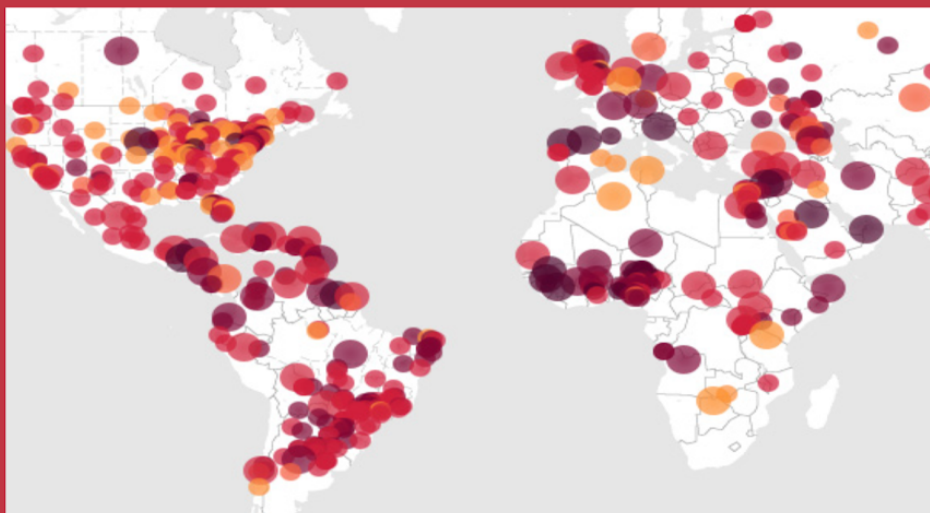


2019 | Facilitator Guide

EPIDEMIOLOGY AND ONE HEALTH



Modeling of disease emergence



USAID
FROM THE AMERICAN PEOPLE

OneHealth
WORKFORCE



UNIVERSITY OF MINNESOTA

Tufts
UNIVERSITY

This is a product of the One Health Central and Eastern Africa (OHCEA) for health professionals' training with support from the United States Agency for International Development (USAID).

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Course Developed by

Dr Etienne Rugigana

Senior Lecturer

Department of Epidemiology and Public Health

School of Public Health, University of Rwanda

Dr Yohannes Tsegabirhan Kifle

Epidemiologist and Gender Focal Person

Associate Professor

College of Veterinary Medicine

Mekelle University, Ethiopia

Dr Fred Monje

Senior Veterinary Inspector and One Health Focal Person

Ministry of Agriculture, Animal Industry and Fisheries

P.O Box 102, Entebbe, Uganda



OHCEA
8 Countries
16 Universities
24 Institutions



Contents

- Preface vi
- Acknowledgements vii
- General Introduction viii
- Module Developers and Reviewers x
- Overview of Epidemiology Module 1
 - Goals 1
 - Learning Objectives 1
 - Target Audience 2
 - Program/Agenda 2
 - Module Overview 4
 - Materials 6
- SESSION 1: Definitions of Epidemiology and One Health 8
 - Session Learning Objectives 8
 - Registration 9
 - Facilitator Welcoming Remarks and Introductions 9
 - Expectations and Concerns 9
 - Goals of the Short Course 10
 - Guest Speaker Opening Workshop and Pre-test 10
 - Pre-training Reading Materials 11
 - What is One Health? 11
 - Overview of One Health Concepts 12
 - What is Epidemiology? 12
 - PowerPoint Presentation on *Contagion* Fundamentals 15
 - The Epidemiological Triad 15
 - Story Telling on Epidemiological Triad 16
 - What is Web of Causation? 17
 - The Principles of Epidemiology and Infectious Disease Epidemiology 18
 - Participatory Methodologies in Epidemiology 18
 - Case Study using PE 19
 - Causes of Diseases 20
 - Disease Transmission 21
 - Infectious Disease Discovery 22
 - Summary of Definitions 22
- Facilitator Notes for Session 1 24
- SESSION 2: One Health, Epidemiology and Gender Gaps 26
 - Overview of Session 2 26
 - Session Learning Objectives 26
 - Materials 27
 - Morning Reflections 27
 - Factors Contributing to Emergence of Infectious Diseases 27
 - Zoonosis, Epizootic and Enzootic 28
 - Food and Water Transmission 31
 - Biological Vectors 32

Case Study: Sirari Village	33
Introducing Measures of Diseases Frequency and their Uses. (Understanding the principles of epidemiology).....	33
Case Study: Outbreak of Brucellosis in Mukono District	35
Steps in Outbreak Investigation	36
Case Studies in Outbreak Investigation and Stakeholder Involvement.....	37
Epidemiology and Gender Gaps	39
Mapping Gender Risks and Disease Transmission Pathways	39
Gender Influences on Outbreaks.....	40
Cryptosporidiosis and Gender	40
Gender Roles and Influences in Disease Management	40
Session 2: Facilitator Notes	41
SESSION 3: Disease Outbreak Investigations, Descriptive, Analytic and Participatory Epidemiology.....	47
Session Overview	47
Session Learning Objectives	47
The Burden of Communicable Diseases	47
Global Epidemiology of Infectious Disease	47
Classification of Infectious Diseases	49
Measures of Disease Frequency.....	50
Plenary: Group Presentations	51
Concluding Comments	51
Gender and Epidemiology	51
Measures of Diseases Frequency	52
Session 3: Facilitator’s Notes.....	54
SESSION 4: Disease Surveillance and Outbreak Investigation	56
Session Overview	56
Session Learning Objectives	56
The Elements of Public Health Surveillance	56
Case Study on Malaria	58
Types of Surveillance.....	59
Dissemination of Surveillance Data.....	60
Linking Surveillance to Action	61
Uses of Public Health Surveillance	61
The Laboratory in Surveillance	62
Simulation Exercise and Case Study Reviews on Disease Surveillance	63
Case Scenario	64
Session 4: Facilitator’s Notes.....	66
Session 5: Case Study Reviews	68
Session Overview	68
Session Learning Objectives	68
Case Study Identification.....	68
Identification of Relevant Case Studies	69
Post Test.....	69
Closing Session and Course Evaluation	70
Session 5: Facilitator’s Notes.....	71
References.....	73
OHCEA EVENT EVALUATION – EPIDEMIOLOGY AND ONE HEALTH SHORT COURSE	74

Preface

This module is One of the 16 One Health Training Modules developed by the One Health Central and Eastern Africa Network (OHCEA). OHCEA is an international network, currently of 24 institutions of higher education in public health, veterinary sciences, pathobiology, global health and environmental sciences. These are located in 16 universities in 8 countries in Eastern, Central and Western Africa regions.

The universities currently forming OHCEA are: Université des Montagnes and University of Buea (Cameroon), University of Lubumbashi and University of Kinshasa (DRC), Jimma University, Addis Ababa University and Mekelle University (Ethiopia), Moi University and University of Nairobi (Kenya), Université Cheikh Anta Diop (Senegal), Muhimbili University of Health and Allied Sciences and Sokoine University of Agriculture (Tanzania), University of Rwanda and University of Global Health Equity (Rwanda), Makerere University and Mbarara University of Science and Technology (Uganda).

The OHCEA network's vision is to be a global leader in One Health, promoting sustainable health for prosperous communities, productive animals and balanced ecosystems. OHCEA seeks to build capacity and expand the human resource base needed to prevent, detect and respond to potential pandemic disease outbreaks, and increase integration of animal, wildlife and human disease surveillance and outbreak response systems.

The overall goal of this collaboration is to enhance One Health policy formation and implementation, in order to contribute to improved capacity of public health in the region. OHCEA is identifying opportunities for faculty and student development as well as in-service public health workforce that meet the network's goals of strengthening One Health capacity in OHCEA countries.

The 16 modules were developed based on One Health core competencies that were identified by OHCEA as key elements in building a skilled One Health workforce. This network is supported by two United States University partners: Tufts University and the University of Minnesota through the USAID funded One Health Workforce Project.

Acknowledgements

This module was made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the One Health Central and Eastern Africa (OHCEA) university network under the Emerging Pandemic Threats 2 One Health Workforce Project and do not necessarily reflect the views of USAID or the United States Government. USAID reserves a royalty-free nonexclusive and irrevocable right to reproduce, publish, or otherwise use, and to authorize others to use the work for Government purposes.

OHCEA extends her gratitude to those who participated in earlier works that informed the development of this module as well as reviewers and editors of the module. Sections/parts of the materials for this course were adopted from RESPOND SEAOHUN One Health Course Modules:
<https://seahunonehealth.wordpress.com/ecosystem-health/>

Health soft skills such as communication, culture, leadership, gender and core technical skills such as ecosystem health, infectious disease epidemiology, One Health concepts and outbreak response. The modules are intended to:

- create a framework for One Health curriculum.
- improve workforce capacity to prevent, detect and respond to threats posed by infectious diseases and zoonosis.
- generate a shift in countries' workforce culture and training structure.
- enable working across sectors and disciplines for a stronger and more effective public health sector.
- allow universities to be key drivers of the future workforce as they forge partnerships and drive change.
- combine human health, animal health and infectious disease with principles of ecology and environmental sciences.

The modules can be used at both pre-service and in-service levels as full courses, workshops or integrated into course materials for professionals who impact disease detection, prevention and response, allowing them to successfully function as an integral part of a larger, multi-disciplinary, team of professionals. This is key to creating a stronger sustainable Public Health workforce.

Each module contains a Facilitator Guide, Student Guide, PowerPoint slides and a folder of resources/ references for users. These modules are iterative and are continuously being revised.

These 16 modules were developed by collaborative efforts of multiple disciplines and teams of people from seven different OHCEA partner countries with the support of two US university partners namely Tufts University and University of Minnesota. A team of 66 people were engaged in the development of these modules. All the materials represent contribution by the faculty and leadership of the OHCEA network institutions and the technical and managerial support of the OHCEA Secretariat.

The modules were built off previous One Health modules developed by SEAOHUN-network: [https:// seahunonehealth.wordpress.com/ecosystem-health/](https://seahunonehealth.wordpress.com/ecosystem-health/) with addition of more Africa-specific materials, examples and case studies relevant and applicable to the region. Each module was reviewed by OHCEA network faculty including US university partners with technical expertise as well as partners with field experience that allows for One Health application and appreciation of the local African context.

For any inquiries, please email: OneHealthModules@ohcea.org or wbikaako@ohcea.org

Module Developers and Reviewers

1. *Dr Richard Mugambe,
Makerere University, SPH*
2. *Dr Hellen Amuguni,
Tufts University*
3. *Dr Christine Muhumuza,
Makerere University, SPH*
4. *Dr Diafuka Saila Ngita,
Tufts University*
5. *Prof. Anthony Mugisha,
Makerere University, COVAB*
6. *Dr Innocent Rwego,
University of Minnesota*
7. *Prof. Elizabeth Kyewalabye,
Makerere University, COVAB*
8. *Dr Larissa Minicucci,
University of Minnesota*
9. *Dr Terence Odoch,
Makerere University, COVAB*
10. *Dr Japhret Kitaa,
University of Nairobi*
11. *Dr Lawrence Mugisha,
Makerere University COVAB*
12. *Dr Omer Njajou,
Universite de Montagne*
13. *Ms Juliana Bbuye,
Makerere University School of
Education*
14. *Dr Jemimah Oduma,
University of Nairobi, VET*
15. *Prof. Peter Gatongi,
Moi University, SPH*
16. *Dr Gaymary George Bakari,
Sokoine University, VET*
17. *Prof. James Mbaria,
University of Nairobi, VET*
18. *Ms Agnes Yawe,
OHCEA Secretariat*
19. *Prof. Andrew Thaiyah,
University of Nairobi, VET*
20. *Dr Tsegabirhan Kifleyohannes,
Mekelle University, VET*
21. *Dr Charles Nkuranga,
University of Rwanda, VET*
22. *Mr Timothy Wakabi,
OHCEA Secretariat*
23. *Prof. Mannaseh Nzayimanirah,
University of Rwanda, SPH*
24. *Dr Irene Naigaga,
OHCEA Secretariat*
25. *Dr Theoneste Ntakirutimana,
University of Rwanda, Env. Sci.*
26. *Dr Gilbert Kirui,
University of Nairobi, VET*
27. *Dr Etienne Rugigana,
University of Rwanda, SPH*
28. *Ms Jackline Sitienei,
Moi University, SPH*
29. *Prof. Hailu Degefu,
Jimma University, VET*
30. *Dr Endale Balcha,
Jimma University, SPH*
31. *Prof. Abebaw Asfaw,
Mekelle University, VET*
32. *Dr Joanne Kisaka,
Makerere University, SPH*
33. *Dr Fesahaye Alemseged
Tesfamichael,
Jimma University, SPH*
34. *Prof. Joel Nkiama Konde,
University of Kinshasa, SPH*
35. *Dr Asfaw Yohannes Tekle,
Jimma University, VET*
36. *Prof. Justin Masumu,
University of Lubumbashi VET*
37. *Prof. Kimpanga Diangs,
University of Kinshasa, SPH*
38. *Dr Yosseff Deneke,
Mekelle University, SPH*
39. *Prof. Idi Ngona,
University of Lubumbashi, VET*
40. *Dr Samuel Mamuya,
Muhimbili University, SPH*
41. *Dr Peninah Nsamba,
Makerere University, COVAB*

42. Prof. Emmanuel Batamuzi,
Sokoine University, VET
43. Prof. Kiyombo Mbela,
University of Kinshasa, SPH
44. Prof. Donath Tarimo,
Muhimbili University, SPH
45. Prof. Tona Lutete,
University of Kinshasa, SPH
46. Prof. Mahangaiko,
University of Lubumbashi, VET
47. Prof. Brigitte Bagnol,
Tufts University
48. Prof. Malangu Mposhy,
University of Lubumbashi, VET
49. Prof. Amuli Jiwe,
Insititue Demedical Techniques,
Kinshasa
50. Ms Winnie Bikaako,
OHCEA Secretariat
51. Niyati Shah,
USAID Washington
52. Mr Musa Sekammate,
Ministry of Health, Uganda
53. Dr Patrick Ntantu,
Public Health Expert
54. Dr Fred Monje,
Field Epidemiologist
55. Prof. Mariano Lusakibanza,
University of Kinshasa,
Pharmacy
56. Dr Sarah Ssali,
Makerere University, Gender
Studies
57. Richardson Mafigiri,
Infectious Disease Specialist,
Ministry of Health, Uganda
58. Dr Deo Ndumu,
Ministry of Agriculture, Animal
Industry and Fisheries, Uganda
59. Ms Rebecca Racheal Apolot,
Field Epidemiologist
60. Dr Angella Musewa,
OHCEA Fellow
61. Ms Milly Nattimba,
OHCEA Secretariat
62. Ms. Elizabeth Alunguru,
OHCEA Secretariat
63. Dr Juvenal Kagarama,
OHCEA Secretariat
64. Dr Monica Musenero,
EpiTeam International, Uganda
65. Dr Charles Muchunguzi,
Mbarara University of Science
and Technology
66. Dr Sam Wanjohi
Environmental Health
Specialist

Module Editors

Dr Hellen Amuguni DVM, MA, PhD
Infectious Disease and Global Health
Cummings School of Veterinary Medicine
Tufts University, USA

Ms Winnie Bikaako, BA(SS), MPAM
Head Training and Research
OHCEA Secretariat, Kampala, Uganda

Dr Irene Naigaga BVM, Msc, PhD
Regional Program Manager
OHCEA Secretariat, Kampala, Uganda

Prof. William Bazeyo, MBChB, MMed (OM), PhD
Deputy Vice Chancellor, Finance and Administration
Makerere University and OHCEA CEO, OHCEA Network, Kampala, Uganda

Overview of Epidemiology Module

Epidemiology encompasses issues that relate to health, disease, microbiology and immunology; medicine, control and prevention. This module introduces participants to the concepts and terminologies relating to and surveys the basic principles of epidemiology. It also explicitly exposes participants to the burden of communicable diseases and guides them to support the improvement of disease surveillance as well as identify how outbreak investigations are conducted.

