges associated with zoonotic disease threats using a One Health approach. To begin

addressing these challenges, a One Health Zoonotic Disease Prioritization Workshop was conducted March 23–24, 2017 in Dar es Salaam, Tanzania. The purpose of this 2-day workshop was to identify zoonotic diseases of greatest national concern for Tanzania using input from representatives of human health, livestock, agriculture, wildlife, environment, research, and higher education sectors. The goal of the prioritization process was to use a multisectoral, One Health approach to prioritize endemic and emerging zoonotic diseases of major public health concern that should be jointly addressed by ministries responsible for

human, animal, and environmental health, taking into account the limited available government resources. The effort was supported by the Government of Tanzania, CDC, USAID, and the Preparedness and Response (P&R) project as part of the Global Health Security Agenda (GHSA).

To build in-country capacity to conduct future One Health prioritization workshops, nine local partners representing human, animal, and environmental health sectors were trained by CDC as facilitators and three served as the facilitators during the workshop. The in-country facilitator training took place March 20–22, 2017, at the Kunduchi Beach Resort in Dar es Salaam, Tanzania.



**Photo 6. Panorama of Dar Es Salaam City Centre with waterfront and ships.**



**Photo 7. Flag and coat of arms of Tanzania, façade with red roof tiles of the Forodhani building, a colonial period building used currently by the Tanzanian Government.**

## METHODOLOGY

CDC and USAID collaborate with countries on the prioritization of endemic and emerging zoonotic diseases, development of One Health coordinating mechanisms, and other One Health activities to further global health security. In Tanzania, the prioritization of zoonotic diseases was coordinated by the One Health Coordination Unit, under the PMO, which is charged with spearheading collaborative efforts amongst government sectors to prevent, detect, and respond to existing zoonotic diseases as well as emerging pandemic threats. During the workshop, representatives selected from a list of 39 endemic and emerging zoonotic diseases relevant for Tanzania, defined the criteria for prioritization, and determined questions and weights relevant to each criterion in order to identify the top zoonotic diseases to be prioritized.

## GOAL AND EXPECTED OUTCOME

The goal of Tanzania's One Health Zoonotic Disease Prioritization Workshop was to use a multisectoral, One Health approach to prioritize endemic and emerging zoonotic diseases of major public health and animal health concern that should be jointly addressed through inter-ministerial collaboration including human health, livestock, agriculture, wildlife, environment, research, and higher education partners. The expected outcome was a list of six zoonotic diseases of highest priority to Tanzania that will be used to advocate for and build capacities in many areas including surveillance and laboratory detection systems, with the goal of improving prevention and control across the key One Health sectors in the country over the next five years and beyond.

## ATTENDANCE

Representatives from multiple sectors participated in the workshop as voting members, observers, facilitators, and organizers (Appendix 2). Organizers began preparations more than two months in advance and activities were coordinated by the CDC One Health Office in collaboration with USAID. In-country facilitators representing human, animal and environment sectors were trained in the three days prior to the workshop. Workshop observers from various participating organizations, including local and international partners as well as non-governmental organizations, provided subject matter expertise to voting members.

### **Key participating organizations include the following:**

- One Health Coordination Unit—Prime Minister's Office
- Ministry of Health, Community Development, Gender, Elderly and Children
- Ministry of Agriculture, Livestock and Fisheries (now referred to as the Ministry of Livestock and Fisheries and the Ministry of Agriculture)
- Tanzania Veterinary Laboratory Agency
- Ministry of Natural Resources and Tourism

- Tanzania Wildlife Research Institute
- Tanzania National Parks
- National Environmental Management Council (NEMC)
- Vice President’s Office—Environment
- Sokoine University of Agriculture (SUA)
- Nelson Mandela African Institute of Science and Technology (NM-AIST)
- Muhimbili University of Health and Allied Sciences (MUHAS)—OHCEA
- Food and Agricultural Organization (FAO)
- World Health Organization (WHO)
- U.S. Agency for International Development (USAID)
- USAID Preparedness and Response Project (P&R)
- U.S. Centers for Disease Control and Prevention (CDC)

## WORKSHOP METHOD

The prioritization process involved application of CDC’s One Health Zoonotic Disease Prioritization tool. The first step of the process was to identify a country-specific list of potential zoonotic diseases of concern. This was achieved by reviewing data, literature, and using Tanzania’s notifiable human and animal diseases to generate a singular list of 45 diseases considered potential candidates, which was then shared with all participating ministries and organizations. Through multiple revisions with subject matter experts from these ministries and organizations, the list was further refined to 39 zoonotic diseases that formed the initial list of zoonotic diseases for consideration during the prioritization workshop. See Appendix 3 for a complete listing of all zoonotic diseases considered during the workshop.



