



# Workshop Summary

# One Health Zoonotic Disease Prioritization for Multisectoral Engagement in Mali

Bamako, Mali



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United Nations



**Photo 1. Baobab tree at sunset, Kayes, Mali**

## **PARTICIPATING ORGANIZATIONS**

Members from multiple sectors attended as voting members, observers, facilitators, and organizers. The list below indicates the participating organizations; however, a complete list of participants can be found in the appendix.

**ASCOMA:** Association des Consommateurs du Mali / Consumer Association of Mali

**CDC:** U.S. Centers for Disease Control and Prevention

**CNAM:** Centre National d'Appui à la Lutte contre la Maladie/ National Center for Support of Disease Control, Ministry of Health and Public Hygiene

**CNASA:** Centre National d'Appui à la Santé Animale / National Center for Support of Animal Health, Ministry of Livestock and Fisheries

**CT/MESRS:** Conseiller Technique du Ministère de l'Enseignement Supérieur et de la Recherche Scientifique / Technical Adviser in the Ministry of Higher Education Scientific Research

**DCSSA:** Direction Centrale des Services de la Santé des Armées / Central Directorate of Army Health Services

**DGPC:** Direction Générale de la Protection Civile / General Directorate of Civil Protection, Ministry of Security and Civil Protection

**DNA:** Direction Nationale de l'Agriculture / National Directorate of Agriculture, Ministry of Agriculture

**DNACPN:** Direction Nationale de l'Assainissement et de la Lutte contre les Pollutions et les Nuisances / National Directorate of Sanitation and the Fight against Pollution and Nuisances

**DNEF:** Direction Nationale des Eaux et Forêts / National Directorate of Water and Forest, Ministry of Environment, Sanitation and Sustainable Development

**DNS:** Direction Nationale de la Santé / National Directorate of Health

**DNSV :** Direction Nationale des Services Vétérinaires / National Directorate of Veterinary Services

**ECTAD:** FAO Emergency Centre for Transboundary Animal Diseases

**FAO:** Food and Agricultural Organization

**FETP:** Field Epidemiology Training Program

**Fondation Merieux**

**ICD:** Initiative Commune pour le Développement / Joint Initiative for Development

**ICER-SEREFO:** International Center for Excellence in Research

**IMC:** International Medical Corps

**INRSP:** Institut National de Recherche en Santé Publique / National Institute of Public Health Research, Ministry of Health and Public Hygiene

**IPR/IFRA:** Institut Polytechnique Rurale/Institut de Formation et de Recherche Appliquée / Rural Polytechnic Institute / Institute of Training and Applied Research

**LCV:** Laboratoire Central Vétérinaire / Central Veterinary Laboratory

**MA:** Ministère de l'Agriculture / Ministry of Agriculture

**MDAC:** Ministère de la Défense et des Anciens Combattants / Ministry of Defense and Veterans

**MEADD:** Ministère de l'Environnement, de l'Assainissement et du Développement Durable / Ministry of Environment Sanitation and Sustainable Development

