

VETERINARY EPIDEMIOLOGY

WORKSHOP MATERIALS CATALOG



COLORADO STATE UNIVERSITY - ANIMAL POPULATION HEALTH INSTITUTE

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VETERINARY EPIDEMIOLOGY WORKSHOP MATERIALS

INTRODUCTION

The veterinary epidemiology workshop materials are contained within a password protected web-based repository.

The workshop materials are organized as individual building blocks by topic and can be combined to create a curriculum for a workshop with a maximum length of two weeks. These materials, which have been routinely updated, have been used in veterinary epidemiology workshops within the United States and abroad for more than a decade.

The workshop materials were developed and subsequently modified by a team of veterinary epidemiologists who are/were members of the Association of Veterinary Epidemiology and Preventive Medicine. A list of the authors is provided below. These materials were developed for audiences consisting of practicing veterinary professionals with little background knowledge in animal health programs including epidemiology. The aim of these materials is to show the applications of epidemiology as aids for the decision-making process. Please note that some materials are better suited to international audiences.

The materials are best used when trainers become “facilitators” and not “lecturers”. The facilitation approach emphasizes active learning, which is recognized as one of the best means to educate practicing professionals. Thus, it is imperative that the “talking head” classroom is replaced by a collaborative workshop environment that includes round table discussions and table-top exercises. Readings are provided for each topic and are meant to be studied outside workshop hours.

AUTHORS

The members of the team of veterinary epidemiologists who are/were members of the Association of Veterinary Epidemiology and Preventive Medicine include the following individuals.

- I. Gardner, University of Prince Edward Island
- D. Hird, University of California – Davis (retired)
- L. Hungerford, University of Maryland
- B. McCarthy, Colorado State University (retired)
- P. Morley, Colorado State University
- J. New, University of Tennessee (deceased)
- S. Rao, Colorado State University
- R. Ruppner, University of California – Davis
- L. Russell, Texas A&M
- M.D. Salman, Colorado State University
- D. Thawley, University of Minnesota
- C. Zepeda, USDA

INSTRUCTIONS

CREATING THE CURRICULUM

Materials available through the catalog can be combined to create a curriculum for a workshop with a *maximum* length of two weeks. However, materials can be selected to create workshop curricula of shorter duration.

It is imperative to design a curriculum and select appropriate materials based on an overall workshop goal. That is, what is the purpose of the workshop, who are the intended participants, what specific information is needed by participants to reach the stated purpose, and how much time is needed to provide the necessary information? If these questions have not been answered completely (and accurately) then the subsequent curriculum that is designed is nothing more than a collection of materials thrown at the workshop participants. The “sink-or-swim” approach to curriculum development rarely, if ever, results in a useful workshop.

Example Guide for Curriculum Development

Workshop Name

Veterinary Epidemiology – Management Plans for Animal Diseases & Production International Workshop

Workshop Purpose

As a result of the workshop, participants are able to apply the principles of veterinary epidemiology to provide relevant, appropriate information that aids decision-making for animal health programs. Participants acquire basic epidemiological skills and learn appropriate epidemiologic tools in animal disease surveillance/survey systems that focus on improving disease control programs. Emphasis is placed on analysis and interpretation of field data, diagnostic test results, and the use of economic principles in animal health.

Intended Participants

International Animal Health professionals working in their government services who are able to speak and understand the English language.

Necessary Information & Time Distribution

The topics deemed necessary to include in this two week workshop include all those for which materials are provided in this catalog: veterinary epidemiology concepts, surveillance, epidemiologic indices, disease control, diagnostic tests, economics, epidemiologic study designs, sampling, sample size determination, statistics, disease freedom, risk analysis introduction, and decision making for animal health programs. Provided below is a *generic* agenda to use as an example of time distribution for each of the topics. The order of topics and/or the length of time spent per topic can be modified.

Generic Workshop Agenda

DAY 1	
08:00 – 9:00	Welcome & Introductions
9:00 – 11:30	Veterinary Epidemiology Concepts <i>Includes Break (10:00 – 10:20)</i>

11:30 – 12:00	Surveillance Systems
12:00 – 13:00	Lunch
13:00 – 15:00	Surveillance System Design
15:00 – 15:15	Break
15:15 – 16:30	Prioritizing Surveillance Activities Group Activity
16:30	Wrap-up & Reading Assignment (for next topic)
DAY 2	
08:00 – 9:00	Review & Discussion
9:00 – 12:00	Epidemiologic Indices <i>Includes Break (10:00 – 10:20)</i>
12:00 – 13:00	Lunch
13:00 – 14:30	Database Design & Data Presentation
14:30 – 16:30	Epidemiologic Indices Group Activity <i>Includes Break (15:00 – 15:15)</i>
16:30	Wrap-up & Reading Assignment
DAY 3	
08:00 – 9:00	Review & Discussion
9:00 – 12:00	Disease Control <i>Includes Break (10:00 – 10:20)</i>
12:00 – 13:00	Lunch
13:00 – 15:00	Surveillance & Disease Control Activity
15:00 – 15:15	Break
15:15 – 16:30	Global Disease Control
16:30	Wrap-up & Reading Assignment
DAY 4	
08:00 – 9:00	Review & Discussion
9:00 – 12:00	Diagnostic Tests <i>Includes Break (10:00 – 10:20)</i>
12:00 – 13:00	Lunch
13:00 – 15:00	Diagnostic Tests: Examples with Epi Z
15:00 – 15:15	Break
15:15 – 16:30	Diagnostic Test Sensitivity & Specificity Interpretation Activity
16:30	Wrap-up & Reading Assignment
DAY 5	
08:00 – 9:00	Review & Discussion
9:00 – 11:30	Epidemiology & Economics <i>Includes Break (10:00 – 10:20)</i>
11:30 – 12:00	Question & Answer Time

