Manual
and tools
for outbreak investigation training

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1. Executive resume

Despite achievements in the eradication and elimination of certain diseases, public health authorities face the double challenge of maintaining those achievements and solving the problems posed by the emergence and re-emergence of various diseases.

The recent coronavirus 2019 (COVID-19) pandemic, the rise in arboviral diseases, the emergence of avian influenza in places not previously considered at risk of this disease, and new mechanisms of antimicrobial resistance are some examples of these problems in the Region of the Americas. Other factors that make the situation more challenging include health personnel turnover, the potential for events of unknown etiology and impact, and current lifestyles, all of which favor the rapid spread of infectious diseases.

Given these circumstances, outbreak investigation and response are particularly relevant and are part of the skills required by the International Health Regulations (IHR) (2005)[1]. Based on the IHR, Member States have been working to develop their capacity to respond to public health events, with an emphasis on local skills and sustainability. In order to collaborate in this effort, the Pan American Health Organization/World Health Organization (PAHO/WHO) seeks to facilitate short-term trainings in outbreak investigation for health personnel and other sectors involved in the response to public health events at the local level.

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[1] World Health Organization. International Health Regulations (2005). Third edition. Geneva: WHO; 2016. Available from: https://www.who.int/publications/i/item/9789241580496

The proposed methodology gathers experience from over a decade of training professionals in public health and other sectors in several countries of the Region. It is a brief, in-person outbreak investigation training based on the needs and gaps detected by public health authorities, both nationally and locally. The training combines lectures with case studies that mimic the actual steps of an outbreak investigation, in order to convey concepts, methods, and the use of tools to local public health professionals. This approach is low-cost and less complex to organize than broader field epidemiology programs.

2. Glossary[2]

Acute public health event: Any event that constitutes an immediate threat to human health and requires the adoption of immediate measures, i.e., the application of control or preventive measures to protect public health. It includes events that have not yet caused disease in humans but have the potential to do so through human exposure to infected or contaminated food, water, animals, processed products, or environments, or as a direct or indirect consequence of natural phenomena, conflict, or other damage to essential infrastructure.

Alert: Initial notification that a public health event with adverse consequences may occur or is occurring.

Annex 2 of the International Health Regulations (IHR) (2005): A decision-making instrument that all Member States must use to assess events within their territory, in order to determine whether an event may constitute a public health emergency of international concern and therefore require notification to the World Health Organization (WHO) in accordance with Article 6 of the IHR.

Attack rate: An incidence rate that measures the proportion of people in a population experiencing an acute health event for a limited period (for example, during an outbreak). It is calculated as the number of new cases of

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[2] The definitions were taken or adapted from the following PAHO/WHO documents:
- World Health Organization. Rapid risk assessment of acute public health events. Geneva: WHO; 2012. Available from: https://www.who.int/publications/i/item/rapid-risk-assessment-of-acute-public-health-events
- World Health Organization. Early detection, assessment, and response to acute public health events: Implementation of early warning and response with a focus on event-based surveillance. Geneva: WHO; 2014. Available from: https://www.who.int/publications/i/item/WHO-HSE-GCR-LYO-2014.4
- World Health Organization. International Health Regulations. Third edition. Geneva: WHO; 2016. Available from: https://www.who.int/publications/i/item/9789241580496
- Pan American Health Organization / World Health Organization. Modules of Principles of Epidemiology for Disease Control. Epidemiological field research: application to the study of outbreaks. Second edition. Washington DC: PAHO / WHO; 2002. (PALTEX Series for Medium and Auxiliary Technicians N° 24). Available in Spanish from: https://iris.paho.org/bitstream/handle/10665.2/54457/9275324077_mod5_spa.pdf?sequence=2&isAllowed=y

a health problem during an outbreak period of time among the population exposed at the beginning of the period.

Case: Illness, injury, or other particular conditions that meet the selected criteria. (See *Case definition*)

Case definition: A set of criteria to decide whether a person should be classified as a case (i.e., whether they have the health condition or disease status of interest).

Chemical event: A manifestation of a disease or potentially pathogenic event as a result of exposure to or contamination with chemicals.

Cluster: Set of cases in a given area during a given period, whether or not the number of cases exceeds expectations.

Early warning and response: A mechanism established to detect, as early as possible, any abnormal event or any alteration of the usual or usually observed frequency of a phenomenon.

Epidemic: (See *Outbreak*)

Epidemic intelligence: The systematic collection, analysis, and communication of any information to detect, check, evaluate, and investigate events and health risks with the aim of obtaining an early warning.

Evaluation: Periodic determination of the relevance, effectiveness, and impact of activities in relation to the objectives of surveillance and response systems. (See *Monitoring)*

Event: According to IHR, "a manifestation of disease or an occurrence that creates a potential for disease"; Events may be of infectious, zoonotic, food safety-related, or of chemical or radiological/nuclear origin, which may spread through humans, vectors, animals, products, or food, or through the environment. In event-based surveillance, an "event" also includes an event of unknown origin and refers to a proven signal. (See *Alert and Signal*)

Event-based surveillance: The collection, monitoring, analysis, and organized interpretation, mainly of unstructured ad hoc information on health-related events or risks, which may pose an immediate risk to human health. Event-based surveillance is a functional component of the early warning and response mechanism. (See *Indicator-based Surveillance* and *Epidemic Intelligence*)

Hazard: An agent or source that may cause harmful effects on the health of the exposed population. One example is a toxic chemical introduced into a

water supply source. However, in most languages, there is no distinction between the terms *hazard*, *risk*, and *threat.* (See *Risk*)

Indicator-based surveillance (IBV): The systematic (periodic) collection, monitoring, analysis, and interpretation of structured data (i.e., indicators) from well-identified and mostly health-related authoritative sources.

Information: The process by which health events and health risks are brought to the attention of health authorities.

Measures of association: Indicators that quantify the relationship between exposure and disease between two groups.

National IHR Focal Point: A national body or institution designated for each Member State, with which one may communicate at any time to receive communications from the WHO Focal Points, with the aim of implementing the IHR.

Outbreak: The unusual increase in the number of epidemiologically related cases, of sudden onset and localized spread in a specific space.

Points of entry (PoEs): According to the IHR, PoEs are defined as "a passage for international entry or exit of travelers, baggage, cargo, containers, conveyances, goods and postal parcels; as well as agencies and areas providing services to them on entry or exit," including ports, airports, and border land crossings.

Public health emergency of international concern: pursuant to the IHR, "an extraordinary event which is determined, as provided in these Regulations: (i) to constitute a public health risk to other Member States through international spread of a disease and (ii) to potentially require a coordinated international response." In the event of a public health emergency of international concern, some extraordinary IHR provisions apply in order to minimize the risks of international spread and avoid unnecessary obstacles to international traffic. Only the Director-General of the WHO may determine whether an event constitutes such an emergency. Member States report to the WHO on potential public health emergencies of international concern, in accordance with the IHR.

