Guidance for One Health field epidemiology learning evaluation and certification

A supplemental manual to the *Competencies for One Health field epidemiology (COHFE) framework*

Food and Agriculture Organization of the United Nations

World Health Organization

World Organisation for Animal Health
Founded as OIE

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Contents

Foreword

Infectious diseases are emerging at a rapid rate and pose a severe threat to health security, the global economy, and food safety. Novel infectious diseases have been increasingly reported in the past 50 years, including severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), Ebola virus disease, avian influenza H5N1, pandemic influenza A (H1N1), Zika virus and COVID-19. As demonstrated by the COVID-19 pandemic, emerging infectious diseases can cause massive health and socio-economic impacts.

More than 60% of emerging infectious diseases are of animal origin.[1] Diseases emerge from a confluence of several drivers, including rapid population growth and urbanization, land-use change, encroachment on wild habitats, and changing global and local weather patterns. As the world population has grown from about 1.6 billion in the 1900s to 7.8 billion today, the demand for food and housing has increased concurrently. To meet this demand, we have resorted to intensive farming and clearing forests at the rate of 10 million hectares per annum. As a result, humans and domestic animals are coming into closer contact with wild animals, increasing the chances for spillover of pathogens from wildlife to domestic animals and humans. The risk is further exacerbated by climate change, antimicrobial resistance, and cross-border trade of livestock and wildlife.

The challenges to address emerging infectious diseases are multifactorial. The traditional siloed approach of working in isolation in the public health, animal health and environment sectors is not adequate to tackle them. Instead, we need a workforce that can function across all of these sectors using the One Health approach, defined recently as "an integrated, unifying approach that aims to sustainably balance and optimise the health of people, animals and ecosystems. It recognises the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent."[2]

The current field epidemiology workforce is not yet sufficiently prepared to work across the human-animal-environment interface. Field epidemiology training programmes (FETPs) are crucial for preparing the health workforce to prevent, detect and contain infectious diseases. Still, most programmes currently train either public health or animal health epidemiologists, with very few programmes working across both sectors and even fewer that include the environment sector or wildlife. It is only with this kind of collaboration and the ability of professionals in various sectors to work together that the emergence of new infections can be limited, preventing negative health outcomes and socio-economic disruptions.

The *Competencies for One Health field epidemiology (COHFE) framework* addresses the increasing and urgent need to strengthen collaboration among the public health, animal health and environment sectors to tackle health threats at the human-animal-environment interface*.* Developed jointly by the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH), the *COHFE framework* defines the core One Health, optional One Health, and sector-specific knowledge, skills, and competencies for field epidemiologists. The framework can be used by existing public health and veterinary field epidemiology training programmes to design and update their curriculum, or by countries or regions to set up new One Health field epidemiology training programmes. A specifically designed prioritization tool allows programmes to rank optional One Health and sector-specific knowledge, skills, and competencies and create a framework to suit their context and needs. The adoption of this framework will ensure that training participants are able to work across multiple sectors to tackle emerging infectious diseases and other evolving challenges and apply the necessary systems thinking of the One Health approach.

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1   Jones KE, Patel NG, Levy MA, Storeygard A, Balk D, Gittleman JL, Daszak P. Global trends in emerging infectious diseases. Nature. 2008 Feb 21;451(7181):990-3. doi: 10.1038/nature06536. PMID: 18288193; PMCID: PMC5960580.

2   One Health High-Level Expert Panel (OHHLEP), Adisasmito WB, Almuhairi S, Behravesh CB, Bilivogui P, Bukachi SA, et al. (2022) One Health: A new definition for a sustainable and healthy future. PLoS Pathog 18(6): e1010537. https://doi.org/10.1371/journal.ppat.1010537

The *COHFE framework* is accompanied by four supplemental manuals:
- *Guidance for One Health field epidemiology curriculum development*
- *Guidance for One Health field epidemiology mentorship*
- *Guidance for One Health field epidemiology learning evaluation and certification*
- *Guidance for One Health field epidemiology continuing education programmes*

These manuals are meant to assist countries with implementation of the *COHFE framework*. We believe the framework and guidance documents present an innovative approach to strengthening field epidemiology capacity and health security. Together with other resources and tools, the *COHFE framework* and supplemental guidance will help governments and international organizations to effectively prevent and manage emerging infectious diseases and other evolving health challenges at the human-animal-environment interface.

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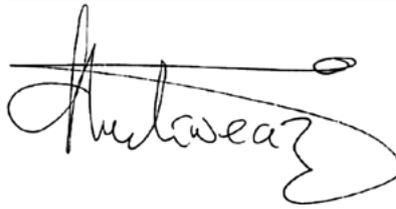
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Acknowledgements

Acronyms

FETP	Field epidemiology Training Program
FETPV	Field epidemiology Training Programme for Veterinarians
FAO	Food and Agriculture Organization of the United Nations
TEPHINET	Training Programmes in Epidemiology Public Health Intervention Network
UNEP	United Nations Environment Programme
WOAH	World Organisation for Animal Health
WHO	World Health Organization

