Manual and tools

for outbreak investigation training

Syllabus

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Contents

1. Overview

- Total number of hours: 40
  - 21 hours of theory
  - 9 hours of practical work (group work)
  - 5 hours of independent work (additional reading)
  - 5 hours of exams and exam preparation

1.1 Methodology

- Lectures
- Group work – case studies
- Additional reading

1.2 Training format

- Lectures
- Additional readings: These readings will supplement the topics that will be discussed each day, according to each program session. It is essential that participants read and study the topics in advance, so that they can actively participate and better understand the content of each session.
- Case studies: Participants will receive information about real outbreaks, which will be discussed in group sessions with the support of trainers. All steps of an outbreak investigation will be covered.
  - Outbreak report: The preparation and oral presentation (in PowerPoint) of an outbreak report analyzed during group work has been scheduled. Presentations will be prepared in working groups and will contain the information obtained by the participants and, where possible, complemented by input from trainers.

2. Objectives

The course presents a practical methodology for detecting and investigating infectious disease outbreaks. Participants will analyze the steps involved in such investigations, as well as the application of study designs and quantitative methods used in outbreak situations in the Region of the Americas. The theoretical information provided will be put into practice through case studies to be analyzed by the participants. The training concludes with an oral presentation of the case study report.

3. Skills

Upon completion of the training, participants will be able to detect and investigate infectious disease outbreaks.

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

- Know and describe the dynamics of disease transmission.
- Develop an appropriate case definition for outbreak investigation.
- Recognize the different types of epidemic curves.
- Develop an outbreak study design appropriate for the type of transmission detected.
- Know, plan and carry out the necessary stages of outbreak investigation.
- Identify protocols for the collection and handling of human, vector, animal, and environmental samples.
- Know the general measures of outbreak response and monitoring.
- Know the basics of outbreak reporting.
- Know the basics of preparing a press release.

4. Content

The draft training agenda can be found in Document ***5_Draft_agenda*** of Section **8_*Other_resources*** of the toolkit. Each component is listed below.

1. P01 – Introduction
2. Pre-test
3. P02 – Identifying an outbreak and investigation steps
4. Case studies – Session 1
5. P03 – Chain of transmission
6. P04 – Defining a case
7. Exam 1
8. P05 – Epidemic curves
9. P06 – Planning a field investigation
10. Case studies - Session 2
11. P07 – Epidemiological studies
12. P08 – Healthcare-associated Infections (HAI)
13. Exam 2
14. P09 – Collection and handling of human samples
15. P10 – Laboratory tests
16. P11 – Collection and handling of environmental samples
17. Case studies - Session 3
18. P12 – Role of vectors in disease transmission
19. Exam 3
20. P13 – Reservoir studies
21. P14 – Contingency tables and measures of association
22. Case studies - Session 4
23. P15 – Control and response measures

24. P16 – Safety, occupational health, and biosecurity in the field
25. Exam 4 and final exam
26. P17 – Outbreak study report
27. P18 – Interacting with the media
28. Case studies - Session 5
29. Case studies - Session 6
30. Case Study Presentations
31. Closing session

5. Lectures

The content of the presentations is described below.

Presentation 1 – Introduction (See Document ***P01 - Introduction*** in Section **3_*Presentations*** of the toolkit)

Methodology and training agenda. Trainers will explain to the students how the teaching materials distributed to them in the folder are organized. Trainers will explain how the exams and group work will take place, and how the training will be graded. Trainers will review instructions for participants (See ***Appendix 1*** of this document).

Presentation 2 – Identifying an outbreak and investigation steps (See Document ***P02 - Identifying an outbreak and investigation steps*** in Section ***3_Presentations*** of the toolkit)

Common terms used in outbreak investigations. Outbreak investigation responses and objectives. The steps of an outbreak investigation are presented and a local example of an investigation is discussed.

Presentation 3 – Chain of transmission (See Document ***P03 - Chain of transmission*** in Section ***3_Presentations*** of the instrument package)

Disease transmission and outbreak dynamics. Basic reproductive number (Ro), herd immunity, epidemiological triad (host, agent, and environment), incubation period, and latency. Mode of transmission and reservoirs.