Radiological/nuclear event: A manifestation of a disease or potentially pathogenic event resulting from exposure of humans, animals, or plants to a radiological or nuclear source or contamination by such a source.

Notification:

- **Notification within the framework of the IHR:** As established in Article 6 of the Regulation on communication by a Member State to the WHO on an event in its territory: *"Each Member State shall notify the WHO, by the most efficient means of communication available, by way of the National IHR Focal Point, and within 24 hours of the assessment of public health information, of all events which may constitute a public health emergency of international concern within its territory in accordance with the decision instrument, as well as any health measures implemented in response to those events."*

- **Notification**: A formalized process of mandatory communication whereby notifiable diseases or events are reported, as part of national or international surveillance systems.

Response: A public health measure taken following the detection of a public health risk (e.g., monitoring the event, informing the public, field investigation, or implementation of any control or mitigation measures). The response will have to be adapted to the nature of the public health risk.

Risk: The probability that an event may have negative consequences for public health.

Risk assessment: The systematic process of information gathering, assessment, and documentation that determines the risk of an event to human health. Three components are assessed: hazard, exposure, and context. Risk assessment provides the basis for guiding the work of managing and reducing the negative impacts of acute public health events. It is a continuous process, ranging from signal detection to event response. Under the IHR, risk assessment may include assessing the risk to human health, the international spread of a disease, and how the event may disrupt international traffic. The core capacity for risk assessment required of all countries is described in Annex 1 of the IHR.

Risk to public health: According to the IHR, this means that the "likelihood of an event that may affect adversely the health of human populations, with an emphasis on one which may spread internationally or may present a serious and direct danger".

Screening: A step in the process of selecting and prioritizing event-based surveillance. It consists of detecting duplicate information and event-based surveillance information unrelated to early warning and response (i.e., not related to early detection of acute public health events).

Selection: After screening, selection is the second step of selecting and prioritizing event-based surveillance. It consists of the classification of

information according to national priority criteria. For example, information could be discarded if it relates to a mild illness that is not among the priorities or to an anticipated illness in a given time and place.

Sentinel surveillance: A surveillance system that uses a sample of pre-established sources (e.g., doctors, hospitals, or clinics) that have agreed to report all cases of one or more notifiable diseases.

Signal: Data or information that the early warning and response mechanism considers indicative of a potential acute risk to human health. Signals may include reports of cases or deaths (individual or aggregate), of possible human exposure to biological, chemical, or radiological/nuclear hazards, or of natural or man-made disasters. Signals can come from any source (health-related or unrelated, informal, or official), including the media. Raw data or information (unpolished and unverified) is first detected and classified; only what is relevant for early detection is retained (i.e., signals). Once identified, the signals must be verified. After verification, the signal becomes an event.

Sources of information:

- **Official sources**: All government institutions, whether local, national, or international (public or equivalent), accredited to provide public health information. Some examples are the National Institutes of Public Health, ministries of health, agriculture, foreign affairs, and others such as reference laboratories and international and supranational organizations. The latter includes the World Health Organization (WHO), World Organization for Animal Health (WOAH), and the United Nations Food and Agriculture Organization (FAO). The European Centre for Disease Prevention and Control (ECDC), the US Centers for Disease Control and Prevention (CDC), and other supranational organizations and institutional networks are also considered official sources.

- **Formal sources**: Unofficial sources and authoritative sources, i.e., those that do not depend on a government agency but are in direct contact with the event (e.g., non-governmental organizations, hospitals and medical organizations, clinicians, local laboratories, and others).

- **Informal sources**: Includes sources that are not official or authorized, including the press and other mass media (radio, television, etc.), blogs, and social networks (e.g., Facebook®, Twitter®, etc.).

Surveillance: The systematic and ongoing collection, collation, and analysis of data for public health purposes and the timely dissemination of public health information for assessment and public health response, as necessary.

Syndromic surveillance: A method that uses health-related data based on clinical observations rather than confirmation of laboratory diagnosis. It is used to detect outbreaks earlier than would be possible with methods based on the laboratory-confirmed diagnosis. Syndromic surveillance case definitions are based on clinical signs and symptoms, rather than specific laboratory criteria for confirmation of the causative agent.

Threat: Something that can cause harm or pose danger (real or perceived). Sometimes, the term threat is used to refer to deliberate acts, while risk is used more to refer to natural phenomena. However, in most languages there is no distinction between the terms risk and threat. (See Risk)

Monitoring: In the context of surveillance and response, monitoring refers to the systematic and continuous monitoring of the implementation of planned surveillance activities (monitoring the implementation of the action plan) and the overall performance of surveillance and response systems. (See Evaluation)

Verification: In the context of the IHR, verification means the "provision of information by a State Party to WHO confirming the status of an event within the territory or territories of that State Party". The IHR requires all Member States, upon request from WHO, to confirm events within a limited time frame. In this document, verification also involves the proactive verification of the validity (veracity) of the signals captured by the early warning and response mechanism, through contact with the original source or additional sources or by field investigation. Verification requires that hoaxes, false rumors, and disinformation be discarded and no longer taken into account.

Zoonotic event: A manifestation of a disease or potentially pathogenic event in animals (and animal products) that could cause disease in humans as a result of exposure to the animal source (or vector).

3. Introduction

In recent years, demographic pressure, globalization, and climate change have accelerated the emergence of new infectious agents and facilitated the reemergence of other agents that had previously been controlled. This has led to the increasingly frequent declaration of public health emergencies of international concern. Infectious disease outbreaks and other public health events, regardless of the type of risk, can occur at any time and very often without warning. Therefore, public health authorities must be prepared to respond promptly and efficiently, both in investigating such events and in implementing public health measures to mitigate or control outbreaks. Preparedness will improve the response and decrease the likelihood that the outbreak will have serious public health impacts. Good preparedness entails the need for a methodology for investigating and responding to outbreaks; and, ideally, public health personnel should be trained in that methodology.

All global health events start locally and expand from there to the national and then international levels. One of the key paradigms of the International Health Regulations (IHR) is containing the focus of the public health event. This involves shifting the emphasis from border control to developing alert and response capacities in all locations to detect and contain events as they arise before they spread internationally.

One of the biggest challenges facing the development of alert and response capacities is the need for qualified and trained personnel at the local level, who are able not only to detect an event in a timely manner and alert national authorities but also to investigate and take the initial relevant containment measures. The recent coronavirus 2019 (COVID-19) pandemic has shown how early detection of the virus at the beginning of the pandemic at the local level and containment of the spread of the virus in each context were essential to minimize its impact on public health. COVID-19 case tracking has also helped identify patterns in the data to take preventive measures and allocate resources more effectively.

Ongoing training of health personnel in outbreak investigation is necessary for two reasons. One is related to the high turnover of health workers. The other is that new threats emerge and diseases reappear, posing new challenges to health systems. Additionally, technological advances and variations in the epidemiological and environmental context facilitate the

faster spread of diseases but also enable new prevention and control interventions.