Introduction
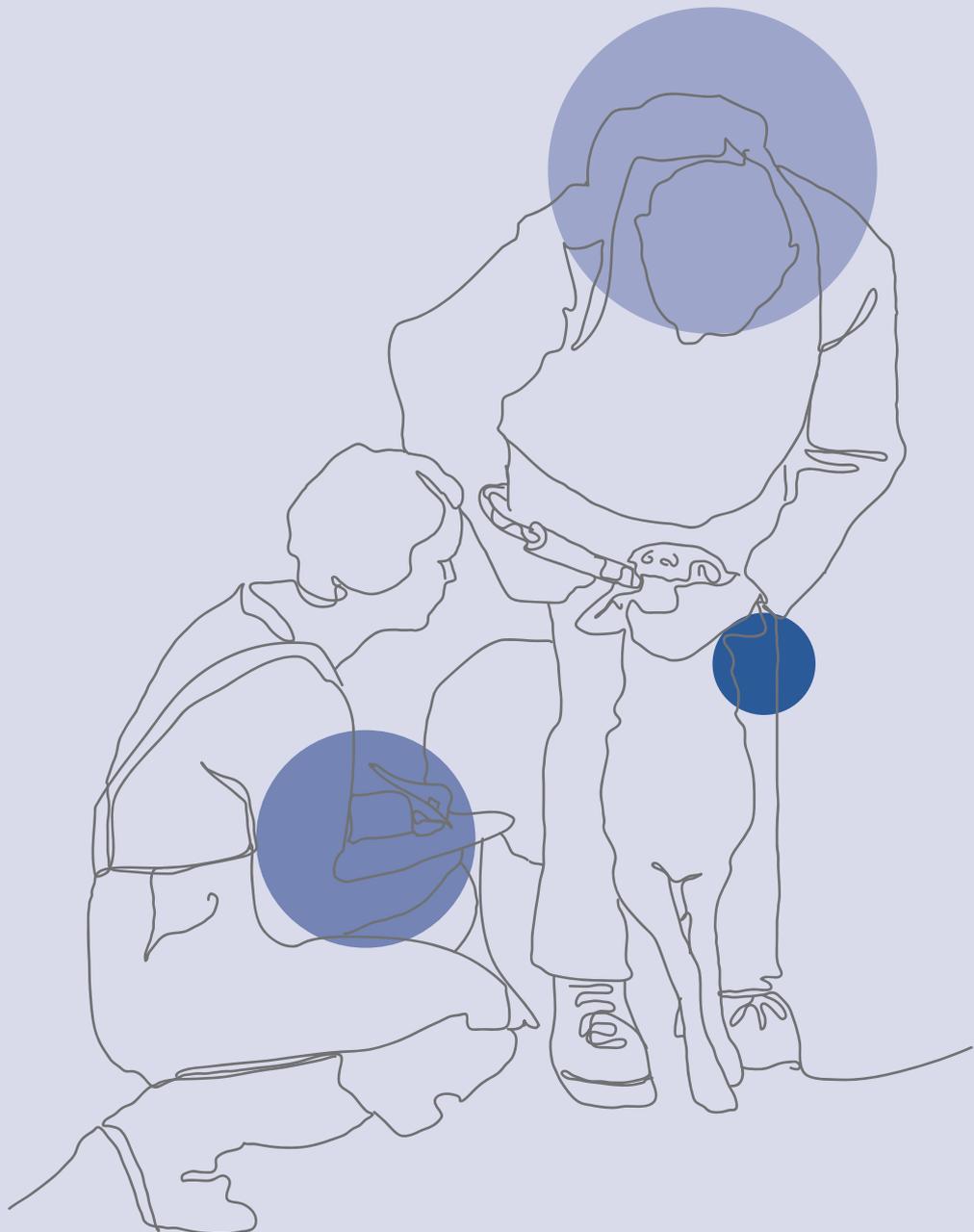
1.1 Background

Field epidemiology is the application of epidemiological principles and methods in response to urgent health problems. Applied epidemiology includes field epidemiology but also refers to epidemiology conducted in academic and research settings *(1)*. Applied or field epidemiology training programmes have played an essential role in preparing the existing epidemiological workforce to perform emergency public health investigations and other essential public health programs since the first in service epidemiology training programme was established in 1951 at the US Centers for Disease Control and Prevention *(2)*. Today, more than 200 countries and territories throughout the world participate in Field Epidemiology Training Programs (FETP), and 81 of 98 active programmes are members of the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) global network of FETPs *(3)*. Programmes are typically comprised of one or more levels of a three-tiered training structure made up of frontline, intermediate, and advanced levels *(4)*. According to local needs and the resources and mentorship available, certain programmes have incorporated specializations such as laboratory training or veterinary field epidemiology. With the support from the Food and Agriculture Organization (FAO), field epidemiology training programmes for veterinarians (FETPV) and in-service applied veterinary epidemiology training (ISAVET) programmes have been established, enabling veterinarians to tackle transboundary animal diseases and support disease surveillance *(5)*. Other programmes have been developed to train environmental experts to address ecosystem health and its relationship with human and animal health.

FAO, the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH, formerly OIE) consider workforce capacity as a core need to ensure the effectiveness of public health programmes. Increasing numbers of infectious disease epidemics across the human animal interface and poor health outcomes due to climate change and environmental degradation highlight the need for an epidemiology workforce skilled at working across the human, animal and environmental health sectors and implementing the One Health approach. To address this growing need, field epidemiology training programmes must not only provide training on existing core competencies for field epidemiologists, but their graduates must also demonstrate competencies based on the foundational principles of One Health: collaboration, cooperation, and communication. Methods of evaluation and certification of programme participants must address these principles as well.

