



Workshop Summary

Prioritizing Zoonotic Diseases for Multisectoral One Health Collaboration in Ethiopia



Addis Ababa, Ethiopia



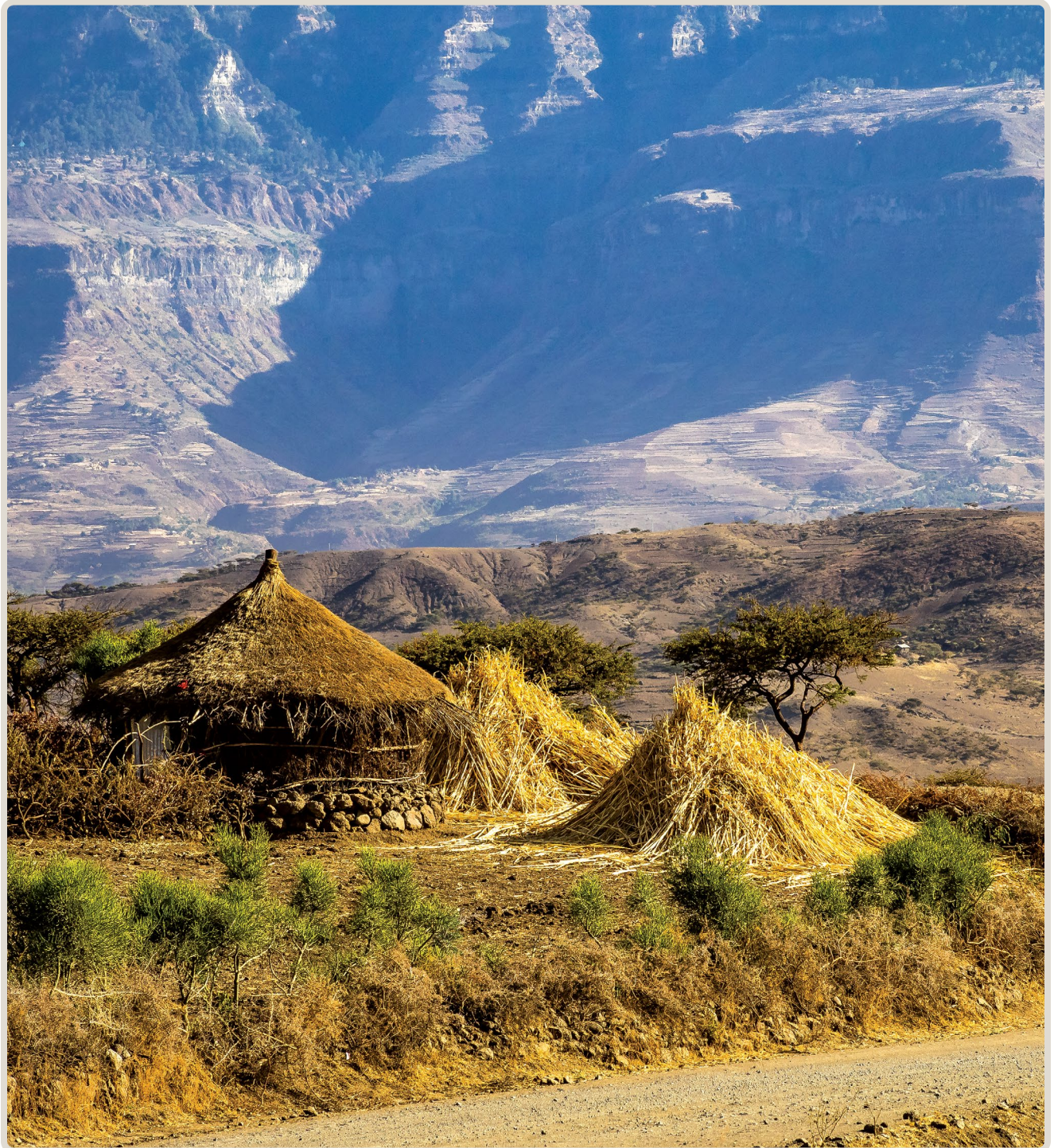


Photo 1. Landscape in the highlands of Lalibela, Ethiopia, Africa.

DISCLAIMER

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Photo 2. Camels (*Camelus*) resting in the Danakil Desert of Ethiopia.

PARTICIPATING ORGANIZATIONS

- Ethiopian Public Health Institute (EPHI)
- Ethiopian Wildlife Conservation Authority (EWCA)
- Environment, Forestry and Climate Change Commission (EFCCC)
- Ministry of Agriculture (MoA)
- Addis Ababa University (AAU)
- Carter Center
- Core Group Polio
- Ethiopian Wolf Conservation Program (EWCP)
- Food and Agriculture Organization of the United Nations (FAO)
- Human Resources for Health in 2030 (HRH 2030)
- International Livestock Research Institute (ILRI)
- Johns Hopkins University Center for Communication Programs (JHU-CCP)
- National Animal Health Diagnostic & Investigation Center (NAHDIC)
- National Veterinary Institute (NVI)
- Public Health England (PHE)
- The Ohio State University—Global One Health Initiative (OSU-GOHi)
- University of Liverpool/International Livestock Research Institute/HORN
- Vétérinaires Sans Frontières Suisse (VSF Swiss)
- U.S. Agency for International Development (USAID)
- U.S. Centers for Disease Control and Prevention (CDC)
- U.S. Department of Agriculture (USDA)
- U.S. Defense Threat Reduction Agency (DTRA)



Photo 3. Woman picking lettuce with her baby.