Presentation 4 – Defining a case (See Document ***P04 - j Defining a Case*** in Section ***3_Presentations*** of the toolkit)

Elements of a case definition according to time, place, and person. Definitions of suspected, probable, and confirmed cases. Selection of clinical criteria for a case definition. Sensitivity and specificity; Review of examples of selected outbreaks.

Presentation 5 – Epidemic curves (See Document ***P05 - Epidemic curves*** in Section ***3_Presentations*** of the toolkit)

Attack rate. Epidemic curve analysis. Mode and route of transmission. How to build epidemic curves. Interpretation of curves: determining the mode of transmission, exposure, and/or incubation period. Building epidemic curves in Excel.

Presentation 6 – Planning a field investigation (See Document ***P06 – Planning a field investigation*** in Section ***3_Presentations*** of the toolkit)

Objectives of an outbreak investigation and its planning, including how to set up the team, selecting partners, contact with authorities, recognizing the area, materials, and equipment, storage of samples, and transport.

Presentation 7 - Epidemiological studies (See Document ***P07 - Epidemiological studies*** in Section ***3_Presentation***s of the toolkit)

Types of design. Retrospective cohort studies. Case-control study. Spacial analysis. Time analysis. Space and time analysis.

Presentation 8 – Healthcare-associated infections (HAI) (See Document ***P08 - Healthcare-associated infections (HAIs)*** in Section ***3_Presentations*** of the toolkit)

Definition of HAIs. Most common HAIs. Vulnerable population. Prevention and response measures.

Presentation 9 - Collection and handling of human samples (See Document ***P09 - Collection and handling of human samples*** in Section ***3_Presentations*** of the toolkit)

General information on collecting biological samples in the field: syndromic approach for the collection of human and environmental samples. Possible etiologies and related specimens. Clinical sampling: techniques, preparation, and equipment. Logistics and guidelines for storage and transport.

Presentation 10 – Laboratory tests (See Document ***P10 - Laboratory tests*** in Section ***3_Presentations*** of the toolkit)

Most frequent etiological agents in the Region of the Americas. Most commonly used tests for the diagnosis of etiological agents. Sample type, collection, and storage.

Presentation 11 - Collection and handling of environmental samples (See Document ***P11 - Collection and handling of environmental samples*** in Section ***3_Presentations*** of the toolkit)

Considerations in collecting environmental samples. Reasons for rejecting these samples. Characteristics of food and water samples. Features of the tests most commonly used in this type of study.

Presentation 12 – Role of vectors in disease transmission (See Document ***P12 - Role of vectors in disease transmission*** in Section ***3_Presentations*** of the toolkit)

Definition of vector. Description of types and examples of vectors. Main vector-borne agents in the region. Definition of vector capacity.

Presentation 13 – Reservoir studies (See Document ***P13 - Reservoir studies*** in Section ***3_Presentations*** of the toolkit)

Definition of zoonosis. Emerging zoonoses. Definition of reservoir. Reservoir-borne diseases in the Americas and examples of outbreaks. The importance of small mammals as reservoirs of disease, especially rodents. Capture and collection of reservoir samples. Monitoring and surveillance of reservoir populations.

Presentation 14 - Contingency tables and measures of association (See Document ***P14 - Contingency tables and measures of association*** in Section ***3_Presentations*** of the toolkit)

Study types. 2x2 tables. Use of EpiDat (Relative risk, confidence interval, p-value, odds ratio, stratification). Testing statistical hypotheses. Strength of association and statistical significance. Interpreting results. Examples.

Presentation 15 - Control and response measures (See Document ***P15 - Control and response measures*** in Section ***3_Presentations*** of the toolkit)

Introduction to control and response measures during an outbreak. The importance of control measures and priorities. Evaluating control measures. Final considerations.

Presentation 16 – Safety, occupational health, and biosecurity in the field (See Document ***P16 - Safety, occupational health, and biosecurity in the field*** in Section ***3_Presentations*** of the toolkit)

Field work safety. Occupational health. Biosecurity.

Presentation 17 – Outbreak study report (See Document ***P17 - Outbreak study report*** in Section ***3_Presentations*** of the toolkit)

Purposes and recipients of an outbreak report. Justification for reporting an outbreak. Report types, structure, and components.