12:00-13:00	Lunch
13:00 – 15:00	Epidemiologic Studies
15:00 – 15:15	Break
15:15 – 16:30	Topical Wrap-up for Week 1 & Reading Assignment
DAY 6	
08:00 – 9:00	Review
9:00 – 12:00	Sampling Strategies & Sample Size <i>Includes Break (10:00 – 10:20)</i>
12:00 – 13:00	Lunch
13:00 – 14:30	Sampling Examples & Activity
	Survey Design Activity
14:30 – 16:30	<i>Includes Break (15:00 – 15:15)</i>
16:30	Wrap-up & Reading Assignment
DAY 7	
08:00 – 9:00	Review
9:00 – 12:00	Introduction to Probabilities <i>Includes Break (10:00 – 10:20)</i>
12:00 – 13:00	Lunch
13:00 – 16:30	Statistics in Epidemiology <i>Includes Break (15:00 – 15:15)</i>
16:30	Wrap-up & Reading Assignment
DAY 8	
08:00 – 9:00	Review
9:00 – 12:00	Statistics - Measures of Association & Risk <i>Includes Break (10:00 – 10:20)</i>
12:00 – 13:00	Lunch
13:00 – 15:00	Disease Freedom
15:00 – 15:15	Break
15:15 – 16:30	Additional time for optional activities or “catch-up” <i>Often, additional time is needed for sampling and statistics questions</i>
16:30	Wrap-up & Reading Assignment
DAY 9	
08:00 – 9:00	Review
9:00 – 12:00	Risk Analysis Introduction, Public Policy, Regionalization, & Discussion <i>Includes Break (10:00 – 10:20)</i>
12:00 – 13:00	Lunch
13:00 – 15:00	Risk analysis - LPAI in meat example
15:00 – 15:15	Break
15:15 – 16:30	Risk Analysis Activity

16:30	Wrap-up & Reflection
	<ul style="list-style-type: none"> How will you use the information you learned in this workshop?
DAY 10	
08:00 – 9:00	Review
09:00 – 10:00	Decision Making for Animal Health Programs
10:00 – 10:20	Break
10:20 – 11:30	Wrap-up & Reflection Discussion
11:30 – 12:00	Certificates & Course Assessment

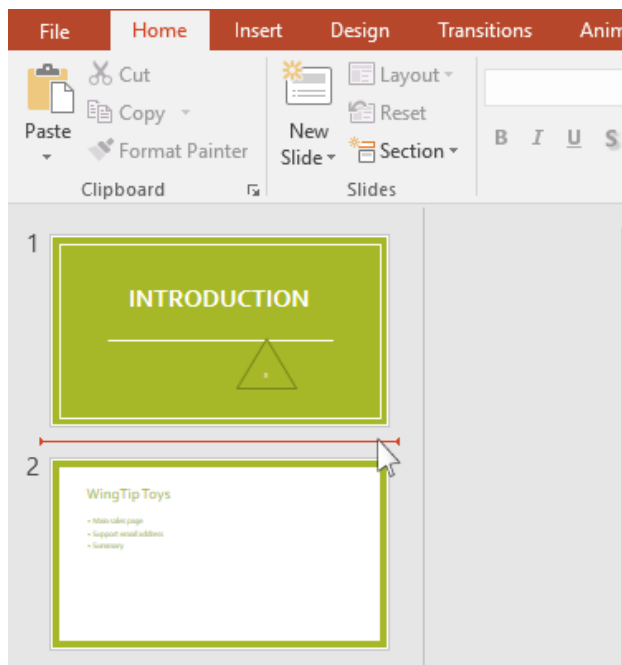
PREPARING FOR A WORKSHOP

Although each workshop requires different arrangements depending on the locale and participant list, three separate documents are offered as supporting materials and can be modified as needed. These documents include a preparatory activities checklist for the workshop organizers and two generic workshop evaluation forms. See the Appendix.

USING THE POWERPOINT SLIDE COLLECTIONS

To use the Slide Collection for each topic, follow the following steps to reuse (import) one or more slides from another presentation.

1. Open the presentation that you want to add a slide to.
2. In the slide pane, click where you want to add a slide.
3. On the **Home** tab, in the **Slides** group, click the arrow below **New Slide**, and then select **Reuse Slides**.
4. In the **Reuse Slides** pane, click **Open a PowerPoint File**.
5. In the **Browse** dialog box, locate and click the presentation file that contains the slide that you want, and then click **Open**.
6. In the **Reuse Slides** pane, do one of the following:
 - a. To add a single slide, click the slide.
 - b. To add all of the slides, right click any slide, and then select **Insert All Slides**.



NOTE: If you want the slide that you are adding to the destination presentation to maintain the formatting of the original presentation, select the **Keep source formatting** check box before you add the slide to the destination presentation.

Applies To: PowerPoint 2016 Preview, PowerPoint 2010, PowerPoint 2013

COMPUTER TOOLS

OpenEpi and Epi Z are the chosen computer tools for the application of presented materials. OpenEpi is an open source epidemiologic statistics program and provides statistics for counts and measurements in descriptive and analytic studies. OpenEpi is free and can be run from a web server or downloaded to be run without a web connection. The program is updated regularly.

Citation: **Dean AG, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2015/05/04, accessed 2015/10/07.**

Epi Z is a Microsoft Excel Workbook created by Dr. Cristóbal Zepeda. Dr. Zepeda was the Senior Epidemiologist with USDA-APHIS Veterinary Services employed with the International Animal Health Standards group in the National Import-Export Services Branch. Currently, he is Veterinary Attaché for the USDA-APHIS-IS Mexico Region and is stationed in Mexico City, Mexico.

Epi Z is a series of Microsoft Excel worksheets that are compiled into a workbook. Several worksheets in the workbook are described below. .

Worksheet Name	Use
Detection	Calculate sample size to detect disease
Prevalence	Calculate sample size to estimate disease prevalence
RR-OR	Calculate the difference in two proportions, RR, OR
Se-Sp 1	Calculate predictive value positive & negative given Se, Sp and p

Because computer-based tools are readily available and necessary to use when applying epidemiologic principles in professional situations, workshop participants are expected to provide their own personal computers or tablets with either Microsoft Excel or a similar spreadsheet program installed. If participants are not familiar with Microsoft Excel, tutorials and other on-line resource materials are available using the following link.

Microsoft Excel tutorials: <https://support.office.com/en-in/article/Office-training-and-tutorials-B8F02F81-EC85-4493-A39B-4C48E6BC4BFB>

NEED HELP?

Individuals who require clarification or have questions on borrowed materials are asked to contact Drs. Mo Salman (m.d.salman@colostate.edu) and Barbara McCarthy (Barbara.mccarthy@colostate.edu) who will direct you to the appropriate resource person (the main contributor for that topic).

TOPICS

VETERINARY EPIDEMIOLOGY CONCEPTS

Key Points

Upon completion of materials within this topic, participants will be able to:

- List the key objectives of veterinary epidemiology;
- Identify the main differences and uses of descriptive epidemiology, analytical epidemiology, surveys and modeling and their application within disease control programs;
- Explain the impacts of social, cultural and economic factors on the epidemiological triad and provide examples;
- Use temporal and spatial distribution concepts to explain disease spread.