Photo 8. Dar es Salaam port.



**Photo 9. Cows and goats being herded along a dirt road in Moshi area, Northern Tanzania.**

The voting members jointly identified five criteria for quantitative ranking of these 39 zoonotic diseases. Once criteria were chosen, each voting member individually ranked the relative importance of each criterion to help generate a final group of weighted criteria. One categorical question for each criterion was selected through group discussion. All questions had either “yes/no” answers or ordinal multinomial answers, with weights assigned to each answer. These were then agreed upon through group consensus or voting. See Appendix 4 for ranked criteria and questions with weighted answers.

The five criteria, ranked in order of importance as selected in Tanzania, are as follows:

**1. Presence of disease in Tanzania or the region**—Whether a disease was reported in humans or animals in Tanzania or the surrounding region (East, Central, or Southern Africa) over the past 10 years was the most important criterion for Tanzania. If the zoonotic disease was reported in humans or animals in Tanzania or the region in the last 10 years, it received the full weight of 1. If the zoonotic disease was not reported in humans or animals in Tanzania or the region in the last 10 years, it received a score of 0.

**2. Social and Economic Impacts**—Whether a disease reduced animal productivity by more than 20% and was on the Tanzania Animal Disease Act list and/or the OIE Disease List was the second criterion. If the zoonotic disease reduced animal productivity by 20% or more and was on both of the two lists, it received the full weight score of 2. If the zoonotic disease reduced animal productivity by 20% or more and was on either one of the two lists, it received a score of 1. If the zoonotic disease did not reduce animal productivity by 20% or more and was not on either list, a score of 0 was assigned.

**3. Availability of interventions**—The ability to control a zoonotic disease through vaccination, treatment, or vector control in either humans or animals in Tanzania was the third most important criterion. Diseases with available interventions for both humans and animals were given the full weight score of 2. Diseases with available interventions for either humans or animals, but not both, were given a score of 1. In this scenario, a control strategy for either humans or animals carried the same scoring weight. Finally, diseases with no available interventions for either humans or animals in Tanzania received a score of 0.

#### 4. The potential to cause an epidemic or pandemic

Whether a disease has caused an outbreak in humans or animals in Tanzania or the region in the last 10 years was the fourth most important criterion. Diseases that have caused an outbreak in the last 10 years in Tanzania or the region received a score of 1. Diseases that had not caused an outbreak in Tanzania or the region during the last 10 years were given a score of 0.

#### 5. The severity of disease in humans in Tanzania

The severity of disease in humans in Tanzania was the fifth criterion. Diseases that cause a heavy burden in human populations were of concern. Diseases with a high mortality rate (CFR >20%) received the full weight score of 2. Diseases with a mid-range mortality rate (CFR >5% but 20% or less) received a score of 1. Diseases with a lower mortality rate (CFR <5%) received a score of 0.

Data for answering the questions for each of the 39 zoonotic diseases were identified through an extensive literature search referencing more than 300 sources, including information from the government of Tanzania, WHO, OIE, FAO, CDC, USAID, and online sources such as ProMED and Health Map. If information for a particular disease was not available for Tanzania specifically, regional data for East Africa or global data were used.

A decision tree tool developed within Microsoft Excel was used for determining the final disease ranking. Each weighted criterion was applied across all diseases, and scores were assigned based on the response to each question. The scores for all five questions were summed and then normalized such that the highest final score was 1 (Appendix 3).

The list of zoonotic diseases and their normalized scores was presented by facilitators to the group on day two of the workshop for discussion. After much discussion among groups comprising an array of sectors, the voting members from all represented ministries agreed on the following final list of priority zoonotic diseases or disease groups for Tanzania:

- Rabies
- Rift Valley Fever and other viral hemorrhagic fevers (Marburg, Ebola)
- Zoonotic influenza
- Anthrax
- Human African trypanosomiasis (Sleeping Sickness)
- Brucellosis



Photo 10. African elephants and a snow capped Kilimanjaro mountain in Tanzania.