**MEP:** Ministère de l'Elevage et de la Pêche / Ministry of Livestock and Fisheries

**OPV:** Office de la Protection des Végétaux /Office of Plant Protection

**P&R:** Projet Préparation et Réponse / Preparedness and Response

**VSF-B:** Vétérinaires Sans Frontières Belgique / Veterinarians Without Borders Belgium

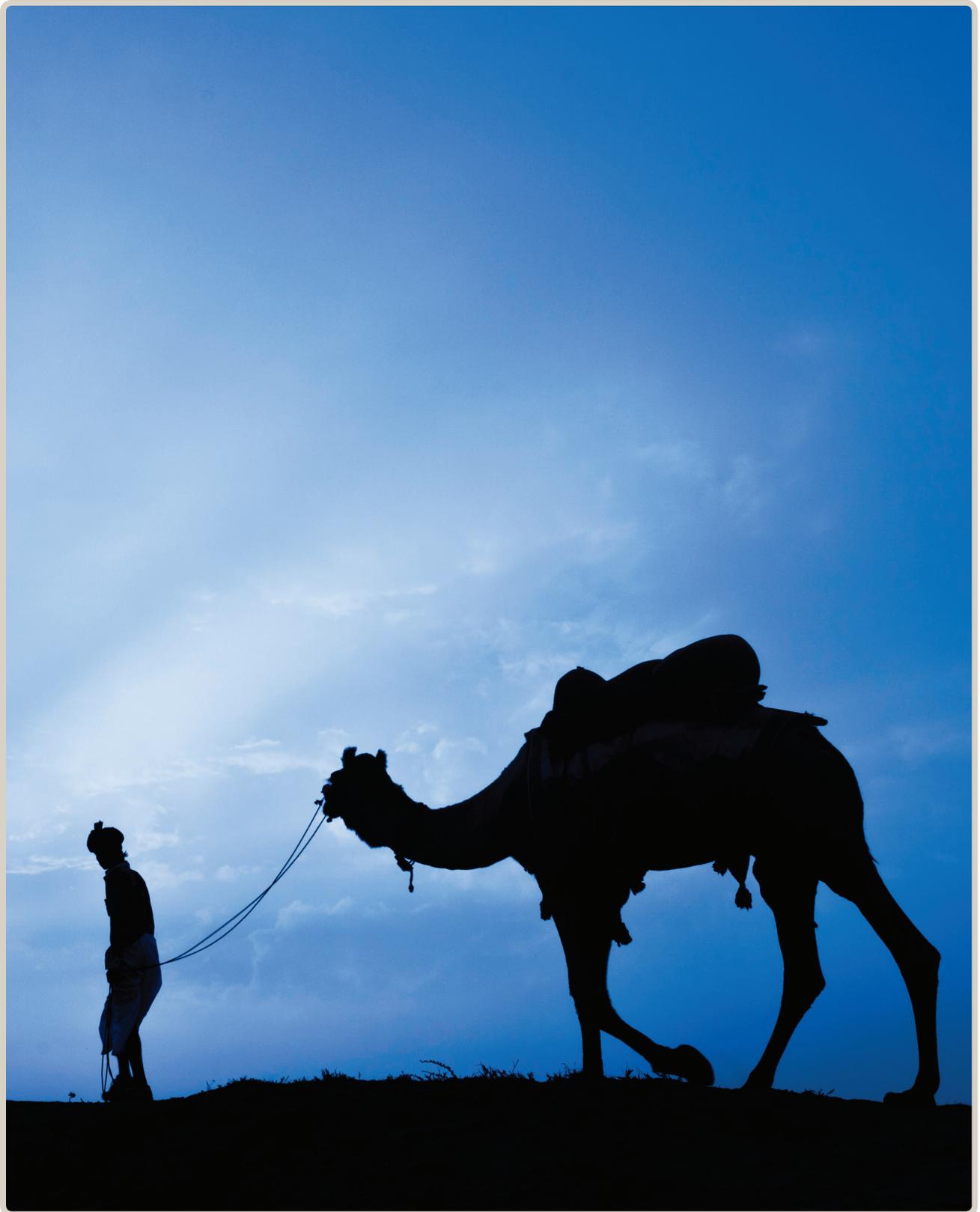


Photo 2. A man walking his dromedary camel at dusk.

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## SUMMARY

The purpose of this 2-day workshop was to identify zoonotic diseases of greatest national concern for Mali using a One Health approach with input from representatives of human health, livestock, agriculture, and environmental sectors. In preparation for the workshop, representatives identified a list of zoonotic diseases relevant for Mali. Before the workshop, representatives from the different sectors refined the list of diseases for consideration. During the workshop, they defined the criteria for prioritization and determined questions and weights relevant to each criterion. Mali's prioritized zoonotic diseases were identified using the One Health Zoonotic Disease Prioritization (OHZDP) tool, a semi-quantitative selection tool developed by the U.S. Centers for Disease Control and Prevention (CDC) (Appendix A)<sup>1,2</sup>. At the workshop, representatives from Mali (Appendix B), prioritized the following five diseases: anthrax, bovine tuberculosis, rabies, viral hemorrhagic fevers (including Crimean-Congo hemorrhagic fever, Ebola, Lassa, Marburg, Rift Valley fever, and yellow fever) and zoonotic influenza (Table 1).



The final results of the OHZDP Tool, including normalized weights for all zoonotic diseases discussed in Mali, are shown in Appendix C. This report summarizes the One Health process used to prioritize the top zoonotic diseases for Mali that should be jointly addressed using a multisectoral, One Health approach including human, livestock, agriculture, and environmental sectors.



**Photo 3. One Health Zoonotic Disease Prioritization Workshop participants from human, livestock, agriculture, and environmental health sectors in Bamako, Mali.**

**Table 1. Prioritized Zoonotic Diseases Selected in Mali during the One Health Zoonotic Disease Prioritization Workshop in October 2017**