Workshop Materials

1. Reading: Veterinary Epidemiology Concepts Reference

Reference material introducing epidemiology. Includes definition of epidemiology, medical ecology, epidemiological triad, disease transmission, agent factors, host factors, environmental parameters, infectious agent life cycle, descriptive epidemiology, infectious disease epidemiology, and herd immunity.

2. Review: Veterinary Epidemiology Concept Review & Terminology Matching Activity

- a. Activity Answer Sheet
- b. PowerPoint Presentation: Veterinary Epidemiology Concept Review Answers

Epidemiology concept review that provides key objectives, diagrams describing infectious agent transmission, infection stages, disease spectrum, epidemiological triad, and a summary of important points.

The terminology matching activity is accompanied by an answer sheet and slide presentation, which can be used to review in a group discussion setting.

3. Example Presentation: An Introduction to Veterinary Epidemiology

4. Example Presentation: The Basic Reproductive Number & Infection Spread

5. Group Discussion Questions

Includes discussion questions concerning qualifications of a veterinary epidemiologist and how epidemiology can be applied in one's current job and/or country. The document also includes four USA scenarios for discussion, which highlight specific questions or needs for which veterinary epidemiology is used.

6. Glossary

A glossary of epidemiological terms.

7. PowerPoint Slide Collection (112 slides)

The slide collection includes the slides shown in the two example presentations. Additional slides are included that support the reference and review materials.

SURVEILLANCE SYSTEMS

Key Points

Upon completion of materials within this topic participants will be able to:

- Define surveillance and differentiate survey, surveillance and monitoring;
- Design and implement survey or surveillance programs utilizing appropriate scientific approaches;
- Assess the scientific value and effectiveness of an existing surveillance system including its limitations;
- Assess the scientific value and the limitations of a given survey outcome.

Workshop Materials

1. Reading: Chapter 1 in Salman, MD., editor. Animal Disease Surveillance and Survey Systems. Iowa: Iowa State Press – A Blackwell Publishing Company. 2003: 3-13.

Chapter 1 is titled "Surveillance and Monitoring Systems for Animal Health Programs and Disease Surveys". The chapter is a good introduction to animal health surveillance and provides definitions of disease monitoring, surveillance, "targeted surveillance", a disease control program, and a disease eradication program. Active and passive data collection methods are discussed.

2. Reading: Chapter 3 in Salman, MD., editor. Animal Disease Surveillance and Survey Systems. Iowa: Iowa State Press – A Blackwell Publishing Company. 2003: 35-43.
 - a. Animal Disease Surveillance & Survey Systems – Chapter 3 Review
 - b. Animal Disease Surveillance & Survey Systems – Chapter 3 Review Answer Sheet

Chapter 3 provides a guide for planning and implementing surveillance and monitoring systems that will be efficient and provide credible information for making decisions.

3. Example Presentation: Surveillance Systems – An Introduction
4. Activity: Surveillance Design
 - a. Surveillance System Design Reference
 - b. Activity worksheet

The surveillance design activity and supporting explanatory material supplement the chapters from Salman's (Ed) "Animal Disease Surveillance and Survey Systems" and guide participants by focusing on the many considerations that must be addressed in the design of a surveillance system. Participants specify system aims, identify system components, outline planning steps, identify essential implementation requirements, list expected outcomes, and outline system limitations. The exercise is designed as a group activity. Each group selects one of the following diseases to use in the exercise: Bovine tuberculosis, Avian Influenza, Food and Mouth Disease, Rift Valley Fever, and Anthrax. See Iowa State University's The Center for Food Security & Public Health website for disease information (<http://www.cfsph.iastate.edu/DiseaseInfo/index.php>).

5. Activity: Prioritizing Surveillance Activities – A Suggested Approach
 - a. Introductory presentation (Prioritizing surveillance activities.pptx)
 - b. Activity worksheet
 - c. Microsoft Excel Workbook (Priorities DZ surveillance.xlsx)

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The activity includes a supporting presentation and Microsoft Excel Workbook. Through the presentation, participants are given background information concerning the basis of prioritizing surveillance activities and a suggested approach based on scoring diseases considering a set of defined criteria. A Microsoft Excel workbook is provided to serve as a template for the scoring matrix. The activity is designed to be completed by a group of individuals.

6. Group Discussion/Challenge Questions

A series of seven questions designed to challenge a group of participants to discuss the important implementation aspects of a surveillance system.

7. Activity: Contagious Bovine Pleuropneumonia (CBPP) Case Study

a. Supporting Materials

- i. 1_FactSheet_CBPP-OIE
- ii. 2_ContagiousBovinePleuropneumonia.ppt
- iii. 3_CBPP_DiseaseSynopsis
- iv. 5_Scenario.docx

b. 7_CBPP_Surveillance

c. 7_CBPP_SurveillanceANS

The complete CBPP case study is provided in the "Case Studies" section of the catalog. The relevant supporting materials and section are listed above. The surveillance section emphasizes the differences between a survey and surveillance and the surveillance system design process.

8. PowerPoint Slide Collection (33 slides)

The slide collection includes the slides shown in the example presentation; additional slides that support the reading materials are included.

EPIDEMIOLOGIC INDICES

Key Points

Upon completion of this topic participants will be able to:

- Properly calculate prevalence and incidence and apply the measures appropriately;
- Utilize epidemiological indices in assessing disease management strategies and options;
- Analyze a disease situation using the appropriate epidemiological indices;
- Interpret findings from literature or technical reports in which epidemiological indices are used.
- Present epidemiologic information using tables and charts.

Workshop Materials

1. Readings:

- a. Epidemiologic Indices
- b. Creating 2-by-2 Tables
- c. Selected Definitions & Formulas

The Epidemiologic Indices reading includes descriptions and examples of ratios, proportions, and rates. The discussion details the importance of the case definition, the concept of the population-at-risk, prevalence and incidence, cumulative incidence, incidence density, and specific measures of morbidity and mortality, such as the attack rate, case-fatality rate, cause-specific mortality rate, and proportional mortality. Furthermore, the reading highlights the 2-by-2 table, measures of risk including the risk ratio or relative risk, risk difference or attributable risk, and odds ratio. A brief description of the use of effective illustrations for communicating differences in proportions or rates among different subgroups of the population. The Creating 2-by-2 Tables document includes a recap of creating a 2-by-2 table using conventional formatting and a scenario-based exercise.