Presentation 18. Interacting with the media (See Document ***P18 - Interacting with the media*** in Section ***3_Presentations*** of the toolkit)

This presentation explains the importance of reporting during an outbreak or emergency, the population's perception of risk, the main communication activities during an emergency or crisis, and how to develop a risk communication strategy for outbreak control and response. Principles of risk communication (early announcement, maintaining trust, transparency, listening to public concerns, and planning ahead). It explains the importance of communicating with the media in outbreaks and emergencies; what journalists are looking for; how to prepare to face the press (preparing key messages, preparation for interviews and press conferences, the role of the spokesperson); journalists' techniques and what spokespersons can do.

6. Case studies

To review case studies, participants will be divided into up to six groups of up to five participants each. Professionals from different specialties will be combined so that the groups are as diverse as possible and to ensure a balance of experience and knowledge. Each group will receive a case to work on with the help of trainers. Depending on the number of participants, two groups might work on the same topic, albeit independently. Both groups will answer the case study questions during each session and both will submit their answers at the end of the session.

The cases studied describe real situations of interest to relate the content of a given topic to a particular case. At the end of each session, the groups will answer a set of questions and determine what other information they need to move on to the next stage of outbreak investigation.

At the beginning of each session, the instructors and trainers will discuss the availability and usefulness of the requested information with each group and will deliver a new package of information about the case. At the end of the training, each group will present a short written report and an oral report.

Case study topics provided for training (See Section *4_Case_studies* of the toolkit):

1. Gastrointestinal syndrome
2. Respiratory syndrome
3. Acute febrile syndrome of unknown cause

These case studies are analyzed in the following sessions:

Session 1: The objective of this session is to identify the outbreak, evaluate preliminary data, identify suspected etiologic agents, determine additional information needed and objectives of the investigation, and to suggest preliminary response measures.

Session 2: More detailed information will be provided in this session; it is expected that based on this session, the selection of agents identified in Session 1 and the investigation objectives will be reassessed; a case

definition will be established; the epidemic curve will be prepared and analyzed, and the investigation will be planned. These topics will be addressed in presentations 3 to 6.

Session 3: with the additional information received, the group will have to identify the research team that would be sent to the field, the techniques to be used to search for information, the epidemiological study design, the type of samples to be collected for the laboratory, and the data necessary for the variables to be analyzed. These topics will be addressed in presentations 7 to 11.

Session 4: Based on the new information provided, participants should calculate attack rates and indicate sources of transmission or potential risk factors; hypothesis testing on the source, transmission mechanism, and risk factors; interpretation of results and further analysis. These topics will be addressed in presentation 14.

Session 5: preparation of the short report, which will be discussed in presentation 17. (See Document ***2_Template_Report*** in Section ***4_Case_studies*** of the toolkit)

Session 6: preparation of the oral report. (See ***Appendix 2*** to this document and Document ***1_Template_Oral_presentation*** of Section ***4_Case_studies*** of the toolkit.)

On the last day of the training, one of the two groups assigned to each topic will be selected to make a PowerPoint presentation of the most important aspects of their research, findings, and conclusions (10 minutes). The other group will be able to ask questions about the definitions and methods applied, as well as about the conclusions drawn (7 minutes). A trainer will close the discussion with a final review (5 minutes).

The trainers will assist the groups in analyzing the cases and evaluating the quality of their presentations. They will also clarify theoretical concepts related to the presentations. Each group will have a permanently assigned trainer, who will be present throughout the course.

7. Evaluation

The following criteria and the following table of equivalences will be considered for evaluation:

Exams (1–3)	30% (10% each)
Exam 4 and final exam	30%
Case studies	40%

The pretest, which will be taken on the first day of the training, does not count towards the final assessment. Rather, it aims to determine what knowledge the participants bring and compare it with the results of the final exam.