There are different approaches to outbreak investigation training. Some emphasize the training of specialists with several years of experience, similar to a medical residency. This includes applied practice in various sectors of the public health service and real-life experience in outbreak investigation and response in the field. This approach is of high quality and aims to create a pool of critical personnel, who will often serve at the central levels of the health authority or on elite teams. A complementary approach consists of short-term (often one-week) training workshops to provide basic skills to a greater number of professionals who often work in the local and intermediate areas of the health system and who are not normally dedicated exclusively to alert and response tasks. This option achieves immediate results, although it cannot give deeper insight or incorporate real field experience. Each country should select the approach best suited to its available local resources and capacities. However, a timely alert and response to public health events requires specialized professionals at the highest decision-making levels, as well as those with basic training at the local level.

Regardless of the approach selected, training public health personnel in outbreak investigation should combine an academic perspective with a public health focus, be adapted to the local context, contribute to strengthening national capacities, and improve coordination within the public sector.

The guidance and materials provided in this document are intended to support Member States in training national and local staff from public health institutions and other sectors mandated to detect and respond to events with a potential impact on human health. This document is based on PAHO/WHO's experience in outbreak investigations in the Region of the Americas. These materials should be adapted to the situation of each Member State, its needs, current capacity, and available resources. Although most of the materials offered here relate to the investigation of and response to public health events of infectious origin, the same principles and methods can also be applied to other types of risk.

3.1   Who is this document for?

This document is intended to support national and local health authorities as they conduct training activities for public health personnel working at the local level in outbreak detection, investigation, and response. It can also be used for training activities involving more than one country once the relevant materials have been adapted.

Training through this tool can benefit not only staff working in public health, epidemiology, and surveillance departments and offices or those in charge of outbreak investigation, but also a broader group of participants, including staff from other sectors, such as animal, environment, and agriculture, with a mandate to investigate outbreaks from a perspective other than human health.

The examples and materials included as part of the proposed methodology address different outbreak situations at both the national and local levels and will need to be adapted to the context in which they are used. However, and despite the differences between Member States, this instrument proposes a standardized methodology for training in outbreak investigation in order to strengthen this activity.

3.2 Aims of this document

- To provide national public health authorities with materials and suggestions for planning and conducting a short training course in outbreak investigation.

- To contribute to the improvement of protocols and procedures for outbreak investigation.

3.3 Training objectives and method: an overview

The training's objective and method should be determined in advance. Initially, the focus should be on defining why the training is needed. This will lead to a better selection and understanding of the topics to be included. If expectations are conceptually compatible with short-term training, operational aspects should be defined, such as who will be involved, the duration, budget, and key partners, among others.

The methodology proposed in this document should be analyzed to determine whether it responds to needs and which adaptations may be necessary. If additional needs are identified, they can be integrated into the proposed training method or addressed by other means. Potential adjustments to the proposed training structure, including changes to content, additional activities, adaptation of materials, or exclusion of content that may be redundant or unnecessary, should be carefully considered by the entire training team.

Also, when making local adaptations to the materials, it will be useful to review previous experiences related to outbreak investigation and response

in the country, as well as lessons learned from such experiences. The proposed changes should be part of the initial steps of planning the training.

3.4   Preparation and organization of training

There should be a preparation stage in which specific training needs are defined, adaptations are made, and an agreement is reached on the plan, among other tasks. Logistical aspects should not be neglected, namely:

- Decide on a place and date for the training to take place.

- Appoint a general or local coordinator, preferably someone with experience, time availability, and decision-making skills, who can respond quickly to queries, requests, or requirements.

- Ensure a budget and funding, considering the number of participants and trainers.

- Select a suitable location for training, considering the expected number of participants. One room will be required for plenary sessions and two to six smaller rooms will be needed for group work. Such places may be scarce in some cities, so, depending on the site chosen, it may have to be reserved several weeks or even months in advance.

The next stage of planning should consider:

- Selection of experienced instructors. If international instructors are expected to participate, they should be invited well in advance. Usually, this is also true for local or national trainers.

- Assessing local experts' availability and interest in participating in the various aspects of the training, such as: laboratory diagnosis, food safety, environmental and water sampling, entomology, risk communication, and infection control, among others. The final list will depend on the topics agreed upon in the training plan.

- Adapting case studies and scenarios to the local reality. The team of trainers must be responsible for this item.

- Define the participants' characteristics and selection mechanisms.

- In the case of a local training session, assess the possibility of an advance visit to determine needs with a local group of technicians and incorporate all relevant ideas into the final decision on goals, participants, and methodology.

4. Methodology

The training objectives are provided below, as well as a summary of the recommended methods to follow in order to achieve those objectives. Based on this manual, national and local authorities should define their own objectives together with trainers, based on their context and needs. For further information on the training content, please refer to Section *2_Syllabus* of the toolkit.

4.1 Training objectives

The proposed content aims to introduce outbreak investigation concepts and methods, promote creative problem-solving, encourage constructive discussion, and examine the current challenges of outbreak investigation. Participants can learn to deduce, analyze, and solve key problems from outbreak investigations and combine their previous experience with knowledge gained in training, under the continuous supervision of experienced trainers and instructors. The training will prepare participants to handle real public health situations, even with limited resources, through structured, systematic, and scientific methods.

Upon completion of the training, participants should be able to:

- describe the dynamics of disease transmission;

- develop a case definition as part of outbreak investigation;

- identify various types of epidemic curves;

- design an outbreak study appropriate to the type of transmission detected;

- plan and conduct the stages of an outbreak investigation;

- identify protocols for the collection and handling of samples from people, vectors, animals, and the environment;

- describe general outbreak response and control measures; and

- describe the fundamentals of preparing outbreak reports and press releases.

4.2   Duration, participants, and training format

Duration: usually five days but can be adjusted for a duration of three to 12 days, depending on the objectives chosen. Longer training courses allow for a greater number of topics (e.g., data analysis), simulations, or demonstrations and guided field activities. Depending on the profile of the participants, the training may focus on a portion of the content or delve into each topic.

Participants: health personnel involved in or with high potential to investigate outbreaks, including members of national and local epidemiology teams, laboratory personnel, clinicians, infection control, animal and environmental health and disaster response professionals, public health, military and police officials, and others. The number of participants may vary depending on the number of trainers and logistical capacity. The ideal is a number between 25 and 30 participants, although in some circumstances it could be higher.

Format: The training can be organized in two phases: 1) the in-person instructional phase, and 2) the remote practical phase. In-person training can last five days (40 hours), although it can be adjusted to between three and 12 days, with 25 to 30 participants divided into five to six groups working on three case studies, with one trainer per group. The remote phase includes the preparation of an actual outbreak investigation report.

4.3   In-person instruction

This training phase combines lectures, supplementary readings, exams, and group work for case studies. Materials for each of these components can be found in the following sections of the toolkit:

- Lectures (See Section *3_Presentations* of the toolkit)
- Group work for case studies (See Section *4_Case_studies* of the toolkit)
- Further reading (See Section *5_Readings* of the toolkit)
- Exams (See Section *6_Exams* of the toolkit)

Figure 1 presents a proposed training agenda that can be changed and adapted according to local needs (See Document *5_Draft_agenda* in Section *8_Other_resources* of the toolkit).