The Selected Definitions & Formulas document is designed to be a workshop handout. This handout provides brief descriptions and associated formulas for prevalence, incidence, incidence density, attack rate, case-fatality rate, crude mortality rate, cause- and age-specific mortality rates, risk ratio, attributable risk, and odds ratio. Furthermore, the last three pages include summaries and formulas for sensitivity, specificity, predictive value, confidence intervals, Chi-squared test, and a table of selected percentile values for the t-distribution. Please note that some of these formulas are not covered in this topic.

2. Example Presentation: Epidemiologic Indices

3. Reading: Presenting Epidemiologic Information

The reading on presenting epidemiological information includes descriptions of qualitative data (nominal and ordinal) and quantitative data (discrete and continuous-scale) and the appropriate means to summarize these data types. Following this introduction on data types, a discussion of the art of presenting data using tables, graphs, and charts is provided by listing general common sense recommendations. Examples of histograms, stem-leaf plots, frequency polygons, arithmetic scale line graphs, scatterplots, pie charts, and bar charts are given.

4. Activity: Data Presentation.

- a. Introductory presentation

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b. Microsoft Excel Worksheet (FMDTrainingData.xlsx)

The data presentation activity includes a brief supporting presentation and a Microsoft Excel Worksheet. This activity provides an opportunity for participants to decide how to organize a table to summarize and communicate data provided in a data set. Furthermore, participants are able to practice creating appropriate charts to communicate these summarizations.

5. Activity: Contagious Bovine Pleuropneumonia (CBPP) Case Study

a. Supporting Materials

- i. 1_FactSheet_CBPP-OIE
- ii. 2_ContagiousBovinePleuropneumonia.ppt
- iii. 3_CBPP_DiseaseSynopsis
- iv. 4_CBPP.xlsx
- v. 5_Scenario.docx

b. 8_CBPP_EpiIndices

c. 8_CBPP_EpiIndicesANS

The complete CBPP case study is provided in the "Case Studies" section of the catalog. The relevant supporting materials and section are listed above. The Epi Indices section includes calculating measures of disease frequency (ratios, proportions), incidence versus prevalence, creating 2-by-2 tables, summarizing data, and interpreting data summarizations.

6. Activity: HPAI in Thailand, 2004

- a. Activity worksheet
- b. Data & Map
- c. Microsoft Excel Workbook
- d. Activity Answers & Discussion Topics

Activity includes describing an epidemic by charting and mapping the individual outbreaks, delineating bird-level or flock-level measures of incidence, interpreting temporal and geographic distributions, and examining the level of infection in different species/production types. Discussion topics concern obtaining information for action.

7. Group Discussion/Challenge Questions

Six questions are available, which are focused on asking participants to demonstrate the value of incidence data, prevalence data, baseline data, and non-diseased animal data.

8. PowerPoint Slide Collection (89 slides)

The slide collection includes the slides shown in the example presentation; additional slides that support the reading materials are included.

DISEASE CONTROL

Key Points

Upon completion of the materials within this topic, participants will be able to discuss the factualness of the following statements:

- No single action against a disease is sufficient.
- In order to select the proper actions for prevention, control, or eradication of a disease within an animal population, knowledge about the epidemiology of the disease is required.
- Measures to accomplish disease exclusion include: quarantine of sick or exposed animals and animal testing prior to joining a specific disease-free population.
- Methods for disease prevention within a population where disease is present include immunization, chemoprophylaxis, sanitation, genetic engineering/selective breeding, and education.
- Control measures include practicing appropriate herd management, increasing resistance to the agent in healthy animals, and detecting disease early.
- Disease eradication methods include mass treatment regardless of disease status, mass immunization, quarantine, selective slaughter, and depopulation.
- Quarantine and isolation are usually NOT adequate for non-endemic or exotic pathogens. Additional measures for non-endemic pathogen exclusion should focus on adequate screening, documenting sources of new animals, restricting animal movement and restricting trafficking before eventual mingling.

Workshop Materials

1. Reading: Methods for Directed Action against Diseases

Topics covered in the reading include discussions of disease prevention, control, and eradication methods for endemic and non-endemic pathogens and biosecurity.

2. Example Presentation: Methods for Directed Action against Diseases

The example presentation contains only five slides and serves as an introduction to discussion using the option table and scenarios.

3. Activity: Option Table – Disease Prevention, Control, Eradication

The methods for directed action against diseases are provided in table format according to the categories of prevention, control, and eradication. Each action is defined and space is available for participants to list the pros/cons of each action.

4. Activity: Discussion Scenarios

Five different scenarios are provided within this document that are helpful when discussing appropriate disease prevention and/or control strategies to use in a specific situation.

5. Presentation: Global Strategy for FMD Control & Discussion

This is a special standalone presentation that provides a walk-through of the global strategy for FMD control.

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6. Group Discussion/Challenge Questions

Four questions are provided to engage groups in discussions of disease prevention and control.

7. PowerPoint Slide Collection (22 slides)

The slide collection includes the slides shown in the example presentation; additional slides that support the reading materials are included.

DIAGNOSTIC TESTS

Key Points

Upon completion of materials within this topic, participants will be able to:

- Differentiate between diagnostic and screening tests in terms of their application in detecting diseases in a population;
- Properly use and apply diagnostic and screening tests in terms of their sensitivity and specificity;
- Apply test outcome to clinical relevant differential diagnosis and/or confirm diagnosis.

Workshop Materials

1. Reading: Tests & Accuracy

Several types of clinical tests are discussed including serological tests for screening, screening tests, and diagnostic tests. Test characteristics, such as sensitivity, specificity, and predictive values are explained and calculation formulas are given.

2. Activity: New ELISA Test for Johne's Disease

- a. Blank contingency table
- b. Activity Worksheet
- c. Answers

The blank contingency table can be used when leading a discussion to introduce the concept of clinical tests & accuracy of the tests. Assuming the workshop participants have read the topic reference, a facilitator can devise a hypothetical scenario and lead the participants to calculate sensitivity, specificity, and predictive values or work through the Johne's scenario

3. Activity: Contagious Bovine Pleuropneumonia (CBPP) Case Study

- a. Supporting Materials
 - i. 1_FactSheet_CBPP-OIE
 - ii. 2_ContagiousBovinePleuropneumonia.ppt
 - iii. 3_CBPP_DiseaseSynopsis
 - iv. 4_CBPP.xlsx
 - v. 5_Scenario.docx
- b. 9_CBPP_DiagTest
- c. 9_CBPP_DiagTestANS

The complete CBPP case study is provided in the "Case Studies" section of the catalog. The relevant supporting materials and section are listed above. The Diagnostic Testing section includes creating an appropriate 2 - by -2 table, calculating sensitivity, specificity, predictive value positive, and predictive value negative, and relevant interpretations.