## RECOMMENDATIONS FROM WORKSHOP

Every government ministry involved in the decision process and collaborating agencies who observed the process were given an opportunity to suggest specific next steps that they could take to improve multisectoral surveillance and lab capacity, prevention and control strategies and conduct outbreak investigations.

**For Tanzania's prioritized zoonotic diseases, all human, animal, and environmental health sectors and university partners represented at the One Health Zoonotic Disease Prioritization Workshop in Tanzania made the following recommendations at the end of deliberations to advance One Health collaborations across sectors:**

- Advocate the One Health approach to multiple levels and across sectors in Tanzania
- Regularly share reports on zoonotic diseases with the other sectors
- Collaborate with the relevant sectors during outbreak responses
- Identify opportunities or internships for students to gain experience and training for priority zoonotic diseases

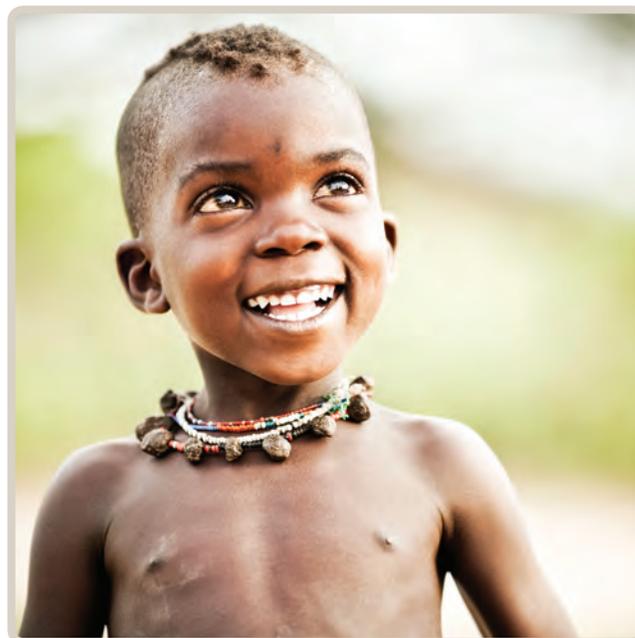
**For Tanzania's prioritized zoonotic diseases, the following was agreed to:**

### One Health Coordination Unit

- Prepare a report summarizing this workshop with approval by the Prime Minister's Office
- Disseminate workshop report to technical and financial partners to increase awareness of Tanzania's prioritized zoonotic diseases
- Consider publication of Tanzania's prioritization process in a peer-reviewed journal
- Operationalize the One Health Strategic Plan for the prioritized zoonotic diseases; the established technical working groups can create expert sub-groups for prioritized diseases as necessary

### Public Health

- Build laboratory capacity and strengthen surveillance for brucellosis in humans since it is not currently a reportable disease
- Strengthen capacity for surveillance and diagnosis, including community-based surveillance for early detection of events in both animals and humans
- Consider the inclusion of brucellosis as an IDSR reportable disease (brucellosis is currently the only priority zoonotic disease that is not an IDSR reportable disease)
- Utilize existing Emergency Operations Center (EOC) for information sharing across sectors
- Integrate priority diseases into existing control platforms (e.g., vector control), or build multi-sector control platforms if they are not already in place
- Utilize public health services, both human and animal, at the borders for the control of trans-boundary zoonotic diseases
- Identify sustainable funding to support programs and plans



**Photo 11. A curious young child of the Hadzabe tribe (Africa's last hunter/gatherer tribe) in Tanzania, looks up at the sky with a big smile and bright eyes full of hope and joy.**

## Agriculture, Livestock, and Fisheries

- Strengthen capacity for surveillance and diagnosis
- Incorporate the priority zoonotic diseases into the new Biosafety and Biosecurity Multisectoral Network
- Develop integrated control plans for prevention and control
- Share data and laboratory capacity with the National Multisector Diagnostic Laboratory Network
- Utilize satellite veterinary diagnostic capacities in the field (zone based) for sample handling and storage (including vaccines)
- Incorporate a One Health approach when updating the animal trypanosomiasis surveillance platform