The training days can begin at 8 a.m. with a 30-minute exam that will include questions about the previous day's lectures and corresponding readings. This will be followed by a brief presentation of the topics to be covered during the day, their relationship to prior content, and their use in outbreak investigation.

After lunch, case study working groups will be formed, with successive presentations of the case studies. These exercises will present methodological questions on how to investigate and respond to an outbreak, for which the groups should discuss the answers by consulting the concepts and methods from lectures and readings. Participants will analyze the situations, apply the protocols and procedures, interpret the results obtained, and plan the next steps of the investigation, including control measures.

Figure 1. Draft agenda for outbreak investigation training (See Document 5_Draft_agenda of Section 8_Other_resources of the toolkit)

	Day 1	Day 2	Day 3	Day 4	Day 5
30 minutes		Exam 1	Exam 2	Exam 3	Exam 4 and Final Exam
30 minutes	P01 - Introduction	P05 - Epidemic curves	P09 - Collection and handling of human samples	P13 - Reservoirs study	P17 - Outbreak study report
30 minutes					
30 minutes	Pre-test				
30 minutes	Break				
30 minutes	P02 - Identifying an outbreak and investigation steps	P06 - Planning the field investigation	P10 - Laboratory tests	P14 - Contingency tables and measures of association	P18 - Interacting with the media
30 minutes			P11 - Collection and handling of environmental samples		
30 minutes					Case study - Session 5
30 minutes	Lunch				
30 minutes					
30 minutes	Case study - Session 1	Case study - Session 2	Case study - Session 3	Case study - Session 4	Case study - Session 6
30 minutes					
30 minutes					
30 minutes	Break				
30 minutes	P03 - Transmission chain	P07 - Epidemiological studies	P12 - Role of vectors in disease transmission	P15 - Control and response measures	Case study presentations
30 minutes					
30 minutes	P04 - Case definition	P08 - Healthcare-associated Infections (HCAI)		P16 - Safety, occupational health, and biosecurity in the field	Closing session
30 minutes					

Additional topics will then be addressed through lectures and the day will culminate with a summary of what has been learned. A trainer will summarize the tasks assigned to complete before the next day's session, connect what has been learned with the upcoming session's content, and indicate the readings for the next morning's exam. Participants will be informed about the required reading hours after the end of the day, as well as about the daily exams at the beginning of each day so that they can make the arrangements necessary to fully participate.

The training will begin with an explanation of the methodology and evaluation criteria. The participant evaluation will include a group case study review, which will conclude on the last day with a presentation from each group. Presentations and exams will make up 75 per cent of the training time, with the remaining time dedicated to case studies.

It is recommended that Member States create and maintain a file with data on local and international trainers, as well as participants who have received the training.

4.3.1 Lectures

The training has 12 to 18 presentations (included in Section *3_Presentations* of the toolkit) covering a variety of topics and methods related to outbreak investigation, including epidemiology concepts, laboratory diagnosis, reservoirs/vectors, report writing, and communicating with the press. The agenda in *Figure 1* includes suggestions about general topics that might be covered during the training. However, it will be necessary to select those presentations and topics for each training course according to the country's needs, desired skills, resources, and the likelihood of participants applying the skills learned. Selected trainers and instructors should have experience in outbreak investigation and training in epidemiology.

4.3.2 Group Work – Case Studies

Participants will generally be divided into up to six groups of up to five participants each, with guidance from an experienced trainer. Participants will remain in the same groups throughout the training. Each group will be assigned one of the case studies that they will complete throughout the training (See Section *4_Case_studies* of the toolkit), and it is possible for more than one group to work on the same case. This component of the training is a simulation exercise in response to a hypothetical outbreak.

Participants will be assigned to working groups on the first day of the training (or even before). Participants of a similar profession or training will be assigned to different groups in order to diversify and balance expertise and experience across the groups. Each group will choose one person to write down the answers to the questions in the case study, and a facilitator whose role will be to encourage discussion and participation, while taking into

account the different opinions that may exist within the group. Trainers will evaluate and question the groups' answers, clarify theoretical questions, and sometimes lead the discussion without interfering and while avoiding active participation themselves. The mechanics of participation for these sessions should be presented in advance during the first case study working session.

Case studies will not require participants to act out any scenarios. However, they will be expected to respond and make decisions based on their professional experience and the content of the training, considering the information from the case study in question.

Each study will be divided into six sessions (See Sections *2_Syllabus* and *4_Case_studies* of the toolkit). At the beginning of each session, participants will receive the corresponding information packet and the questions to be answered. With this, they will analyze the information using their theoretical knowledge and the methods learned and apply them to problem-solving while promoting a constructive debate to resolve each issue; Responses should be justified and supported by the necessary data. The groups will write down the responses from each session and determine what information they will need for the next phase of the analysis. Trainers should challenge requests for additional information and ensure that these requests are relevant.

The case studies included in this tool were based on actual outbreaks in the Region of the Americas and were adapted to the training. They include cases of a gastrointestinal condition, a respiratory condition, and an acute febrile syndrome of unknown origin (See Section *4_Case_studies* of the toolkit). The results of each case will be presented at the end of the week in a one-page summary report, which will include the methods used in the investigation (See Document *2_Template_Report* in Section *4_Case_studies* of the toolkit). A presentation of results will also be prepared using the predefined template (See Document *1_Template_Oral_presentation* of Section *4_Case_studies* of the toolkit). The presentation will be the last activity of the in-person training.

In the final session of the case study, trainers will be able to randomly select a group from each of the cases analyzed to make a 10-minute oral presentation on the most important aspects of their research, including its results and conclusions. In the event that another group has worked on the same case, it will make a critical analysis of the presentation made by the first group, using brief questions about the definitions and methods applied, and present its own results and conclusions. At the same time, the second group will also be able to propose other approaches they have found to answer questions from the exercise.

4.3.3 Additional reading

This training proposes four readings that will serve to supplement the knowledge acquired during the training (See Section *5_Readings* of the toolkit). These readings may be assessed throughout the training during exams 1, 2, 3, and 4 (See Section *6_Exams* of the toolkit). Each day one of the readings assigned on the previous day will be evaluated.

Participants should be advised of the additional readings in advance in order to give them sufficient time to prepare. If necessary, the readings could also be sent prior to the training.

4.3.4 Exams

It is suggested to give participants a pre-test and then a final exam, (with some repeated questions to measure the change in individual knowledge during the training), in addition to four exams during the week to assess the lectures and additional readings (See Section *6_Exams* of the to*olkit)*. The fourth exam and the final exam may be taken during the same session on the last day of the training.

Generally, the pre-test score will not be part of the participants' final assessment. Exams may assess both participants' mastery of the main concepts and definitions, as well as comprehension of the additional readings. The proposed exams (See Section *6_Exams* of the toolkit) include open-ended questions, which can be answered briefly to facilitate correction on the same day.