Zoonotic Disease	Causative Agent	Human Disease Burden	Animal Disease Burden	Diagnostics, Treatment, and Prevention
<b>Anthrax</b>	Bacteria	Anthrax is endemic in Mali. The last major reported outbreak among people was in Kati and resulted in 84 human cases and 19 deaths <sup>3</sup> .	The primary source of infection for anthrax is soil. Animals in Mali and in the region are commonly infected with anthrax, particularly during the dry season <sup>4</sup> .	Effective animal and human vaccine and treatment for people exist <sup>5,6</sup> . The Central Veterinary Laboratory of Mali produces the animal anthrax vaccine.
<b>Bovine tuberculosis</b>	Bacteria	The exact number of human cases of bovine tuberculosis in Mali is unknown; however, crude prevalence estimates suggest that at least 1.5% of the population is infected <sup>7</sup> .	Bovine tuberculosis is considered highest in intensive peri-urban production farms where bovine skin tests show 19% of animals are positive <sup>8</sup> . Abattoir studies show pulmonary lesions in 1.9% of cattle <sup>9</sup> .	Effective treatment for humans is available. Tuberculosis is prevented in people by controlling the infection in animals and by boiling or pasteurizing milk and dairy products. In Mali, as in most countries in the region, vaccination in animals is not a common practice.
<b>Rabies</b>	Virus	Between 2007-2012, 40 human cases of rabies were reported in Mali; however, this is believed to be a substantial underestimation of the burden due to insufficient disease surveillance <sup>10</sup> .	Mali's Central Veterinary Laboratory has documented 447 animals (435 dogs, 4 cats, 4 cows, and 4 monkeys) as being positive for rabies from samples submitted between 2000-2013 <sup>11</sup> .	Effective animal vaccines exist. Post-bite vaccines in humans can be effective if given early enough. Once symptoms begin, all patients die <sup>12</sup> .
<b>Viral hemorrhagic fevers (including Crimean-Congo hemorrhagic fever, Ebola, Lassa, Marburg, Rift Valley fever, yellow fever)</b>	Virus	Viral hemorrhagic fevers are serious diseases that can be fatal. There were 8 human cases and 6 deaths caused by Ebola virus in Mali during the 2014-2016 outbreak in West Africa <sup>1</sup> . In September 2016, outbreaks of Rift Valley fever were registered in humans in Niger, close to Mali's northern border <sup>14</sup> .	Viral hemorrhagic fevers are present in animals in Mali. Malian cattle show 66% seropositivity to Crimean-Congo hemorrhagic fever <sup>15</sup> . In September 2016, outbreaks of Rift Valley fever were registered in Niger, close to Mali's northern border and waves of abortions and deaths among livestock were reported <sup>14</sup> .	Vaccines exist for yellow fever virus and Ebola virus <sup>16</sup> . The antiviral ribavirin has been used for some viral hemorrhagic fevers; however, treatment is largely supportive <sup>17</sup> .
<b>Zoonotic influenza</b>	Viruses	Zoonotic influenza viruses have the potential to cause global pandemics. Mali reported 40 human cases in 2010 following the H1N1 pandemic <sup>18</sup> .	Influenza viruses have been documented in both swine and avian populations in West Africa <sup>19</sup> .	Oseltamivir (Tamiflu™) can reduce mortality in people with H5N1 and has been shown to control disease outbreaks for avian influenza subtype H7 <sup>20</sup> . Otherwise, treatment for people is mainly supportive <sup>21</sup> .

## INTRODUCTION

Zoonotic diseases are diseases that spread between animals and people. Most known human infectious diseases and about three-quarters of newly emerging infections originate from animals. Mali is a land-locked country located in West Africa. It is bordered by Mauritania and Algeria to the north, Niger and Burkina Faso to the east, Côte d'Ivoire and Guinea to the south, and Senegal to the west. Mali has 10 administrative regions (Kayes, Koulikoro, Sikasso, Ségou, Mopti, Gao, Tombouctou, Kidal, Taoudénit, and Ménaka) as well as the District of Bamako, which has a special administrative status. The population of Mali was estimated to be 17,885,245 in 2017, with 51% of the population being female, 67% being people under 25 years of age, and only 3% being people over 60 years of age. Most of the population resides in the southern part of the country and along the Niger River. The average annual population growth rate is 3%<sup>22</sup>.

Sixty-four percent of Mali's area is rural. Two major rivers flow through Mali: the Niger and the Senegal. The country has four bioclimatic areas in 49 agroecological zones in addition to the inner Niger Delta, characterized by specific ecosystems. From north to south, there are: the Saharan zone in the north, which covers two-thirds of the country, with annual rainfall less than 150 mm; the Sahelian zone in the center, with rainfall between 200 and 550 mm; the Sudanian zone to the south, with rainfall varying from 600 to 1,200 mm per year; and the Sudano-Guinean zone in the southernmost part of the country, with rainfall averaging more than 1,200 mm per year. The inner Niger Delta, in the center of the country, is characterized by a Sudano-Sahelian climate with rainfall between 200 and 600 mm per year and hydrologic and specific ecologic conditions<sup>23</sup>.

Mali is a country with considerable natural resources and a wide variety of species. It has 1,739 spontaneous woody plant species distributed between 687 genera from 155 families. Eight species



of plants are considered endemic to Mali: *Leptadenia waillyi*, *Elatine fauquei*, *Pteleopsis habeensis*, *Hibiscus pseudohirtus*, *Acridocarpus monodii*, *Gilletiodendron had*, *Brachystelma medusanthemum*, and *Pandanus raynalii*. There are several national parks within Mali, including the Mandingue highlands classified forest, Faya Forest Reserve, Bafing National Park, Bougouni-Yanfolila wildlife reserve, and Boucle du Baoulé National Park<sup>24</sup>. Mali's wildlife is characterized by a diversity of species and a relatively small number of staff to protect them. It has more than 136 species of mammals<sup>25</sup>, including 70 species of large mammals. Forty-two species live in the Western Savanna and the Sahel region. Some of these species are currently declining or regionally extinct. There are at least 640 species of birds, of which 15 are considered rare. Migratory birds spend 75% of their time in the Niger Delta, where they protect themselves from the harsh winter and prepare to face their journey to Europe. They take advantage of the abundant food and breed between two migrations. The country's rivers are rich with nearly 143 species of fish belonging to 67 genera and 26 families<sup>26</sup>.