EXECUTIVE SUMMARY



Figure 1. Participants from the One Health Zoonotic Disease Prioritization Workshop in Ethiopia.

The purpose of the One Health Zoonotic Disease Prioritization workshop for Ethiopia was to prioritize zoonotic diseases of greatest concern using a multisectoral, One Health approach with equal input from representatives of human, animal (livestock and wildlife), and environmental health sectors, and other relevant partners.

The specific workshop goals were to use a multisectoral, One Health approach to

1. Prioritize zoonotic diseases of greatest concern for Ethiopia
2. Develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners

During the workshop, participants developed a list of zoonotic diseases for prioritization for Ethiopia, defined the criteria for prioritization, and determined questions and weights relevant to each criterion. A total of 5 zoonotic diseases were identified as a priority by participants using a mixed methods prioritization process, the One Health Zoonotic Disease Prioritization Process, developed by the U.S. Centers for Disease Control and Prevention (CDC) (Appendix A).^{1,2}

After the participants selected the priority zoonotic diseases, participants developed next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners.

The priority zoonotic diseases for multisectoral, One Health collaboration for Ethiopia are (Table 1):

- Anthrax
- Rabies
- Brucellosis
- Rift Valley Fever
- Zoonotic Avian Influenza

This report summarizes the One Health Zoonotic Disease Prioritization Process used to prioritize zoonotic diseases of greatest concern for Ethiopia, as well as next steps and action plans to jointly address these zoonotic diseases using a multisectoral, One Health approach including human health and animal health (livestock and wildlife) ministries, and the environment and other relevant sectors.

Table 1. Priority zoonotic diseases selected in Ethiopia by participants in the One Health Zoonotic Disease Prioritization workshop conducted September 25–26, 2019

Zoonotic Disease	Agent	Human Disease Burden	Animal Disease Burden	Diagnostics, Treatment & Prevention
Anthrax	Bacteria	From 2009–2013, a total of 5,197 human cases of anthrax were reported, with 86 deaths. ³	Anthrax is endemic in Ethiopia. From 2009–2013, 26,737 animal anthrax cases were reported. ³	An effective vaccine for both humans and animals is available globally, however only the animal vaccine is available in Ethiopia. Anthrax vaccination is not recommended to the general public, but rather to those with a high rate of contact with livestock or animal-processing. ⁴
Rabies	Virus	Ethiopia has one of the highest rates of rabies deaths in the world, with an estimated 2,700 deaths annually. Thousands of people are exposed each year. ⁵	Ethiopia reported 56 cases of animal rabies to OIE in 2017. ⁶ Ethiopia has a large dog population with a high endemicity of canine rabies. A study examined bites from 655 animals; 96.5% were caused by a dog and 73.6% of the biting dogs were potential rabies suspects. ⁷	A vaccine is available in Ethiopia for both humans and animals, although it is not always accessible to all areas. ⁸ The disease is nearly 100% fatal and treatment is only supportive care.
Brucellosis	Bacteria	The seroprevalence of brucellosis in humans varies based on location. In pastoral regions, the rate is 17.4, whereas in sedentary regions, the rate is 3.1. ⁹	Similar to humans, the seroprevalence rate in animals varies by region. In pastoral regions, it is 4.7, versus 1.7 in sedentary regions. ⁹	While a vaccine is available for animals and treatment is available for humans, ¹⁰ the vaccine is not available in Ethiopia.
Rift Valley Fever	Virus	No clinical cases of RVF have been reported, but serological evidence has been detected. ¹¹	No cases of clinical disease have ever been reported in Ethiopia. ¹²	No vaccine or treatment available for humans. A vaccine is available for animals, but not in Ethiopia. ¹³
Zoonotic Avian Influenza	Virus	There have been no confirmed outbreaks of avian influenza in Ethiopia. ¹⁴	There have been no confirmed outbreaks of avian influenza in Ethiopia. ¹⁴	Both a vaccine and treatment are available for humans globally. ¹⁵ but there is no vaccine for either animals or humans currently available in Ethiopia.



Photo 4. Dorze women preparing banana bread in Southern Ethiopia.

INTRODUCTION

Zoonotic diseases are diseases that are spread between animals and people. Most known human infectious diseases and about three-quarters of newly emerging infections originate from animals.¹⁶ Zoonotic diseases that occur in large numbers can impact society in three main ways. Specifically, they:

- Threaten the health of animals resulting in illness, loss of productivity, and death.
- Threaten the livelihood of the population dependent on livestock as a major source of income.
- Threaten the health of people, with ability to cause significant illness and death, which is associated with significant social and economic losses.

In order to best address zoonotic disease threats, a multisectoral, One Health approach is needed. One Health means a collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment.