**Photo 12. Herd of goats in a Maasai boma (village) in Tanzania.**

## Wildlife

- Strengthen capacity for surveillance and diagnosis
- Provide a platform for investigation, surveillance, and response in protected areas
- Utilize the wildlife biological specimen bank for research
- Build laboratory capacity for wildlife disease diagnostics
- Provide training on wildlife capture, immobilization, sampling, and outbreak response
- Continue to mitigate interactions between humans and wildlife by enhancing anti-poaching awareness and activities around wildlife protected areas
- Continue to collaborate with stakeholders in the prevention, detection, response, and control at the human-wildlife-livestock interface areas

## Environment/Forestry

- Utilize available environmental programs and instruments for the prevention, control, and predicting of outbreaks

- Build capacity for environmental practitioners
- Strengthen capacity for surveillance and diagnosis
- Continue to mitigate interactions between humans and wildlife by enhancing anti-poaching awareness and activities around wildlife protected areas

## Research and Academia

- Ensure the curricula cover the priority zoonotic diseases
- Share existing courses and curricula in One Health, identify gaps and develop new materials, incorporating into routine curricula and training
- Provide evidence-based information and research
- Update research agendas to include priority zoonotic diseases
- Utilize university expertise for laboratory, response, prevention, and control
- Conduct community-based research to better understand and prevent priority zoonotic diseases, leveraging social science knowledge
- Strengthen capacity for surveillance and diagnosis in animal and human health

- Work with professional organizations covering One Health sectors providing short courses for continuous professional development (CPD)
- Secure sources of funding for student fellowships to study priority zoonotic diseases
- Work with other One Health sectors to advocate for internships for student engagement and training and ensure that the curricula allow time for students to participate in field work
- Utilizing Tanzania's One Health Coordination Unit as a One Health coordination mechanism to address the prioritized zoonotic diseases is an important next step.
- It will be useful to utilize structures already in place through GHSA, such as the GHSA goals for the zoonotic disease action package. Existing GHSA mechanisms and work plans can be used for coordination purposes as well as for furthering ongoing capacity building efforts.

### International Partners

- FAO, WHO, CDC, and USAID will work with the relevant sectors and other technical experts and development partners on core capacities related to the prevention, detection, and response for prioritized diseases in line with global health frameworks such as the IHR, OIE-PVS, and GHSA.

### Reflections and Recommendations

- Strong government ownership of the process of selecting the top zoonotic diseases was evident as the workshop attendees actively engaged in robust multisectoral discussions. Compromise, trust, and collaboration were hallmarks of this process.

- Findings from the workshop can be used to focus resources on the identified priority diseases for more in-depth capacity building such as training of local workforce to address the needs related to fighting these zoonotic disease threats.
- The activities developed by the committee should remain focused on the prioritized zoonotic diseases to ensure the greatest impact and promote future sustainability. The workshop can be repeated with the assistance of the trained in-country facilitators at any time should country needs change.



Photo 13. The fruit markets of Stone Town, on the western coast of Unguja, the main island of the Zanzibar Archipelago.



Photo 14. Young Masai woman displaying her work in a market near Arusha city, Tanzania.

## APPENDIX 1: Five Steps for CDC’s One Health Zoonotic Diseases Prioritization Tool and Workshop

### BEFORE THE WORKSHOP

<b>STEP</b> <b>1</b>	<b>PREPARE FOR THE WORKSHOP</b> <ul style="list-style-type: none"> <li>• Contact the CDC One Health Office at least 60 days before the workshop</li> <li>• Work with in-country leadership to identify 8 to 12 voting members from all relevant sectors to participate in facilitated group work</li> <li>• Clearly define the purpose and goal of the workshop with all sectors to be represented</li> <li>• Generate a list of all endemic and/or emerging zoonoses to be considered for ranking; include input from all represented sectors                         <ul style="list-style-type: none"> <li>» Note: Involves gathering reportable diseases lists</li> </ul> </li> </ul>
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### DURING THE WORKSHOP

<b>STEP</b> <b>2</b>	<b>DEVELOP CRITERIA</b> <ul style="list-style-type: none"> <li>• Identify 5 criteria that will be used to define the relative national importance of the list of zoonoses; criteria should be locally appropriate and agreed upon by voting members</li> </ul>
<b>STEP</b> <b>3</b>	<b>DEVELOP QUESTIONS</b> <ul style="list-style-type: none"> <li>• Develop one categorical question for each of the selected criteria</li> </ul>
<b>STEP</b> <b>4</b>	<b>RANK CRITERIA</b> <ul style="list-style-type: none"> <li>• Each voting member individually ranks the selected criteria; individual scores are combined to produce an overall ranked list of criteria</li> </ul>
<b>STEP</b> <b>5</b>	<b>PRIORITIZE ZONOTIC DISEASES</b> <ul style="list-style-type: none"> <li>• Score each zoonotic disease based on the answers to the categorical questions for each weighted criterion using the One Health Zoonotic Disease Prioritization Tool</li> <li>• Discuss next steps for multisectoral engagement for prioritized zoonoses</li> </ul>