Evaluation is the systematic process of collecting, analysing and interpreting information to determine the extent to which training participants have acquired knowledge, skills and competencies. Evaluation of training participants during (formative evaluation) and at the end (summative evaluation) of training is essential for supporting learning and ensuring they have obtained a set of minimum core competencies prior to completing the training. The scientific literature contains little evidence on best methods for evaluation of field epidemiologists participating in in-service training programmes, although many evaluations have been published on the perceived competence and productivity of graduates, based, for example, on the number of peer-reviewed publications, scientific presentations, and surveillance bulletins they produce in the years following programme completion *(6–11)* partly due to their responsiveness to the countries' unique needs. The Centers for Disease Control and Prevention has partnered with ministries of health to strengthen their workforce through customized competency-based training programs. While desirable, emphasis on program flexibility can result in redundancy and inconsistency. To address this challenge, the ADDIE model (analysis, design, development, implementation, and evaluation). At the global level, field epidemiology training programmes are assessed and accredited by TEPHINET using standard accreditation criteria *(12)*. This external accreditation recognizes programmes that meet minimum global standards which reassures employers and provides accountability to financial supporters, whether governmental or donor based. There is currently no accreditation body for veterinary field epidemiology training programmes, although WOAH, mirroring its international standards, has developed a capacity building programme for the sustainable improvement of national Veterinary Services and Aquatic Animal Health Services based on a monitoring mechanism of these services' performance, including critical competencies related to risk analysis and epidemiology, surveillance and early detection, disease prevention, control and eradication *(13)*. While the evaluation of training programmes themselves

is beyond the scope of this manual, guidance is outlined for education providers on evaluation of One Health field epidemiology training programme participants, i.e. learners' acquired knowledge, skills and competencies throughout and upon completion of the programme.

For existing field epidemiology training programmes, completion requirements are typically determined at the country or regional level and vary across training levels (i.e., frontline, intermediate, and advanced). Traditionally, they require a set of deliverables upon which programme completion is based, such as completion of a surveillance evaluation, outbreak investigation and epidemiologic study, as well as demonstration of various forms of communication to present the results of their work, including a scientific bulletin or manuscript and an oral presentation. More information on existing programme completion requirements by training level, based on data collected in the TEPHINET 2021 FETP Survey, is presented in Annex 2. Some programmes include requirements for attendance and participation or written and oral examinations. Some programmes, especially those linked with universities that issue diplomas, require the completion of a written thesis. Other participants are issued a certificate of completion. For the purpose of this manual, the term certification refers to the official recognition that a training participant has successfully completed all training programme requirements, whether they receive a certificate or diploma. Certification is not the same as licensing that might be required for employment in certain related fields by some countries.

FAO, WHO, and WOAH have defined core and optional One Health field epidemiology knowledge, skills and competencies in the *Competencies for One Health field epidemiology (COHFE) framework*. Consisting of 14 domains divided into 75 subdomains, One Health and sector specific competencies are defined at three training levels (frontline, intermediate and advanced). The framework aims to provide flexible minimum standard and competency guidance for field epidemiology training programmes promoting the One Health approach. To support training programmes, the Tripartite has also developed guidance for curriculum development, mentorship, and continuing education. This supplemental manual, *Guidance for One Health field epidemiology learning evaluation and certification,* provides recommendations for participant evaluation

and certification, or programme completion, requirements.

1.2
How the guidance was developed

A global analysis of existing practices from field epidemiology training programmes informed the development of this guidance. Documents from 18 advanced, 2 intermediate and 3 frontline field epidemiology training programmes were assessed by a multisectoral team of subject matter experts from FAO, WHO and WOAH. Practice activities and certification requirements were defined based on these existing practices and then refined to emphasize the multisectoral coordination, collaboration and communication needed for implementation of the One Health approach. Through performance of the recommended practice activities, participants demonstrate the knowledge, skills and competencies outlined in the *COHFE framework*. The draft evaluation and certification guidance developed by the core technical team were presented to a technical advisory group of global field epidemiology and One Health experts (Annex 1) for feedback and validation. Revisions based on their feedback resulted in this final guidance document.

1.3
Scope of work

This guidance was created to assist One Health field epidemiology training programmes determine how best to evaluate their participants and create a set of certification criteria that best fits their country context. We discuss the strengths and weaknesses of different approaches and provide recommendations based on a review of existing programmes and expert consultation. The guidance is intended for in-service training programmes only and does not necessarily apply to preservice training programmes, which typically involve more didactic learning and limited field experiences. While the focus of the document is to support One Health field epidemiology training programmes, this guidance depends heavily on practices from existing primarily sector specific programmes and therefore may also be applicable for other types of FETPs.

1.4
How to use this document

This document is intended to be used by authorities in member countries and regions and by education or continuing education providers when planning or reviewing learning evaluation practices and certification requirements for their field epidemiology training programmes. Programmes are encouraged to consider:

- workforce needs

- priorities and resources of each sector

- practices of existing training programmes (sector specific or multisectoral)

- time availability of supervisors and mentors

- adequate time and opportunity for participants to fulfill certification requirements.

There is no single approach that will fit the needs and priorities of all countries. However, it is recommended that each country should work to harmonize training programmes (governmental, nongovernmental, and academic) to allow for better multisectoral linkages amongst participants within training programmes.

The *COHFE framework* and *Guidance for One Health field epidemiology learning evaluation and certification* are accompanied by three additional supplemental manuals:

- *Guidance for One Health field epidemiology curriculum development*

- *Guidance for One Health field epidemiology mentorship*

- *Guidance for One Health field epidemiology continuing education programmes*

1.5
Definitions

The following definitions were specifically developed for use in the *Competencies for One Health field epidemiology (COHFE) framework* and supplemental

guidance manuals. The terms may be used differently in other contexts or publications. Additional terms are defined in the One Health glossary in Annex 1 of the *COHFE framework*.

Domain: A broad topic or subject area from the *Competencies for One Health field epidemiology (COHFE) framework* that is divided into subdomains

Subdomain: In the *COHFE framework*, a narrower topic or subject area than a domain. Subdomains consist of knowledge, skills, and competencies.

Knowledge: Assimilation of information through learning. Knowledge is the body of facts, principles, theories, and practices related to a field of work or study. It is described as theoretical and factual.