Each day of the training begins with an exam. Exams will not be repeated for participants who have been absent or late, except in exceptional cases announced in advance.

Regarding the assessment, a satisfactory answer should earn a 1, no answer a 0, and a partially correct answer a fraction of 1. Section *6_Exams* of the toolkit includes exam templates that can be modified as needed for each specific environment. Some questions from the pre-test will be repeated in the final exam in order to evaluate what the participants have learned.

Assessment: A final score of 12/20 indicates satisfactory completion of the training. Different components of the evaluation might be weighted as follows:

- Pre-test: no score
- Exams 1, 2, and 3: 30% of the total grade (10% each)

- Exam 4 and Final exam: 30%
- Case studies: 40%

4.4   Remote practice

Following the in-person training, the relevant national authorities may consider reinforcing learning with a distance learning component, which could take place immediately after the in-person phase. This could consist of preparing a written report about a real outbreak that has been investigated by the participants themselves or a colleague in the same department. This report could be written as a scientific manuscript, with the involvement of an educational or other institution related to the Ministry of Health's training area, or another organization which can provide academic and methodological support to follow up on the report.

This activity will generate data and evidence on the epidemiological features of outbreaks and their impact on public health in the country and provide participants with the opportunity to learn the form and methods of scientific writing. It will also be an opportunity to critically review the results obtained from the investigation of an outbreak, as well as its limitations.

Certification: Participants who complete the report on an actual outbreak during the distance training phase and receive a final grade must receive a certificate documenting their training. All participants may receive a certificate of participation (See Section ***7_Evaluation_and_accreditation*** of the toolkit).

4.5   Evaluation and certification

In order to evaluate the training and compare it with the proposed objectives, a formal evaluation should be conducted to indicate strengths, weaknesses, and lessons learned in a systematic, methodical, and organized manner. This activity could be delegated to a university or specialized unit (e.g., human resources) within the Ministry of Health or another relevant institution.

This toolkit includes a template survey evaluating the content of the in-person training (lectures, case studies, follow-up readings, overall course assessment, exams, outbreak report) and participants' expectations as to how it might affect their career (See Document ***1_Satisfaction_survey*** in Section ***7_Evaluation_and_accreditation*** of the toolkit). The results of these surveys, together with the trainers' daily reports, their observations, and suggestions, should be considered part of the performance evaluation. In addition, any issues or concerns raised during the training, as well as

lessons learned, particularly those related to success in the process, should be recorded.

The organizers may arrange for these training courses to meet the corresponding requirements and serve as continuing education credits, for example, in agreements with a university or technical-scientific society. This can be another incentive for participation in and completion of the training module.

4.6   Pros and cons of this method

This is a practical training method for the national or local professional working in outbreak investigation. Since it requires few resources, expenses can be relatively low, with a short time commitment. It serves to simultaneously train a number of people with different professional characteristics and experiences, which also enhances interdisciplinary exchange.

On the other hand, one of the limitations of this method is the lack of an applied practical approach, because case studies cannot address all existing gaps or more specific situations involving a real outbreak. The absence of field activities prevents students from engaging in a more realistic experience.

5. Planning the training

The training will involve preparation and follow-up activities before, during, and after, to ensure the proper functioning of each activity and to evaluate its success. *Figure 2* shows an example of the different phases of planning, as well as the suggested times for each phase. This example can be adapted and modified according to local needs and the teams in charge of training (See Document *6_Proposed_planning* in Section *8_Other_resources* of the toolkit).

Figure 2. Proposed timeline for planning the training

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
Initial meeting	▓	▓							
Final training plan		▓	▓						
Material adaptation			▓	▓	▓				
Training								▓ (blue)	
Follow-up			▓	▓	▓	▓	▓	▓	
Final meeting									▓

5.1 Initial meeting with stakeholders

Whether training takes place at the provincial or local level, onsite visits are extremely valuable, although not always possible due to logistical, budgetary, or other reasons. If face-to-face planning meetings are not possible, they may

be held virtually or by conference call. One of the objectives of the initial meeting is to meet with the director of epidemiology or the official responsible for outbreak investigation in order to define training needs and priorities and to learn about specific local challenges and gaps. Working sessions with local health authorities will serve to decide on the number of participants and their characteristics, potential training dates, financing mechanisms, and infrastructure and resources potentially available for training.

A working session should be held with other stakeholders from the local and national teams, for example, with the national reference laboratory and officials from different sectors, including environmental health, agriculture, infection control, leaders of major public and private hospitals, disaster response personnel, military public health, and other health care providers. If possible, the teaching staff of a university or the training area of the Ministry of Health or other related institutions may be involved in order to give the training continuity.

After a tentative list of participants has been drawn up, calculations can be made. If there are many potential participants, consideration may be given to reducing the number or planning multiple training events.

Prior to beginning the training, it will be necessary to visit various premises to see the size of the meeting rooms and other necessary spaces and verify that they will be available and adequate.

5.2 Final training plan

Once all the relevant information is available, the training agenda can be developed, and the methodology adjusted, as necessary. Each topic added to the training entails an extension of the training time or eliminating part of the original content. Therefore, parallel sessions for different participants should be considered according to their specialty (infection control, vector/reservoir control, laboratory), as they may have dissimilar needs.

Each training is an opportunity to select local material that can be adapted and added to the methodology. Most updated content can be included in the lectures, requiring an additional 5–10 minutes; therefore, the proposed training agenda will have to reflect any updated content.

For issues related to transport and shipment of samples, differential diagnosis, vector control, reservoirs, and other local concerns, a local expert will have to be selected for the respective presentation.

Local trainers who have taken part in previous training activities can play a critical role as course facilitators. Local trainers may also be selected from among teachers from educational institutions or training officials of the Ministry of Health or related public health organizations. They can combine their public health expertise with a structured research approach.

Each training should have someone assigned as: a general coordinator;[3] one or more persons responsible for adapting the materials to the local situation, and trainers. Managers will also have to be assigned to prepare a budget and obtain the necessary resources (See Document *1_Checklist* in Section *8_Other_resources* of the toolkit). Individuals assigned to perform one or more functions will maintain constant communication with one another and attend relevant follow-up meetings.

5.3   Adapting course material

Well in advance of the training, local trainers should adapt presentations, case studies, and other content topics to the country's specific environment and local language (See paragraph *8 Teaching material* in this document). If possible, trainers should use information from a previous local outbreak, which will facilitate direct application of the training. The general coordinator should ensure that materials have been reviewed, adapted, and are ready for distribution at least two weeks prior to the training.

5.4   Monitoring

A checklist (See Document *1_Checklist* of Section *8_Other_resources* of the toolkit) should be used to track the activities and tasks to be performed before and during the training, based on deadlines and prior commitments. A manager should be assigned to each activity to ensure it is completed. Virtual meetings or bi-weekly or weekly teleconferences with managers are essential to assess how preparations are progressing and identify any potential problems. Monitoring should continue until the first day of training.