### WORKSHOP OUTCOMES

<b>OUTCOMES</b>	<ul style="list-style-type: none"> <li>• Prioritized list of at least 5 zoonotic diseases that are agreed upon by all stakeholders at the end of the workshop</li> <li>• Discussions about next steps for the prioritized zoonoses in terms of identifying areas for multisectoral engagement in developing control and prevention strategies</li> <li>• Workshop summary that includes the details of the process, the list of prioritized zoonoses, and discussions and recommendations by the participants on how to jointly address capacity building, prevention, and control of prioritized zoonotic diseases</li> <li>• Final report, approved by all ministries representing core voting members, within a few months of workshop completion</li> </ul>
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For more information, visit [www.cdc.gov/onehealth](http://www.cdc.gov/onehealth)

## APPENDIX 2: Participants of the One Health Zoonotic Disease Prioritization Workshop, Dar es Salaam, Tanzania

Name	Institution	Position
<b>Voters</b>		
<b>Public Health</b>		
Dr. Faraja Lutula Msemwa	Ministry of Health—Preparedness and Response Section	Medical Officer
Ms. Jubilate Bernard	Prime Minister’s Office, One Health Coordination Unit	Public Health Specialist
Dr. George Cosmas	Ministry of Health—Epidemiology and Disease Control Section	Epidemiologist
<b>Livestock</b>		
Dr. Emmanuel Swai	Ministry of Agriculture, Livestock, and Fisheries—Epidemiology Unit	National Veterinary Epidemiologist
Dr. Joseph Masambu	Tanzania Veterinary Laboratory Agency	National Veterinary Laboratories Focal Point
Dr. Ebron Karimuribo	Sokoine University of Agriculture—SACIDS	Professor of Veterinary Public Health
<b>Wildlife</b>		
Dr. Alex Choya	Ministry of Natural Resources and Tourism	Manager Research and wildlife monitoring
Dr. Julius Keyyu	Tanzania Wildlife Research Institute	Director of Research
Dr. Morris Kileo	Ministry of Natural Resources and Tourism—Tanzania National Parks	Principal Veterinary Officer
<b>Environment</b>		
Dr. Bwire Kaitira	Vice President’s Office—Environment	Principal Environmental Officer
Mrs. Jackline Makupa	Ministry of Health—Environmental Health	Environmental Health Officer
<b>Local Facilitator Trainees</b>		
Dr. Mary Kitambi	Ministry of Health—Emergency Preparedness and Response Section	Medical Officer EPR
Ms. Abela Muyungi	Vice President’s Office—Environment Sector, National Environment Management Council	Senior environmental manager
Dr. Henry Budodi Magwisha	Ministry of Agriculture, Livestock and Fisheries—Tanzania Veterinary Laboratory Agency (TVLA)	Acting Director, Surveillance and Diagnostic Services, TVLA
<b>CDC Facilitators</b>		
Dr. Karen Alroy	CDC-Atlanta	Epidemiologist
Ms. Carrie Eggers	CDC-Atlanta	Epidemiologist
Dr. Casey Barton Behraves	CDC-Atlanta	Director, One Health Office