Skill: Ability to apply knowledge and complete tasks and solve problems; skills are described as cognitive (involving the use of logical, intuitive, and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools, and instruments)

Attitude: A person's feelings, values and beliefs, which influence their behaviour and the performance of tasks

Competency: Proven ability to apply knowledge, skills and personal, social and methodological abilities (attitudes and behaviours), in work or study situations and in professional and personal development in terms of responsibility and autonomy. It is not limited to cognitive elements (involving the use of theory, concepts, or knowledge), as it also requires the use of interpersonal skills (e.g., social or organizational skills) and ethical values where relevant. A core competency is the minimum level of competency expected to be achieved by the participants in a training programme.

Core: A required knowledge, skill or competency for a specific level of training (frontline, intermediate or advanced) for One Health field epidemiologists

Optional: A knowledge, skill, or competency that a country programme can choose to include in their programmes based on a country needs assessment but which is not considered a required core competency for One Health field epidemiologists

Training levels

Frontline[3]: A 3–4 month mentored in-service applied training programme for field staff from human, animal or environmental health sectors to strengthen epidemiologic capacity at the community to the district level. It aims at improving competencies to conduct data collection, disease monitoring, and investigation and response to health events across the One Health spectrum.

Intermediate: A 9–12 month mentored in-service or fulltime applied training programme for staff from human, animal or environmental health sectors who provide epidemiologic services, usually at the district to provincial levels. It includes additional training in surveillance, data analysis and interpretation, and management of investigations and responses to health events, across the One Health spectrum.

Advanced: A two-year mentored fulltime intensive training programme for experienced staff from human, animal or environmental health sectors to prepare them for applied epidemiology leadership roles at provincial and national levels. It includes advanced training in designing and managing surveillance programmes, complex epidemiologic methods and management of investigations and responses to health events, across the One Health spectrum.

Additional definitions

Certification: Official recognition that a training participant has successfully completed all training programme requirements

Competence: The state of proficiency of a person to perform the required practice activities to the defined standard. This incorporates having the requisite competencies to do this in a given context. Competence is multidimensional and dynamic. It changes with time, experience and setting.

Evaluation: The systematic process of collecting, analyzing and interpreting information to determine the extent to which training participants have acquired knowledge, skills and competencies

Formative evaluation: Used during the learning process, provides feedback on learning-in-process, and is dialogue based and ungraded

Instructor: An individual responsible for teaching training programme participants, typically in a didactic or classroom setting. They may also guide participants during case studies and simulation exercises.

Mentor: An experienced epidemiologist who provides technical, supportive guidance to training programme participants, particularly on their field or practice activities.

Output: A product produced while engaging in the practice of field epidemiology (e.g., written report, manuscript, or oral presentation)

Practice activity: A core function of field epidemiology practice comprising a group of related tasks; practice activities are time limited, trainable and, through the performance of tasks, measurable; Individuals may be certified to perform practice activities

Summative evaluation: Used at the end of the training course or programme, evaluates the student against some standard or benchmark, and is graded

Supervision: The provision of guidance and support in learning and working effectively by observing and directing the execution of tasks or activities and making certain that everything is done correctly, from a position of being in charge

Supervisor: An institutional mentor; an individual who is familiar with the curriculum, programme objectives and structure and ensures the training participant can complete the programme requirements operationally and logistically; supervisors may also serve as technical mentors for field and practice activities

Task: an observable unit of work within a practice activity that draws on knowledge, skills and attitudes; tasks are time limited, trainable and measurable

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3   The term Frontline with regards to health workers is controversial because its meaning is unclear, may be unintentionally divisive or militaristic, and translates poorly in some languages. However, we use this term to align with structures and practices of existing training programmes.

2. Evaluation of training programme participants
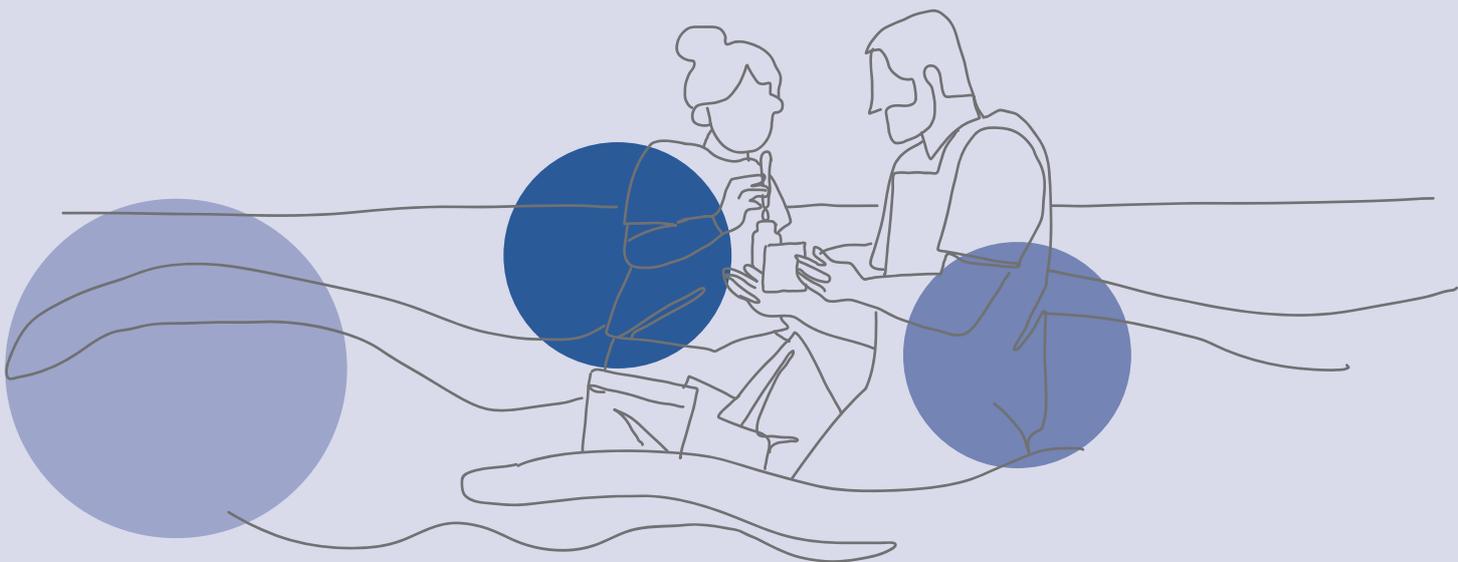
The *COHFE framework* is a comprehensive but flexible list of the knowledge, skills, and competencies expected at the point of completion of a One Health field epidemiology training programme. Evaluation of participants should be based on core One Health knowledge, skills and competencies as learning outcomes, as well as optional One Health and sector specific knowledge, skills and competencies prioritized by the training programme based on the relevant context. This guidance, along with the curriculum guidance accompanying the competency framework, is structured so that programmes can follow the practice of constructive alignment, starting with the outcomes (knowledge, skills, and competencies) and aligning programme curriculum and evaluations to those outcomes.