The topics of each daily exam and the final exam are (See Section ***6_Exams*** of the toolkit):

7.1 First exam

Methods of identifying an outbreak, rationale, investigation steps, and transmission dynamics. Basic reproduction number (Ro), herd immunity, epidemiological triad, incubation period, and latency. Mode of transmission and reservoirs. Elements of a case definition. Definitions of suspected, probable, and confirmed cases. Selection of clinical criteria for a case definition. Sensitivity and specificity. Recommended reading 1.

7.2 Second exam

Attack rate. Curves interpretation and analysis: determining the mode of transmission, exposure, or incubation period. Outbreak investigation responses and objectives. Investigation planning. Types of study design. Retrospective cohort study. Case-control study. Spacial analysis. Time analysis. Space and time analysis. The definition of health care-associated infection (HAI). Most common HAIs. Vulnerable population. Prevention and response measures. Recommended reading 2.

7.3 Third exam

Collecting biological samples in the field: a syndromic approach for the collection of human and environmental samples. Possible etiologies and related specimens. Clinical sampling: techniques, preparation, and equipment. Logistics and guidelines for sample storage and transport. Biosafety guidelines. Factors to ensure correct identification of the etiological agent of an outbreak. Features of the most common tests. Considerations in collecting environmental samples. Characteristics of food and water samples. Considerations for the correct handling of samples. Features of the tests most commonly used in these types of studies. Definition of vector. Description of the types and examples of vectors. Definition of vector capacity. Vector sample collection. Monitoring and surveillance of vector populations. Recommended reading 3.

7.4 Fourth exam

Definition of reservoir. Main vector-borne diseases in the region. Importance of small mammals, especially rodents, as reservoirs of disease. Capture and collection of reservoir samples. Monitoring and surveillance of reservoir populations. Testing statistical hypotheses. Retrospective cohort studies versus cases and controls. Attack and exposure rates. Testing statistical hypotheses. Strength of association and statistical significance. Interpreting results. Control and response measures against an outbreak. Safety, occupational health, and biosecurity in the field. Interacting with the media. Perception of risk. Communication strategies. Recommended reading 4.

7.5 Final exam

This exam is evaluated in conjunction with the fourth exam and includes some of the questions from the pretest.

8. Recommended reading

Recommended readings for training are (See Section ***5_Readings*** of the toolkit):

1. Mebrate M, Hailu C, Alemu S. Measles outbreak investigation in Kasoshekumer kebele, Sinana district, South-Eastern Oromia, Ethiopia: A case-control study. SAGE Open Med. 2023 May 3;11:20503121231169182. Available from: https://doi.org/10.1177/20503121231169182
2. Parejo C, Garcia A, Dominguez C, Ochoa C, Martin J, and Herrera M. Respiratory syncytial virus outbreak in a tertiary hospital Neonatal Intensive Care Unit. An Ped. 2016; 85(3): 199-127. Available from: https://www.analesdepediatria.org/en-respiratory-syncytial-virus-outbreak-in-articulo-S2341287916300965
3. Smith KC, Inns T, Decraene V, Fox A, Allen DJ, Shah A. An outbreak of norovirus GI-6 infection following a wedding in North West England. Epidemiol Infect. 2017 Apr;145(6):1239-1245. Available from: https://doi.org/10.1017/s0950268816003368
4. Morales DO, Quinatoa PA, Cagua JC. Characterization of an outbreak of malaria in a non-endemic zone on the coastal region of Ecuador. Biomedica. 2021 May 31;41(Supl. 1):100-112. Available from: https://doi.org/10.7705/biomedica.5816

8.1 Other resources

1. World Health Organization. Effective communications: Communications training programme for WHO staff. Geneva: WHO; 2015. Available from: https://iris.who.int/bitstream/handle/10665/249241/9789241509466-eng.pdf?isAllowed=&sequence=3
2. World Health Organization. Communicating risk in public health emergencies. Geneva: WHO; 2018. Available from: https://iris.who.int/bitstream/handle/10665/249241/9789241509466-eng.pdf?isAllowed=&sequence=3

3. World Health Organization. WHO emergency risk communication training. Geneva: WHO; [year unknown] [cited 30 March 2023]. Available from: https://www.who.int/emergencies/risk-communications/emergency-risk-communication-training
4. World Health Organization. OpenWHO. Geneva: WHO; [year unknown] [cited 30 March 2023]. Available from: https://openwho.org/
5. Pan American Health Organization. Risk and outbreak communication. Washington, DC: PAHO; [year unknown] [cited 30 March 2023]. Available from: https://www.paho.org/en/topics/risk-and-outbreak-communication

9. Apendices

9.1 Appendix 1 – Instructions for students

9.1.1 During the training

- Sign the attendance sheet prior to the first morning session.
- Be on time for all course sessions.
- Keep your cell phone turned off or set to vibrate only. Participants will not answer calls during presentations and breakout sessions in groups.
- Read all the material given to you.
- Listen to your trainers.