Mali's economy, dominated by the informal sector, is based on primary production (agriculture, livestock, fishing and aquaculture), which covers

almost 80% of the active population. The potential benefits of the agricultural sector are enormous since 43.7 million ha of land are used for agriculture and livestock, on which 5.2 million ha (11.9%) are cultivated annually. Less than 300,000 ha receive water sources other than rain, with 120,000 ha completely relying on irrigation<sup>27</sup>.

Mali has the second largest animal population of the Economic Community of West African States (ECOWAS) and the largest of the West African Economic and Monetary Union (WAEMU). According to statistics from the minister in charge of livestock in 2016, the breakdown of livestock is as follows: 10,622,750 cattle; 36 million sheep and goats; 1 million camels; 38,587,450 chickens, of which more than 90% are backyard poultry; and 1.5 million horses and donkeys. The pig population is estimated at less than 100,000<sup>27</sup>. The livestock sector accounts for 15% of Mali's GDP. Mali exports about 20% of its animal products to several countries in West Africa, including Côte d'Ivoire, Ghana, and Nigeria. Therefore, the livestock sector is a key component of the Malian economy, but its development is

hampered by zoonoses and endemic transboundary but its development is hampered by zoonoses and endemic transboundary diseases such as contagious bovine pleuro-pneumonia, rinderpest, pasteurellosis, Newcastle disease, foot and mouth disease, and lumpy skin disease. Additionally, sheep and goats are widely distributed and adapted to many agroecological zones. Most livestock in Mali are produced in extensive production and smallholder systems where they co-exist freely with wildlife. Mali is characterized by wildlife co-existing side-by-side with livestock and humans, especially in rural areas, providing a perfect setting for the emergence and spread of zoonotic diseases.

## ONE HEALTH IN MALI

Following the 2010 Tripartite Concept Note of the FAO-OIE-WHO<sup>28</sup> and the recommendations from the ministerial meeting held in Dakar in November 2016, there was interest from the Government of Mali to develop a National One Health collaboration platform. In Mali, four primary ministries were included in this planning: the Ministry of Health and

Public Hygiene, the Ministry of the Environment Sanitation and Sustainable Development, the Ministry of Livestock and Fisheries, and the Ministry of Agriculture. The Ministry of Agriculture was included in Mali specifically due to the large population involved in agropastoralism and specific diseases related to crops. These four ministries were the key institutions, and the Government of Mali identified an additional eight ministerial departments that were deemed to be essential for One Health collaboration. One or more focal points and alternates from each ministry and relevant department were appointed, totaling 46 focal points.

On October 31, 2016, the Government of Mali held a workshop that included all representing ministries and departments, during which decisions were made regarding the National One Health Platform. The Ministry of Health took the lead on the One



Photo 4. A colorful chameleon.



**Photo 5. Young child carrying home live chickens.**

Health effort, however, an inter-ministerial decree was needed to formalize the One Health Platform among all government parties. The One Health Platform would be organized via a governing secretariat with a steering committee and it would be additionally divided into thematic groups with technical experts under a technical committee. As of October 2017, following the agreed roadmap, a draft decree has been developed and is under review by the key ministries involved in One Health for approval and signature.

Zoonotic diseases that occur in large numbers primarily can impact Malian society in three main ways:

- Threaten the health of animals resulting in illness, loss of productivity, and death.
- Threaten the livelihood of a large segment of the population dependent on livestock as a major source of income, particularly women and smallholders in rural areas.
- 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

A One Health Zoonotic Disease Prioritization Workshop was identified by national representatives from Mali as the first step toward addressing the public health challenges associated with zoonotic disease threats. To begin to address these challenges, a One Health Zoonotic Disease Prioritization Workshop was conducted on October 25-26, 2017, at the Radisson Blu Hotel in Bamako, Mali. The purpose of this 2-day workshop was to identify zoonotic diseases of greatest national concern in Mali using input from representatives from the human health, agriculture, livestock, and environment 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. It was supported by the Government of Mali, CDC, FAO, USAID, and the P&R project as part of the Global Health Security Agenda (GHSA). In efforts to build in-country capacity to conduct future One Health Zoonotic Disease Prioritization Workshops, six local government representatives from the human, animal, and environmental health sectors were trained by CDC and FAO as facilitators and also served as the facilitators during the workshop.