Training programme participants in One Health field epidemiology training programmes may come from a variety of backgrounds with varying levels of experience and expertise. This should be considered a programme strength as it allows for peer mentorship and cross-sectoral teaching and learning. However, during the evaluation process, a consistent minimum standard of performance should be applied for all participants, regardless of their experience or background. Some programmes may wish to offer sector specific training tracts for participants with backgrounds in a specific sector that includes a larger number of knowledge, skill and competency requirements in a specific area of focus, however, all participants should be required to demonstrate the core One Health knowledge, skills and competencies.

2.1
Methods of evaluation

The goal of participant evaluations is to engage them in their own learning process, to foster a sense of trust between participants and their supervisors and mentors, and to promote an attitude of lifelong learning. The role of the mentors in the evaluation process is fundamental. See the *Guidance for One Health field epidemiology mentorship* for closely related guidance and information on best practices for mentorship. The development of professionalism during the training period is as important as the acquisition of technical competencies and can be strengthened through a strong relationship with a supportive mentor.

Evaluation methods selected by One Health field epidemiology training programmes should support adult learning and be primarily formative, rather than summative in nature *(14)*. Formative evaluations are used during the learning process, provide feedback on learning-in-process, and are dialogue based and ungraded. Summative evaluations are used at the end of the training course, evaluate the student against some standard or benchmark, and are graded. Formative evaluations allow the student and evaluator to identify where a learner is in the process of acquiring competency and to identify learning gaps without the pressure of summative evaluations. All of the following methods for evaluation can be either summative or formative in nature.

Practice activities and outputs

Practice activities are the core functions performed by a field epidemiologist while outputs are something produced through the practice of field epidemiology (e.g., written report, manuscript, or oral presentation). Practice activities and outputs are the primary means by which training participants should be evaluated since, as an in-service training programme, participants are expected to spend 70–75% of their time engaging in real world, on the job activities. Practice activities are comprised of a group of related tasks, are time limited, trainable and, through the performance of tasks, measurable *(15)*. Practice activities and the creation of outputs require the performance of tasks that traverse the fourteen domains reflected in the *COHFE framework.* Table 1 presents a cross-tabulation of practice activities and outputs by domain, highlighting the need for integration of learning across domains. Throughout the training period, programmes must ensure that participants have an adequate opportunity to engage in practice activities to promote learning and to demonstrate their newly acquired knowledge, skills and competencies.

Table 1
Cross-tabulation of practice activities and outputs by competency domains, highlighting the need for integration of knowledge, skills, attitudes and competencies across domains.

	1 – Foundational knowledge	2 – Surveillance systems	3 – Field investigations	4 – Disease management	5 – Laboratory capacity	6 – Infection prevention and control, biosafety, and biosecurity	7 – Preparedness and response	8 – Epidemiologic studies	9 – Data management, biostatistics, and informatics	10 – Ecosystem health	11 – Leadership and management	12 – Communication and community engagement	13 – Training	14 - Ethics
Surveillance														
Surveillance data analysis	X	X		X	X			X	X	X	X	X	X	X
Surveillance summary report	X	X		X	X			X	X	X	X	X	X	X
Surveillance system evaluation	X	X		X	X			X	X	X	X	X	X	X
Outbreak investigation														
Outbreak investigation design/implementation	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Outbreak investigation report	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Epidemiologic study														
Scientific protocol	X		X	X	X	X		X	X	X	X	X	X	X
Epidemiologic investigation	X		X	X	X	X		X	X	X	X	X	X	X
Communication														
Data visualization	X	X	X	X	X		X	X	X	X	X	X	X	X
Scientific presentation	X	X	X	X	X		X	X	X	X	X	X	X	X
Abstract	X	X	X	X	X		X	X	X	X	X	X	X	X
Bulletin article	X	X	X	X	X		X	X	X	X	X	X	X	X
Peer-reviewed manuscript	X	X	X	X	X		X	X	X	X	X	X	X	X
Lay audience communication	X	X	X	X	X		X	X	X	X	X	X	X	X
Optional/Other														
Surveillance system design/implementation	X	X		X	X	X		X	X	X	X	X	X	X
Health situation analysis	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Programme evaluation	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Training	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dissertation/thesis	X	X	X	X	X	X	X	X	X	X	X	X	X	X

The evaluation should focus throughout the training period on a participant's technical performance, collaborative interactions and deliverables. This process of evaluation provides a more comprehensive indication of whether participants can put into practice what they have learned and can apply critical thinking to everyday challenges more than evaluation through examinations. A formative evaluation approach is appropriate to place emphasis on continued learning. However, summative evaluations of specific outputs are appropriate to determine whether an adequate level of competency has been achieved at the time of programme completion. See Table 2 for a list of recommended practice activities and outputs by training level.