To continue addressing zoonotic disease challenges in Ethiopia, a One Health Zoonotic Disease Prioritization workshop was held on September 25–26, 2019, at the Azzeman Hotel in Addis Ababa. The purpose of the One Health Zoonotic Disease Prioritization workshop for Ethiopia was to prioritize zoonotic diseases of greatest concern using a multisectoral, One Health approach with equal input from representatives of human, animal (livestock and wildlife), and environmental health sectors and other relevant partners.

The specific workshop goals were to use a multisectoral, One Health approach to:

1. Prioritize zoonotic diseases of greatest concern for Ethiopia
2. Develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners



Photo 5. Woman milking a cow in a village near Lalibela town in northern Ethiopia.

WORKSHOP METHODS

The One Health Zoonotic Disease Prioritization process uses a mixed methods prioritization process developed by the U.S. Centers for Disease Control and Prevention's (CDC) One Health Office. The methods have been previously described in detail (Appendix A). Workshop organizers began to prepare and plan for this workshop months in advance.

Ethiopia had requested to conduct an OHZDP Workshop for a second time to update their priority zoonotic disease list. The initial OHZDP workshop was conducted in September 2015. Priorities may change over time as progress is made in building capacity to address priority zoonotic diseases. Also, new infectious or zoonotic diseases may emerge or previously known endemic diseases may re-emerge. These changing disease patterns could affect priorities. After approximately 3–5 years, countries may want to repeat the OHZDP Process to update their priority zoonotic disease list and associated action plans. As progress is made over time to address priority zoonotic diseases, repeating the OHZDP Process allows a country to further engage in a collaborative discussion with multiple sectors and partners to plan for next steps, update action plans, and develop or update associated One Health strategic plans to effectively address the priority zoonotic diseases and further strengthen the One Health approach for their jurisdiction. Ethiopia is the first country to utilize the OHZDP Process a second time to update their priority zoonotic disease list.

During the preparation process, a core planning team was established to support the preparation and planning of the workshop. The core planning team was made up of representatives from Ethiopian government ministries active in zoonotic disease prevention and control—Ethiopian Public Health Institute (EPHI), Ministry of Agriculture (MoA), Ethiopian Wildlife Conservation Authority (EWCA), and the Environment, Forestry and Climate Change Commission (EFCCC), U.S. government agencies—CDC's One Health Office, CDC Ethiopia, USAID headquarters, USAID Ethiopia, implementing partner—HRH2030, and other technical partners—FAO and OSU-GOHi.

During the planning phase, Ethiopia's national level ministries discussed the importance of incorporating the perspectives from the various regions within the country into this process. In order to best accomplish this, it was decided to conduct a scoping workshop prior to the actual OHZDP Workshop. A one-day scoping workshop was held on August 20, 2019 to bring together government staff from the human, animal, and environmental health sectors from all the regions and city administrations around the country to incorporate their perspectives into the OHZDP Process. During the scoping workshop, participants discussed various zoonotic disease concerns from their respective regions. Participants also had the opportunity to provide input into the initial zoonotic disease list for prioritization. A disease was included if it is known to spread between humans and animals and can therefore be considered zoonotic. The initial list of zoonotic diseases was developed by reviewing and incorporating zoonotic diseases from the human and animal reportable disease lists from Ethiopia. Additional zoonotic diseases were then added to this initial list through a literature review process to identify zoonotic diseases present in Ethiopia and in neighboring countries. Ethiopian government ministries and international partners involved in the core planning team also had opportunities to review and comment on the list. This initial zoonotic disease list was also presented and discussed during the scoping workshop for comment by the regional representatives within the country of Ethiopia. The most updated version of the initial zoonotic disease list was then saved for the upcoming OHZDP Workshop.

The OHZDP Workshop for Ethiopia was held on September 25–26, 2019 in Addis Ababa, Ethiopia. During the OHZDP Workshop in September, participants first reviewed the initial zoonotic disease list to focus on for prioritization. A list of 41 zoonotic diseases, shown in Appendix C, were considered during the workshop.

During the OHZDP workshop, participants developed five criteria for ranking the 41 zoonotic diseases. Once the five criteria were developed, one categorical

question was developed for each criterion through group discussion. Questions were developed to measure each criterion. All questions were ordinal and had either binomial or multinomial answers. The ordinal nature is necessary for the scoring process and each answer choice was given a score, which was determined by the participants. Voting members then individually ranked their preferences according to the relative importance of each criterion. Each individual voting member's ranking were then entered into the One Health Zoonotic Disease Prioritization Tool by a CDC facilitator and a group weight for each criterion was calculated. Facilitators and participants answered each question for each zoonotic disease using data that were identified through literature, country reports, as well as information from WHO, OIE, ProMED, and other relevant websites. Additionally, partners from ILRI have been collecting data for the region through the HORN Project and were able to share relevant data for various questions. Global data on disease transmission, severity, pandemic and epidemic potential, economic impact, prevention and control, and environmental impact were collected for each zoonotic disease. If information

for a particular zoonotic disease was not available for Ethiopia, regional or global data were used. Subject matter expertise was also utilized for some questions where data was unavailable.