The module also attempts to relate all aspects of disease outbreak, surveillance and use of health-related data in real life examples. The case studies provided within the module will enable the participants to easily articulate epidemiology concepts in relation to the One Health concept. Ultimately, the module aims at providing knowledge of descriptive, analytical and participatory epidemiology to participants that leads to their appreciation of its value and importance. In a nutshell, the module provides knowledge and skills to health professionals to enable them to analyze and critically interpret information from the health system and health interventions in the community.

Epidemiology plays a major role in the transmission and containment of infectious diseases and public health outcomes. Accordingly, epidemiological issues must be addressed thoroughly to better understand the risks and develop effective control and response strategies to pandemic disease outbreaks as propagated by the One Health approach. Fortunately, this training will allow participants to develop critical analysis skills as they explore various aspects of epidemiology, in the realm of emerging pandemic threats (EPT), the One Health intersect, and how policies can be developed and/or implemented to address diseases. Thus, this module is designed to introduce individuals with little or no epidemiological background to the history, concepts, theories, terminology and practice of epidemiology, to enhance their education on key public health issues and to improve their capacity to collaborate with epidemiologists.

Goals

This module is designed to equip professionals with capabilities to:

- i) evaluate disease patterns, their determinants and impact on humans, animals and the environment.
- ii) develop disease control strategies using One Health approach e.g. taking consideration of socio-cultural beliefs and values.
- iii) design gender sensitive approaches to disease prevention and control through disease surveillance, disease detection and outbreak response.

Learning Objectives

By the end of this module, participants should be able to:

- i) discuss interactions between humans, animals and the environment.

- ii) distinguish the role of human, animal and environment interaction in disease occurrence and spread.
- iii) describe the concept of epidemiology.
- iv) explain disease occurrence, patterns and their determinants.
- v) describe measures of disease frequency.
- vi) describe the significance of epidemic curves.
- vii) explain measures of disease risks.
- viii) identify disease control measures focusing on One Health approaches.
- ix) discuss the strategies of disease screening.
- x) explain epidemiological intelligence of diseases (surveillance).
- xi) discuss disease intervention techniques.
- xii) analyze socio-cultural impact of disease prevention and control strategies in a One Health context.
- xiii) develop gender sensitive interventions and emergency responses.
- xiv) describe the basic gender concepts.
- xv) explain gender influences in disease outbreak investigations.
- xvi) evaluate the role of gender in disease control and prevention strategies.

Target Audience

This module on epidemiology can be used by undergraduate and postgraduate learners, middle cadre trainees, and in-service personnel from multiple disciplines and sectors (private, NGO's, civil society). The module can be adapted for continuous professional development by health professional organizations such as medical and veterinary associations, nursing, public health, environmental scientists and biotechnologists.

Program/Agenda

Session 1	Session 2	Session 3	Session 4	Session 5
Definition of epidemiology and One Health	Factors contributing to emergence of infectious diseases	Disease outbreak investigations	Epidemiologic al transitions of diseases/ changing patterns of mortality and population dynamics	Evaluation of simulation s
Uses and principles of epidemiology	Measures of disease frequency and their uses	Significance of epidemic curves		Identificati on of appropriat e epidemiolo gy-related case studies for use in various scenarios
The epidemiologic triad		Disease control strategies		
The web of causation	Focus on basic gender concepts: gender and prevalence of selected			

	diseases; gender role in prevention and control of selected diseases			
Epidemiology in the context of One Health (human, animal and environmental health)	Burden of communicable and non- communicable diseases	Applying descriptive, analytical and participatory epidemiology	Simulation exercise and case study reviews on disease, surveillance, and economic parameters of disease	Departure

Module Overview

	Topic (Goal)	Learning Objectives	Instructional Activities (Mode of Delivery)	Time (Min)
1	Learn the terminology and concepts used in epidemiology and One Health	<p>Define epidemiology and One Health</p> <p>Explain the meaning of the epidemiologic triad</p> <p>Discuss the web of causation</p>	<p>Brainstorming using sticky notes and PowerPoint slides to articulate the definition of epidemiology</p> <p>Storytelling to carve out the concept and meaning of epidemiological triad</p> <p>PowerPoint presentation on web of causation followed by group discussion</p>	65
2	Explore the principles of epidemiology	<p>Explain uses and principles of epidemiology</p> <p>Identify and describe sources of routine morbidity and mortality</p> <p>Use epidemiological methods to assess a health problem</p>	<p>PowerPoint presentation, Guest speaker from relevant institution</p> <p>Group work</p> <p>Case study</p> <p>Simulations</p>	155
3	a) Relationship between One Health, and epidemiology	<p>Describe the uses of epidemiology in the context of One Health</p> <p>Discuss the major factors contributing</p>	<p>PowerPoint presentation</p> <p>Pictionary game: to illustrate One Health approach</p>	445

	b) Design gender sensitive approaches to disease surveillance, response, prevention and control	<p>to the emergence of infectious diseases</p> <p>Describe the basic gender concepts</p> <p>Explain gender influences in disease outbreak investigations</p> <p>Evaluate the role of gender in disease control and prevention strategies</p>	<p>Complex case study</p> <p>Group work PowerPoint presentation</p> <p>Simulation exercise Group activity</p>	
4	Understand the burden of communicable diseases and the significance of gender gaps in epidemics and health care access	<p>Discuss the major causes of morbidity and mortality, nationally, regionally and globally</p> <p>Classify infectious diseases</p> <p>Debate principles of control of communicable diseases</p> <p>Define specific terms related to infectious diseases</p> <p>Analyze gender gaps in communicable diseases</p>	<p>Interactive PowerPoint presentation</p> <p>Group discussion</p> <p>Videos</p> <p>PowerPoint presentation and case studies</p> <p>Group discussion</p> <p>Problem based learning</p>	80
5	To know the various measures of disease frequency	<p>Use the measures of diseases frequency</p> <p>Define and differentiate the measures of diseases frequency: ratios, proportions,</p>	<p>PowerPoint presentation</p> <p>Writing task</p> <p>Debates</p> <p>Critical review of a</p>	30

		incidence, prevalence, attack rates	peer journal article	
6	To understand descriptive and analytic epidemiology	<p>Define descriptive epidemiology</p> <p>Describe categories of time, place and person</p> <p>Discuss the uses of descriptive studies</p> <p>Define analytical epidemiology</p> <p>Explain the importance of analytical epidemiology</p>	<p>PowerPoint presentation</p> <p>Group discussion</p> <p>Critical appraisal of published epidemiologic literature health</p>	125
7	Understand the importance of disease surveillance and outbreak investigations	<p>Define elements of public health surveillance</p> <p>Describe functions of public health surveillance</p> <p>Describe different types of surveillance</p> <p>Know the steps of outbreak investigations</p>	<p>PowerPoint presentation</p> <p>Debates</p> <p>Critical review of a peer journal article</p> <p>Guest lecture</p>	35

Materials

- Articles for review
- Brief for participants on how to use problem-based learning case
- Case study handouts
- Flip charts/ Manilla paper
- Group work guidelines
- Internet connection

- Laptop
- Pictorial game
- Simulation exercise
- Simulation guideline
- Sticky notes

SESSION 1: Definitions of Epidemiology and One Health

This session will introduce the One Health approach and concepts, and the terms *epidemiology* and *epidemiologic triad* will be defined with examples. The web of causation will be illustrated and discussed. In addition, the various uses and principles of epidemiology will be described. One Health Approach will be introduced and explained.

Session Learning Objectives

By the end of this session, participants should be able to:

- i) define epidemiology.
- ii) explain the meaning of the epidemiologic triad.
- iii) discuss the web of causation.
- iv) explain the uses and the principles of epidemiology.
- v) display basic principles and related concepts of epidemiology, disease transmission, and the response cycle (preparation, detection, response and evaluation).
- vi) explain the One Health approach.
- vii) describe the principles of ecosystem health and the human-animal-environmental interface.
- viii) address health issues that cannot be solved through a single disciplinary approach.

Schedule	Topic/Activity	Learning Activity	Materials
8:00 - 9:00	Registration		Sign in sheet
9:00 - 10:00	Introduction <ul style="list-style-type: none"> ▪ Goals and Agenda ▪ Expectations ▪ Guest Speaker ▪ Pre-test 	Presentations	PowerPoint Sticky Notes (2 colors) Flip Charts Tape Pre-test
10:00 - 10:15	Tea Break		
10:15 - 1:00	What is One Health? What is Epidemiology?	Small Group Activity	Flip Charts & Markers
1:00 - 2:00	Lunch		
2:00 - 3:30	Principles of Epidemiology	Small Group Activity	Flipcharts & Markers
3:30 - 3:45	Tea Break		
3:45 - 4:30	Causes of Diseases (Morbidity and Mortality)	Interactive Presentation	PowerPoint
4:30 - 4:45	Evaluation of the Day	Plenary	Flip Chart

Time Activity/Topic Facilitator Instructions

(Facilitator notes are provided at the end of the session)



20 min

Registration



Registration

- i) Have participants sign the OHCEA attendance register
- ii) Explain logistics (e.g., breaks, meals, etc.)
- iii) Issue per diem
- iv) If the short course is residential, check on housing accommodations



15 min

Welcome



Facilitator Welcoming Remarks and Introductions

Participant introductions:

- i) In pairs, have participants share their:
 - Name
 - Where they are from
 - Type of work and position
 - A story about an experience they had that made them aware of the difference between men and women
- ii) Have participants prepare a 1-minute introduction of their partner to the class.
- iii) Go around the room and have each pair present their partner to the class.

Expectations and Concerns

Set up: Have two flip charts in the front of the room: one titled “Expectations” and the other “Concerns.”

- i) Give each participant two different colored sticky notes.
- ii) Ask participants to write down their expectations for the short course on one of the sticky notes (specify color) and their concerns about the course on the second sticky note (specify color).
- iii) Have participants place their expectation sticky notes on a flip chart titled “Expectations” and their concerns sticky notes on another flip chart titled “Concerns”.
- iv) Organize the sticky notes according to common themes.
- v) Explain the agenda for the week and the goals of the short course highlighting the expectations that will be met over the week and those that will not be met. Comment and address concerns.



15 min

Expectations and concerns



Goals of the Short Course

By the end of the course, participants should be able to:

- i) show an understanding of the basic terminology and concepts used in epidemiology.
- ii) demonstrate comprehension of the basic principles of epidemiology.
- iii) recognize the relationship between One Health, epidemiology and gender gap.
- iv) recognize the burden of communicable diseases and value of the gender gaps in epidemics and health care access.
- v) appreciate the various measurements of disease frequency and effect.
- vi) show knowledge of the scope of descriptive, analytical and participatory epidemiology.
- vii) demonstrate an understanding of the need to support and improve disease surveillance and outbreak investigation.

Explain that this course is sponsored by the One Health Central and Eastern Africa (OHCEA) network. OHCEA network is comprised of 24 academic institutions from eight African countries consisting of public health and veterinary schools and two US partner universities: Tufts University and the University of Minnesota. OHCEA is funded under a major USAID grant.

OHCEA's vision is to be a global leader in One Health promoting sustainable health for prosperous communities, productive animals and balanced ecosystems. OHCEA seeks to expand the human resource base needed to detect and respond to potential pandemic disease outbreaks.

OHCEA has identified gender, culture and beliefs as a critical competency to achieving their vision. This is the reason why they are sponsoring this course.



30 min

**Guest Speaker Opening
Workshop
and Pre-test**



Guest Speaker Opening Workshop and Pre-test

- i) In advance, be sure the speaker is prepared to address the group. Share with the speaker the short course goals and desired outcomes and what you would like him/her to emphasize in her/his address.

- ii) Introduce the invited guest speaker to “officially open the course.”
- iii) Give out copies of the pre-test. Tell participants they have 15 minutes to complete the pre-test. Explain to them that a pre-test is used to gauge how much they know about epidemiology in relation to the One Health concept. A post-test will be administered at the end of the course. The two tests will be compared. There is no grade associated with the pre-test.
- iv) When participants finish, they can begin their break.



105
min

Pre-training reading materials



Pre-training Reading Materials

- i) In preparation for this module, the class should watch the movie *Contagion*. They should focus on the epidemiology of the infectious disease and try to identify the relevant epidemiological components of the movie.
- ii) They should also read the following articles:
 Barreto M., Teixeira M. G., Carmo E. H. (2006). Infectious Diseases Epidemiology. *J Epidemiol Community Health* 2006, 60: 192-195
 One Health: Interdependence of People, other Species and the Planet by Meredith A. Barret and Steven. A. Osofsky
<https://rmportal.net/groups/one-health-students-online-platform/one-health-interdependence-of-people-other-species-and-the-planet/view>
 Checklist for One Health Epidemiological Reporting of Evidence (COHERE). Davis et al *One Health* Volume 4: December 2017 page 14-21
<https://www.sciencedirect.com/science/article/pii/S2352771417300022>



15 min

Discovery Activity: What is One Health?



What is One Health?

- i) Begin the session by having the participants watch the following videos:

One Health: from Concept to Action by CDC

<https://www.youtube.com/watch?v=TG0pduAYESA>

One Health: from Idea to Action:

<https://www.youtube.com/watch?v=gJ9ybOumITg&t=4s>

- ii) Briefly discuss the two videos with the participants.
- iii) Have each participant take 5-7 minutes to think about and legibly write down on separate sticky notes the answers to the following:
 1. Give the meaning of One Health approach.
 2. Identify two examples of One Health in practice.
 3. Identify two to three advantages of multiple disciplines working together to promote One Health.
- iv) Let participants display these sticky notes on the wall in the three separate sections. Then in a plenary, review the following:
 1. What are the common things identified?
 2. What are the differences?
 3. Is there anything that surprised anyone?
- v) Come up with a group description of what One Health is. (See facilitator notes at end of session for definition of One Health)



15 min

Overview of One Health Concepts



Overview of One Health Concepts

- i) Give a PowerPoint presentation (PPP No. 1) of an overview of One Health concepts. The presentation introduces One Health, the interdependence between humans, animals and the environment, and why disciplines need to work together. Also highlighted are the One Health core competencies and answers to the questions: Why One Health and why now?
- ii) Debrief the session by asking participants to reflect on what One Health is and any other questions related to the PowerPoint presentation they may have.
- iii) As part of this presentation, discuss the One Health core competencies, and how epidemiology and research are key to One Health change makers.



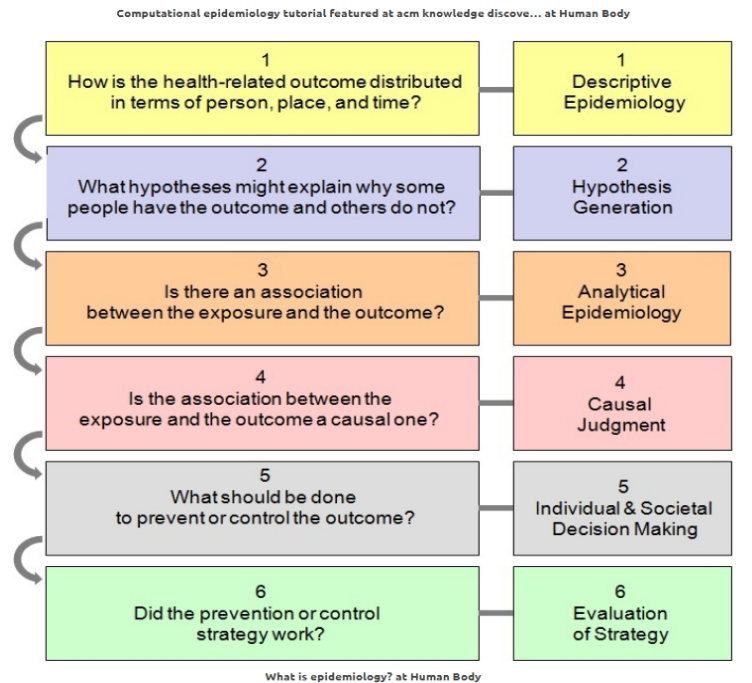
15 min

Discovery Activity: What is Epidemiology?