Name	Institution	Position
<b>Voters</b>		
<b>Observers</b>		
Janeth Maridadi Mghamba	Ministry of Health, Community Development, Gender, Elderly and Children	Assistant Director Epidemiology
Mr. Harrison Chinyuka	Prime Minister's Office—One Health Coordination Unit	One Health National Coordinator
Dr. Justine Assenga	Prime Minister's Office—Coordination Unit	Veterinary Epidemiologist
Dr. Gabriel Shirima	Nelson Mandela Institute of Science and Technology	Senior Lecturer
Prof. David Urassa	Public Health-Muhimbili University of Health and Allied Sciences—OHCEA	Professor of Community Medicine and Dean Faculty of Medicine
Prof. Japhet Killewo	Muhimbili University of Health and Allied Sciences—OHCEA	Professor of epidemiology and OHCEA focal person
Prof. Rudovic Kazwala	Sokoine University of Agriculture—PREDICT	Professor of Veterinary Public Health and PREDICT focal person
Dr. Selemani Makungu	MALF	Rabies Project Leader from MALF
Dr. Niwaeli Mtui	FAO	Epidemiologist
Dr. Theopista John	WHO	National Professional Officer
Dr. Wangeci Gatei	CDC-Tanzania	Health Scientist
Dr. Rachel Eidex	CDC-Tanzania	GHS Country Director
Ezra Mwijarubi	USAID-Tanzania	Project Manager
Ms. Ashna Kibria	USAID-Washington, USA	Public Health Advisor
Dr. Sarah Paige	USAID-Washington, USA	Senior Infectious Disease Advisor
Dr. John Kunda	USAID Preparedness and Response Project	National One Health Technical Adviser—Tanzania
Dr. Samuel Muriuki	USAID Preparedness and Response Project	Regional One Health Technical Advisor and Country Manager for Tanzania and Ethiopia

## APPENDIX 3: Complete listing of all zoonotic diseases considered during Tanzania's One Health Zoonotic Disease Prioritization Workshop and resulting scores

Prioritized Zoonotic Diseases are bolded.

#	Disease	Normalized Final Score
<b>1</b>	<b>Rabies</b>	<b>1.000</b>
<b>2</b>	<b>Rift Valley fever</b>	<b>0.907</b>
<b>3</b>	<b>Zoonotic influenza viruses</b>	<b>0.907</b>
<b>4</b>	<b>Anthrax</b>	<b>0.894</b>
<b>5</b>	<b>Trypanosomiasis (Sleeping Sickness)</b>	<b>0.802</b>
<b>6</b>	<b>Brucellosis</b>	<b>0.787</b>
7	Q-fever	0.787
8	Plague	0.706
9	Salmonellosis	0.687
10	<b>Marburg hemorrhagic fever</b>	0.613
11	Middle East Respiratory Syndrome	0.613
12	Tularemia	0.602
13	Yellow fever	0.600
14	Leptospirosis	0.589
15	Leishmaniasis	0.502
16	Campylobacteriosis	0.500
17	Cryptosporidiosis	0.500
18	Bovine cysticercosis/Taeniasis	0.496
19	Hydatidosis	0.496
20	Porcine cysticercosis/Taeniasis	0.496

#	Disease	Normalized Final Score
21	Escherichia coli	0.493
22	Giardiasis	0.493
23	Fascioliasis	0.488
24	Transmissible spongiform encephalopathy	0.413
25	Dengue fever	0.400
26	Zoonotic tuberculosis	0.395
27	Schistosomiasis	0.395
28	Toxoplasmosis	0.395
29	West Nile virus	0.395
30	Toxocariasis	0.388
31	Crimean Congo Hemorrhagic Fever (CCHF)	0.313
32	Tick borne relapsing fever	0.295
33	Trichinellosis	0.295
34	Onchocerciasis	0.295
35	Dermatophytoses (ring worms)	0.295
<b>36</b>	<b>Ebola viruses</b>	<b>0.213</b>
37	Zika virus	0.202
38	Monkeypox	0.200
39	Lassa fever	0.093

## APPENDIX 4: Ranked criteria and corresponding question and answers with assigned weights

### Criteria 1: Severity of Disease in Humans (E-0.2128808)

Question: What is the case fatality rate?

Answer:

- 0–5% (0)
- More than 5 to 20% (1)
- More than 20% (2)

### Criteria 2: Presence of Disease in Country/Region (A-0.2017294)

Question: Has the disease been reported/prevalent in humans or animals in the country/region in the past 10 years?

Answer:

- Yes (1)
- No (0)

### Criteria 3: Socio-economic Impact (B-0.2005564)

Question: Does the disease have an impact on animal production (>20%) and on trade (Tanzania Animal Disease Act/OIE list)?

Answer:

- Both (2)
- Either one (1)
- Neither (0)

### Criteria 4: Epidemic and Pandemic Potential (D-0.198375)

Question: Has there been an outbreak in the last 10 years in Tanzania or the region?

Answer:

- Yes (1)
- No (0)

### Criteria 5: Availability of Interventions (C-0.1864584)

Question: Is there any intervention (vaccine, treatment, or vector control) in either human or animal populations?