5.5   Final meeting

Following the training, a final meeting should be held with the training team to assess how the activity was conducted and evaluate the changes in knowledge demonstrated by comparing the answers in the initial and final

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[3] Where training is organized jointly by the national and local levels, a local coordinator with decision-making power should also be designated as liaison with the national level.

exams. In addition, this meeting will provide an opportunity to distribute pending tasks among the team members and discuss the content of the final report (See Document *4_Final_report_template* of Section *8_Other_resources* of the toolkit).

6. Resources

This section indicates the main resources that are required to conduct the training. Some of these resources will require coordination at the local level well in advance of the first day of training.

Trainers should use and adapt checklist (See Document *1_Checklist* of Section *8_Other_resources* of the toolkit) according to the resources needed to ensure its availability.

6.1 Training site

Lectures will require an auditorium large enough to accommodate the number of participants arranged as a classroom (tables with chairs), with a podium, laptop, projector, and wireless microphones. The auditorium must be able to accommodate participants, speakers, trainers, and administrative staff. The following will also be necessary:

- individual classrooms for group work;

- a computer for each group to record responses to case study questions; participants' own laptops can often be used;

- If two or more groups have to share the same classroom, the space must be large enough that the discussions of one group do not interfere with those of the other;

- a dedicated room with a computer, printer, and Internet connection throughout the training, for use by speakers and trainers when needed;

- Projectors, flipcharts, whiteboards, erasers, markers, and other materials are useful for group work, but not essential;

- refreshments during breaks and lunches.

6.2 Participant accommodation and travel expenses

Local organizers will provide transportation, lodging, and per diems to participants coming from other cities. Participants should be hosted in the same place as the training to avoid inconveniences related to traveling to the

training site that may affect participation and, therefore, the training's success. Participants who live near the training site can return home at night after the training and commute daily.

6.3   Speakers

Speakers will present their topics in lectures; They may be epidemiologists with experience in outbreak investigation who have been involved in organizing training activities before. Ideally, in addition to this experience, they will also be skilled in adult training.

If no local speakers specialized in certain topics are available (reservoir specialists, vector control, or environmental sample collection), organizers may invite experts from neighboring countries with experience in outbreak investigation. Involving local professionals is especially important in matters related to the collection and processing of clinical samples, food and water processing, entomology, and other matters that involve local procedures and regulations.

6.4   Trainers

Trainers will be present throughout the training to help moderate the case study sessions and administer and grade the exams. They may also be in charge of some presentations. Before the training begins, all trainers will meet to review the case studies and standardize the concepts, terminology, and methods to be used. Trainers can be national, but if no local trainers are available, those from neighboring regions or countries may be invited.

The number of trainers varies according to the number of participants. Generally there will need to be six trainers, including the training coordinator. Professionals who have previously participated in similar trainings are ideally suited to serve as trainers, as they are familiar with the methodology and thereby contribute to building local outbreak investigation capacities.

During the training, tutors will monitor the progress of the case studies and ensure that each question in the document is given close attention. They will also inform the coordinator how the training is progressing in each group.

6.5   Teaching material

Section *8 Teaching material* contains the complete list of generic teaching materials to be used. This material should be adapted to the local context if

necessary. Participants, speakers, and trainers must receive an electronic (or printed) copy of this material. If not all participants have a laptop or similar instrument, hard copies remain a valuable resource. Following the training, participants will be given electronic copies of all materials in the original format.

6.6   Administrative support

Organizers should consider having at least one person provide full-time administrative support throughout the training, as there will be multiple tasks related to participant registration, delivering training materials, printing, assistance and coordination with training site staff, and others. Administrative support tasks will include managing documents and drafting spreadsheets; participant registration; delivering teaching materials; recording attendance; collecting satisfaction surveys; recording personal information on each participant in a prepared spreadsheet and coordinating communications, printing, and other services.

7. Training team: Roles and responsibilities

The following describes the training-related roles that will need to be reviewed and adapted to the local situation:

- General coordinator of training
- Local coordinator
- Logistics manager
- Protocol and agenda manager (timekeeper)
- Satisfaction survey manager
- Exam officer
- Photographer
- Administrative support

In some cases, more than one person may perform the same role, depending on the number of participants. Most responsibilities will continue until the training ends.

7.1 General coordinator

The general coordinator is responsible for implementation of the training and for maintaining fluid communication with the rest of the team during the planning phase as well as during the workshop itself. Team members should communicate by some electronic means that facilitates the rapid exchange of information to ensure the training's success. An epidemiologist with experience in outbreak investigation, ideally with a graduate degree, may serve as general coordinator. The general coordinator will be responsible for:

- planning the training with all parties and helping define the training objectives;

- proposing the training agenda, speakers, and trainers; inviting the selected speakers and trainers and following up to confirm their participation;

- preparing a draft budget (See Document *2_Budget_template* in Section *8_Other_resources* of the toolkit);

- selecting the training site and approving general changes to methodology and relevant teaching materials;

- coordinating the operational progress of the training;

- supervising the tasks delegated to trainers and speakers before, during, and after the training;

- pointing out lessons learned and proposing corrective measures for future trainings;

- preparing the final report and delivering it to the relevant authorities.

7.2   Local coordinator

This role should be filled by a professional with experience in outbreak investigation and response, who is familiar with designing and running workshops. The local coordinator may be part of the Ministry of Health or another health institution. The local coordinator will be responsible for:

- presenting the training plan to the Ministry of Health authorities;

- providing and defining the final list of participants, coordinating invitations, and ensuring attendance;

- taking part in in the adaptation of teaching materials, including case studies;

- suggesting and approving the selection of speakers and trainers.

7.3   Logistics manager

The logistics manager will be responsible for all administrative and financial processes, including:

- coordinating travel and accommodation arrangements for all participants, speakers, and trainers;

- printing the necessary training materials, ensuring their availability at the training site prior to the start, and supporting the printing of additional materials during the training;

- ensuring and facilitating the availability of space, equipment, and supplies;

- arranging proper storage of material during the training.

7.4   Protocol and agenda manager

This person will ensure that the activities are conducted within the deadlines established in the agenda (See Document *5_Draft_agenda* of Section *8_Other_resources* of the toolkit) by performing the following:

- organizing the opening session and final ceremony with key authorities and partners;

- selecting a master of ceremonies and giving guidance on the local context;

- coordinating the attendance and arrival of all speakers and trainers, identifying scheduling conflicts, and proposing alternatives to the general coordinator.

- monitoring the duration of the lectures based on the number of slides presented, and monitoring the time allocated to each speaker;

- ensuring that working group presentations are progressing appropriately and on time;

- coordinating breaks and lunches and ensuring that they occur during the time limits assigned.