What is Epidemiology?

- i) Ask the participants to study Image 1 below and brainstorm what is happening.



Above image obtained from:

<http://craftbrewswag.info/what-is-epidemiology/>

- ii) Show the participants slide 8 and ask them to continue with the brainstorming on the definition of epidemiology referring to the following readings posted to them earlier on.

<http://www.cdc.gov/excite/epidemiology.html>

<http://www.soph.uab.edu/epi/academics/studenthandbook/what>

<https://aea.asn.au/about-us/what-is-epidemiology>

- iii) Display slide 10, 11 and 12 in an interval of 15 minutes and ask participants to jot down on their post cards what they think the statements refer to. Participants should also begin to include the One Health concept in this discussion. The slides make the following statements:

“Epidemiology is the study of the patterns of disease occurrence”

1. Are we referring to patterns of disease occurrence only in humans, or can this be extended to other species?
2. What is impacting this pattern of disease occurrence? Could they be ecological, environmental or man-made factors?

“Epidemiology identifies the risk factors”

3. Can they think of risk factors related to humans, animals and the environment?

“Epidemiology defines the relationship of disease to the population at risk”

4. Can they extend the population at risk to include other species and not just humans?

- iv) Pin the post cards on the wall for reference and inputs. The participants may then adopt the following definition for epidemiology:

« The study of the distribution and determinants of health-related states or events in specified populations and the application of this study to the control of health problems”.

- v) Remind the participants that we are approaching epidemiology from a One Health perspective.



45 min

**Discussion of the Movie
*Contagion***



To better understand the importance of the epidemiology of the disease, mode of disease transmission and possible risk factors, and to form a logical disease management plan, consider the following questions based on the movie:

1. What are the human-animal-environmental interactions?
2. What type of infectious organism is involved in the outbreak?
3. What host species are usually infected?
4. Are there known reservoir hosts that spread organisms, but do not develop disease?
5. How is the disease transmitted from host to host?
6. What interventions (treatment, prevention, vaccination) are available?
7. What are the different non-traditional health disciplines involved? What is their relevance to the epidemiology of the disease and control of the problem?
8. How do they go about tracing the disease and making a diagnosis?
9. What are possible disease control and prevention strategies?

- Lower the risk of infection by implementing interventions that limit contact between susceptible hosts and infectious agent.
- Change high-risk behavior(s) through health education.
- Quickly identify, properly treat and where appropriate, isolate newly infected cases (i.e. persons or animals with the disease of interest).



30 min

PowerPoint Presentation on *Contagion* Fundamentals



PowerPoint Presentation on *Contagion* Fundamentals

Give the PowerPoint presentation (PPP No. 3) on *Contagion* Fundamentals discussing all the different terms in the movie.

1. Explain the progression of a disease within an individual.
2. Describe how infections are transmitted from individual to individual.
3. Describe the transmission of disease within a population.



15 min

The Epidemiological Triad



The Epidemiological Triad

- i) Display slide 13. Ask participants in groups to populate the words in the triad. Let each group present in the plenary. In addition to what they have come up with regarding the triad, wrap up by displaying slides 14, 15 and 16. Table 1 as displayed in slide 17 gives an overview of each of the elements of host, agent and environment.

Host	Agent	Environment
<ul style="list-style-type: none"> • Age • Sex • Race/ethnicity • Religion • Marital status • Lifestyle • Exercise • Behavior • Co-morbidity 	<ul style="list-style-type: none"> • Biological • Microorganisms • Chemicals • Toxins, tobacco • Alcohol, drugs • Physical • Trauma • Radiation • Fire 	<ul style="list-style-type: none"> • Disease vector • Population density • Substances in surroundings and workplace • Air quality • Weather • Noise • Food and water sources • Special



<ul style="list-style-type: none">• Genetic set up	<ul style="list-style-type: none">• Nutrition• Lack of exercise	environments e.g. hospitals, day-care institutions, bathhouses, crack houses, refugee camps
--	--	---

- ii) Print out the table and display it on the wall for further reference.
- iii) Analyze the three tips of the triad from a One Health perspective - looking at humans, animals and environments, and how they interact with the triad.
- iv) Participants will discover more about what the epidemiology triad means through group work.
- v) Group work will be based on the fundamental axioms/assumptions displayed in slide 8 as shown below. Group 1 to explain assumption 1 and Group 2 to explain assumption 2.
 1. Diseases (or other health events) do not occur at random.
 2. Disease has identifiable causes:
 - ❖ which can be altered and therefore
 - ❖ prevent disease from developing.
- vi) Plenary discussions follow.
- vii) Explain that the triad helps to relate well the factors that influence disease transmission. This will be followed by an exercise on storytelling by every participant as per the following instructions.



30 min

Exercise: Story Telling on Epidemiological Triad



Story Telling on Epidemiological Triad

The epidemiological triad provides a basis of understanding communicable diseases.

Considering that the factors involved in disease transmission are the agent, the host and the environment, briefly create a One Health story and present to your colleagues. The story should be relating to the triad.

Examples of the story could be: the transmission of a zoonotic disease of your choice from your community; a toxicosis that is present in the environment affecting

both humans and animals; a natural event like flooding or earthquake that causes an outbreak of a disease.

The roles of each factor should be clearly brought out.

Inform the participants that:

- The story should not exceed 3 paragraphs (half a page).
- The presentation can be supported by drawing the triad.
- The presentation should not last more than 15 minutes.

You will need the following resources: a flip chart; computer and projector; epidemiology course material; pen and markers.

Display slide 18 after the story telling plenary.



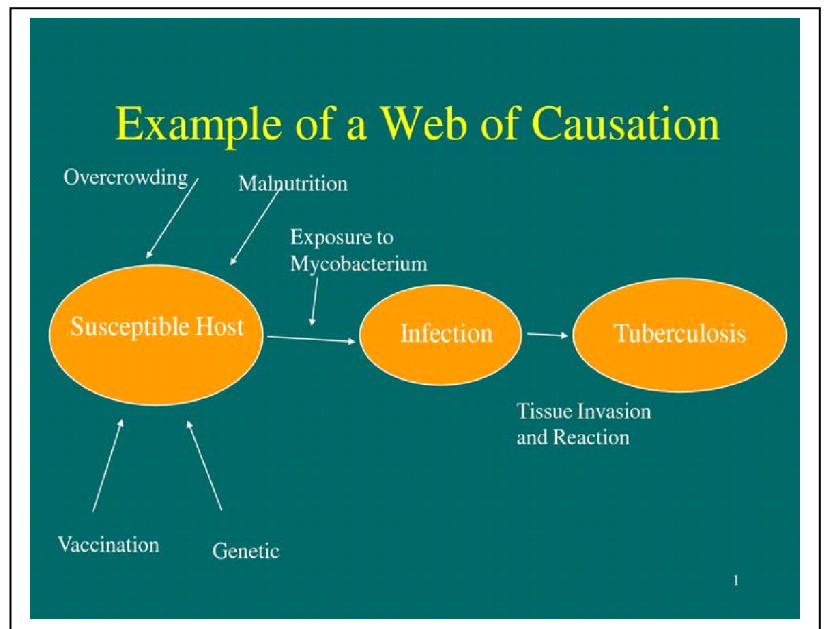
What is Web of Causation?

15 min



What is Web of Causation?

- What is web of causation?
- The participants will study the figure on web causation and explain in their own words what they understand by the phrase “web causation”.
- Study the figure that follows.



30 min

- The web of causation is based on the fact that there is/are no simple cause(s) of disease although they interact. The web of causation illustrates the

interconnectedness of possible causes. This can be linked to drivers of disease emergence. Refer back to the introduction of One Health and the different drivers of disease emergence such as climate change, globalization and travel, habitat reduction, increased interactions between humans and wildlife.

Study the figure provided.



The Principles of Epidemiology and Infectious Disease Epidemiology



The Principles of Epidemiology and Infectious Disease Epidemiology

- i) Let participants study the following quotation:

“Epidemiology is the study of the distribution and determinants of health-related states or events in a specified population and the application of this study to the control of health problems.”

- ii) From the quotation, participants will identify the principles of epidemiology. They should note that Epidemiologists ask the following questions as far as disease outbreaks are concerned.
 1. What - referring to event
 2. Who - referring to person
 3. Where - referring to place
 4. When - referring to time
- iii) Ask the participants to individually reflect on the community where their homes are based. Let them identify a disease outbreak they witnessed. Using the above questions (what, who, where, and when) and considering the principles of epidemiology and One Health, let them describe the events. Let them show the epidemiological issues evident in one paragraph.
- iv) Do a PowerPoint presentation (**PPP No. 2**) on infectious disease epidemiology.



Using Participatory Methodology in Epidemiology



Participatory Methodologies in Epidemiology

- i) Briefly review the participatory methodologies in the facilitator notes that can be used to establish rapport with stakeholders and support epidemiologic investigations. The participants should know when to use various participatory methods. The participatory research typically

combines a different set of methods.



30 min

Case Study using PE



Case Study using PE

- i) Give the participants the following scenario.
There is a suspected outbreak of Rift Valley Fever in a village in North Eastern Province of Kenya. Twenty people have died and hundreds of animals have also died. More people and animals seem to be infected. You are the lead epidemiologist going in to investigate.
- ii) Task them to do the following:
 - Identify the team that is needed to carry out investigations (remember, it must be a multidisciplinary team).
 - Identify which participatory methodologies you will use and why those methods provide you with the relevant information.
- iii) Participants should try to use methods that are inclusive of all stakeholders, culturally and gender sensitive and provide qualitative and quantitative information. They should keep in mind the role of different disciplines in this scenario, i.e. environmentalists, veterinarians, medical personnel and entomologists.
- iv) Divide the participants into two main groups. Each group should develop a plan for investigating their case. They should identify both qualitative and quantitative methodologies they will use to investigate. As they present their methodologies, they need to ensure they are One Health inclusive at the human, animal and environmental components.
- v) Give the groups the following case scenario and have them answer the questions that follow:

There are reports from a local radio station about a strange illness that kills animals suddenly without prior symptoms in Sheema District, Uganda. So far, 12 animals have been reported dead on three farms. In one of the farms, two people who ate the meat of the dead animals have also died. The other five people who ate the same meat are in a critical state and have been rushed to the nearby health facility. The community where these deaths of animals and people have occurred are worried and are seeking for government intervention. Your supervisor has requested you to

intervene in this worrying situation.

1. Describe how you would proceed.
2. How are you going to constitute your investigative team?
3. Which participatory approaches would you apply to obtain the relevant information?
4. Why do you think the participatory approaches you selected are suitable for this case study?



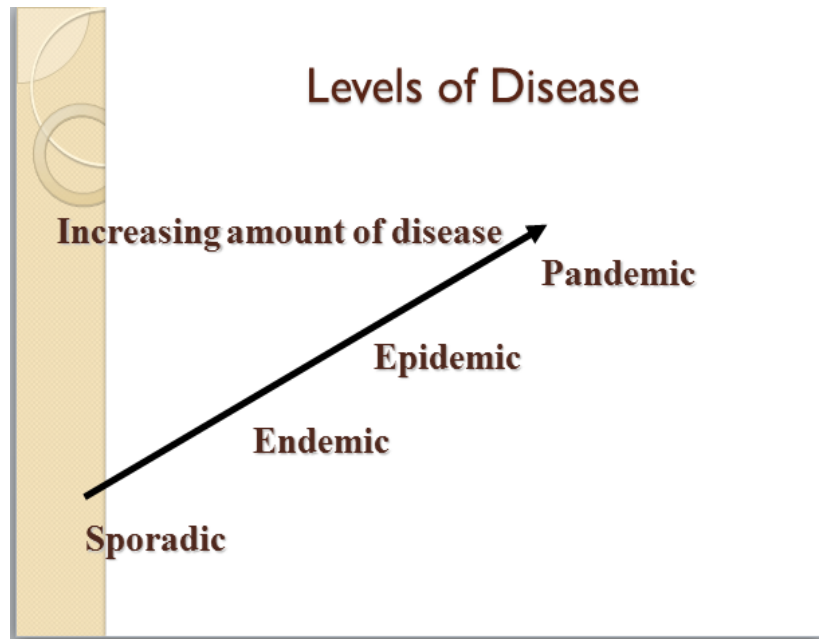
Causes of Diseases (Morbidity and Mortality)

20 min



Causes of Diseases

- i) Let participants jot down on a piece of paper the types of diseases they are aware of.
- ii) Let each participant exchange their paper with a colleague, who will report what the other colleague has jotted down.
- iii) Then flash slide 21 that shows a variety of:
 - Epidemic communicable disease
 - Zoonotic disease
 - Infectious diseases
 - Endemic communicable disease
 - Non-communicable disease
 - Chronic diseases
 - Injuries
 - MCH, occupational, and environmental health
 - Health behaviors
- iv) Together with participants, outline the diseases mentioned under each of the categories above.
- v) Expose participants to levels of disease (the increasing amount of disease) as displayed in the following figure.
- vi) Display the following slide.



Small Group Role Play: Disease Transmission

60 min



Role play

Disease Transmission

- i) Create four groups ensuring that all disciplines are represented in each group. Post the group assignments so that participants assemble in the correct groups. Each group will be assigned one of the diseases presented and will develop a role play to demonstrate how the disease is transmitted and how the transmission cycle can be interrupted and disease prevented.

- ii) Give participants the following instructions:

“For the disease you have been assigned, design a short role play (no more than 5 minutes) demonstrating how the disease is transmitted. Once you have demonstrated transmission, show how certain prevention measures can break the cycle of transmission.”

- iii) Give the participants 15 minutes to plan their role plays. Let each group present their role play over the next 20 minutes.

During role play presentations:

- iv) Other participants not in the role play will observe the presentations and take notes to provide feedback as well as identify gaps. A checklist may be developed to aid in evaluation.

Large Group Debrief



20 min



After role play presentations:

- v) Participants will individually fill out an index



20 min

Infectious Disease Discovery



Role play

card listing one thing they think would help prevent transmission of the disease they presented. This aspect will allow you to assess individual participant knowledge of disease transmission.

Infectious Disease Discovery

- i) Let participants discuss the activity and identify key take-home messages and conclusions. Consider using the following questions as prompts:
 1. What did you observe during the role play presentations?
 2. Describe different ways that diseases can be transmitted.
 3. Based on the transmission method, how can disease prevention and control vary?
 4. Are there other professionals you may need to work with to understand transmission mechanisms or implement prevention and control measures?
- ii) Provide additional feedback and identify gaps if necessary. If applicable, distribute notes on disease after the discussion.
- iii) Divide the participants into groups. Each group should develop a role play that mimics a disease that attacks many people. The other groups should be able to name it as you write it on the board.
- iv) Together with the participants, identify the level of the disease from the mimic. Explain the increasing amount of disease from sporadic to endemic to epidemic and finally to pandemic.

Summary of Definitions

- Epidemiology – the study of how disease is distributed in populations, and the factors that influence or determine this distribution.
- Sporadic level – occasional cases of disease occurring at irregular intervals.
- Endemic – habitual presence of a disease within a given geographic area.
- Epidemic – the occurrence of illness of similar nature in a community or region. It is clearly more than the

normal expected rate, and is derived from a common or propagated source.

Flush the slide showing the summary of the words in the figure.

Facilitator Notes for Session 1

1. Definition of One Health

There are many different definitions of One Health by different health organizations. But for purposes of this course, we will adopt the American Veterinary Medical Association (AVMA) definition of One Health (www.avma.org).

AVMA defines One Health as the integrative (collaborative) effort of multiple disciplines working together locally, nationally, and globally to attain optimal health for people, animals, and the environment. The health of people, animals and the environment make up the One Health triad, for each of them is inextricably connected to the others in the triad.