**Photo 6. Goats wandering in front of the Great Mosque of Djenné in Mali.**

The in-country facilitator training took place on October 23-24, 2017, at the Radisson Blu Hotel in Bamako, Mali. All but one voting members of this workshop were in attendance for the training.

## WORKSHOP METHODS

### Prioritization Process

The prioritization process involved application of CDC's One Health Zoonotic Disease Prioritization Tool<sup>1,2</sup>. Preparations for the One Health Zoonotic Disease Prioritization Workshop began more than two months in advance. FAO coordinated the in-country Mali team and CDC's One Health Office organized and coordinated activities for the workshop.

The first step of the process was to identify a country-specific list of potential zoonotic diseases of concern. This was achieved in a multi-step process. The ministry focal points of GHSA in Mali met with P&R and generated an initial zoonotic diseases list for prioritization. The zoonotic diseases from Mali's reportable animal diseases list as well as from the Mali Epidemiology Bulletin were compared to this list and missing diseases were added. A single draft list was compiled from these sources and was shared with all participating organizations for review

and comment. Through multiple revisions with subject matter experts from these ministries and departments and further input from the facilitator training participants, the list was refined to include 38 zoonotic diseases. These zoonotic diseases formed the final list for prioritization during the workshop. See Appendix C for a complete list of the zoonotic diseases used for prioritization and their resulting scores.

Next, during the workshop, voting members jointly identified five criteria for quantitative ranking of these 38 zoonotic diseases. The five criteria were: gravity of the disease, capacity for intervention, socioeconomic impact, bioterrorism potential, and presence of the disease in Mali and neighboring countries. Once criteria and questions were chosen, each voting member individually ranked the relative importance of each criterion to 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 questions were developed and agreed upon through group consensus. Data for answering the questions for each of the 38 zoonotic diseases were



**Photo 7. A woman washing a gourd.**

identified through an extensive literature search, including information from the government of Mali, WHO, OIE, FAO, CDC, USAID, and online sources such as ProMED and HealthMap. If disease information for a particular disease was not available for Mali specifically, regional 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. See Appendix C for the list of 38 diseases and corresponding scores, as prioritized by the OHZDP Tool. See Appendix D for a complete listing of all criteria, criteria ranking,

questions, answers and corresponding scores.

The list of zoonotic diseases and their normalized scores was presented by the national facilitators to the group (i.e., voting members, observers, and organizers) on the second day of the workshop for discussion. After discussion among the various sectors, the voting members from all represented government departments agreed on a final list of priority zoonotic diseases or disease groups for Mali: anthrax, bovine tuberculosis, rabies, viral hemorrhagic fevers (Crimean-Congo hemorrhagic fever, Ebola, Lassa, Marburg, Rift Valley fever, yellow fever), and zoonotic influenza.

### Criteria Selected for Ranking Zoonotic Diseases

The criteria for ranking zoonotic diseases selected by the voting members in Mali are listed in order of importance below. See Appendix D for the weighted criterion, questions, and answers.

1. Severity of the Disease
2. Capacity of Intervention
3. Socioeconomic Impact
4. Bioterrorist Potential
5. Presence of the Disease

## PLANS AND RECOMMENDATIONS

Following the agreement of the prioritized diseases, the workshop participants identified next steps and further actions that could be taken by each sector to engage in a One Health, multisectoral approach. Participants were asked to make general recommendations for how to approach the priority diseases without considering the constraints. They were then asked to identify specific activities that their sectors and organization could accomplish. The recommendations for additional actions are described below.

### Collaboration

- For each of the prioritized zoonotic diseases, specific surveillance and response plans will be developed and integrated between all sectors, if ones do not already exist.

- In the development of these surveillance and response plans, the ministries will capitalize on the existing achievements in multisectoral collaboration and cooperation, and will purposefully avoid creating redundant systems.
- Development of Human Resources
  - The notion of One Health, Une Seule Santé, will be promoted in a multisectoral way through a national celebration/day of awareness for One Health, rabies, and other prioritized diseases.
  - Personnel will be trained in biosecurity and biosafety across sectors in order to strengthen the country’s ability to safely handle and diagnose the prioritized zoonotic diseases.
  - The five prioritized diseases and disease groups will be emphasized in trainings within each ministry and for collaborative trainings with multiple sectors.

### Scientific Research

- Multisectoral, collaborative scientific research will be pursued with a focus on one or more of the five prioritized diseases.
- Reinforce Laboratory and Surveillance Capacity
  - Laboratory tests will be made available at the peripheral levels for improved diagnosis of the five prioritized diseases.
  - Training and continuing education programs will be conducted for laboratory personnel on the topic of the five prioritized diseases.
  - Systems of packaging, shipping, specimen transportation methods, and referral will be improved for the prioritized diseases.
  - Systems of detection, notification, and response will be enhanced in a multisectoral way for the prioritized diseases.