After scoring all zoonotic diseases, decision tree analysis was used to determine the ranked zoonotic disease list. Each weighted criterion was applied across each question's answers for each zoonotic disease, and then normalized across criteria. The scores for all five questions for each zoonotic disease were then summed. The highest raw score was then normalized, giving that zoonotic disease a normalized score of 1. See Appendix C for a complete listing of raw and normalized scores for all zoonotic diseases that were considered for prioritization.

The zoonotic diseases, with their raw and normalized scores, were presented to the participants for discussion. Workshop participants then utilized the ranked OHZDP list to discuss and decide on a final priority list of 5 zoonotic diseases (Table 1). After the participants decided on the priority zoonotic diseases, they developed next steps and action plans to address the priority zoonotic diseases.



Photo 6. Man walking with his donkey in Ethiopia.

CRITERIA AND QUESTIONS DEVELOPED

The criteria for ranking zoonotic diseases selected by the voting members in Ethiopia are listed in order of importance below. A description of how the questions assessed the criteria are listed below. For the list of criteria, questions, and answer choices, see Appendix D.

Rank	Criteria	Weight	Questions
1	Epidemic/pandemic Potential	0.29	Epidemic/pandemic potential was measured based on the number of human or animal outbreaks that have occurred in Ethiopia for each zoonotic disease in the last 10 years.
2	Severity in humans	0.25	Severity in humans was measured by the case fatality rate of the zoonotic disease in humans.
3	Socioeconomic impact	0.20	Socioeconomic impact was measured by the impact on tourism or trade to Ethiopia. The tourism data was based on expert opinion and the trade data was extracted from Ethiopia's notifiable disease list and the OIE notifiable disease list.
4	Availability of prevention and control strategies	0.17	Availability of prevention and control strategies was measured by the global availability of a vaccine or treatment or if a response plan existed in Ethiopia.
5	Presence of disease in Ethiopia/region	0.08	Presence of the disease in Ethiopia/region was measured by reviewing data if the zoonotic disease was present in humans in Ethiopia or IGAD countries.

PRIORITY ZONOTIC DISEASE LIST FOR ETHIOPIA

The 5 priority zoonotic diseases for multisectoral, One Health collaboration for Ethiopia are (Table 1):

- 1. Anthrax**
- 2. Rabies**
- 3. Brucellosis**
- 4. Rift Valley Fever**
- 5. Zoonotic Avian Influenza**



Photo 7. Great White Pelicans (*Pelecanus onocrotalus*) in Lake Chamo of Ethiopia.

NEXT STEPS AND ACTION PLANS

After finalizing the list of priority zoonotic diseases, workshop participants discussed next steps and action plans to address the priority zoonotic diseases using a multisectoral, One Health approach.

Participants were then asked to develop next steps and action plans for how to address the priority diseases using a multisectoral, One Health approach. Participants were then asked to develop specific next steps for their sectors. A summary of the recommendations organized by theme follows:

One Health Coordination

Challenges

- Highlight importance of One Health to decision makers in order to increase awareness and support for One Health programs
- Ensure sustainability of One Health efforts through the institutionalization of the National One Health Platform
- Conduct policy gap analysis for One Health and develop a draft One Health policy

Opportunities

- Establish national multisectoral, One Health coordination mechanism at national and regional levels
- Increased understanding /importance of One Health across sectors
- Develop a National Action Plan for Health Security
- Leverage abilities of technical working group to strengthen One Health coordination efforts
- Secure funding to establish legal mechanisms to support One Health coordination endorsed by government officials
- Identify partners and potential funding sources and conduct resource mapping

Surveillance

Challenges

- Financial constraints exist
- No interaction with surveillance systems across sectors
- No surveillance data sharing system among sectors
- Systems utilize paper-based reporting
- Need to establish standardized case definitions to use in surveillance for the priority zoonotic diseases
- Need to strengthen core structure for surveillance across sectors
 - Internet (IT issues)
 - Phone (IT issues)
 - Data sharing platform doesn't exist (limited data sharing due to access issues)

Opportunities

- Existence of well-equipped diagnostic laboratories (NAHDIC with BSL-3 and EPHI with BSL-2) to support joint surveillance
- Collaborate with international public and private sector partners
- Available trained epidemiologists to support surveillance activities
- Leverage capacity of current surveillance personnel

- Establish standardized case definitions for humans and animals by coordinating efforts between human and animal health professionals
- Establish an electronic reporting system that has capacity to work offline when internet access is not available
- Increased front line surveillance training entities (Field Epidemiology Training Programs (FETP) and Inservice Applied Veterinary Epidemiology Training (ISAVET))

Laboratory

Challenges

- Secure funding for more laboratory supplies
- Lag between laboratory and procurement of supplies/reagents
- Lack of mechanism/system to share laboratory results across sectors
- Lack of BSL-3 laboratory to handle highly infectious pathogens
- Lack of diagnostic laboratory capacity at the regional level
- Shortage of laboratory supplies (reagents, chemicals, equipment)
- High turnover of laboratory professionals
- Shortage of FOREX
- Shortage of highly skilled laboratory personnel