The common theme of One Health is multiple disciplines working together to solve problems at the human-animal and environmental interface. Collaborating across sectors that have a direct or indirect impact on health involves thinking and working across silos and enhancing resources and efforts while valuing the role each sector plays. To improve the effectiveness of the One Health approach, there is a need to create a balance and a greater relationship among existing groups and networks, especially between veterinarians and physicians, and to amplify the role that environmental and wildlife health practitioners, as well as social scientists and other disciplines play to reduce public health threats.

In less than 10 years, One Health has gained significant momentum. It is now a fast growing movement. The approach has been formally endorsed by the European Commission, the US Department of State, US Department of Agriculture, US Centers for Disease Control and Prevention (CDC), World Bank, World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO), World Organization for Animal Health (OIE), United Nations System Influenza Coordination (UNSIC), various universities, NGOs and many others.

One Health movement is an unexpected positive development that emerged following the unprecedented global response to the highly pathogenic Avian Influenza. Since the end of 2005, there has been increasing interest in new international political and cross-sectoral collaborations on serious health risks. Numerous international meetings and symposia have been held, including major initiatives in Winnipeg (Manitoba, Canada, March 2009), Hanoi (Vietnam, April 2010), and Stone Mountain (Georgia, US, May 2010), as well as four international One Health scientific congresses. The last one took place in Saskatoon, Canada, in 2018.

2. Methods used in Participatory Epidemiology (Adapted from Saito and Spurling, 1992: 10; Catley, Alders & Woods, 2012; Ahlers et al., 2009:157)

Informal interviews

- i) Semi-structured interviews and focus groups combined with visualization, ranking and scoring methods. Also, used as a stand-alone method. Same sex focus groups are used to identify specific needs of men and women.
- ii) Timelines: History and timing of disease events
- iii) Walking tour: Used by interdisciplinary teams of technicians and male and female farmers to develop maps locating main infra-structures, scavenging areas, biosecurity issues and to understand the farming systems.
- iv) Family roles and access, control and benefits: Identify ownership, control over benefits of poultry production and activities carried out by male and female adults and children in relation to breeding specific species.
- v) Dreams realized or visioning: to identify indicators and to discuss how to measure the benefits and changes expected by men and women.

Visualization methods

- i) Participatory mapping: Look at each of the specific agro-ecological and social situation and discuss the implication of these situations for biosecurity
- ii) Seasonal calendars: Seasonal variation in disease incidence; seasonal variation in human livelihoods e.g. consumption of livestock products and livestock trade; seasonal variation in contact with disease vectors, neighboring livestock and wildlife; seasonal variation in vector populations
- iii) Radar diagrams: Analysis of disease control strategies
- iv) Venn diagrams: Well-being stratification exercise and analysis of community structures. Helps to understand who will be affected by proposed development activities.

Ranking and scoring

- i) Counting: Identification of consumption and sale
- ii) Simple ranking: Analysis of disease control strategies; ranking of activities per their contribution to household income
- iii) Simple scoring: Prioritization of livestock diseases or impact of project activity per defined indicators
- iv) Matrix scoring: Analysis of disease control options
- v) Before and after scoring: Local characterization of the clinical signs and causes of disease; local characterization of disease vectors; comparison of clinical diagnoses of livestock keepers and veterinarians; analysis of veterinary service providers

SESSION 2: One Health, Epidemiology and Gender Gaps

Overview of Session 2

This session will provide participants with a foundation for understanding One Health concepts. It will also enable them to appreciate how developing One Health competencies enhances health professionals, practitioners, and partners' effectiveness. Epidemiology in the context of One Health approach will be explained to the participants. With this background, the gender sensitive approach to epidemiology in addressing emerging pandemic threats will be explored. Participants in a participatory manner will explore factors contributing to the emergence of infectious diseases. They will also learn about measures of disease frequency and their uses, and in a participatory approach, explore the burden of communicable diseases through analysis of tools. Examples will be drawn from multiple public health related outcomes, case studies and video displays.

Session Learning Objectives

By the end of this session, participants should be able to:

- i) use epidemiological methods to assess a health problem.
- ii) identify the major causes of morbidity and mortality nationally, regionally or globally.
- iii) classify infectious diseases.
- iv) explain the principles of control of communicable diseases.
- v) discuss the burden of communicable diseases.
- vi) explain the One Health approach:
 - describe the principles of ecosystem health and the human-animal-environmental interface.
 - address health issues that cannot be solved through a single disciplinary approach.
- vii) use a gender-sensitive approach to epidemiology to:
 - develop gender sensitive interventions and emergency responses.
 - describe the basic gender concepts.
 - explain gender influences in disease outbreak investigations.
 - evaluate the role of gender in disease control and prevention strategies.

Schedule	Topic/Activity	Learning Activity
8:00 - 9:00	Registration	
9:00 - 1:00	What is Epidemiology?	Small Group Activity
1:00 - 2:00	Lunch	

2:00 - 3:30	Consequences of Gender Roles	Small Group Activity
3:30 - 3:45	Tea Break	
3:45 - 4:30	Quick Facts about Gender, One Health and EPT	Interactive Presentation Role Play
4:30 - 4:45	Evaluation of the Day	Plenary

Materials

- Sign in sheet
- Flip charts
- Markers
- PowerPoint

Time Activity/Topic Facilitator Instructions



15 min

Morning Reflections



Morning Reflections

- i) Ask participants to jot down the:
 - new things they learnt yesterday.
 - something they knew that was clarified yesterday.
 - something that was not clear yesterday and required more clarification.
 - something to be used when they go back to their work stations.



30 min

Power point Presentation on Factors Contributing to Emergence of Infectious Diseases



Factors Contributing to Emergence of Infectious Diseases

- i) Remind the participants about the levels of diseases and display slide 23 again.
 - Epidemiology – study of how disease is distributed in populations, and the factors that influence or determine this distribution.
 - Sporadic level – occasional disease cases occurring at irregular intervals.
 - Endemic – habitual presence of a disease within a given geographic area.
 - Epidemic – the occurrence of illness of similar nature in a community or region. It is clearly more than the normal expected rate. It is derived from a common or propagated source.
- ii) Ask participants to brainstorm what infectious diseases are and name them. Let them also brainstorm the causes of infectious diseases.
- iii) Explain the various causes of infectious diseases in

technical terms. Some of the causes may have already been mentioned in the brainstorming exercise.

- iv) Flash PowerPoint slides 25, 26, 27 and 28 which show the chain of infection, dynamics of disease transmission, factors affecting disease transmission, and routes of transmission.

Zoonosis, Epizootic and Enzootic



15 min



**Zoonosis,
Epizootic and
Enzootic**

- i) Introduce the zoonosis, epizootic and enzootic.
- Zoonosis is an infection that is transmissible under natural conditions from vertebrate animals to man, e.g. rabies, plague, bovine tuberculosis.
 - An epizootic is an outbreak (epidemic) of disease in an animal population, e.g. rift valley fever.
 - An enzootic is an endemic occurring in animals, e.g. bovine TB.



15 min



- ii) Divide the participants into 3 groups and ask each group to do the following:

Group 1: Show how zoonosis infection affects areas you know of.

Group 2: Show how epizootic outbreaks end up affecting human beings.

Group 3: Show how enzootics endemics end up affecting human beings.

- iii) Ask participants to refer to the case study on Rift Valley Fever (facilitator notes attached).
- iv) Cross check also with slide 29 which indicates the various routes of transmission.
- v) Review the following terms as well:
- Clinical infection
 - Sub-clinical infection
 - Carrier
 - Death
 - Immunity
 - No immunity



- vi) Ask participants to identify how they could have caught a disease (infectious) at any one time. This could be a buzz session whereby a neighbor tells a neighbor. In the process, exposure to infectious agents may be mentioned e.g. clinical, non-clinical, carrier, etc.

- vii) It would be good to associate the exposure to

outcomes, e.g. death, carrier, immunity, no immunity

- viii) Explain the transmission process to participants as indicated in slide 31.
- ix) Let participants use the following table to further understand the transmission agents.

Agents	
Biological	Bacteria, viruses, fungi, parasites
Chemical	Pesticides, drugs
Physical	Automobile, guns

- x) Cover the main categories of infectious organisms using slide 34 and ask participants if they can think of other examples of diseases caused by each. A few examples are shown below. Ask the participants to identify those they know.

Bacteria: *Leptospira interrogans*, *Yersinia pestis* (causes plague), *Borrelia burgdorferi* (Lyme disease), *E. coli*, *Salmonella*, *Campylobacter* (all food borne)

Viruses: Avian influenza, SARS, Ebola, Dengue, Japanese encephalitis, Nipah, Hendra

Parasites: Malaria (protozoan), roundworms, hookworms, tapeworms (helminths), cryptosporidium (protozoan)

Fungi: *Candida albicans*, *Aspergillus*, histoplasmosis, cryptococcus, pneumocystis

Prions: Bovine spongiform encephalopathy (mad cow disease), creutzfeldt-Jakob disease, kuru

Bacterial viruses, fungi parasites, biological

- xi) Explain, those that are not familiar to them.
- xii) Flash slide 35 to show more pictorial examples.

- xiii) Summarize the transmission method by which the infectious agent passes from a source to the host.



Watch the following video on: How are pathogens spread and controlled | Biology for All | FuseSchoo
<https://www.youtube.com/watch?v=vO51sFre6fgI>

- xiv) Then show slide 38 to enhance knowledge of transmission, e.g. contact, air borne, vector borne, vehicle, etc. You may need to further explain key words like:

- Direct contact, vehicle borne, unclean hands and fingers
 - Droplet infection, vector borne
 - Contact with soil, mechanical
 - Inoculation into skin or mucosa, airborne
 - Transplacental or vertical formula borne
- xv) Ask participants to list diseases they think they acquired through direct contact transmission. The participants should be able to indicate the kind of direct contact.
- xvi) The following summary will enhance the participants' answers.
- Direct contact with infected individual person or animals, or their secretions.
 - Infectious organisms can enter via: *respiratory tract* – inhaled particles from sneezing and coughing; *mucous membranes* – eyes, nose, reproductive and digestive tracts; *skin* – cuts, wounds, open sore or injury can facilitate entry; *ingestion* – swallowing
- xvii) Introduce another mode of transmission which is Contact with fomite. “A fomite is an inanimate object that can carry pathogenic agents from one susceptible animal to another e.g. contaminated:
- Clippers
 - Brushes
 - Needles
 - Balling gums
 - Clothing
 - Milking units
 - Teat dip cups
 - Feed or water
 - Bucket and shovels
- xviii) Urge participants to read further about contact with fomite
- www.cfsph.iastate.edu/Infection_Control/Routes/fomite.php
- www.cfsph.iastate.edu/.../DirectContact_Fomite
- www.infectioncontrolday.com/.../fomites-and-
- xix) Introduce the mode of transmission through food and water.



20 min

Food and Water Transmission



Food and Water Transmission

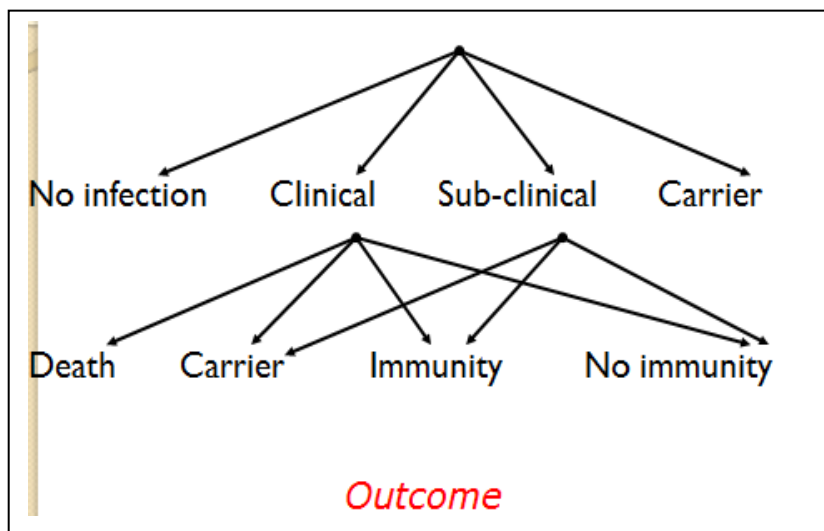
- i) Distribute post cards to the participants and ask them to disaggregate diseases that are transmitted through water and food. After this, let them display the post cards on the wall. They should show possible spots of contamination.
- ii) Flash slide 42 to enhance the learning.
- iii) Introduce the participants to the terms **Host** and **Reservoir Hosts**. Explain that the term Host refers to “A person who becomes infected with an infectious agent.”
- iv) Ask the participants to define the word “reservoir.” Inform them that “Reservoir Hosts is a term worth exploring.

“The medical dictionary defines reservoir host as an infection in *which the infectious agent multiplies and/or develops and on which the agent depends for survival in nature, the host essential for the maintenance of the infection during times when active transmission is not occurring.*”

<http://medical-dictionary.thefreedictionary.com/reservoir+host>

- v) The following summary explains the nature of the Host Reservoir, Reservoir Hosts and Transmission
 - Reservoir hosts with infectious agents can transmit the organism, but may not develop disease.
 - Hosts provide a reservoir for the organism in the environment.
 - Management is difficult if host population is large or difficult to control.
 - Host may be required for stage(s) of an organism’s development or transmission cycle before being capable of infecting another host or vector.
- vi) Ask participants to draw on a piece of paper, reservoir hosts they can think of. The drawn hosts will be displayed on a wall for all to see.
- vii) Participants then can categorize whatever has been drawn under “human reservoir”, “animal reservoir” and “non-living reservoir”.

viii) Then explore further what we mean by a human host and what is involved in human reservoir. Flash slide 47.



20 min

Biological Vectors



Biological Vectors

- i) Ask participants to identify what the reservoir host for malaria, rift valley fever and rabies are. They should note that there are biological vectors – Arthropods.
- ii) Display slide 48 and 49 to illustrate the act of transmission.
- iii) Divide participants in two groups and request them to come up with examples of “environment” hosts using mime. The group that will mime more factors in 5 minutes will be the winner.
- iv) Then flash slide 50 showing the various factors.



Environmental Factors

Population density	☒ Radiation
● Nutrients	☒ Pollutants - chemical agents
● Food supply for animals	☒ Toxins
● Temperature	☒ Air currents
● Rainfall - floods	☒ Sound
● Humidity	☒ War
● Sunlight	☒ Geology - soil type



Case Study: Sirari Village



40 min

Case Study: Sirari Village

Participants are now competent to identify various modes of disease transmission which they have discussed. They should discuss the case study on Sirari found in the Facilitator's Notes provided and answer the following questions.

1. Who are the people affected?
2. What different stakeholders are involved?
3. What disease are you thinking about?
4. How do you link the history of the disease with the epidemiological triad?
5. What should be done differently to prevent and control their conditions?
6. What further investigations should be done at the district hospital?
7. What is the One Health aspect of this case study?



Measures of Diseases Frequency and their Uses



20 min

Introducing Measures of Diseases Frequency and their Uses. (Understanding the principles of epidemiology)

- i) Introduce to the participants the two sayings that explain the major principles of epidemiology.
- ii) Divide the participants into groups and let each group come up with issues that explain the saying allocated to them.
 - Diseases (or other health events) do not occur at random
 - Diseases (or other health events) have causal and preventive factors that can be identified
- iii) In addition to what participants show, flash the key issues that emerge out of the study of epidemiology.
- iv) Epidemiology helps to;
 - determine the magnitude and trends.
 - identify the etiology or cause of disease.
 - determine the mode of transmission.
 - identify risk factors or susceptibility.
 - determine the role of the environment.
 - evaluate the impact of the control measures.
- v) Do we then say epidemiology issues are measurable? Yes! Judging from the Basic Epidemiologic Methods that encompass the following;

- Count cases (events)
 - Define involved population
 - Determine rates/proportions
 - Compare rates
 - Make inferences
- vi) Ask the participants, through brainstorming, to explain how they would judge that a disease is an epidemic disease.
- vii) Then introduce the 3 steps of Epidemiology.
- Counting number of events or conditions in populations or subgroups of persons. (C)
 - Dividing the number of events by the number of persons in the population to make rates. (D)
 - Comparing rates from different populations to make inferences about the cause for the observed differences in rates. (C)
- viii) Provide a case study for the purpose to enable participants practically go through the three steps.