4. Group Discussion – Choosing the Appropriate Test

- a. PowerPoint Presentation
- b. Discussion Worksheet

The activity includes a PowerPoint presentation to introduce the relationships between test sensitivity and specificity, the concepts involved in choosing the appropriate test, and testing in

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series or parallel. Participants can use the worksheet to "answer" the last several slides of the presentation before the slides are revealed.

5. Activity: Interpretation of Diagnostic Tests

a. Answers

The activity provides participants with the opportunity to differentiate testing in series or parallel when given an example. Furthermore, participants are able to practice with Epi Z to calculate predictive value positive after the first test, predictive value positive after the second test, and the overall sensitivity and specificity of the process (both tests

6. Group Discussion/Challenge Questions

Four questions are provided to engage groups in discussions of sensitivity, specificity, predictive value positive, and predictive value negative and their application in an overall plan for planning disease control strategies .

7. PowerPoint Slide Collection (45 slides)

The slide collection includes those slides from the choosing the appropriate test presentation and additional slides to introduce the properties of clinical testing.

EPIDEMIOLOGY & ECONOMICS

Key Point

Upon completion of materials within this topic, participants will be able to use the benefit-cost ratio to assess the feasibility and cost effectiveness of disease control programs.

Workshop Materials

1. Reading: Introduction to Decision Trees

The chapter is one of the free documents for TreePlan, a decision tree add-in for Microsoft Excel and is downloadable from their website. Within this chapter, participants are introduced to decision trees, which can be used when decisions concerning various options are made in sequence. Within the reading, concepts such as nodes, branches, and terminal values are explained.

Source: <http://treeplan.com/chapters/introduction-to-decision-trees.pdf> (Accessed April 2015)

2. Example Presentation: Assessment of Intervention Options

3. Activity:

- a. Example Presentation: Introduction
- b. Worksheet
- c. Answers (written)
- d. Example Presentation: Answers

The introduction is comprised of a series of slides that "match" the description in the worksheet. The answers are given in a written document and contained within a series of slides, which can be shown for discussion. A PDF of the Introduction and Answers slides are included above as example presentations.

4. Group Discussion/Challenge Questions

The questions include one that asks participants to speak on how decisions are made within their animal health program and specifically how a decision is made about the need for a disease control program. The final question is general in nature and pertains to eradication as an endpoint for all disease control programs.

5. PowerPoint Slide Collection (43 slides)

The slide collection includes the entire Assessment of Intervention Options presentation. The second part of this presentation contains the introduction to the activity, and the third part provides the answers to the activity as a PowerPoint presentation, which is useful for discussion.

EPIDEMIOLOGIC STUDIES

Key Points

Upon completion of the materials within this topic, participants will be able to:

- Differentiate between descriptive studies, which describe disease events in a population (e.g. survey, surveillance findings) and analytical studies, which analyze relationships between risk factors (determinants) and diseases or other health events.
- Identify the three most-commonly used types of observational studies (case-control, cross-sectional, and cohort), which have different strengths and weaknesses and can be used either individually or jointly to address research questions of interest.
- Explain that assessments of causal-relationships consider multiple criteria, but a critical factor is provision of evidence to show that the cause precedes the effect.

Workshop Materials

1. Reading: Study Designs in Epidemiology

Reference material defining and describing descriptive epidemiology, and analytical epidemiology. The advantages of analytical studies and the types of analytical studies are provided. A section on the applications of research studies to field epidemiology is included. This reference also contains an introduction to surveys and provides an explanation of when a survey is a cross-sectional epidemiological study.

2. Example Presentation: Analytical Studies

3. Activity: Epidemiological Studies

- a. Worksheet
- b. Answers (PowerPoint)

The activity is comprised of seven different scenarios and discussion questions for each. Participants are asked to identify the study design used in each scenario and discuss what can be learned as a result of each study.

4. Group Discussion/Challenge Questions

Seven questions are provided to engage groups in discussions of the reasons to recognize different study designs, the usefulness of observational analytical studies for government veterinary services, and the differences between association and causation in animal health events.

5. PowerPoint Slide Collection (27 slides)

The slide collection includes the slides in the example presentation, a discussion slide on the relationship between analytical studies and field activities, an introduction to surveys, and the answers to the activity as a PowerPoint presentation.

SAMPLING STRATEGIES & SAMPLE SIZE

Key Points

Upon completion of the materials within this topic, participants will be able to:

- Differentiate among the choices of the sampling methods; the choice depends on the purpose (e.g. detect potential cases or estimate prevalence).
- Recognize that an appropriate sampling strategy does not always have to be random. Sampling can be risk-based or targeted -- indeed many surveillance systems use this approach to ensure that they are cost-effective.
- Recognize that random sampling is difficult to implement in many populations that are not clearly defined in time and space (e.g. wild animals), but efforts should be made to obtain representative samples in a way that theoretically would allow someone else to replicate what was done.
- Discern the difference between sample sizes for disease detection and estimation of prevalence while recognizing both depend on prevalence in the source population, the sensitivity and specificity of diagnostic tests, and the desired confidence. Web and Excel-based templates can facilitate calculations but understanding the underlying concepts is helpful.

Workshop Materials

1. Reading: Surveys & Sampling in Veterinary Epidemiology

The elements of survey design are presented in this reading in addition to the following sampling concepts: probability and non-probability sampling, simple random sampling, simple stratified sampling, proportional stratified sampling, cluster sampling, systematic sampling, and multistage sampling. Tables are provided that list the appropriate sampling strategy by population characteristic and the advantages/disadvantages of each sampling strategy.

2. Example Presentation: Sampling Strategies & Sample Size Concept Review

3. Activity: Sampling Strategies & Sample Size Concept Review and Application

- a. Reference: A. Elsfy et al. 2015. Parasitology International 64; 79-85.

The activity has three sections. The first section is designed as a review of specific sampling concepts including sample vs. census, epidemiologic question & unit of interest, random sampling, and appropriate situations for probability and targeted sampling strategies. The second section is designed to review concepts of sample size and apply them in practical animal health situations. The final section is based on the Elsfy reference (given above) and is designed for participants to read the methods in a published paper, and critique the information provided.