Opportunities

- Existing availability of diagnostic capacity at EPHI and NADIC for multiple diseases
- Develop and increase training efforts to hone and sharpen skills of laboratorians
- Existing support of the government and developmental partners
- Utilize priority zoonotic diseases to unite laboratory capacities
- Increased training to use BSL-3 lab by laboratorians
- Increase training programs to build a larger workforce, potentially by partnering with international reference labs
- The presence of a One Health platform
- List of priority zoonotic diseases developed and agreed upon by One Health sectors

Outbreak Response

Challenges

- Develop a surveillance system that can accurately identify zoonotic disease outbreaks within and across sectors
- Strengthen abilities of health professionals to correctly diagnose priority zoonotic diseases
- Integrated data does not exist across sectors*
- Gaps exist in information sharing
- Need to strengthen diagnostic capacity for priority zoonotic diseases
- No official rapid response team established that engages multisectoral, One Health sectors
- Lack of secure funding to increase resources for zoonotic diseases, including enhanced trainings to build a larger One Health workforce

Opportunities

- Maintain high levels of commitment to One Health activities from government agencies
- Integrate surveillance systems into one joint system to facilitate data sharing between all sectors
- Strengthen training programs across sectors to increase the number of professionals with One Health skills
- Begin One Health trainings at each of the sectors to further incorporate One Health
 - Trainings should occur at both high and low levels and from the universities

Preparedness

Challenges

- Improve access to and logistics of procuring supplies across all sectors
- Provide trainings in preparedness exercises, such as tabletop exercises and point of dispensing (POD) drills

Opportunities

- Integrate surveillance systems into one joint system to facilitate data sharing between all sectors
- Strengthen training programs across sectors to increase the number of professionals with One Health skills

Workforce Development

Challenges

- Need to secure funding to increase resources for zoonotic diseases, including enhanced trainings to build a larger One Health workforce
- Increase training efforts to hone and sharpen skills of laboratorians
- Strengthen abilities of health professionals to correctly diagnose zoonotic diseases
- Provide trainings in preparedness exercises, such as tabletop exercises and point of dispensing (POD) drills
- Shortage of highly skilled laboratory personnel

Opportunities

- Utilize FETP and veterinary FETP officers
- Begin One Health trainings at each of the sectors to further incorporate One Health
 - Trainings should occur at both high and low levels and from the universities
- Increase training programs to build a larger workforce, potentially by partnering with international reference labs



Photo 8. Walia ibex (*Capra walia*) in the Simien Mountains of Ethiopia.

Other

- Establish a communication task force for One Health related information, dissemination and advocacy
- Establish working groups, potentially for each priority zoonotic disease, as well as an epidemic/pandemic threats working group
 - Technical working groups for anthrax, brucellosis, and rabies currently exist
 - Data for other priority zoonotic diseases can be shared through the technical working groups
- Conduct risk assessments for priority zoonotic diseases
 - Rift valley fever and avian influenza have already completed a joint risk assessment
 - Conduct risk assessments for the other priority zoonotic diseases
- Establish a website for One Health Coordination in Ethiopia that includes information about funding sources, zoonotic disease information, and data, maps, etc.
 - This website can be utilized for the country and funding partners
- Establish a platform for information-sharing to integrate data from all sectors

General—One Health sectors

- Need to further collaborate for publications
- National One Health Steering Committee will share report widely
- Different technical working groups should share plans and discuss areas for collaboration
- Report from the One Health Zoonotic Disease Prioritization workshop will be shared with the regions and other partners