Epidemiology Step 1: Counting

- i) Count the number of events or conditions in populations or subgroups of persons.
- ii) The first step in descriptive epidemiology:
 - How many persons experienced a particular condition?
 - Count = “numerator”.

Epidemiology Step 2: Dividing

- i) Divide the number of events by the number of persons in the population to make rates.
- ii) The second step in descriptive epidemiology:
 - What group of persons experienced the event? Population group = denominator.
 - Use events and population to make proportions, rates and odds.

Epidemiology Step 3: Comparing

- i) Compare rates from different populations to make inferences about the cause for the observed differences in rates:
 - Analytic epidemiology:
 - cohort (exposed vs. non-exposed)
 - case-control (sick vs. healthy)
 - Comparison of rates to make rate ratios or rate differences

- Comparison of odds to make odds ratios
- Use ratios or differences to identify risk factors
- Use statistical tests to determine reliability of ratios or differences

ii) You should then summarize the steps as follows:

- **Describe** an event in terms of:
 - Time - When?
 - Place - Where?
 - Person - Who?
- **Analyze** the association between the event (disease, death) and its determinants (risk factors)
- **Make recommendations:** preventive actions, control measures



30 min

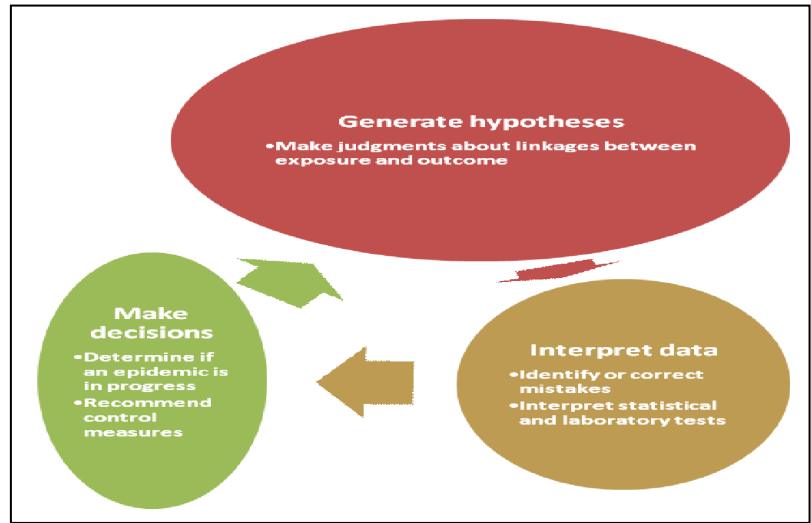
Case Study: Outbreak of Brucellosis in Mukono District



Case Study: Outbreak of Brucellosis in Mukono District

- Ask participants to read the case study on outbreak of Brucellosis in Mukono district and then answer the following questions:
 - Explain whether an epidemic has occurred. Give reasons for your answer.
 - Develop (a) hypothesis/es from the case study.
 - Interpret available data.
 - Show how availability of data led to formulation of policies.
 - Are these policies related to both human health and animal health?
 - In which area were policies formulated faster and why?
- Participants should note that those same measures could have been used to study a whole district or a whole country.
- Ask participants to complete their work, ready to report in the next session.

What is the role of the Epidemiologist?



15 min

Steps in Outbreak Investigation



Steps in Outbreak Investigation

- i) Prior to class, prepare the following game activity by writing the steps involved in an outbreak investigation on separate sheets of paper. The steps include the following:
 - a) Prepare for fieldwork.
 - b) Establish the existence of an outbreak.
 - c) Verify the diagnosis.
 - d) Define and identify cases.
 - e) Describe and orient the data in terms of time, place and subject.
 - f) Develop hypotheses.
 - g) Evaluate hypotheses.
 - h) Refine hypotheses and carry out additional studies.
 - i) Implement control and prevention measures.
 - j) Communicate findings.
- ii) Ask the class to volunteer/shout out steps that they identified in the outbreak investigation discussion. When one is correctly identified, hang the piece of paper with the corresponding step on the wall/whiteboard.
- iii) As additional steps are identified, ask the participants to put them in order so that by the end of the exercise, all steps in the outbreak will be identified.
- iv) The steps listed above are in a logical order, so the final list produced by the participants should be similar.



25 min

Case Studies in Outbreak Investigation and Stakeholder Involvement



Note: In practice, the steps of outbreak investigation are usually not followed in the order listed above. There are always variations depending on the nature of the outbreak and how it presents.

Case Studies in Outbreak Investigation and Stakeholder Involvement

- i) Divide the class into four groups. Give each group one of the following case studies.
 - a) Panic in Rwanda
 - b) Trouble on farm X in Mubende district, Uganda
 - c) Mysterious deaths of wild birds in Uganda
 - d) Bovine Tuberculosis
- ii) Have the groups read their case study, answer the questions at the end of the case and prepare a 10-minute report summarizing the case and conclusions.

Panic in Rwanda

1. Discuss human-wildlife conflict in Rwanda and in the other East African countries.
2. What are the effects of the pesticides on the animals, humans and environment?
3. Considering the information provided by the tourists and how it affected Rwanda, how would you communicate or control flow of information in this scenario?
4. What kind of team should be mobilized to respond to this emergency and to work with the community?
5. What process would the team use to investigate the outbreak?
6. With an international crisis of avian influenza, how should the Rwanda team manage this situation?
7. How does the extinction of the lion affect the ecosystem?
8. What interventions would be used in this situation?
9. What is the role of the community and how should they be involved?

Trouble on Farm X in Mubende District, Uganda

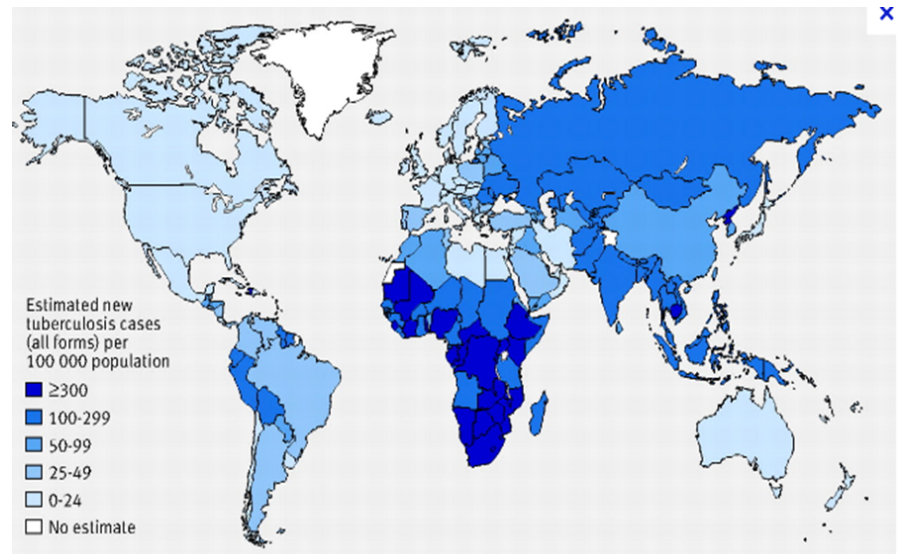
1. Imagine, you have been called to help the residents of that community, how would you proceed?
2. Explain how One Health approach is relevant to this case study.

3. What kind of team should be mobilized to respond to this emergency and to work with the community?
4. What process would the team use to investigate the outbreak?
5. What interventions would be used in this situation?
6. What is the role of the community and how should they be involved?

Mysterious Deaths of Wild Birds in Uganda

1. How would you solve this dilemma?
2. What kind of team should be mobilized to respond to this emergency and to work with the community?
3. What process would the team use to investigate the outbreak?
4. What interventions would be used in this situation?
5. What is the role of the community and how should they be involved?
6. Explain how One Health approach is relevant to this case study.

Bovine Tuberculosis



1. Who and what are the different elements and stakeholders involved in the case of TB?
2. How do you carry out an investigation and what disciplines should work together to control this re-emerging pandemic?



Presentation on Epidemiology and Gender Gaps



3. What are the benefits of cross-sectoral cooperation and the sharing of resources and information between countries?
4. What gender issues do you see in this scenario and how would you deal with them?

Epidemiology and Gender Gaps

- i) Give a brief PowerPoint presentation on Epidemiology and Gender Gaps. This will cover some gender concepts, social issues and culture in infectious disease management. As part of this presentation, discuss:
 1. What is the difference between sex and gender?
 - **Sex:** refers to the biological and physiological factors that define males and females.
 - **Gender:** refers to the socially constructed roles, behaviors, activities and attributes that a given society considers appropriate for males and females.
 - **Gender differences:** both socio-cultural factors as well as male-female differences in access and control over resources
 - Examples of biological differences: Women become pregnant, men do not. Physiological changes in the immune system during pregnancy predispose women to disease.
 - Examples of gender differences are found in the presentation
2. Common gender stereotypes
3. Gender analysis tools, community resource mapping and infectious disease outbreaks
4. WHO framework for sex and gender in infectious diseases



Mapping Gender Risks and Disease Transmission Pathways



Mapping Gender Risks and Disease Transmission Pathways

- i) Divide the participants into two groups and discuss the importance of gender in epidemiology and One Health.

Hint: Gender inequality has an effect in the occurrence and prevalence of certain diseases. Due to different factors, women may have high prevalence to certain diseases. Some of the factors are: lack of information, lack of finances to visit health care centers, shortage of food and access to education, etc.

Activity: Divide the class into three groups. Allow them 20 minutes to discuss and prepare a PowerPoint presentation on what it is regarding being female or being male in exposure to certain diseases. The PowerPoint should not be more than 3 slides.

Activity: Consider the following three diseases:

- TB
 - Brucellosis
 - Cryptosporidiosis
- ii) Map disease transmission pathways and the role of men and women, and how to prevent and control these diseases.
- iii) Clearly indicate where to break the lifecycle of these diseases.
- iv) Who is more susceptible at each point of transmission?



10 min

Gender Influences on Outbreaks



Gender Influences on Outbreaks

Give a PowerPoint presentation on gender influences in disease outbreak investigations and the role of gender in disease control and prevention.



15 min

Group Activity: Cryptosporidiosis and Gender

Cryptosporidiosis and Gender

Have the participants review the abstract in the Facilitator's Notes on cryptosporidiosis and gender, and discuss the following questions.



1. Who has a higher risk of contracting the disease from taking care of sick ones?
2. Who has got more daily contact with cattle feces?
3. Discuss the gender dynamics in relation to disease transmission.



20 min

PowerPoint Presentation on Gender Roles and Influences in Disease Management

Gender Roles and Influences in Disease Management

Give a PowerPoint presentation on gender roles and influences in an outbreak investigation, disease control and prevention.



Session 2: Facilitator Notes

Case Study 1: Sirari in Tanzania

“Sirari is a village located in the north of Tanzania, at the border of Kenya. The estimated population is 5,000. The main livelihood activity is agriculture and livestock. The climate is cool and experiencing sub-tropical temperatures.

An NGO is assisting the community to improve livelihood, food security and income. The NGO introduced exotic breed of goats. Almost on average, each household keeps 5 to 8 goats. The community members loved their goats so much that when they kidded, they carried the kids and lived with them in the same houses. After a while, the female goats started experiencing late abortion and some died. They could not get veterinary service as there were no vets in the area.

Later, some members of the family started experiencing fever-like symptoms and joint pains. The fever would be on during a week, and then off the other week and kept on alternating for at least 4 months. They bought anti-malarial drugs from the local drug shop but showed no improvement.

The drug shop recommended them to visit a health facility for further management. A lab test for malaria turned out to be negative. The health center referred the patients to the district hospital for further investigations...”

Analytical Questions

1. Who are the people affected?
2. What different stakeholders are involved?
3. What disease are you thinking about?
4. How do you link the history of the disease with the epidemiological triad?
5. What should be done differently to prevent and control their conditions?
6. What further investigations should be done at the district hospital?

Case Study 2: Outbreak in Brucellosis in Mukono District

Mr James Illaho enjoys pork and a local brew called Malwa or Ajono with his friends. On the evening of 10th Oct. 2012, he revealed that he had been suffering on and off from malaria for the last 5 months. Sometimes the fever disappeared on its own without swallowing Coartem. Many of his friends were surprised as they were experiencing the same problem. They resolved to go to a private diagnostic clinic in Mukono town where results were positive for brucellosis. The doctor who had received few cases before got concerned and informed the District Health Officer (DHO) who was already being alarmed by similar reports from 2 other private clinics and a government health center. Apparently, records showed that the affected persons were mainly adult males and few women who took malwa at various pork joints.

The DHO consulted his counterpart, the District Veterinary Officer (DVO) and

decided to jointly conduct a preliminary investigation. They informed and requested for support from the District Local Council Chairperson (LC5) and the Chief Administrative Officer (CAO). The LC5 Chairperson informed them that three of his councillors were under medication for the same disease and he quickly ordered the CAO to provide logistics for the investigations. This was a turnabout as the councillors had previously not cooperated on matters of disease control especially with the DVO.

Investigations at the pork/malwa joints revealed that most of the pork was coming from Kyampisi and Ntenjeru sub-counties and few from around the town. Most of the pork was half roasted on sticks using local charcoal ovens. In the sub-counties, pigs were being slaughtered anywhere under trees without inspection by a competent authority. Transportation of pork to trading centers and Mukono was by motorcycles and in dirty sacks. Most farmers owned between 1 -6 pigs and could not afford to rear a boar. As a result, a person kept a village boar to serve sows at a fee or a piglet in return which apparently served as a point of spread for brucellosis.

Screening tests among pig handlers and pigs on randomly selected farms revealed that on average, 36% and 45% of meat handlers and pigs were respectively positive for brucellosis.

A report was made to the District Council with suggestions for mitigation measures. The Council immediately passed by-laws banning all illegal slaughter places in the district. People were advised to eat pork which is deep fried. Plans to seek for funds and carry out a district wide survey on all pigs were made. All positive cases would be destroyed with compensation or sold and eaten after deep frying. Sensitization about the disease on its expensive treatment and consequences on reproduction in men (orchitis) was immediately launched on the media. People with on and off fevers were advised to go for medical check-up. It was also resolved that all pigs to be brought from outside the district whether donated or otherwise had to be tested for brucellosis to stop further introduction and spread of the disease.

Analytical Questions

1. Explain whether an epidemic has occurred or not. Give reasons for your answer.
2. Develop (a) hypothesis/es from the case study.
3. Interpret available data.
4. Show how availability of data led to formulation of policies.

Case Study 3: Panic in Rwanda

In Rwanda, herdsmen frequently graze their animals in the Akagera national park. As a result, their cows are attacked by wildlife specifically lions. This constantly causes conflict between the communities and wildlife park management. In many incidents when domestic animals are killed, the farmers respond by using furadone, a pesticide to poison the wild animals. In one such

incident, when a farmer's cow was killed, he layered the dead animal with furadone. The following day there were dead carcasses of lions, and hyenas. A few days later, many scavenger birds like vultures were found dead. Tourists going through the park found very many dead vultures and immediately panicked and reported it to the game warden as possible cases of avian influenza. Since it coincided with a worldwide outbreak of avian influenza, newspapers magnified the story. Rwanda depends very heavily on the tourism industry and any mention of influenza was immediately going to stall the country economically. Politicians and high-level government officials mobilized a team and sent them to investigate and to work with the community. This incident led to the extinction of the lion in Rwanda.