Table 2
Summary of recommended practice activities and outputs by training level

	Frontline	Intermediate	Advanced
Surveillance			
Surveillance data analysis	Conduct a data quality audit and basic descriptive analysis	Conduct descriptive and/or multivariable analysis	Conduct descriptive and multivariable analysis
Surveillance summary report	Prepare a brief and/or expanded multisectoral surveillance summary report	Prepare a multisectoral surveillance summary report	Prepare a surveillance summary report incorporating data from multiple sectors
Surveillance system evaluation	Prepare a problem analysis report	Prepare a surveillance system evaluation protocol and report (group or individual)	Prepare a surveillance system evaluation protocol and report (individual)
Outbreak Investigation			
Outbreak investigation design/implementation	Participate in a multisectoral investigation of an acute public health event	Conduct a multisectoral investigation of an acute health event	Coordinate a multisectoral investigation of an acute health event
Outbreak investigation report	Prepare a case report and/or outbreak investigation report (group)	Prepare an outbreak investigation report	Prepare an outbreak investigation report
Epidemiologic Study			
Scientific protocol	Not applicable	Participate in the design of a multisectoral scientific protocol	Prepare a multisectoral scientific protocol
Epidemiologic investigation	Not applicable	Participate in conducting a multisectoral epidemiologic investigation, data analysis and reporting	Conduct and implement a multisectoral epidemiologic investigation, including data analysis and reporting
Communication			
Data visualization	Summarize data in a chart, graph, or map	Summarize data in a chart, graph, or map	Summarize and interpret data in a chart, graph, or map
Scientific presentation	Prepare and deliver a poster or short oral presentation	Prepare and deliver a short oral or poster presentation	Prepare and deliver a short and/or long oral presentation
Abstract	Not applicable	Write an abstract for a scientific audience	Write an abstract for a scientific audience

	Frontline	Intermediate	Advanced
Bulletin article	Not applicable	Write an article for a bulletin (public health, animal health, environmental health, other)[a]	Write an article for a bulletin (public health, animal health, environmental health, other)
Peer-reviewed manuscript	Not applicable	Not applicable	Prepare, and potentially submit, a scientific manuscript to a peer-reviewed journal
Lay audience communication	Not applicable	Not applicable	Demonstrate written or oral communication with a lay audience
Optional/Other			
Surveillance system design/implementation	Not applicable	Not applicable	Design and/or implement a multisectoral surveillance system
Health situation analysis	Not applicable	Not applicable	Perform a multisectoral health situation analysis during an acute health event
Programme evaluation	Not applicable	Not applicable	Perform a programme evaluation involving more than one sector
Service[b]	Perform service for the community	Perform service for the community	Perform service for the community
Training	Serve as teacher, trainer, mentor	Participate in teaching a junior cohort by planning, delivering, and evaluating the training activity	Teach a junior cohort by planning, delivering, and evaluating the training activity
Dissertation/Thesis	Not applicable	Not applicable	Write a dissertation or thesis, according to the requirements of the university

a Optional at the intermediate level

b Service refers to a participant's contributions to the overall mission of the organization that are made outside of the performance of tasks and practice activities required for programme completion (measured in hours or number of activities conducted). Examples might include conducting data collection or case finding for a field investigation being led by another colleague or participating in contact tracing during an outbreak.

The evaluation of practice activities is primarily performed by supervisors and mentors; however, self-evaluation, peer-evaluation or 360-degree evaluations can also be beneficial for learners (see section 2.2). Evaluations can be informal or formal and oral or written. Informal evaluations should be provided throughout the training period as participants and mentors collaborate on daily work. Formal evaluations can be performed periodically and at the end of the training period. For formal evaluations of each project, practice activity or output, participants should first self-assess and reflect on their own performance and then discuss with their supervisor or mentors to receive feedback and a sign-off for completion of the deliverable. An example of a competency-based project evaluation form, with reference to applicable practice activities and outputs, is available in Annex 3. Annex 4 shows an example of a competency tracker form that can be used throughout the training period. Through this iterative evaluation process, the training participant and mentor can track which competencies have been achieved and which should be strengthened and evaluated through additional projects and practice activities.

In One Health training programmes, evaluations of practice activities and outputs should look specifically at systems thinking, the process of understanding how things interact within a whole to produce its characteristics or properties, and multisectoral collaboration in the performance of each practice activity. Evaluation of a participant's ability to coordinate, collaborate and communicate across sectors is critical for the implementation of One Health. Participants and their mentors should ensure a range of activities are pursued during the training period that involve collaboration among the human, animal, and environmental health sectors. Some examples of ways in which an evaluation could demonstrate the use of the One Health approach include:

- evidence of communication and collaboration across the human, animal and environmental health sectors in the performance of tasks and practice activities
- integration of information from multiple sectors in surveillance, outbreak investigations, or epidemiologic studies

- contributions from all sectors in performance of joint risk assessments
- coordinated response and risk communication messaging.