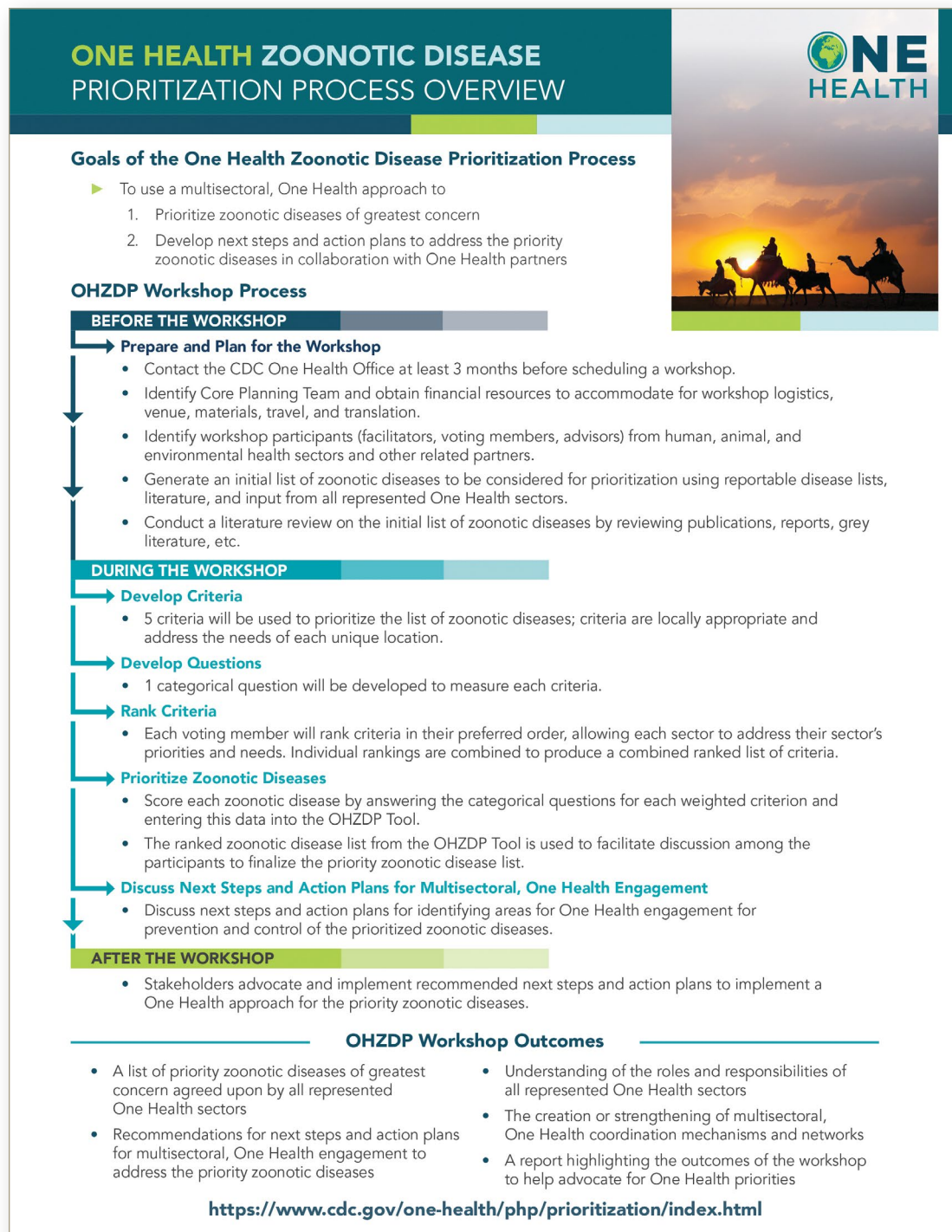
Photo 9. Borana women transporting water.



Photo 10. Close-up of a rare and endangered Ethiopian wolf (*Canis simensis*) in Bale Mountains National Park, Ethiopia.

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/one-health/php/prioritization/>



APPENDIX B: One Health Zoonotic Disease Prioritization Workshop Participants for Ethiopia

Voting Members

Name	Organization	Title/Position
Feyesa Regassa, DVM, MSc	EPHI	Chairman of NOHSC and IHR Focal Person
Birhanu Hurisa, MSc	EPHI	Director, Vaccine and Diagnostic Production Directorate
Negga Asamene, MSc, MPH	EPHI	Bacteriology Senior Expert
Zewdu Assefa, MPH	EPHI	A/Director, Early Warning and Information System Management Directorate
Gedion Yilma, DVM, MVPH	MoA	Export Abattoirs Director
Yismashewa Wogayehu, DVM, MSc	MoA	Director of Veterinary Epidemiology Directorate
Getachew Dinede Aga, DVM, MPH	MoA	Secretary of NOHSC, Field Epidemiologist
Getachew Asmare, DVM, MSc	MoA	Animal Identification, Traceability & Welfare Director
Behailu Goshime, BSc	EWCA	Environmental Health Senior Expert, Co-chair of NOHSC and Core Planning Team Leader for OHZDP
Hamere Melaku, DVM	EWCA	Wildlife Veterinarian
Abebe Tolcha Fita, MSc	EFCCC	Environmental and Social Impact Operation Audit Senior Expert
Ayele Mindaye Teffera, MSc	EFCCC	Environmental Licensing

Advisors

Name	Organization	Title/Position
Zewdu Gashau, MPH	EPHI	Field Epidemiologist
Girma Ayalew, DVM	EWCA/EFCCC	Wildlife Veterinarian
Kenean Melkamu	EFCCC	Environmental Impact Assessment Expert
Tesfa Wakgari Ayana	EFCCC	Environmental Auditor
Kasahun Amsalu, DVM, MVSc	MoA-Directorate	Veterinary Epidemiologist, Disease Prevention and Control Directorate
Wondwosen Bekele, DVM, MSc PhD	MoA	Senior Food Safety and Zoonotic Disease Expert
Meseret Bekele, DVM, MVPH	MoA	Current Chair of NOHSC and Director for Veterinary Public Health Directorate
Nigatu Kebede, DVM, MSc, PhD	AAU-ALIPB	PREDICT Project Coordinator
Sentayehu Menda, DVM, MSc	Carter Center	Guinea Worm Eradication Program Veterinarian
Muluken Asres, MPH, MA	Core Group Polio	GHSA Advisor
Eric Bedin, MSc	EWCP	EWCP Field Director
Girma Eshete, PhD	EWCP-Amhara	EWCP-Amhara Coordinator
Getachew Gari, DVM, PhD	FAO-ECTAD	Veterinary Epidemiologist
Elias Walegn, DVM, MVPH	FAO-ECTAD	MERS-CoV Project Coordinator & OH Focal Person
Nega Tewolde, DVM, MVTE	FAO-ECTAD	Deputy Team Leader of ECTAD Ethiopia