Analytical Questions

1. Discuss human-wildlife conflict in Rwanda and in the other East African countries.
2. What are the effects of the pesticides on the animals, humans and environment?
3. Considering the information provided by the tourists and how it affected Rwanda, how would you communicate or control flow of information in this scenario?
4. What kind of team should be mobilized to respond to this emergency and to work with the community?
5. What process would the team use to investigate the outbreak?
6. With an international crisis of avian influenza, how should the Rwanda team manage this situation?
7. How does the extinction of the lion affect the ecosystem?
8. What interventions would be used in this situation?
9. What is the role of the community and how should they be involved?

Case Study 4: Trouble on Farm X in Mubende District, Uganda

In 2013, trouble befell Farm X, which was a major supplier of milk in one of the communities in Mubende district. The workers reported a series of abortions from Farm X in cattle to Mrs Mukasa (Not real name). Mrs Mukasa notified her busy husband to act. Due to Mr Mukasa's busy schedule, he took another one week before taking action. After that, he finally got the veterinary doctor whom he called to his farm to investigate the cause of abortions. Meanwhile, there were reports in that community that the workers were having fevers not responsive to anti-malarials.

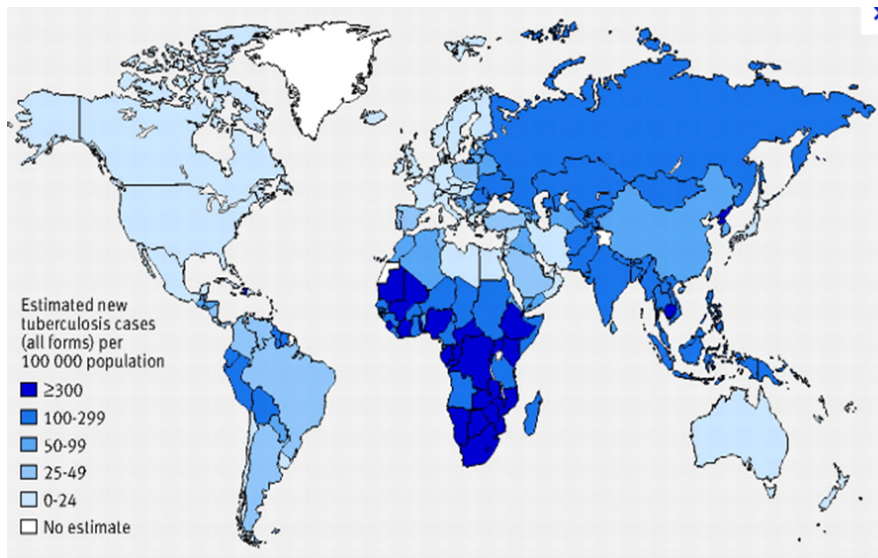
Analytical Questions

1. Imagine, you have been called to help the residents of that community, how would you proceed?
2. Explain how One Health approach is relevant to this case study.

Case Study 5: Mysterious Deaths of Wild Birds in Uganda

In early 2017, mysterious deaths of a large number of birds were reported at Lutembe beach on Lake Victoria, Entebbe. The dead birds were found upstream where a flower factory was situated. This was reported by the fishermen to Uganda Wildlife Education Centre.

Case Study 6: Bovine Tuberculosis



Every year, there are 8–10 million new cases of tuberculosis (TB) reported, and 2–3 million deaths attributed to TB. In many countries in Africa, HIV and AIDS is widespread. The biggest killer of people with HIV and AIDS is TB. However, the impact of Bovine Tuberculosis (BTB) on humans is poorly documented. BTB is a major problem for livestock in developing countries and wildlife play a major role in the failure of BTB eradication programs. In many cases, consumption of raw meat and milk and development of bush meat consumption as a cheap source of protein are the principal routes of human contamination with BTB.

Human TB of animal origin (zoonotic TB) is an important public health concern in developing countries. African nations face a particular challenge in TB control, deficiencies in public health control measures for cattle and animal products. Once detected, tuberculosis is curable in 90 percent of cases for as little as \$15 per treatment. HIV and AIDS is fueling the TB epidemic, and coordination between the TB and HIV communities is lacking.

The spread of extensively drug-resistant TB (XDR-TB) is a major threat and there is significant lack of infrastructure and capacity, including laboratory facilities and health workers. This is made worse by the fact that smaller, less-regulated farmers sell unpasteurized milk directly to consumers and most consumers in the village do not boil their milk to the required standards.

Mycobacterium bovis has a broad host range as the principal cause of TB in free-living wildlife, captive wildlife, domestic livestock, and non-human primates.

Wild ruminants and carnivores, such as African buffalo, lion, cheetah, greater kudu, leopard, warthog, and eland, can be infected and infect both humans and domestic animals. Scavengers (hyenas, genet) and chacma baboons in Kenya became infected through the ingestion of abattoir wastes.

Furthermore, recent development of wildlife activities, such as game tourism, farming, and hunting to develop the peripheral zones of protected areas has increased human contact with wild animals. Due to international travel and migration, TB is now considered a rapidly re-emerging pandemic. Many cases diagnosed are multi-drug resistant (MDR) or XDR.

Questions and Answers

1. Who and what are the different elements involved and stakeholders in the case of TB?
 - Wild animals, domestic animals, humans, birds
 - Multiple governments, veterinarians, medical doctors, wildlife specialists
 - Consumers of milk and meat products, handlers of these products, business people, hunters, women selling milk and handling food as well as those caring for the sick
 - International travel organizations and their governments, WHO, OIE, FAO
 - NGOs involved and engaged in disease control
2. How do you carry out an investigation and what disciplines should work together to control this re-emerging pandemic?
 - All disciplines: medical, veterinary, wildlife, anthropology, local and national leaders, businesses, consumers, multi-lateral organizations: WHO, OIE
3. What are the benefits of cross-sectoral cooperation and the sharing of resource and information between countries?
 - Needed for the effective control of highly contagious disease emergencies.
 - Participants should be able to brainstorm here and come up with multiple ideas.
4. What gender issues do you see in this scenario and how would you deal with them?
 - Women are responsible for milking and cooking food.
 - They are care givers.
 - If not targeted for intervention, cannot be able to control TB.
 - Men are hunters bringing bush meat home.
 - Men are traders in illegal bush meat while sometime women are intermediaries.
 - Access to medical care and training is less for women than men in most communities.
 - Drug resistance (MDR and XDR) makes control difficult.

7. Abstract: Social and Gender Determinants of Risk of Cryptosporidiosis, An Emerging Zoonosis in Dagoretti, Nairobi, Kenya

The aim of the study was to investigate the social and gender determinants of the risk of exposure to *Cryptosporidium* from urban dairying in Dagoretti, Nairobi. Focus group discussions were held in six locations to obtain qualitative information on risk of exposure. A repeated cross-sectional descriptive study included participatory assessment and household questionnaires (300 randomly selected urban dairy farming households and 100 non-dairying neighbors). One-hundred dairy households randomly selected from the 300 dairy households participated in an additional economic survey along with 40 neighboring non-dairy households. We found that exposure to *Cryptosporidium* was influenced by gender, age and role in the household. Farm workers and people aged 50 to 65 years had most contact with cattle, and women had greater contact with raw milk. However, children had relatively higher consumption of raw milk than other age groups. Adult women had more daily contact with cattle faeces than adult men, and older women had more contact than older men. Employees had greater contact with cattle than other groups and cattle faeces, and most (77 %) were male. Women took more care of sick people and were more at risk from exposure by this route. Poverty did not affect the level of exposure to cattle but did decrease consumption of milk. There was no significant difference between men and women as regards levels of knowledge on symptoms of cryptosporidiosis infections or other zoonotic diseases associated with dairy farming. Awareness of cryptosporidiosis and its transmission increased significantly with rising levels of education. Members of non-dairy households and children under the age of 12 years had significantly higher odds of reporting diarrhoea: gender, season and contact with cattle or cattle dung were not significantly linked with diarrhoea. In conclusion, social and gender factors are important determinants of exposure to zoonotic disease in Nairobi.

Analytical Questions

1. Who has a higher risk of contracting the disease from taking care of sick ones?
2. Who has got more daily contact with cattle feces?
3. Discuss the gender dynamics in relation to disease transmission.

SESSION 3: Disease Outbreak Investigations, Descriptive, Analytic and Participatory Epidemiology



Session Overview

Session 3 will be a participatory exercise, with participants studying case studies of reports on disease outbreak investigations and the measures taken to deal with the situations. There will also be further practice on applying descriptive, analytical and participatory epidemiology while dealing with health issues in any given situation. Basic gender concepts and role of gender in epidemiology will be introduced. Participants will also explore the different roles men and women play in disease outbreak investigation, control and prevention.

Session Learning Objectives

By the end of this session, the participants should be able to:

- i) showcase the burden of communicable diseases.
- ii) explain descriptive, analytic and participatory epidemiology.
- iii) discuss the uses of descriptive and analytical studies' data.
- iv) explain the different types of analytical study designs.
- v) differentiate various measures of diseases frequency - ratios, proportions, and incidence, prevalence and attack rates.

Time	Activity/Topic	Facilitator Instructions
 45 min	The Burden of Communicable Diseases 	The Burden of Communicable Diseases <ol style="list-style-type: none"> i) Present a brief PowerPoint on the definition of communicable diseases, slide 67. “A communicable or infectious disease is an illness caused by transmission of a specific infectious agent or its toxic products from an infected person or animal to a susceptible host, either directly or indirectly through an intermediate animal host, vector or inanimate environment” (Last 1995) ii) Ask participants to brainstorm why they think we currently have a burden of communicable diseases. iii) Then flash slide 68 reaffirming what they would have identified as burden of disease.
	Quick Review	Global Epidemiology of Infectious Disease <ol style="list-style-type: none"> i) Infectious diseases are the leading cause of death worldwide ii) New diseases are emerging iii) Old diseases are re-emerging



iv) Ask the participants to read the following extract:

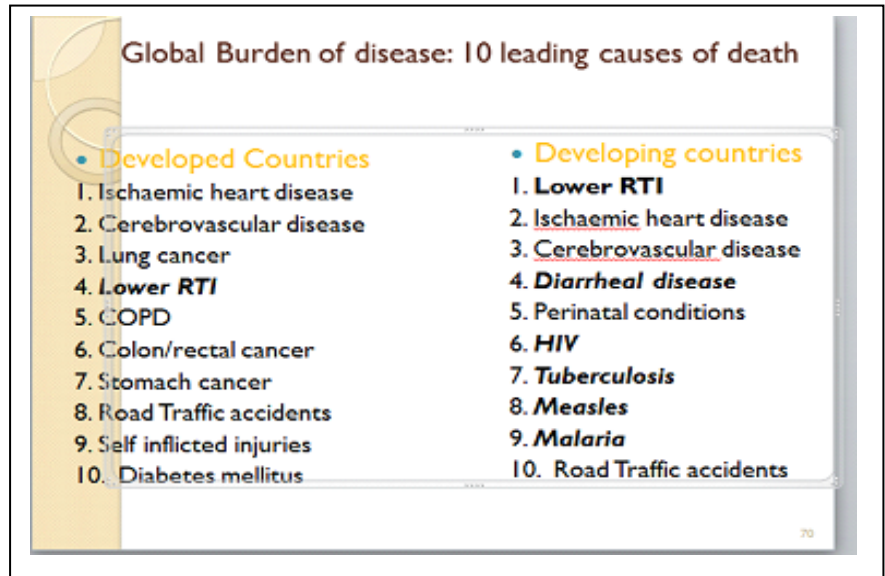
“Although substantial advances in biomedical sciences and public health measures have facilitated control of many infectious diseases in the past century, the world has witnessed an increasing incidence and geographical expansion of emerging and re-emerging infectious diseases which, together with some other old ones, remain among the leading causes of deaths and disability worldwide.

The global environmental, ecological, and socio-economic changes have a significant impact on the distribution, emergence and re-emergence of infectious diseases and are expected to continue to influence such trends. Some recent studies at both global and regional scales have suggested that climatic factors, human movement, and agricultural practices are important factors underlying the distribution, emergence and re-emergence of infectious disease.



- v) After reading the extract, participants should brainstorm what they think is a burden of disease!
- vi) The following statistics make the case clearer as indicated in slides 69-81.
- vii) The slides should be distributed to the participants.
- viii) The following slides would make a good summary:
Global Epidemiology of Infectious Diseases.
 - Infectious diseases account for more than 25% of all deaths in the world.
 - Diarrhea and respiratory tract infections (RTI) account for 50% of all infectious deaths.

- HIV, tuberculosis, malaria and measles are significant causes of deaths.



- ix) Flash or distribute slide 70-78 which all emphasize the burden of disease.
- x) Ask participants to reflect on their own areas where they reside and come up with a list of the cause of deaths in the last 2 years.
- xi) What are the most common diseases that have led to death? They may wish to represent those using percentages% or a pie chart.



Participants may wish to highlight the issue that *“60% of disease burden or global mortalities are due to infectious diseases which result in a total of 445 million cases per day”*.



Classification of Infectious Diseases



Classification of Infectious Diseases

- i) Flash slides 83 and 84, and briefly give the technical classification of infectious diseases.
- ii) Divide participants into two groups.

Group 1 should classify infectious diseases through transmission by a common vehicle and give examples:

- Ingestion
- Inhalation
- Inoculation

Group 2 should classify infectious diseases through propagation by serial transfer from host to host:

- Respiratory
- Anal-oral
- Genital

iii) Let the participants present their findings and you will supplement by stating those diseases that may not have been mentioned.

Measures of Disease Frequency (Descriptive, Analytic and Participatory Epidemiology)



Measures of Disease Frequency

- i) Introduce measurement of disease as is commonly known in epidemiology.
- ii) Flash slide 143.
- iii) Measures of frequency are the basic tools to describe quantitatively the causes and patterns of disease, or any other event related to health in human populations. For example:
 1. How many people are affected by a certain disease?
 2. What is the rate at which the disease is occurring through time?
 3. How does the disease burden vary by geographical region, by sex, by age, or various modes of exposure, among others?
- iv) Emphasize that epidemiology measures are basically about:
 - Count
 - Divide
 - Compare
- v) At this time, introduce various measures used in epidemiology through a short lecture. You should particularly mention descriptive, analytical and participatory measures and introduce the following vocabulary:

Incidence: New cases in each time (percent per year or per person time of observation)

Prevalence: Number of cases at a given time (percent at a given time)

Attack rate: Proportion of non-immune exposed individuals who become clinically ill

Primary case: Person who brings infection into a population

Secondary cases: Persons who are infected by the primary case (further spread is described as 'waves' or 'generations')

Epidemic: Occurrence of case of illness more than expected. An epidemic whose incidence remains stable for

a long period of time is described as endemic.

Pandemic: A global outbreak

vi) All the above vocabulary refers to particular measures the participants should get to know of.

vii) Divide the participants into three groups.

Group 1 should develop a case study and calculate the incidence of an outbreak of a given disease.

Group 2 should develop a case study and calculate the prevalence of a disease.

Group 3 should develop a case study and calculate the attack rate of a given disease.

viii) Still within groups, distribute slides 144 - 155 for practice purposes up to lunch time.

Plenary: Group Presentations

Give each group 10 minutes to present the brief case they developed and the measures they carried out.

Concluding Comments

Each group presents the formulae for a basic measurement e.g. formulae for the measures of: ratios, proportions, and incidence, prevalence and attack rates.

Ask each participant to develop their own case studies and practise the measurement of ratios, proportions, incidences, prevalence and attack rates later at home.



30 min

Plenary: Group Presentations



30 min

Gender and Epidemiology



Gender and Epidemiology

- i) Divide the class into two groups: One group will review the case study on the First Ever Rift Valley Fever (RVF) outbreak in Kabale, Uganda. The second group will review the case study on Crimean Congo Haemorrhagic Fever (CCHF) in Nakaseke, Uganda.
- ii) The groups should then discuss the following questions and present to the plenary.

Questions on Rift Valley Fever in Kabale, Uganda

1. What more measures do you think could have been taken to control RVF?
2. What aspects of descriptive, analytical and participatory epidemiology do you think were involved in this investigation?
3. What do you think could have been the role of gender

in this outbreak investigation?