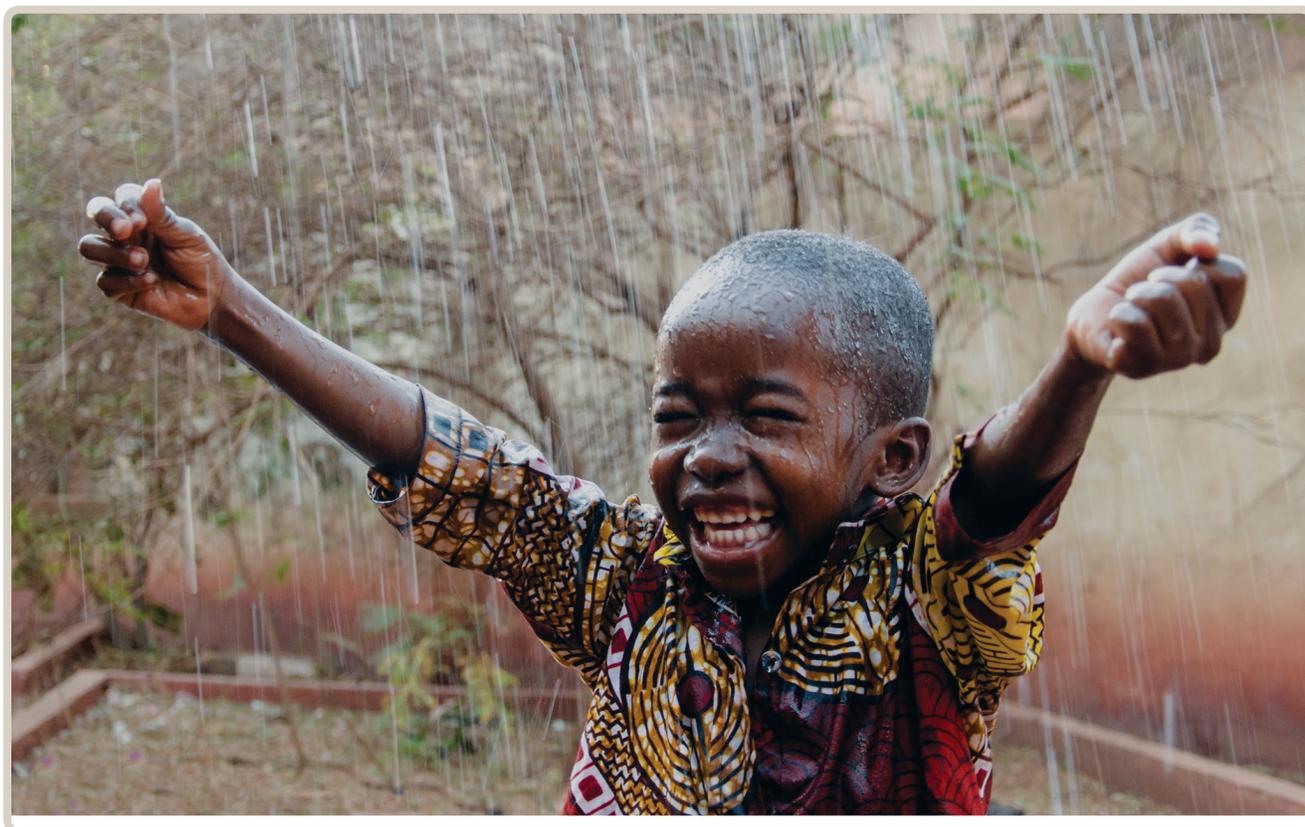


Photo 8. A boy enjoying the rain in Mali.



Photo 9. A woman picking papaya.

## APPENDIX A: Overview of the One Health Zoonotic Disease Prioritization Process

U.S. Centers for Disease Control and Prevention: Overview of the One Health Zoonotic Disease Prioritization Workshop  
<https://www.cdc.gov/onehealth/global-activities/prioritization-workshop.html>

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

#### BEFORE THE WORKSHOP

#### STEP

1

#### PREPARE FOR THE WORKSHOP

- Contact the CDC One Health Office at least 60 days before the workshop
- Work with in-country leadership to identify 8 to 12 voting members from all relevant sectors to participate in facilitated group work
- Clearly define the purpose and goal of the workshop with all sectors to be represented
- Generate a list of all endemic and/or emerging zoonoses to be considered for ranking; include input from all represented sectors
  - » Note: Involves gathering reportable diseases lists

#### DURING THE WORKSHOP

#### STEP

2

#### DEVELOP CRITERIA

- Identify 5 to 8 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

#### STEP

3

#### DEVELOP QUESTIONS

- Develop one categorical question for each of the selected criteria

#### STEP

4

#### RANK CRITERIA

- Each voting member individually ranks the selected criteria; individual scores are combined to produce an overall ranked list of criteria