9.1.2 Questions to speakers and trainers

- Try to ask questions that are as specific as possible and avoid general comments. Focus on the topic of the presentation.
- It is important to make efficient use of the instructor's time.
- Limit your questions to the training topic.
- Questions related to a specific interest can be asked individually at the end of the presentation.

9.2 Appendix 2 – Instructions for the group work presentation

9.2.1 Introduction

- Each group will have worked on a case during the training.
- Case studies will be presented at the end of the training.

- This strategy is part of the learning-teaching process in which each group shares what they have prepared.
- One group will be randomly selected to present one of the three case studies. The other group that has worked on the same case will comment on the presentation.
- At the end of the presentation, trainers will describe the main responses of the case study and the purpose of the specific exercise.

9.2.2 Presentation structure

- The presentation will be prepared in advance, and the corresponding slides can be prepared during each group work session.
- The presentation should be structured as a scientific manuscript: introduction, materials and methods, results, and discussion. In the first session of the working group, a PowerPoint template will be provided to each group.
- The introduction to the presentation should give the context of the outbreak. However, only key and pertinent information should be included on the slide. Remember that the introduction ends the moment the investigator begins investigating the outbreak, and all data collected after that point are results and should be reported on the relevant slide.
- Materials and methods refer to the way the research was conducted, from the gathering of additional information to that obtained during field research.
- Only investigation results should be presented. Avoid adding opinions or mixing results with conclusions.
- The discussion shows the analysis of the results to be carried out by the working group. Opinions and interpretations of the results should be adequately supported by the results presented or described above. The slide should contain only key information. It may include recommendations suggested by the group and include control measures.

9.2.3 Format and style

- The time allocated to each group presentation is 10 minutes for eight to 12 slides.

- The presentation of each slide should last from 45 seconds to one minute. Slides with a single phrase can take 30 to 45 seconds.
- Slides should have little text. The text should be concise and contain only what you want to highlight (the main idea).
- Do not include all information on the slide, in order to make it more legible to the audience. The goal of an oral presentation is for most of the information to be presented orally.
- Ideally, the slides will have a maximum of four paragraphs and should be organized into bullet points, by topic, in order of importance.
- PowerPoint presentation format:
  - Use a simple background with legible colors, including text color (contrasting with the background), which should be large enough to be seen from all parts of the auditorium.
  - Graphs should be flat, not three-dimensional.

9.2.4 Protocol for presentation and discussion

- All groups must choose a moderator who will present the results of the group or lead the discussion.
- For each case study, the group to present will be randomly selected, which will be announced just before the presentation, therefore both groups must be ready to present with their complete presentations.
- By default, the unselected group will lead the discussion.
- Discussion moderators will take notes during the presentation and collect questions and comments from group members.
- The discussion moderator will have five minutes to organize the discussion following the presentation, will give the floor to their fellow group members, and will keep the group in order. After two questions or observations, the presenter or any member of their group will have the opportunity to respond.
- The discussion moderator will ask questions, add supplemental information that has been omitted, note and explain discrepancies in approaches or findings, or make observations.
- Discussion moderators should respectfully address the views of presenters and promote an evidence-based debate.

- Once the discussion group has ended, comments from other groups and trainers will be accepted.
- Presenters should:
  - address the audience in a clear and audible voice;
  - not read the slides or turn their back to the audience; periodically look at the computer screen in front of them to remember the content of the presentation;
  - make eye contact and use appropriate body language: smile, nod, etc.
  - stay within the time limit, otherwise the presentation will be interrupted,
  - use appropriate technical language.

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