Questions on CCHF in Nakaseke, Uganda

1. Suppose, you were the lead investigator in this outbreak, how would you proceed?
2. What measures should be taken to control Crimean Congo Haemorrhagic Fever in this case study?
3. What aspects of descriptive, analytical and participatory epidemiology were involved in this investigation?
4. What do you think could have been the role of gender in this outbreak investigation?



60 min

Measures of Diseases Frequency



Measures of Diseases Frequency

Uses of measures of diseases frequency: ratios, proportions, incidence, prevalence and attack rates

- i) Explain using a PowerPoint presentation, the various uses of measures of disease frequency (slide 141).
- ii) The basic tools to describe, quantitatively, the causes and patterns of disease, or any other event related to health in human populations may be mentioned. For example:
 1. How many people are affected by a certain disease?
 2. What is the rate at which the disease is occurring through time?
 3. How does the disease burden vary by geographical region, by sex, by age, or various modes of exposure?

- iii) Divide the participants into groups and distribute to them the following extract.

“Counting cases of disease in a population is the unique domain of epidemiology, a core component of disease surveillance and of a critical stage in investigating outbreak. Case counts must be placed in proper perspective by using rates to characterize the risk of disease for a population. Calculating rates for different subgroups of age, sex, exposure, history and other characteristics may identify risk groups and casual factors. Such information is vital to the development and targeting of effective control and prevention measures.”

- iv) Using the information in the extract, groups should be able to extract the use of frequency measures and share in a plenary thereafter.
- v) Each group has 10 minutes to present and 10 minutes for discussion on the uses of frequency measurers.
- vi) Introduce another measure, rates, using slide 157.
 - Rate is something that may change over time.
 - Rate is something that is observed during some time.
 - Rate measures the speed of occurrence of an event.
 - It measures the probability to become sick by unit of time.
 - It measures the risk of disease.
 - In rate, time is included in the denominator.
 - Rate, however, is frequently used instead of ratio or proportion!!

vii) Following is an example of a calculation of a rate.

Mortality rate of tetanus in X country in 1995.

- Tetanus deaths: 17
- Population in 1995: 58 million
- Mortality rate = $0.029/100,000/\text{year}$
- Rate may be expressed in any power of 10, 100, 1,000, 10,000, 100,000

Session 3: Facilitator's Notes

Case Study 3.1: First Ever Rift Valley Fever Detected in Kabale, Uganda, 2016

On 11th March 2016, the Ministry of Health (MoH) announced two confirmed cases of RVF in humans after testing positive by RT-PCR by Uganda Virus Research Institute (UVRI). The two confirmed cases were a 48-year-old butcher man from Bugongi North Ward, Kabale Municipal Council and a 16-year-old student from Omururinda village, Kabale District.

Uganda had never had an outbreak of RVF before. The National Task Force, responded by dispatching a multi-sectoral team starting on 11th March 2016 to the field for immediate intervention. The team was composed of experts from Ministry of Health, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), UVRI, Centres for Disease Control (CDC), School of Public Health, Makerere University, One Health Central and Eastern Africa (OHCEA) and Kabale district members of staff.

The objectives were 3-fold, that is:

- i) To establish the existence of RVF in animals.
- ii) To determine the magnitude of the outbreak.
- iii) To report the findings to MAAIF and MoH for actions and planning.

Analytical Questions

1. Identify the measures mentioned that were taken to control RVF in Kabale.
2. What more measures do you think could have been taken to control RVF?
3. What aspects of descriptive, analytical and participatory epidemiology do you think were involved in this investigation?
4. What do you think could have been the role of gender in this outbreak investigation?

Case Study 3.2: Crimean Congo Haemorrhagic Fever (CCHF) in Nakaseke, Uganda

Patient A, 19 (student) from village K, Nakaseke S/C in Nakaseke district. On 10 July 2017, he developed high grade fever, cough and dizziness for a week before admission to Nakaseke Hospital. During this time, he was managed from Kasambya Clinic for filariasis and typhoid. He was admitted to Nakaseke Hospital on 17 July 2017. He had a high-grade fever, was very sick looking, petechial rash, bleeding from venu-puncture site, dizziness, productive cough, mild chest pain, dark and loose stool (with four episodes a day). He tested malaria negative by merit, typhoid RDT (IgG/IgM) positive, CBC showed reduced cells and was sputum negative for TB by GeneXpert™.

On 24 July 2017, he vomited blood while on admission and was referred to Mulago NRH on 25 July 2017 but he did not go. He died on 27 July 2017.

Patient B, 20, male, from village L, Makulubita Sub-County, Luweero district. He was admitted on 14 July 2017 to Nakaseke Hospital with swollen eyes, dry cough, yellow urine, black stool, epigastric pain and was oozing blood out of teeth before death. Malaria, typhoid, brucella and H. Pylori tests were all negative, CBC showed pancytopenia – with reduced WBCs, and marked thrombocytopenia; HB was 6.1 and stool analysis showed nothing found. His blood sample tested negative for CCHF by PCR at UVRI. On 18 July 2017, he was referred to Mulago NRH but he did not go there. He died in the community on 19 August 2017 and was buried on 20 August 2017.

Patient C, 16, male from village N, Makulubita Sub-County in Luweero district. He was admitted to Nakaseke Hospital on 10 August 2017. He developed low grade fever associated with abdominal pain about 4 August 2017. He had a productive cough associated with mild chest pain. He also had jaundice, ascites, hepatomegaly and was anaemic with pancytopenia, reduced HB and HbSAg negative. Other symptoms included recurrent gingival hypertrophy, gum bleeding, epistaxis and joint pains. He escaped from the hospital on 17 August 2017.

Patient D, 30, male from village P, Nakaseke Sub-County in Nakaseke district; a boda rider/charcoal burner. He used to burn charcoal in Ngoma village. On 10 August 2017, he developed high grade fever and headache and was managed at Kaweweta Military Hospital. On 17 August 2017, he collapsed in Nakaseke Hospital while attending to his expectant wife. He reported having noticed epistaxis on the morning of the same day. He was admitted the same day. Key signs included vomiting blood, epistaxis and high-grade fever. He tested positive for CCHF by PCR at the UVRI labs. He was isolated at Nakaseke Hospital.

Patient E, 48, male from village R, Nakaseke Sub-County in Nakaseke district, a peasant farmer. He reported a date of onset of high grade fever on 20 August 2017 and first reported for management at Nakaseke Hospital on the same day. He started bleeding from the mouth on 22 August 2017. He also had oral sores and diarrhoea. He tested mRDT negative and Widal reactive. He was isolated at Nakaseke Hospital.

Analytical Questions

1. Suppose you were the lead investigator in this outbreak, how would proceed?
2. What measures should be taken to control Crimean Congo Haemorrhagic Fever in this case study?
3. What aspects of descriptive, analytical and participatory epidemiology were involved in this investigation? What do you think could have been the role of gender in this outbreak investigation?

SESSION 4: Disease Surveillance and Outbreak Investigation



Session Overview

Session 4 will focus on disease surveillance. Participants will be assisted with the help of case studies and simulations to discover the need to support and improve disease surveillance and outbreak investigation.

Session Learning Objectives

By the end of this session, participants should be able to:

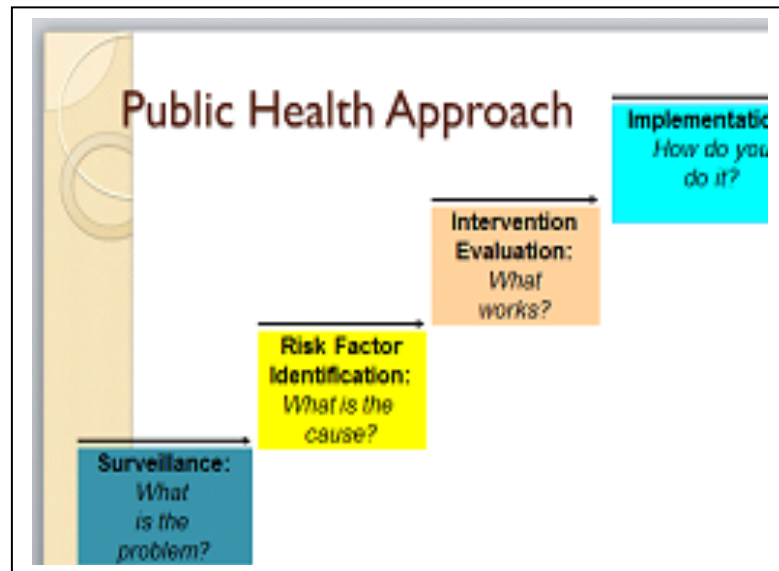
- i) explain the steps in disease outbreak investigations.
- ii) describe different types of surveillance.
- iii) define elements of public health surveillance.
- iv) describe the functions of public health surveillance.
- v) explain the surveillance “feedback loop” of data and information flow through local, state and federal channels.
- vi) list some of the uses of surveillance data.
- vii) indicate the role of laboratory in surveillance.
- viii) compare common surveillance strategies and systems.
- ix) describe and discuss the existing surveillance systems in a given country.

Time	Activity/Topic	Facilitator Instructions
 15 min	Review of Previous Day's Work	Ask participants to reflect on the previous day's work and point out what they enjoyed most and why?
 45 min	The Elements of Public Health Surveillance	The Elements of Public Health Surveillance <ol style="list-style-type: none"> i) Give participants a chance to define health surveillance. ii) You should also give them as many definitions as possible, e.g. disease surveillance is an information-based activity involving the collection, analysis and interpretation of large volumes of data originating from a variety of sources. iii) For effective and efficient practice of the One Health approach, there are defined competencies – skills, knowledge and behaviors – that build upon the foundation of multiple health-related disciplines. One Health competencies are critically important for the early identification and appropriate response to epidemics of emerging infectious pathogens. iv) Flash slide 287 that describes the meaning of public





health surveillance as, “The ongoing, systematic collection, analysis, and interpretation of data on specific health outcomes, closely integrated with the timely dissemination of these data to those responsible for prevention and control.”



20
min



- v) Use slide 288 as shown above that shows the public health surveillance place on a continuum and divide the participants in groups.
- vi) Each group should play a role on the continuum. Give each group a card on a section of the continuum. Each group should not know what the other groups are doing. The groups should then present a role play on their section. The role play should be based on a real-life outbreak of any given disease and guided by the notes on slide 289.
- vii) In surveillance, there ought to be a systematic (organized, not haphazard): ongoing (not just a one-time survey), collection, analysis, interpretation and dissemination of health data and link to public health practice. These are the elements that are (or should be) included in any definition of surveillance. Notice it is not just “the collection of.” It is not just vital statistics. It is data collected with the expectation that public health officials will look at it and act.
- viii) From the role play, ask participants the following

questions:

1. Is identifying a problem all that is needed to come up with a solution?
2. Why identify risk factors?
3. What intervention measures are necessary?
4. How can implementation be carried out?

ix) Let the groups consider the following case study and see how surveillance principles worked in the given situation and respond to the questions that follow.



Case study on Malaria



Case Study on Malaria

Historically, the prevalence of Malaria in northern Uganda has been high (prevalence=15 %+). Between 2012 and 2014, Indoor Residual Spraying (IRS) was introduced as an additive malaria prevention intervention in northern Uganda. A few months after IRS, the population of mosquitoes was drastically reduced and the communities no longer felt the need to use mosquito nets anymore. The number of malaria cases had indeed gone down. However, in June 2015, the Uganda National Medical Stores reported increased consumption of anti-malarials in northern Uganda. This prompted the Ministry of Health to investigate the cause of this increased consumption of anti-malarials. The Ministry discovered that there was an ongoing malaria epidemic that had gone undetected for 3 months.

Analytical Questions

1. How was the public health hazard assessed?
2. How was public health action triggered?
3. What were public health priorities?
4. How could the response be evaluated?

You will then summarize by flashing slide 291 which outlines the purpose of public health surveillance.

- Assess public health status
- Trigger public health action
- Define public health priorities
- Evaluate programs

Ask the participants another vital question: What are the sources of data? Participants should be able to brainstorm, before you flash slide 290 as a summary of the sources.

- Notifiable diseases
- Laboratories
- Vital records

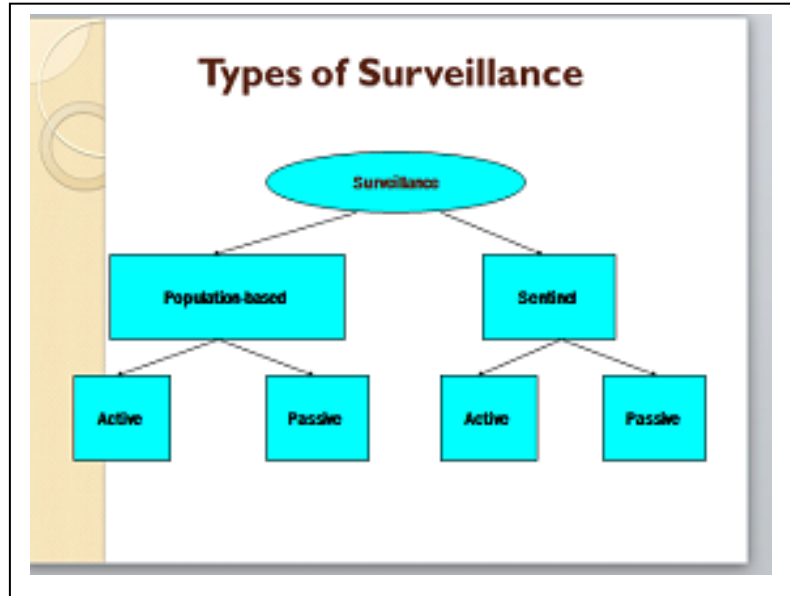
- Registries
- Surveys
- Administrative data systems
- Media
- Other data sources



Types of Surveillance

Types of Surveillance

- Introduce the types of surveillance using slide 294.



Group Discussion

- The slides are accompanied by the following notes which you will share using participatory method with the participants.

Surveillance systems can be classified in a variety of ways. One distinction is whether the system expects reports on the entire population or only a subset. A system that targets the entire population is called (appropriately enough) a population-based system.

A system that targets only a subset is often called a sentinel system. Note in the diagram that both population-based and sentinel systems can be active or passive.

Ask the participants whether anyone of them knows the difference between active and passive surveillance.

The terms active and passive are from the perspective of the health agency. Can the health officials sit back, feet up on the desk, and wait for reports to come in?

That is a passive system from the perspective of the health

agency. In passive systems, physicians, clinicians, laboratories and others required to report disease are given the appropriate mailing forms and instructions, with the expectation that they will report all the cases of reportable disease that come to their attention. So, more work for the clinicians, less work for the health agency.

Alternatively, do the health officials make periodic (usually weekly) telephone calls or personal visits to the reporting individuals to obtain the required data? That's active.

Analytical Question

Which is more common? Why?

Answer

Most routine surveillance systems are passive because they are cheaper and less work for the health agency. They require fewer resources.

Ask participants whether they had ever witnessed any of the active and passive surveillance discussed above.

The women probably would say so as it is done for HIV among expecting women. The hospitals collect data regularly.

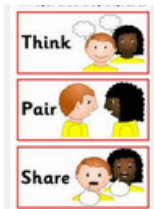


15
min

Dissemination of Surveillance Data

Dissemination of Surveillance Data

- i) Ask participants to pair up and discuss why dissemination of surveillance data is necessary and important. They should write their findings on a card to be posted on the wall for others to see.
- ii) Summarize as follows using slide 296.
 - For appropriate public health action to be taken, those responsible for taking that action need to know, and need to know in a timely fashion. Public health officials in neighboring areas might want to know, so they can be vigilant for cases that might occur across geographic lines.
 - Other government authorities (mayor, governor, etc.) usually want to know, particularly if the situation is serious.
 - Those who sent in the case reports appreciate being “in the loop”, because then they know that their efforts to report are not a waste of time and that the reports they sent in are not just being filed. Also, clinicians like to know what diseases are



prevalent at any given time, since it may help them with a differential diagnosis.