4. Activity: Sample Size & Survey Design

- a. Worksheet
b. Microsoft Excel Workbook
c. Answers

The activity centers about a hypothetical case study in El Salvador in which participants are asked to design a survey to estimate prevalence of Newcastle disease in backyard poultry. Relevant

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supporting information is provided including budget constraints. A data file and the answers are provided.

5. Activity: Survey Design to Estimate HPAI Prevalence in Thailand
 - a. Worksheet
 - b. Microsoft Excel Workbook

This short exercise is designed for participants to practice the design of a survey to estimate prevalence of HPAI-affected flocks in Thailand. The data are provided.

6. Activity: Sampling & Statistics in Epidemiology
 - a. Worksheet
 - b. Flock diagram
 - c. Microsoft Excel Worksheet with data
 - d. Sampling data sheet
 - e. Microsoft Excel Worksheet to use for summarizing sampling results
 - f. Answers

There are three sections to this activity. As the first part of the activity, each participant is asked to take a random sample of 10 from a village with 149 birds using one of two different random sampling methods. The flock information is provided as a diagram and also as a Microsoft Excel Worksheet. Participants can use OpenEpi to generate random numbers. A sampling data sheet is included, which participants will complete and return to facilitators. Facilitators will summarize the sampling results for use in discussion.

The second and third sections of the activity entail knowledge of confidence intervals and calculating the difference between two proportions, which is covered in the statistics topic.

7. Group Discussion/Challenge Questions

Two questions are given. Participants are asked to share practical example of random (probability) sampling approaches they have used for different purposes.

8. PowerPoint Slide Collection (74 slides)

The slide collection includes those slides from the example presentation, which focus on discussion of sampling strategies as described in the reading and sample size. Additional slides are provided that provide additional information on obtaining random numbers, different sampling strategies, recording data, data types, and calculating sample size.

PROBABILITY & STATISTICS

Key Points

Upon completion of the materials within this topic, participants will be able to discuss the factualness of the following statements:

- Use of statistics allows an objective assessment of whether observed differences are likely to be real rather than attributable to chance.
- Hypothesis testing and confidence interval estimation are used to assess differences between groups.
- Importance of an observed difference needs to be assessed biologically and economically – statistics is just one part of a decision-making framework.
- Statistical testing relies on assumptions such as random sampling, independent groups, and in many cases an underlying statistical distribution (e.g. normal) for the data. Statistical methods based on distribution-free methods also exist .
- T-tests and Chi-squared tests are simple tests for comparisons of continuous (quantitative) and categorical (qualitative) data, respectively.
- Odds ratios (odds of disease among the risk-factor positive group/odds of disease among the risk-factor negative group) can be used in all three study types and provides a good approximation to the relative risk (another important measure of risk).

Workshop Materials

1. Introduction to Probabilities
 - a. Presentation

The presentation and included activity provide an introduction to probability and examples of applications in veterinary epidemiology. Examples include determining the probability of infection in a group of animals given disease prevalence in the population. Probability calculations associated with test sensitivity and specificity are highlighted. The presentation is provided as a PowerPoint.

2. Reading: Statistics for Veterinary Epidemiology

The Statistics for Veterinary Epidemiology reading provides a summary of several basic concepts in statistics as applied to veterinary epidemiology. The topics discussed include bias, importance of unbiased data, statistical study summary, quantitative data, qualitative data, mean, median, standard deviation, standard error, proportion, statistic, statistical inference, probability distributions of sample means and proportions, confidence interval, hypothesis testing, level of significance, Chi-Squared test, p-value, measures of risk, risk ratio, odds ratio, attributable risk, power, and the link between probability and statistics.

3. Example Presentation: Statistics in Epidemiology
4. Example Presentation: Measures of Association
5. Activity: Johne's Disease in a Dairy Herd

The focus of the Johne's disease activity is interpretation of the principles of statistics as they are applied to an animal disease situation. The second portion of the activity concentrates on the interpretation of measures of association.

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6. Activity: Measures of Association

Participants are asked to replicate the calculations of relative risks and confidence intervals from a table taken from the literature and provide relevant interpretations.

7. Group Discussion/Challenge Questions

- a. Reference: Elsify A. et.al, An epidemiological survey of bovine *Babesia* and *Theileria* parasites in cattle, buffaloes, and sheet in Egypt. 2015. Parasitology International 64; 79-85.

The two discussion questions are based on an epidemiologic survey of bovine Babesia and Theileria parasites in cattle, buffalo, and sheet in Egypt.

8. PowerPoint Slide Collection (147 slides)

The Slide Collection includes slides for the two example presentations – Statistics in Epidemiology and Measures of Association. Additional slides are provided that give additional detail on topics covered in the reading. The Measures of Association presentation presumes a knowledge of study designs.

DISEASE FREEDOM

Key Points

Upon completion of the materials within this topic, participants will be able to discuss the factualness of the following statements:

- Designation of a country, zone or even a compartment free of disease (strictly speaking, a designated infection) is usually based on multiple sources of evidence.
- Sensitive surveillance systems are critical components of approaches to demonstrate freedom.
- For most OIE listed diseases, there is a generic description of pathways to achieve freedom, but more specific guidance is given for a few diseases such as BSE, FMD, CBPP, and highly pathogenic AI.
- Sometimes a national survey is done to provide additional confidence in freedom especially when there has never been historical occurrence of a pathogen.
- Disease freedom is not a requirement for trading arrangements between partners – that is usually done based on a risk analysis approach.
- Numerous tools and software are available to support planning and analysis of data for designation of disease freedom.

Workshop Materials

1. Reading: Page 268 in Corbellini, L. et.al. 2006. Analysis of national serological surveys for the documentation of freedom from porcine reproductive and respiratory syndrome in Switzerland. *Vet Microbiol* 118: 267-273.

The disease freedom activity is based on data from this paper. Although the entire paper is provided, the activity uses the data on page 268. Participants are invited to read the remainder of the paper, but it will not be discussed because much of it is based on Bayesian approaches to model test results, which is beyond the scope of the workshop.

2. Example Presentation: Disease (Pathogen) Freedom
3. Activity: Freedom from PRRS in Switzerland

The activity is based on the data from the Corbellini paper and is designed for participants to examine the survey data that were collected with the goal of determining the prevalence of PRRS in sows in Switzerland.

4. Group Discussion/Challenge Questions

Two questions are provided to lead groups to discuss the gap between "o" and the survey design prevalence in relation to disease freedom. Furthermore, a discussion of the potential roles of surveillance in demonstrating disease freedom.