The level of supervision required in the performance of practice activities should also be assessed during evaluation. The Dreyfus model of skills acquisition (Figure 1) can be used to evaluate a training participant's progression from novice to advanced beginner to competent, which is the level required for certification, with decreasing levels of supervision required at each level (16). The higher levels of proficiency and expertise are expected to be achieved as field epidemiologists progress through careers, by gaining experience and participating in continuing education. In practice, field epidemiologists collaborate and depend on colleagues with differing expertise for consultation and advice throughout their careers. This type of collaboration should be encouraged as part of the One Health approach. However, an increasing level of independence in the performance of practice activities should be observed
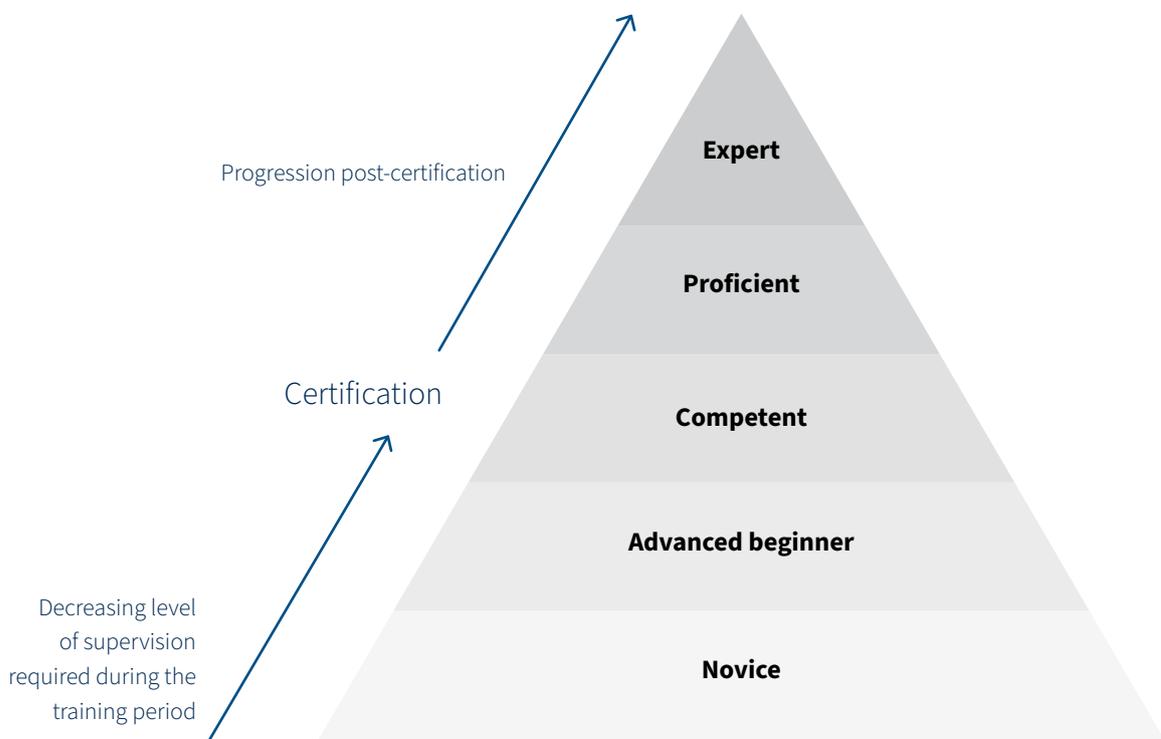

Figure 1
Demonstration of training participant progression from novice to advanced beginner to competent by the time of programme completion or certification based on the Dreyfus model of skills acquisition (16). Progression is expected to continue to proficient and expert after programme completion or certification.

by supervisors and mentors as participants approach programme completion.

Case studies and simulation exercises

Case studies and simulation exercises have become essential training tools for field epidemiology training programmes and are especially useful for multisectoral One Health training. Case studies allow instructors to guide and observe a small group of participants as they work through a realistic scenario in a classroom setting. During a case study, participants can practice and demonstrate newly acquired knowledge and skills in a low pressure environment and consult with other participants from different backgrounds and sectors.

Simulation exercises model an emergency situation on a larger scale and timeframe, allowing participants to collectively demonstrate field epidemiology and transdisciplinary competencies. Simulation exercises also serve the dual purpose of allowing governments to validate and enhance multisectoral response plans, procedures, and systems and systematically address barriers related to One Health implementation prior to a real emergency *(17)*. Programmes may consider in-person versus virtual or blended simulation exercises depending on the resources and time available.

During both case studies and simulation exercises, participants should be evaluated on technical skills, communication skills, critical thinking skills, and multisectoral or systems thinking. Instructors or mentors may also assess their ability to participate in shared learning or ability to cooperatively align thinking on how to address health threats across sectors.

Examinations and assignments

Multisectoral knowledge and some skills and competencies can be evaluated through question and answer methods such as daily review questions (formative), course examinations (formative and summative), or a written or oral certification exam at the end of the training period (summative). Through examinations, instructors can objectively measure a change in performance between a pre-test and post-test. Assignments given during didactic sessions may be collected and graded, allowing the instructor to ensure that the student demonstrates the desired learning outcome, although this places a heavier burden on the instructor. The use of this type of evaluation should be limited unless local cultural

norms or links to academic programmes make them a requirement.

Routine activity reports

Participants can be expected to submit routine reports to their supervisors outlining their activities and achievements and, if appropriate, comment on barriers or personal learning priorities. For intermediate and advanced level, monthly or quarterly reports might be expected. For the frontline level, a shorter, weekly report or email might be expected. Supervisors can use the information in the reports to track progress towards deliverables and the knowledge, skills and competencies they demonstrate. Routine reports also provide programme accountability by documenting that participants are fully engaged in appropriate practice activities rather than being given assignments beyond the scope of the training programme.