Name	Organization	Title/Position
Darsema Gulima, DVM, MSc	HRH2030	Multisectoral Health Security Advisor
Teegne Shiferaw, MSc	JHU-CCP	Senior Risk Com. Coordinator
Lisa Cavalerie, DVM, PhD	Liverpool/ILRI/HORN	Research Associate
Lina Gazis	ILRI	Researcher
Leuel Lisanwork, MD	OSU-GOHi	Study Physician
Tigist Endashaw, MSc	OSU-GOHi	Regional Program Manager
Ashley Sharp, MFPH, MPH, MBChB	PHE	Health Advisor
Redeat Belayneh, DVM, MSc	NAHDIC	Molecular Expert & OH Focal Person
Belayneh Getachew, DVM, MSc, PhD	National Veterinary Institute	Researcher
Diana Onyango, DVM	VSF-Suisse	Regional PM
Sylvia Murphy, DVM, MHS	CDC Ethiopia	Veterinary Officer
Mohammed Subah Raja	DTRA	Program Specialist
Ashna Kibria, MPH	USAID/Washington	Public Health Advisor
Etsub Brhanesilassie	USAID Ethiopia	GHS Advisor
Abu Tefaria	USDA	Agricultural Specialist

CDC Facilitators

Name	Organization	Title/Position
Casey Barton Behravesh, DVM, DrPH	CDC, One Health Office	Director
Grace Goryoka, MPH	CDC, One Health Office	Health Scientist
Nadia Oussayef	CDC, One Health Office	Lead for Policy and Strategy
Kristina Angelo, DO, MPH&TM	CDC	Medical Officer

Workshop Organizers/Core Planning Team

Name	Organization	Title/Position
Abebe Tolcha	EFCCC	Environmental and Social Impact Operation Audit Senior Expert
Abraham Ali, DVM, MPH	EPHI, Zoonoses Research Team	Researcher II
Feyesa Regassa, DVM, MSc	EPHI	Chairman of NOHSC and IHR Focal Person
Birhanu Hurisa, MSc	EPHI	Director, Vaccine and Diagnostic Production Directorate
Behailu Goshime, BSc	EWCA	Environmental Health Senior Expert, Co-chair of NOHSC and Core Planning Team Leader for OHZDP
Wondwossen Bekele, DVM, MSc PhD	MoA	Sr Food Safety and Zoonotic Disease Expert
Bitsu Kiflu, DVM, MVPH	MOA, Veterinary Public Health Directorate	Food Safety Expert
Elias Walelign, DVM, MVPH	FAO-ECTAD	MERS-CoV Project Coordinator & OH Focal Person
Darsema Gulima, DVM, MSc	HRH2030	Multisectoral Health Security Advisor
Tigist Endashaw, MSc	OSU-GOHi	Regional Program Manager

Name	Organization	Title/Position
Sylvia Murphy, DVM, MHS	CDC Ethiopia	Veterinary Officer
Theresa Kanter, MURP	CDC Ethiopia	Public Health Analyst
Casey Barton Behravesh, DVM, DrPH	CDC, One Health Office	Director
Grace Goryoka, MPH	CDC, One Health Office	Health Scientist
Julie Sinclair, DVM	CDC, One Health Office	Veterinary Medical Officer/One Health Liaison to the OIE
Nadia Oussayef	CDC, One Health Office	Policy and Strategy Lead
Kristina Angelo, DO, MPH&TM	CDC, Division of Global Migration and Quarantine	Medical Officer
Stephanie Martz	USAID Ethiopia	Global Health Security Advisor
Etsub Brhanesilassie	USAID Ethiopia	GHSA advisor
Ashna Kibria, MPH	USAID/Washington	Public Health Advisor
Lisa Kramer, DVM	USAID/Washington	Regional Emerging Threats Advisor



Photo 11. Male Gelada baboon (*Theropithecus gelada*) in Simien Mountains National Park, Ethiopia.

APPENDIX C: Final Outputs of the One Health Zoonotic Prioritization Tool in Ethiopia