5. PowerPoint Slide Collection (16 slides)

The slides within the collection are the same as those in the example presentation.

RISK ANALYSIS

Key Points

At the completion of this topic, participants will be able to:

- Name the key principles and components of a basic risk analysis.
- Identify and describe the main pathways of introduction of a disease into a country and recommend mitigation measures to prevent disease introduction for each identified pathway.
- List the main uses of risk analysis in animal health decision-making.

Please note that participants are NOT learning how to conduct a risk analysis. That is a topic for a completely different workshop.

Workshop Materials

1. Reading: Risk Analysis, International Trade & Epidemiology

This document is a short primer on the importance of risk analysis and epidemiology as they relate to international trade of animals and animal products. The components of risk analysis and the steps in a risk assessment are given. The document ends with a short discussion of the need for epidemiology in risk assessment. For a complete discussion, participants are directed to C. Zepeda et al., 2001. International trade, animal health and veterinary epidemiology: challenges and opportunities. Preventive Veterinary Medicine 48 261-271. This historical paper is included as a reading for the topic, Decision-Making in Animal Health Programs.

2. Reading: C. Zepeda et.al. The role of veterinary epidemiology and veterinary services in complying with the World Trade Organization SPS agreement. 2005. Preventive Veterinary Medicine 67: 125-150

This paper lists the key provisions of the SPS agreement (regionalization, risk analysis, harmonization, equivalence, transparency) and focuses on the contribution of epidemiology for each area in the effective implementation of the SPS agreement. Moreover, the paper provides a discussion of the crucial role of veterinary services in protecting their country's animal health status, providing sound surveillance information, and conducting scientifically valid risk analyses.

3. Example Presentation: Risk Analysis: An Introduction

4. Example Presentation: Surveillance, Regionalization, and Compartmentalization

5. Example Presentation: An Approach for the Implementation of Compartmentalization

6. Presentation: Risk Analysis Example – LPAI in meat

The slides for this presentation are provided separately from the others. This presentation outlines an example of the application of the risk assessment process in determining the risk of transmitting low pathogenicity avian influenza virus through the export of poultry meat.

7. Activity: Risk Analysis

Participants are asked to create a scenario tree approach to identify and describe main pathways of introduction of a disease into their countries and recommend measures to prevent the introduction. The aim of this activity is to incorporate disease epidemiology into a risk assessment.

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8. Group Discussion/Challenge Questions

Two general questions are brought forward for discussion, one of which focuses on the uses of risk analysis in decision-making.

9. PowerPoint Slide Collection (110 slides)

The slide collection contains the slides for the following example presentations: Risk Analysis – An Introduction, Surveillance, Regionalization, and Compartmentalization, and An Approach for the Implementation of Compartmentalization.

DECISION-MAKING FOR ANIMAL HEALTH PROGRAMS

Key Points

At the completion of this topic, participants should be able to:

- Describe how the principles of veterinary epidemiology and other workshop concepts fit together and contribute to animal health programs.

Workshop Materials

1. Reading: C. Zepeda, M. Salman, R. Ruppanner. 2001. International trade, animal health and veterinary epidemiology: challenges and opportunities. Preventive Veterinary Medicine 48: 261-271.

This historical paper describes the interactions among international trade, animal health and epidemiology and discusses the inputs of epidemiology in surveillance, risk analysis and regionalization. Table 1 within the paper shows a listing of the epidemiological components and data/knowledge requirements for each step in a risk assessment

2. Example Presentation: Decision Making for Animal Health Programs – A Proposed Approach
3. Group Discussion/Challenge Questions

The three discussion questions challenge participants to consider the necessary inputs for decision-making for animal health programs and how epidemiology concepts that were covered contribute to animal health programs.

4. Example Presentation: Recommended Epidemiology Books
5. PowerPoint Slide Collection (36 slides)

The slide collection contains both slides for the decision making presentation and the recommended epidemiology books.

CASE STUDIES

CBPP IN “EXPO”

The CBPP case study is comprised of different sections that correspond to different topics within the materials library. The case study can be completed as a standalone project after all relevant topics have been covered or each section can be used as an activity within its corresponding topic. To accommodate the incorporation of individual sections as an activity within a specific workshop topic, the supporting materials including the scenario write-up (Event Description) are provided separately.

Workshop Materials

Supporting Materials

1. CBPP Fact Sheet (OIE)
2. CBPP PowerPoint Presentation (Center for Food Security & Public Health – Iowa State University)
3. CBPP Disease Synopsis
4. CBPP Microsoft Excel Workbook
5. Scenario Event Description

Case Study Sections

6. Section – Risk Analysis
 - a. Answers – Risk Analysis
 - b. Introduction to Animal Health Risk Analysis

Includes the application of veterinary epidemiology to risk analysis and the risk analysis process including hazard identification, risk assessment, and risk communication.

7. Section – Surveillance
 - a. Answers – Surveillance

Includes an emphasis on the differences between a survey and surveillance and the surveillance system design process.

8. Section – Epidemiologic Indices
 - a. Answers – Epidemiologic Indices
 - b. Use “Epi Indices” worksheet within the CBPP Excel Workbook

Includes calculating measures of disease frequency (ratios, proportions), incidence versus prevalence, creating 2-by-2 tables, summarizing data, and interpreting data summarizations.

9. Section – Diagnostic Tests
 - a. Answers – Diagnostic Tests
 - b. Use “Diag Tests” worksheet within the CBPP Excel Workbook

Includes calculation and interpretation of diagnostic test sensitivity, specificity, and predictive values.

10. Section – Measures of Association
 - a. Answers – Measures of Association

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- b. Use "Epi Indices" worksheet within the CBPP Excel Workbook

Includes calculation and interpretation of risk ratios, odds ratios, confidence intervals, Chi-squared statistic using OpenEpi, and two-sample T-test

TRICHINOSIS IN NAN PROVINCE

Trichinosis in Nan Province is a detailed, lengthy case study that focuses on survey design, implementation, and results interpretation and communication. In this scenario, public health authorities request veterinary epidemiology help to design and conduct a survey to answer a specific question about trichinosis in humans because no existing data and information are available on the status of disease in swine. The case study highlights that carrying out a survey is a great deal of work!

The case study is divided into two sections that correspond to the Sampling Strategies & Sample Size and Probability & Statistics topics. The case study can be completed as a standalone activity after the above sections have been completed.

Workshop Materials

Supporting Materials

1. Trichinosis_Fact_Sheet.pdf

Brief fact sheet providing information on causal agents, life cycle, host range, geographic distribution and testing methodologies.