7.5   Satisfaction survey manager

This role may be filled by a trainer or speaker with experience in data entry and use of spreadsheets for the evaluation of satisfaction surveys (See Document *1_Satisfaction_survey* of Section *7_Evaluation_and_accreditation* of the toolkit). This person will be responsible for the following:

- supervising daily surveys and presenting the summary of each day's final discussion;

- reminding participants to complete surveys at the end of each session and taking note of attendance at each session;

- collecting and organizing completed surveys, entering the data into a spreadsheet, and analyzing and presenting the results to the training team on a daily basis;

- promptly identifying corrective or other actions from surveys and identifying lessons learned;

- supervising the final satisfaction surveys and presenting the results to the team at the end of the training;

- participating in drafting the final report.

7.6   Exam officer

This role may be assigned to a trainer or speaker who has participated in similar training, has teaching experience, and is familiar with the use of spreadsheets for coordinating and evaluating exams (See paragraph *4.3.4* **Exams** in this document). The exam officer will be responsible for:

- organizing the exams;

- confirming exam grades;

- entering each participant's exam scores into a spreadsheet

- assessing scores for any unusual patterns (e.g., grades that are too high or too low, questions that are poorly answered), and presenting them to the Training Coordinator;

- participating in drafting the final report.

7.7   Photographer

A trainer with knowledge of photography might be responsible for documenting the training in images; a professional may also be hired for this purpose, in which case the cost must be included in the budget. It is suggested that before and during the training, participants, trainers, or speakers who do not want to be photographed be asked to inform the person in charge of photography directly or through a form for that purpose. The processed images will be shared with the participants and the training team.

7.8   Administrative Support

See paragraph *6.6 Administrative support* in this document.

8. Teaching material

Participants should receive an electronic or printed copy of the teaching materials at the beginning of the training. At the end of each training course, participants should have electronic copies of all training materials used. The material is listed below.

8.1 Folder

A folder containing materials should be distributed to participants, speakers, and trainers at the beginning of the training. This folder will contain:

- Training agenda (See Document *5_Draft_agenda* of Section *8_Other_resources* of the toolkit)

- Registration form (See Document *3_Registration_form_template* of Section *8_Other_resources* of the toolkit)

- Initial participant survey (See Document *3_Initial_participant_survey* of Section *7_Evaluation_and_accreditation* of the toolkit)

- Additional readings (See Section *5_Readings* of the toolkit)

- Lectures (See Section *3_Presentations* of the toolkit)

This will all be emailed to all participants at least two weeks before the start of training. Each participant will also need a notebook for taking notes.

8.2 Exams

Among the training documents are five generic exams, with and without answers, which can be adapted according to the local context and needs (See paragraph *4.3.4 Exams* (See Section *6_Exams* of the toolkit)

- Pre-test
- Exam 1
- Exam 2

- Exam 3

- Exam 4 and Final exam (same document)

The electronic version of the exams without answers provided should be printed in advance in the correct number of copies, based on the number of participants. Each exam has more than one side, so it can be printed on both sides on a single sheet of paper. Each of the five exams should be packaged separately and clearly labeled.

8.3   Case studies

Three case studies are provided, with and without responses (See Section *4_Case_studies* of the toolkit). These must also be printed beforehand, in the same format as the originals or with adjustments made to adapt them to the local context. One case study should be printed for each participant, based on the groups to which they are assigned (See paragraph *4.3.2 Group work – Case studies* of this document). As each case study consists of six sessions, each case study will be printed with each session separately, one per session. Each page should be placed separately for easy delivery.

8.4   IDs

Each participant will receive an ID with their name, the institution where they work and their position. The organizing institution's logo, or logos if there are more than one, may also appear on the IDs, but they should be small and avoid distracting from the participant's name and position. The IDs may include a mark or colored stripe to distinguish the groups, which will be placed discreetly on the left side of the badge to help quickly break into working groups[4] (See paragraph *4.3.2 Group work – Case studies* in this document).

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[4] Working groups must be created prior to the training's start, so it is important to have the final list of participants at least one week in advance. Based on this list, the participants may be distributed into groups before starting.

8.5   Reading material

A list of readings is included in the training materials (See Section *5_Readings* of the toolkit) in addition to the training itself (See paragraph *4.3.3 Additional readings* in this document). These readings will also be evaluated during the training exams. All participants should receive the reading list in advance and, if possible, guidance on how to obtain the material, indicating that they need to read it prior to the training as it will be part of the assessment.

9. Conducting the training

The training follows the order proposed in the agenda of *Figure 1* of this document (See Document *5_Draft_agenda* of Section *8_Other_resources* of the toolkit). Any change in programming must be immediately reported to the general coordinator so that the necessary adjustments can be made so as not to affect the calendar or activities. Students should also be informed of the change and their suggestions should be received and taken into consideration. Organizers can adapt the distribution of workload either by concentrating it on a single week or by spreading it over several weeks. The latter is preferable, but the context and availability of local staff should be taken into account.

The following are some elements that will need to be considered during the training development, and which may represent changes to the training planning and agenda based on local needs.

9.1   Confirmation of arrival

Typically, the general coordinator and logistics manager will make a supervisory visit to the training site the day before the training begins. If possible, the visit will be made early in the morning to check that all the necessary components are in place: the room layout and audiovisual material, folders, and other course materials. The arrival and confirmation of attendance will also be corroborated for all participants, trainers, and speakers.

Trainers and speakers should meet the evening before the start of the course to assign responsibilities, discuss concerns, and prepare alternative plans of action.

9.2   Opening session

The magnitude and scope of the training can generate significant interest in the country. It may attract various government authorities and other institutions, as well as members of the press. Therefore, the relevant coordinators and authorities should be prepared to receive journalists from the press, radio, and television.

The opening and closing sessions should strictly adhere to local protocol. The relevant authorities should participate in the honor roll and establish the appropriate order. Potential interactions with the press should also be coordinated in advance. A master of ceremonies must be chosen in advance and informed of the activities and functions. These components should be included in the training agenda in order to avoid subsequent delays.

9.3   Daily work

The agenda manager will strictly follow the proposed program, in constant communication with the coordinator to make adjustments if necessary (See Document *5_Draft_agenda* of Section *8_Other_resources* of the toolkit). Some aspects that will require adjustments are the early or late completion of lectures, coffee break and lunch delays, and matters related to the discussion of case studies, particularly those during the final session when participants are preparing the presentation.

It is especially important to monitor the times of the lectures and leave enough time for the participants to partake in a question-and-answer session. It is also essential that each day, the speakers and trainers analyze and evaluate the use of time and other aspects of the training in order to apply immediate corrective measures, if necessary. Discussions with participants during the plenary session are an effective way to answer questions and address concerns.

9.4   Photos and electronic material

Photographs of the activities conducted during the training are important. A photographer should be appointed for the entire training (See paragraph *7.7 Photographer* of this document). A group photo should be taken at the opening session or one day before the end of the training. Photos may also be taken of lectures, group work, and groups of participants, with the most representative photos selected to give to the participants.

On the last day, participants will be given an electronic copy of the training material, usually on a memory stick (USB), to include the following:

- Material from the training kit (See paragraph *8.1 Folder* in this document).