#### STEP

5

#### PRIORITIZE ZOOTIC DISEASES

- Score each zoonotic disease based on the answers to the categorical questions for each weighted criterion using the One Health Zoonotic Disease Prioritization Tool
- Discuss next steps for multisectoral engagement for prioritized zoonoses

#### WORKSHOP OUTCOMES

#### OUTCOMES

- Prioritized list of at least 5 zoonotic diseases that are agreed upon by all stakeholders at the end of the workshop
- Discussions about next steps for the prioritized zoonoses in terms of identifying areas for multisectoral engagement in developing control and prevention strategies
- 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
- Final report, approved by all ministries representing core voting members, within a few months of workshop completion

For more information, visit [www.cdc.gov/onehealth](http://www.cdc.gov/onehealth)

## APPENDIX B: Participants of the One Health Zoonotic Disease Prioritization Workshop, Bamako, Mali

### Voting Members

Name	Title/Position	Organization
Abdoul Karim SIDIBE	Physician / Chief, Division of Epidemiological Surveillance	DNS, Ministry of Health and Public Hygiene
Seydou DIARRA	Physician / Head of the Bacteriology Department	INRSP, Ministry of Health and Public Hygiene
Mamoudou KODIO	Physician / Laboratory Manager	CNAM, Ministry of Health and Public Hygiene
Seydou DARA	Veterinarian / Program Officer	DNSV, Ministry of Livestock and Fisheries
Abdallah TRAORE	Veterinarian / Laboratory Manager	LCV, Ministry of Livestock and Fisheries
Soumaïla SANTARA	Veterinarian / Head of Risk Assessment Department	CNASA, Ministry of Livestock and Fisheries
Karim COULIBALY	Professor of Secondary Education / Head of the Communication Sector	DNACPN, Ministry of the Environment, Sanitation, and Sustainable Development
Madame Maïga Awa Cherif DOUMBIA	Water and Forestry Engineer / Planning Officer with Area of Interest in Hunting	DNEF, Ministry of the Environment, Sanitation, and Sustainable Development
Sékou CISSE	Agricultural and Rural Engineer / Program Manager	DNA, Ministry of Agriculture
Dr Issa BARADJI	Veterinarian / Technical Advisor	Ministry of Higher Education and Scientific Research
Dr Mamadou Moussa DIARRA	Veterinarian / Professor of Animal Health	IPR/IFRA, Ministry of Higher Education and Scientific Research

### Observers

Name	Title/Position	Organization
Médecin Col. Aïssata MAIGA	Physician / Chief of the Division of Medical Aid	DGPC, Ministry of Security and Civil Protection
Dr Abasse SANOGO	Physician / Military	DCSSA, Ministry of Defense and Veterans
Dr Lassina DOUMBIA	Physician	Faculty of Science and Technology (Laboratory of Zoonoses), Ministry of Higher Education and Scientific Research
Cheick Abdel Kader FOFANA	Architect	ASCOMA
Professeur Massambou SACKO	Disease Control Adviser	Representative of the World Health Organization (WHO) in Mali
Dr Aliou KAYO	Technical Officer	IMC
Mohamed GADIAGA	Project Manager	Mérieux Foundation
Dr Fatou SAMAKE	Director ICD	Veterinarians Without Borders Belgium
Dr Adama DAOU	Public Health Doctor, Member of the National Council of the Order	Order of Physicians of Mali

## Facilitators

Name	Title/Position	Organization
Dr Souleymane DIARRA	Physician / National Coordinator, GHSA	INRSP, Ministry of Health and Public Hygiene
Adama DIAWARA	Physician / Head of the Emergency Operations Department / Public Health	CNAM, Ministry of Health and Public Hygiene
Dramane DAO	Veterinarian / Chief, Epidemiological Surveillance Section	DNSV, Ministry of Livestock and Fisheries
Satigui SIDIBE	Veterinarian / Chief, Diagnostic and Research Service	LCV, Ministry of Livestock and Fisheries
M. Thieman DRAME	Water and Forestry Engineer / Chief, Hunting, Beekeeping, Game, and Forest Focus Area Section	DNEF, Ministry of the Environment, Sanitation, and Sustainable Development
M. Oumar SY	Agricultural and Rural Engineer	OPV, Ministry of Agriculture
Dr Lassina OUATTARA	Veterinarian / Country Team Leader, ECTAD	FAO Mali
Dr Karen ALROY	Epidemiologist	CDC
Dr Julie R. SINCLAIR	One Health Liaison to OIE	CDC/ World Organization for Animal Health
Dr Issa BARADJI	Veterinarian / Technical Advisor	Ministry of Higher Education and Scientific Research
Dr Mamadou Moussa DIARRA	Veterinarian / Professor of Animal Health	IPR/IFRA, Ministry of Higher Education and Scientific Research