2. Trichinosis_in_Thailand.pdf

This document details the history of trichinosis in Thailand.

3. Surveys in Epidemiology.pdf

The major topics covered in this description of surveys in veterinary epidemiology include the details and considerations for each of the survey design elements and descriptions of the appropriate sampling strategies for populations with different characteristics .

4. SurveyQuestionnaires.pdf

This one page document describes the fundamentals of writing good survey questions.

5. PigConsumption_Nakai.pdf

For those who are interested in additional information on pig consumption by hill tribes as influenced by culture, a research article titled, Analysis of Pig Consumption by Smallholders in a Hillside Swidden Agriculture Society of Northern Thailand, by Shinsuke Nakai is available.

Case Study Booklet

6. Trichinosis_CaseStudy_Booklet.pdf

The case study booklet is designed to lead an individual through the process of designing, implementing, and communicating the results of a survey. A question/answer format is used that is appropriate for a group activity and follow-up discussion. Major topics include: survey objectives, a case definition, target population, study population, sampling strategies, sampling frame, epidemiological unit of interest, data collection methodologies and considerations, implementation logistics, questionnaire design, seroprevalence, Chi-squared test for association, comparison of two proportions, and communication of results. OpenEpi is used for the statistical calculations.

7. Trichinosis_CaseStudy_ANS.pdf

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Answers to the questions in the case study booklet

8. SamplingFrameQuestionsANS.pdf

Provides additional answers to the Survey Design Elements 3 Table that are not in the case study answer booklet.

Supporting PowerPoint Presentations

9. Trichinosis in Nan Province _1.pptx

10. Trichinosis in Nan Province _2.pptx

The PowerPoint slide presentations can be used to present the case study in a group setting and aid discussion of the questions.

APPENDIX

PREPARATORY ACTIVITIES CHECKLIST

Workshop Location:			Coordinator:	
Workshop Name	Start Date:		Status Date:	
Task	Who	Due	Done	Comments
Reserve Conference Space & Equipment				
Preliminary Agenda				
Speaker List				
Speaker's Suggestions due				
Speaker Contact info & bio				
Agenda - Format & Finalize				
Speaker List - Format & Finalize				
Evaluations (create and Finalize)				
Design Notebook Cover				
Consolidate Speaker Bios				
Changes to pre-course work due				
Finalize Notebook Cover				
Request Supplies				
DEADLINE: Speaker Presentations				
DEADLINE: Send pre-course work to participants				
Certificates (prepare draft)				
Nametags - Finalize, print & assemble				
Participant list; Notebook cover to venue				Create signs for venue
Notebooks to Printer				
Room set-up				
Participants arrive at hotel				
WORKSHOP BEGINS		Date		Give Flash Drives with readings and data sets
Photo				
Flash Drives (create, copy)				
De-briefing meeting				
Enter Evaluations in Excel & prepare summary results				
Prepare Course Evaluation Summary				
Provide feedback to Speakers				with evaluation report
NOTES:				
Enter the course date above and the #value in column C will become a date. You can vary the formulas to change the dates as needed. <i>(This is an Excel file on the library website.)</i>				

EVALUATION

Part I: Please circle the number that best describes your satisfaction level with various parts of the workshop experience.

	Very Low	Low	Moderate	High	Very High
Degree to which objectives were met:	1	2	3	4	5
Relevance of subject matter to your job:	1	2	3	4	5
Value added by activities:					
List activities	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
Value added by interactions with subject-matter experts:					
List subject matter experts	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
Value added by review sessions	1	2	3	4	5
Overall value of the program for you:	1	2	3	4	5

Part II: Please answer the questions below based on your workshop experience.

1. What was the most valuable aspect of the workshop?

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2. Why did you select this aspect?
3. With what aspects of the workshop were you least satisfied?
4. How can we improve?
5. Are there any other opinions you would like to express regarding any aspect of the workshop?

Thank you!

WORKSHOP EVALUATION

Please evaluate the workshop by circling the number on the scale which corresponds to your opinion. Your written comments are greatly appreciated.

- Please rate the importance of the instruction for each topic in increasing your knowledge of **veterinary epidemiology** and applying epidemiologic principles in your position.

	Very Low	Low	Moderate	High	Very High
<u>Topics</u>					
1 – Veterinary Epidemiology	1	2	3	4	5
2 – Surveillance Systems	1	2	3	4	5
3 – Epidemiologic Indices	1	2	3	4	5
4 – Disease Control	1	2	3	4	5
5 – Diagnostic Tests	1	2	3	4	5
6 – Epidemiology & Economics	1	2	3	4	5
7 – Epidemiological Studies	1	2	3	4	5
8 – Sampling Strategies & Sample Size	1	2	3	4	5
9 – Probability & Statistics	1	2	3	4	5
10 – Disease Freedom	1	2	3	4	5
11 – Risk Analysis	1	2	3	4	5
12 – Decision Making for Animal Health Programs	1	2	3	4	5

- Which topics were the **least** beneficial to you? Why?

- Which topics were the **most** beneficial?

The workshop was formatted to emphasize active participation through exercises, discussions and breakout scenario sessions rather than lectures.

- In what manner did active participation through exercises, discussions, and breakout scenario sessions add to your learning experience?

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5. Please rate the overall quality of **instruction** (in general for the entire workshop) and other facets of the workshop. Please rate the overall value of the workshop:

	Very Low	Low	Moderate	High	Very High
<u>Instruction</u>					
Knowledge of subject	1	2	3	4	5
Conciseness and clarity of delivery	1	2	3	4	5
Organization of presentations	1	2	3	4	5
Responsiveness to questions	1	2	3	4	5
Effective use of audiovisuals	1	2	3	4	5
Ability to engage participants	1	2	3	4	5
<u>Other Workshop Facets</u>					
Notebook & Flash Drive	1	2	3	4	5
Website	1	2	3	4	5
Computer programs (Epi Z, OpenEpi)	1	2	3	4	5
Meeting facility – Week 1 (facility)	1	2	3	4	5
Meeting facility – Week 2 (facility)					
Refreshments	1	2	3	4	5
Hotel facilities (name)	1	2	3	4	5
Rate the overall value of the course	1	2	3	4	5

6. Please provide instruction and instructor comments - *general observations or instructor-specific*.

7. Would you recommend this workshop to a colleague in your country? YES NO

8. What changes would you suggest for future workshops?

Additional comments:

Thank you!

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