- Finally, the public is sometimes interested.



20
min

Linking Surveillance to Action



Linking Surveillance to Action

Surveillance should be linked to action.

- i) Review the previous case studies on Panic in Rwanda, CCHF in Uganda, and RVF in Kabale, Uganda, and analyze the following in relation to the cases.

1. Is surveillance linked to action as follows:

- Outbreak investigation
- Disease control
- Vaccination / prophylaxis
- Elimination of cause
- Interruption of transmission
- Development, targeting of programs (education, risk reduction, etc.)
- Development of policies, regulations

2. If not, what should be done?

Actions can include:

- Outbreak investigation
- Disease control, such as:
 - Vaccination / prophylaxis (e.g., immune globulin for hepatitis A outbreak)
 - Elimination of cause (e.g., discarding contaminated food)
 - Interruption of transmission (e.g., spraying to kill mosquitoes transmitting arthropod-borne disease)
- Development, targeting of programs (education, risk reduction, etc.)
- Development of policies, regulations



25
min

Uses of Public Health Surveillance

Uses of Public Health Surveillance

- i) You can now flash slide 297 and summarize the session in addition to groups presentations.
- ii) Let participants brainstorm the uses of public health surveillance. Use slide 298 to wind up the subject.
- iii) Public health surveillance is used to:



- investigate cases and implement control measures.
- detect epidemics/define a problem.
- estimate the magnitude of the problem.
- evaluate control measures.
- facilitate planning.
- determine geographic distribution of illness.
- portray the natural history of a disease.
- generate hypotheses, stimulate research.
- monitor changes in infectious agents.
- detect changes in health practices.



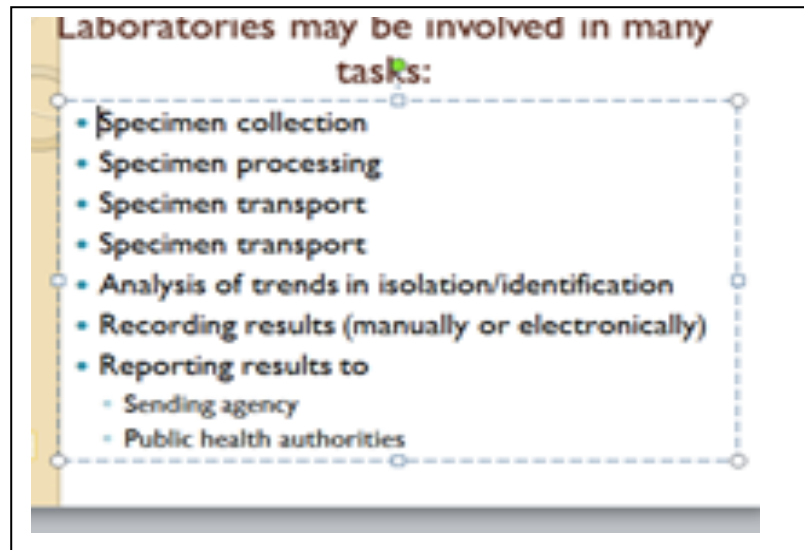
25
min

Panel Discussion on Laboratory Surveillance



The Laboratory in Surveillance

- i) Introduce laboratory surveillance to the participants.
- ii) Let them discuss in a panel what they think laboratory surveillance means.
- iii) Flash slide 300:



Peripheral (e.g. health center, outpatients)

- Intermediate (district/regional laboratory)
- National (e.g. national meningitis reference) laboratory
- International (international polio laboratory)

- iv) Explain the importance of accurate and timely laboratory information that has become the



v)

foundation upon which current disease treatment, prevention and control programs are based.

Divide the participants into three groups and let them discuss the following questions:

1. How can laboratory surveillance help to clarify clusters and outbreaks of diseases?
2. How can laboratory surveillance help to compare infection rates?
3. How can laboratory surveillance help to measure internal improvement over time?

vi)



Ask participants to indicate, on a piece of paper, examples from their local environments of disease surveillance at levels where laboratories have been involved in disease surveillance using the following as subheadings.

- Peripheral (e.g. health center, outpatients)
- Intermediate (district/regional laboratory)
- National (e.g. national meningitis reference laboratory)
- International (international polio laboratory)

vii)

Again, ask participants to indicate on pieces of paper the usefulness of laboratory surveillance and flash PowerPoint slides 302,304, and 305.



45
min

Case Studies Disease Surveillance



Simulation Exercise and Case Study Reviews on Disease Surveillance

Let participants form groups and have them discuss the case study on Karatu and review the Sirari case study.

Karatu Case Study



Analytical Questions on Karatu Case Study

1. What is the problem?
2. Who is affected by the problem?
3. What are the sectors that can be involved in solving the problem?
4. What measures/actions can be done to safeguard the public health, animals and the environment?

Analytical Questions on Sirari Case Study

1. Who are the people affected?
2. What different stakeholders are involved? What could be their interest in this scenario?
3. What disease are you thinking about?
4. How do you link the history of the disease with the epidemiological triad?
5. What should be done differently to prevent and control their conditions?
6. What further investigations should be done at district level?

Case Scenario

- i) Provide the participants with the following scenario:

You are working at the Ministry of Health's Epidemiology Surveillance Division. A school in Kakamega District, Kenya

reported an outbreak of suspected measles; the symptoms included fever and rash. Your supervisor asked you to take the lead to deal with this situation.

1. What would you do?
2. How would you link surveillance data from the Epidemiology Surveillance Division to this outbreak?
3. What public health interventions would you take in this case study to stop further spread of the disease and /or prevent future outbreaks?

Session 4: Facilitator's Notes

Case Study 4.1: Karatu Case Study



Karatu District, Arusha, Tanzania

Karatu district is located in Arusha region, Tanzania and is known by its agricultural activities. People practise irrigated farming. Among the major drawbacks that face the farmers are pests. As a means to overcome such problems, farmers indiscriminately use pesticides to protect their crops. This practice has been reported to be associated with many problems to the people, domestic and wild animals and the environment at large.

Cases of abortions in humans and animals are quite high in the district and are associated with pesticide poisoning. Skin diseases and infertility are also rampant especially to people working in horticultural farms. Incidences of fish and aquatic bird mortalities especially lesser flamingoes (*Phoenicopterus minor*) are observed and all are linked with pesticide poisoning.

In 2004, up to 45,000 Lesser flamingoes died at Lake Manyara, which is being fed by rivers draining from the agricultural fields in Karatu district. Studies have shown high levels of pesticide residues in milk, beef and local chicken eggs. A case control study conducted in pregnant women who go to deliver at Mount Meru Hospital in Arusha showed that they had very high levels of pesticide residues in breast milk and abdominal fats. The newly born babies had also high levels of pesticides in muconeum and umbilical blood. Studies further showed high levels of pesticides in water collected from Lake Manyara and different rivers around irrigated farms.

Efforts have been done by the government to overcome the problem. The Tanzania Ministry of Agriculture has been conducting seminars, extension work and restricting uses of pesticides including advocating the integrated pest control systems but the problem still exists and is getting worse.

Analytical Questions on Karatu Case Study

1. What is the problem? Who is affected? What are the challenges?
2. What do you see as the social, economic, political angle to this?
3. What key One Health issues can be identified?
4. What sectors are involved?
5. Are there any government policy implications?
6. What measures can be done to protect the health of humans, animals and the environment?
7. Can you give similar examples from your own background/work? How did you deal with it?

Case Study 4.2: Measles Case Study

You are working at the Ministry of Health's Epidemiology Surveillance Division. A school in Kakamega District, Kenya, reported an outbreak of suspected measles; the symptoms included fever and rash. Your supervisor asked you to take the lead to deal with this situation.

1. What would you do?
2. How would you link surveillance data from the Epidemiology Surveillance Division to this outbreak?
3. What public health interventions would you take in this case study to stop further spread of the disease and /or prevent future outbreaks?

Session 5: Case Study Reviews

Session Overview

The morning session will focus on identification of case studies that can be used for training purposes. Based on examples already used in the training, participants will be required to review at least 4 case studies in total and suggest situations where they can be used.

Session Learning Objectives

By the end of this session, participants should have acquired ability to:

- i) identify or develop epidemiology case studies related to One Health initiatives.
- ii) determine possible ways of mitigating widespread disease outbreaks in a given community.
- iii) use existing case studies to respond to an emerging pandemic threat as members of a One Health team.

Time	Activity/Topic	Facilitator Instructions
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Reflection



- i) Begin with an ice breaker and circulate the following fig to everyone and ask them how yesterday's training was. Give support to their opinions.
- ii) Let groups present the role plays they derived from the case studies they took home the previous night, as participants note their observations and questions.
- iii) The following questions may be of help:
 - 1. What sources of data might be available?
 - 2. What factors make one source of data more appropriate than the other?
 - 3. Who is going to utilize the data?
 - 4. How can data be routed, transferred and stored?
- iv) Debrief the participants after the role play and discussions outlining key issues on data for surveillance.



Case Study Identification

Case Study Identification

Using the 5 case studies provided for this section, have the participants analyze how each case study is relevant for epidemiology training and One Health. Review the case studies based on the following



questions:

1. The National Task Force appointed you to take the lead in the investigation, how would you proceed to handle this scenario?
2. To ensure that you are applying the principles of One Health, what kind of team would you constitute to investigate and what would be their roles?
3. What kind of data would your team collect?
4. Describe the steps that you would take to solve the problem in each case.
5. What lessons could be taken from this scenario?
6. Describe how you would investigate this cluster to identify the cause and recommend prevention measures.



20 min

Identification of Relevant Case Studies



Identification of Relevant Case Studies

- i) After discussion of these case studies, divide the participants into four groups. Each group should identify a case study that can be used for epidemiology training purposes. The case study must be relevant to One Health, addressing aspects of human, animal and environmental health and including multiple stakeholders. The participants should feel free to search the Internet or to create their own case studies and present these.
- ii) Each group should present their case study while the other groups critique and supplement. Ensure that every case study is One Health relevant.
- iii) Collect and document the case studies for future use.



30 min

Post Test



Post Test

- i) Handout the post test.
- ii) Tell the participants they have 30 minutes to complete the post test.
- iii) If they finish early, ask them to remain quiet until everyone is done.



15 min

Closing Session and Course Evaluation



Closing Session and Course Evaluation

- i) Have participants form a circle and ask each of them to say in one or two words what they associate with either disease surveillance or infectious diseases.
- ii) Give out certificates.
- iii) Give out OHCEA Event Evaluation.
- iv) Tell participants to place their completed evaluations in an envelope.
- v) Seal the envelope and give the evaluations to the OHCEA course coordinator.

Session 5: Facilitator's Notes

Case Study 5.1

On 17 October 2017, a national reference lab in Uganda confirmed by PCR, a positive case of Marburg Virus Disease (MVD) from a sample obtained from District X, in Eastern Uganda. An outbreak of Marburg was officially declared by the Ministry of Health on 19 October 2017. The index case was believed to have been an adult male, aged about 35 years, who was a herdsman with frequent hunting missions to the areas where there are caves heavily infested with Egyptian Fruit bats. Bats are known to be a delicacy in District X since time immemorial. The National Task Force appointed you to take the lead in the investigation. How would you proceed to handle this scenario?

Case Study 5.2

On 7 May 2017, the UNHCR public health officers reported suspected cases of anthrax at Olujobi HC III- Rigbo Health Centre. That is, 2 from the same family (children aged 6 and 12 years) had consumed meat from a dead animal. The children came from Walope village, Rigbo sub-county. The 3rd case (18 months old) was from Malangacia village. On 5 June 2017, Rhino Camp HC IV reported to Arua DHO death of a 35-year-old male. On 4 June 2017, a resident of Ledriva village, Eramva parish, Rhino Camp Sub-county was admitted with restlessness, sweating and confusion; Papulo-vesicular lesion became an eschar. He deteriorated, got dyspnoea and died on 5 June 2017. Skin sample tested positive for *Bacillus anthracis* by gram stain on 8 June 2017. You got to know about this scenario on 9 June 2017 and you were tasked to take charge of the investigations by your supervisor. Describe the steps that you would take to solve the problem in Arua. What lessons could be taken from this scenario?

Case Study 5.3

A district in northern Rwanda reported a sudden influx of refugees from a neighboring country. Local newspapers and social media reported terrible hygienic conditions at the refugee reception centre and rumors of communicable disease outbreaks. The Ministry of Health appointed you to take the lead to deal with this situation. What would you do?

Case Study 5.4

During the week of 6 December 2015, a man running a veterinary drug shop in Kibera, Nairobi, reported to Kibera Clinic with a slight fever, and headache for treatment in the first week of his infection virus. In the second week when the fever intensified, he then visited Kenyatta National Hospital from where his blood was suspiciously drawn and sent to Kabete Research Institute where it was diagnosed positive with Crimean Congo Haemorrhagic Fever (CCHF). Describe

how you would deal with this situation.

Case Study 5.5

In November 2016, three deaths of unknown cause occurred in the same household in the Rural District, Mekelle, Ethiopia. All were reported to have eaten the meat of a dead pig. Describe how you would investigate this cluster to identify the cause of death and recommend prevention measures.

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OHCEA EVENT EVALUATION – EPIDEMIOLOGY AND ONE HEALTH SHORT COURSE

Facilitators: _____

Dates: _____

OHCEA supported you to attend the **Epidemiology and One Health Short Course** event. Please take a few minutes to fill out the following confidential questionnaire. Your responses will help us better understand the value of this event and improve future programs. Thank you!

Please circle your response to each of the following.

<p>This event met my expectations.</p> <ul style="list-style-type: none">a) Strongly disagreeb) Disagreec) Agreed) Strongly agreee) Don't know	<p>6. This event helped clarify my understanding of "One Health."</p> <ul style="list-style-type: none">a) Strongly disagreeb) Disagreec) Agreed) Strongly agreee) Don't know
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<p>2. This event was relevant to my personal interests.</p> <p>a) Strongly disagree b) Disagree c) Agree d) Strongly agree e) Don't know</p>	<p>7. The pre-event logistics were well organized.</p> <p>a) Strongly disagree b) Disagree c) Agree d) Strongly agree e) Don't know</p>
<p>3. This event was relevant to my professional interests.</p> <p>a) Strongly disagree b) Disagree c) Agree d) Strongly agree e) Don't know</p>	<p>8. The event itself was well organized.</p> <p>a) Strongly disagree b) Disagree c) Agree d) Strongly agree e) Don't know</p>
<p>4. The information presented was new to me.</p> <p>a) Strongly disagree b) Disagree c) Agree d) Strongly agree e) Don't know</p>	<p>9. Overall, I found this event to be worthwhile.</p> <p>a) Strongly disagree b) Disagree c) Agree d) Strongly agree e) Don't know</p>
<p>5. The amount of information provided was:</p> <p>a) Not enough b) About right c) Too much</p>	<p>10. I intend to take actions in my work as a result of what I learned at this event.</p> <p>a) Strongly disagree b) Disagree c) Agree d) Strongly agree e) Don't know</p>

11. Describe what, if any, actions you will take in your work as a result of this event.

12. What were the strengths of this event?

13. What can be done to improve this event?

14. What single most important lesson did you learn from this event?

15. Please write any additional comments you may have about this event.

16 i). Did you present at this event?

- a) Yes
- b) No

16 ii). If yes what was the topic of your presentation?

17. What is your *primary* area of work?
- a) Nursing
 - b) Human Medicine
 - c) Veterinary Medicine
 - d) Wildlife Medicine
 - e) Public Human Health
 - f) Public Veterinary Health
 - g) Other (please specify): _____

18. Which sector do you represent?
- a) Government
 - b) Private sector
 - c) Education
 - d) Non-governmental organization (NGO)
 - e) Research
 - f) Other (please specify): _____

19. What is your sex?
- a) Male
 - b) Female

20. Nationality: _____