## Organizers

Name	Title/Position	Organization
Lionel GBAGUIDI	Regional One Health Technical Advisor (ROHTA)	P&R
Dr SYLLA Djénéba SY	Technical Advisor	P&R
Dr Jean KAMATE	Medical Officer / Public Health Advisor	CDC Mali
Celia WOODFILL	DGHP Country Director	CDC Mali
Karen KOPRINCE	Acting Health Office Director	USAID Mali
Stephanie MARTZ	Technical Advisor GHSA	USAID Mali
Sidi Yeya CISSE	Health Policy Advisor	USAID Mali
Mahmoudou DIALL	Veterinarian / National Coordinator ECTAD	FAO ECTAD Mali
Lassina DOUMBIA	Veterinarian / Expert Epidemiologist ECTAD	FAO ECTAD Mali
Alhousseini DICKO	Veterinarian / Animal Science Expert	FAO Mali
Anou There Thérèse THERA	Operations Assistant	FAO Mali
Dr Bouyagui TRAORE	Physician / Coordinator	Mali FETP Coordination Team
Dr Ken KAYEMBE	Physician	Mali FETP Coordination Team
Grace GORYOKA	Health Scientist	CDC, One Health Office
Dr Casey BARTON BEHRAVESH	Director	CDC, One Health Office

## APPENDIX C: Zoonotic Disease List Considered in One Health Zoonotic Disease Prioritization Workshop and Resulting Scores

Zoonotic diseases considered for prioritization in Mali: Final results of prioritization and normalized weights for 38 zoonotic diseases. The top prioritized zoonotic diseases selected by the voting members representing all ministries active in zoonotic disease work are shown in bold.

#	Disease	Normalized Final Score
<b>1</b>	<b>Anthrax</b>	<b>1.00</b>
<b>2</b>	<b>Rift Valley fever</b>	<b>1.00</b>
<b>3</b>	<b>Rabies</b>	<b>0.93</b>
<b>4</b>	<b>Zoonotic influenza (including avian influenza and swine influenza)</b>	<b>0.85</b>
<b>5</b>	<b>Ebola virus disease</b>	<b>0.84</b>
<b>6</b>	<b>Yellow fever</b>	<b>0.71</b>
<b>7</b>	<b>Bovine tuberculosis</b>	<b>0.71</b>
8	Brucellosis	0.70
<b>9</b>	<b>Lassa fever</b>	<b>0.68</b>
10	<b>Marburg hemorrhagic fever</b>	0.62
11	Colibacillosis	0.52
12	Salmonellosis	0.43
13	Q Fever	0.38
14	Borreliosis and recurrent tick fever	0.37
<b>15</b>	<b>Crimean-Congo hemorrhagic fever</b>	<b>0.33</b>
16	Botulism	0.33
17	Ascariidosis	0.31
18	<i>Taenia solium</i>	0.31
19	<i>Taenia saginata</i>	0.31
20	Trypanosomiasis	0.31

#	Disease	Normalized Final Score
21	Leptospirosis	0.30
22	Pasteurellosis	0.30
23	Toxoplasmosis	0.28
24	Dracunculiasis	0.27
25	Cutaneous and visceral leishmaniasis	0.27
26	Severe acute respiratory syndrome (SARS)	0.27
27	Contagious ecthyma	0.26
28	Contagious vesicular stomatitis	0.26
29	Cowpox	0.22
30	Erysipeloid	0.19
31	Listeriosis	0.19
32	Lyme disease	0.19
33	Tularemia	0.18
34	Lymphocytic choriomeningitis	0.15
35	Bartonellosis	0.11
36	Trichinellosis	0.11
37	Bubonic plague	0.07
38	Psittacosis	0.04

## APPENDIX D: Ranked Criteria, Corresponding Questions, and Answers with Assigned Weights

### Criteria A: Severity of the disease (0.35)

**Question: What is the lethality in humans?**

**Answer:**

- >50% (3)
- 6-49% (2)
- 0-5% (1)

### Criteria B: Capacity of intervention (0.17)

**Question: Does the country of have available capacity for diagnosis, vaccine or treatment in humans or animals?**

**Answer:**

- All three capacities (3)
- Two of the three (2)
- One of the three capacities (1)
- No capacity in humans nor animals (0)

### Criteria C: Socioeconomic impact (0.13)

**Question: What is the socioeconomic impact of the disease?**

**Answer:**

- Impact on both mortality and productivity in animals (3)
- Impact on mortality in animals (2)
- Impact on productivity in animals (1)
- No impact (0)

### Criteria D: Bioterrorism potential (0.08)

**Question: Is the disease on the list of select bioterrorism agents?**

**Answer:**

- Yes (1)
- No (0)

### Criteria E: Presence of the disease (0.26)

**Question: Has the disease been present in Mali and neighboring countries over the past 10 years?**

**Answer:**

- Present in Mali (2)
- Present in the sub-region (1)
- Not present in Mali or the sub-region (0)



Photo 10. A boy carrying a goat.

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Photo 10. Sunset at Niger's River, with a young fisherman in a pinnace in Mali.