- List of participants with contact information

- Results of the case studies (See paragraph *4.3.2 Group work – Case studies* in this document).

- Training photos

- Corrected exams (See paragraph *4.3.4 Exams* in this document).

- Certificates (See Document *2_Certificate_template* of Section *7_Evaluation_and_accreditation* of the toolkit)

9.5   Closing ceremony and presentation of diplomas

The closing session may attract more attention than the inauguration, so it should be planned in advance. This is the time to deliver diplomas and electronic materials. Depending on time availability and other factors, diplomas may be delivered during the ceremony, at a time separate from the ceremony, or mailed to participants.

9.6   Finalization and delivery of the final report

Ideally, the final report will be completed immediately after the training in order to avoid delays in submitting it to the host country authorities (See Document *4_Final_report_template* in Section *8_Other_resources* of the toolkit). The training coordinator, with the support of the other managers, trainers, and speakers, should start preparing the report during the training and especially take care to record the summaries of the daily discussion with trainers and instructors.

9.7   Follow-up survey

Participants should receive a follow-up survey 1, 3, or 5 years? after completion of the training in order to assess the impact on their daily work, professional development, and, above all, response activities.

The initial survey used at the beginning of the training (See Document *3_Initial_participant_survey* of Section *7_Evaluation_and_accreditation* of the toolkit) may be reused to record changes, if any, or the follow-up survey proposed in this toolkit (See Document *4_Participant_follow-up_survey* of Section *7_Evaluation_and_accreditation* of the toolkit). In addition, relevant authorities at the Ministry of Health or other health institutions may be interviewed to assess the training's contribution to response capacity.

10. Materials and templates

The materials and templates (See *Table 1*) provided as part of this toolkit are intended to support organizers in planning and implementing training courses.

Table 1. Materials and templates for outbreak investigation training, and where to find them in the toolkit

Sections	Material and templates
1_Contents_and_Manual	Contents Manual
2_Syllabus	Syllabus
3_Presentations	Lectures
4_Case_studies	Case studies Oral presentation template Report template
5_Readings	Additional reading
6_Exams	Exams with and without answers
7_Evaluation_and_accreditation	Satisfaction survey Certificate template Initial participant survey Participant follow-up survey
8_Other_resources	Checklist Budget template Registration form template Final report template Draft agenda Proposed planning

11. References

1. Centers for Disease Control and Prevention. Principles of epidemiology in public health practice; an introduction to applied epidemiology and biostatistics. 3rd edition. Atlanta: CDC; 2012. Available from: https://stacks.cdc.gov/view/cdc/6914

2. Donna Jones, Víctor Caceres and Dionisio Herrera-Guibert. A tool for quality improvement of field epidemiology training programs: Experience with a new scorecard approach. Hum Resour Health. 2012; 10: 36. Available from: https://academicjournals.org/journal/JPHE/cited-by-article/16F98A35394

3. Gebbie EN, Morse SS, Hanson H, McCollum MC, Reddy V, Gebbie KM, Smailes E, Balter S. Training for and Maintaining Public Health Surge Capacity: A Program for Disease Outbreak Investigation by Student Volunteers. Public Health Rep. 2007 Jan-Feb;122(1):127-33. Available from: https://doi.org/10.1177/003335490712200119

4. Lescano AG, Salmon-Mulanovich G, Pedroni E and Blazes DL. Outbreak Investigation and Response Training. Science. 2007 Oct 26;318(5850):574-5. Available from: https://doi.org/10.1126/science.1146837

5. Subramanian, R.E., Herrera, D.G. & Kelly, P.M. An evaluation of the global network of field epidemiology and laboratory training programmes: a resource for improving public health capacity and increasing the number of public health professionals worldwide. Hum Resour Health 11, 45 (2013). Available from: https://doi.org/10.1186/1478-4491-11-45

6. Sadana R, Chowdhury AM, Chowdhury R, Petrakova A. Strengthening public health education and training to improve global health. Bulletin of the World Health Organization. 2007 Mar;85(3):163. Available from: http://dx.doi.org/10.2471/BLT.06.039321

7. Jones, Donna et al. (2014). Multisite evaluation of field epidemiology training programs : findings and recommendations. Available from: https://stacks.cdc.gov/view/cdc/24471

8. Schneider D, Evering-Watley M, Walke H, Bloland PB. Training the Global Public Health Workforce Through Applied Epidemiology Training

Programs: CDC's Experience, 1951–2011. Public Health Reviews. 2011;33:190-203. Available from: https://doi.org/10.1007/BF03391627

9. Bhatnagar T, Gupte MD, Hutin YJ, Kaur P, Kumaraswami V, Manickam P, Murhekar M, Ramachandran V, Ramakrishnan R, The NIE FETP (in alphabetical order). Seven years of the field epidemiology training programme (FETP) at Chennai, Tamil Nadu, India: an internal evaluation. Hum Resour Health. 2013; 11: 45. Available from: https://doi.org/10.1186/1478-4491-10-36

10. Thacker SB, Buffington J. Applied epidemiology for the 21st Century. Int J Epidemiol. 2001 Apr;30(2):320-5. Available from: https://doi.org/10.1093/ije/30.2.320

11. Weis E, Ergor GL, Din GNL, Kalaa S, Nal B, Babalioglu N. Start of a field epidemiology training program in Turkey. Manag Health 2011, 15(2).

12. World Health Organization. Communicable disease surveillance and response systems : guide to monitoring and evaluating. Geneva: WHO; 2006. Available from: https://apps.who.int/iris/handle/10665/69331

13. World Health Organization. Rapid risk assessment of acute public health events. Geneva: WHO; 2012. Available from: https://apps.who.int/iris/handle/10665/70810?locale-attribute=es&

14. World Health Organization. Public health for mass gatherings: key considerations. Geneva: WHO; 2015. Available from: https://www.who.int/publications/i/item/public-health-for-mass-gatherings-key-considerations

15. World Health Organization / Western Pacific Regional Office. Third Workshop on Field Epidemiology Training Programmes : Opportunities to Strengthen International Collaboration, Bali, Indonesia, 8 November 2011. Manila: WHO / WPRO. Available from: https://apps.who.int/iris/handle/10665/207144?locale-attribute=es&

16. World Health Organization. International Health Regulations (2005). Second edition. Geneva: WHO; 2008. Available from: https://www.who.int/publications/i/item/9789241580410

17. World Health Organization. Health Topics. Geneva: WHO; 2023. Available from: https://www.who.int/health-topics

18. World Health Organization. Early detection, assessment and response to acute public health events: implementation of early warning and response with a focus on event-based surveillance. Geneva: WHO; 2014. Available from: https://www.who.int/publications/i/item/WHO-HSE-GCR-LYO-2014.4

19. Centers for Disease Control and Prevention. The CDC Field Epidemiology Manual. Atlanta: CDC; 2006. Available from: https://www.cdc.gov/eis/field-epi-manual/index.html