Rank#	Disease	Etiologic Agent	Raw Score	Final Score
1	Anthrax	<i>Bacillus anthracis</i>	0.827	1.000
2	Rabies	Rabies virus	0.827	1.000
3	Q-fever	<i>Coxiella burnetii</i>	0.727	0.879
4	Echinococcosis	Echinococcus spp	0.727	0.879
5	Human African Trypanosomiasis	<i>T. b. rhodesiense</i> , <i>T. b. gambiense</i>	0.721	0.872
6	Leishmaniasis	<i>Leishmania</i>	0.721	0.872
7	Epidemic Typhus	<i>Rickettsia prowazekii</i>	0.686	0.830
8	Cysticercosis/Taeniasis	<i>Taenia saginata</i>	0.665	0.804
9	West Nile Fever	West Nile fever virus	0.654	0.791
10	Listeriosis	<i>Listeria monocytogenes</i>	0.591	0.715
11	Toxoplasmosis	<i>Toxoplasma gondii</i>	0.591	0.715
12	Brucellosis	<i>Brucella</i> spp.	0.566	0.685
13	Bovine spongiform encephalopathy	Bovine spongiform encephalopathy	0.558	0.675
14	Bovine Tuberculosis	<i>Mycobacterium bovis</i>	0.544	0.657
15	Crimean Congo hemorrhagic fever	Crimean Congo hemorrhagic fever	0.536	0.648
16	Staphylococcus aureus	<i>Staphylococcus aureus</i>	0.529	0.640
17	Yellow Fever	Yellow fever virus	0.528	0.638
18	Rift Valley Fever	Rift Valley fever virus	0.488	0.590
19	Dracunculiasis (Guinea-worm)	<i>Dracunculus medinensis</i>	0.483	0.585
20	Ebola Virus Disease	Ebola virus	0.472	0.571
21	Schistosomiasis	<i>Schistosome</i>	0.472	0.571
22	Ascariasis	<i>Ascaris lumbricoides</i>	0.467	0.564
23	Dengue fever	Dengue virus	0.466	0.563
24	Marburg hemorrhagic fever	Marburg virus	0.462	0.559
25	Zoonotic Avian Influenza	Influenza A viruses	0.453	0.548
26	Plague	<i>Yersinia pestis</i>	0.449	0.543
27	Salmonellosis	<i>Salmonella</i> spp.	0.431	0.522
28	Leptospirosis	<i>Leptospira</i> spp.	0.409	0.494
29	Camelpox	Camelpox virus	0.409	0.494
30	Campylobacteriosis	<i>Campylobacter</i> spp.	0.404	0.489
31	E. coli	<i>Escherichia coli</i>	0.404	0.489
32	Zoonotic Swine Influenza	Influenza A viruses	0.386	0.467
33	MERS-CoV	Middle East Respiratory Syndrome	0.370	0.448
34	Severe Acute Respiratory Syndrome	Severe Acute Respiratory Syndrome	0.370	0.448

Rank#	Disease	Etiologic Agent	Raw Score	Final Score
35	Monkeypox	Monkeypox virus	0.366	0.442
36	Chikungunya	Chikungunya virus	0.341	0.412
37	Trichuriasis	<i>Trichuris trichiura</i>	0.331	0.400
38	Orf	Orf virus	0.320	0.387
39	Cryptosporidiosis	<i>Cryptosporidium</i>	0.319	0.386
40	Giardiasis	<i>Giardia spp</i>	0.195	0.235
41	Diphyllobothriasis	<i>Diphyllobothrium latum</i>	0.189	0.229



Photo 12. Sulphur lake Dallol in a volcanic explosion crater in the Danakil Depression.

APPENDIX D: Criteria and Questions Utilized to Determine the Ranked Outcomes of the One Health Zoonotic Disease Prioritization Process in Ethiopia

1. Epidemic/Pandemic potential (criterion weight = 0.295)

Question: How many human or animal outbreaks have occurred in Ethiopia in the last 10 years?

Answers:

- ☐ >5 in both humans and animals (4)
- ☐ 1–5 in both humans and animals (3)
- ☐ > 5 in either humans or animals (2)
- ☐ 1–5 in either humans or animals (1)
- ☐ None in both (0)

2. Availability of prevention/control Strategies (Criterion weight = 0.173)

Question: Is there a prevention or control tool available in humans or animals?

Assumptions: Vaccines or treatment would need to be commercially available anywhere in the world.

Answers:

- ☐ All three (3)
- ☐ Two of the three (2)
- ☐ One of the three (1)
- ☐ None (0)

3. Severity in humans (Criterion weight = 0.250)

Question: What is the case fatality rate in humans?

Answers:

- ☐ <1% (0)
- ☐ 1 to 5% (1)
- ☐ >5 to 20% (2)
- ☐ >20 to 50% (3)
- ☐ >50% (4)

The most severe clinical manifestation of the zoonotic disease was used. If Ethiopia or the region was not available, global data was used.

4. Socioeconomic impact (Criterion weight =0.204))

Question: Does the disease have an impact on tourism or trade?

Answers:

- ☐ Neither tourism nor trade (0)
- ☐ Yes tourism, no trade (1)
- ☐ Yes trade, no tourism (2)
- ☐ Yes, both (3)

5. Presence of disease in Ethiopia/region (Criterion weight = 0.079)

Question: Is the disease currently present in humans in Ethiopia or Intergovernmental Authority on Development (IGAD) (without Ethiopia)?

Answer:

- ☐ No for Ethiopia, No for IGAD (0)
- ☐ No for Ethiopia, Yes for IGAD (1)
- ☐ Yes for Ethiopia, No for IGAD OR Yes for Ethiopia, Yes for IGAD (2)



Photo 13. Blue Nile Falls during rainy season in Tis Abay, Ethiopia.

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Photo 14. Kniphofia also called Tritoma or Red Hot poker (*Kniphofia foliosa*), Simien Mountains National Park, Ethiopia.



<http://www.cdc.gov/onehealth>