Answer:

Intervention exists in:

- Both human and animal (2)
- Either human or animal (1)
- Neither human or animal (0)



Photo 15. A TingaTinga painter painting a TingaTinga painting in Dar es Salaam.

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**Photo 16. Masai herding cattle in the Ngorongoro Conservation Area.**

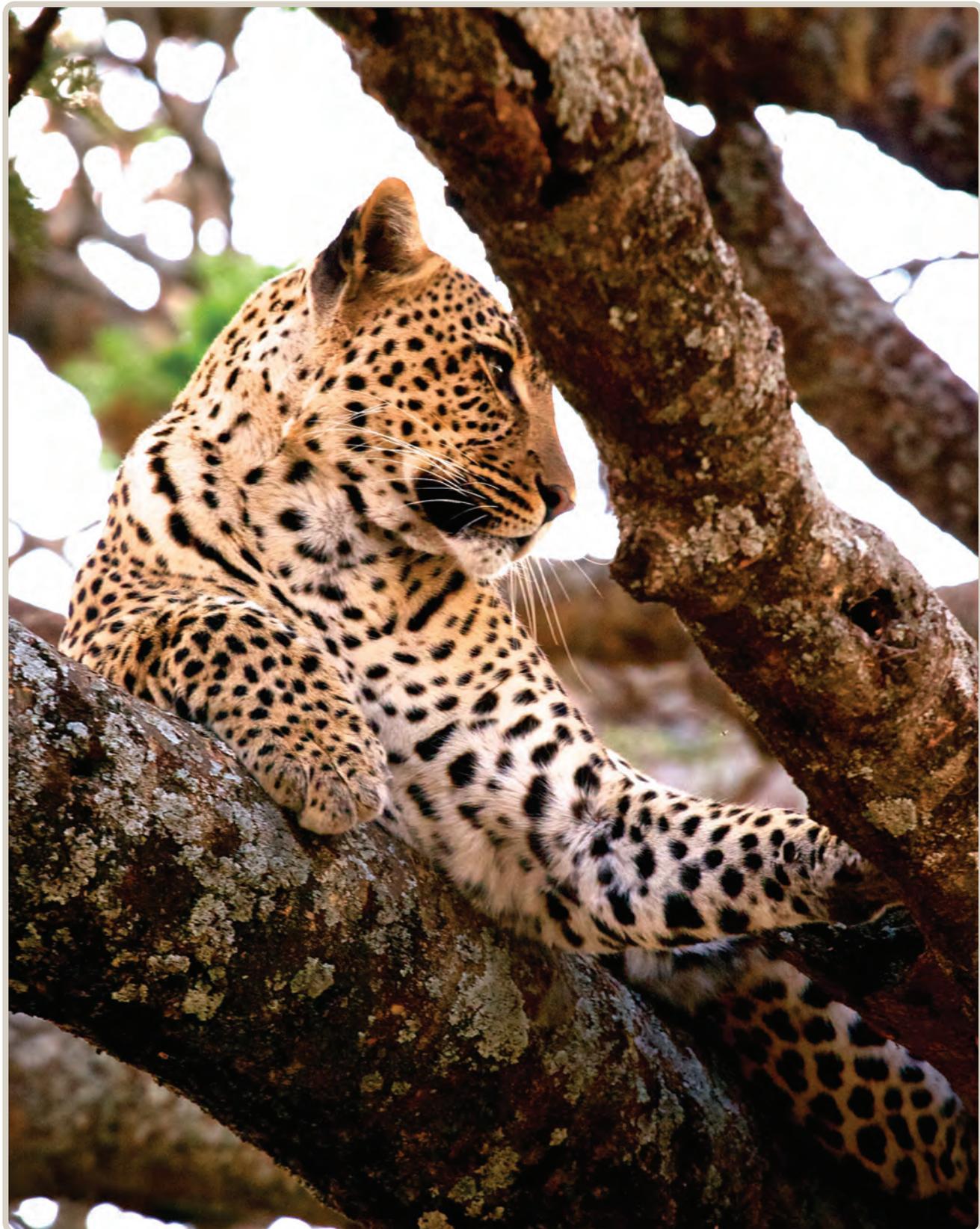


Photo 17. Cheetah in a tree in Serengeti National Park, Tanzania.