2.2
Types of evaluators

Self-evaluation

Self-evaluation or self-assessment is the act of evaluating one's abilities, processes and products *(18)*. The purpose of self-assessment, like all assessments, is to generate feedback that promotes learning and improvements in performance, and it can be done at any time during the training period. It allows training participants to participate and direct their own learning by promoting the skills of reflection and self-monitoring, as they track their own progress on their learning journey *(19)*. Self-evaluation can be both formative and summative, with an emphasis on formative so that the participant can improve and adapt to the feedback within the training period. Self-evaluation is a skill that participants can use throughout their careers for continuous self-improvement.

Methods for self-evaluation can be informal or formal ranging from oral discussions with mentors and peers to written formal self-evaluation forms. The evaluation forms presented in Annexes 3 and 4 may first be filled out by the training participant for discussion with supervisors and mentors or filled out separately by participants and mentors for comparison during discussions. Some programmes may wish to develop a digital application for participants to track their own

progress towards achieving knowledge, skills and competencies.

Peer evaluations

Peer evaluation is an essential part of One Health practice to which training participants must become accustomed, and it may be used as a tool to improve cross-sectoral communication and engagement. Proposing ideas to colleagues with different areas of expertise and receiving feedback is key to the collaborative spirit of One Health. Training participants benefit from peer-to-peer evaluations through the development of their abilities to constructively provide and receive feedback. It additionally facilitates learning through the observation of the performance of others. Programmes may conduct peer evaluations formally during and after simulation exercises or other collaborative practice activities. These formal written peer evaluations can be included as part of an overall evaluation of competencies. Informal peer evaluation, however, should be routine and enjoyable and benefit participants not only through shared technical learning but also by allowing participants to practice leadership, communication, and collaboration skills. Peer evaluation and collaborative learning should be encouraged by programmes by, for example, holding practice sessions for oral presentations and encouraging collaboration.

Mentor and supervisor evaluations

Mentors and supervisors are expected to provide both informal and formal evaluations of participants. See the *Guidance for One Health field epidemiology mentorship* for additional guidance on the role of the mentor in One Health field epidemiology training. Training participants may have a number of mentors, including at least one from each of the three main One Health sectors (human health, animal health, and environmental health). Mentors should participate in joint training in order to foster multisectoral collaboration and further facilitate consistent and standardized evaluation of participants from various sectors. Mentors guide participants in the implementation of practice activities and production of outputs and should provide routine formative evaluations as the participant progresses through a set of tasks. In addition, mentors are well placed to provide summative evaluations of specific practice activities and outputs upon completion of a certification requirement. Mentors can apply

and assess the following criteria when evaluating participants:

- works collaboratively
- makes decisions independently when appropriate
- delivers results
- knows and manages their self
- demonstrates systems thinking, integration, and sharing of multisectoral information
- works as a member of a team, engages in conflict management, and has a solution-oriented working style
- practices a sound scientific approach.

In addition, each participant should have an institutional mentor or supervisor who helps ensure their overall learning experience is both broad and meets all minimum requirements for programme completion. Supervisors are expected to formally evaluate participants periodically throughout the training period by preparing interim progress reports and at the end of the training period with a final written evaluation. Scheduled interim evaluations give supervisors and participants an opportunity to discuss strengths and weakness, to track learning progression and identify learning gaps in time for them to be corrected. Supervisors should write and discuss their interim evaluations either in person or virtually with their participants. A maximum evaluation interval of 6 months is recommended for advanced participants, 3 months for intermediate participants, and 1 month for frontline participants. These intervals allow participants to receive at least 2–3 progress reports during their training period. In exchange, participants may be asked to periodically evaluate their supervisor, as well.

Evaluation committees

A committee evaluation of the performance of each participant against the required knowledge, skills and competencies from the *COHFE framework* should be conducted at the end of the training period. This typically involves the delivery with or without an oral defense of a compilation or portfolio of work completed during the training period. In certain circumstances involving sensitive data, outputs may need to be assessed in confidence and require prior agreement with the field supervisors. Committee evaluations tend to be less biased than an individual evaluation by a supervisor or mentor who may have played a central role in the learning process and

project oversight. A focus of the evaluation committee should be on whether the participant demonstrated the principles of the One Health approach in the performance of required practice activities. Through this process, the committee not only evaluates the participants but may also either directly or indirectly evaluate training sites with regard to how well they identified suitable projects for participants.

Whenever possible, evaluation committee members should be external experts (individuals who did not play a supervisory or mentorship role in the learning process of the participant under evaluation) with experience in field epidemiology, One Health and adult learning processes. Committee members might be invited from:

- national agencies for human, animal, and environmental health (at the national or sub-national level)
- field epidemiology training programme stakeholders (e.g., advisory board or steering committee members, programme directors, educators, alumni, or other mentors who have not directly worked with the participant)
- members of academia with subject matter expertise.

The evaluation committee should be composed of members representing all three One Health sectors (human, animal, and environmental health), as a spectrum of views is important when evaluating cross-sectoral work. The evaluation committee may be the same committee that certifies graduates, or it may be a separate group, with or without overlapping membership. If a training programme is associated with a university, the university may mandate the rules and procedures by which an evaluation committee is established and performs. Other programmes may be influenced by institutional regulations impacting the makeup of such committees. Experts who engage in evaluation committees will benefit by staying up to date on current local One Health issues and learning best practices through the observation of different methods of cross-sectoral collaboration. Still, the availability of enough experts with field epidemiology or One Health experience and the time and commitment to serve on such a committee may be a limitation for some programmes. In such cases, a small internal evaluation committee consisting of a supervisor and at least 2–3 other mentors representing all three sectors is enough to ensure at least a small range of views on the performance of a participant.

3. Training certification requirements
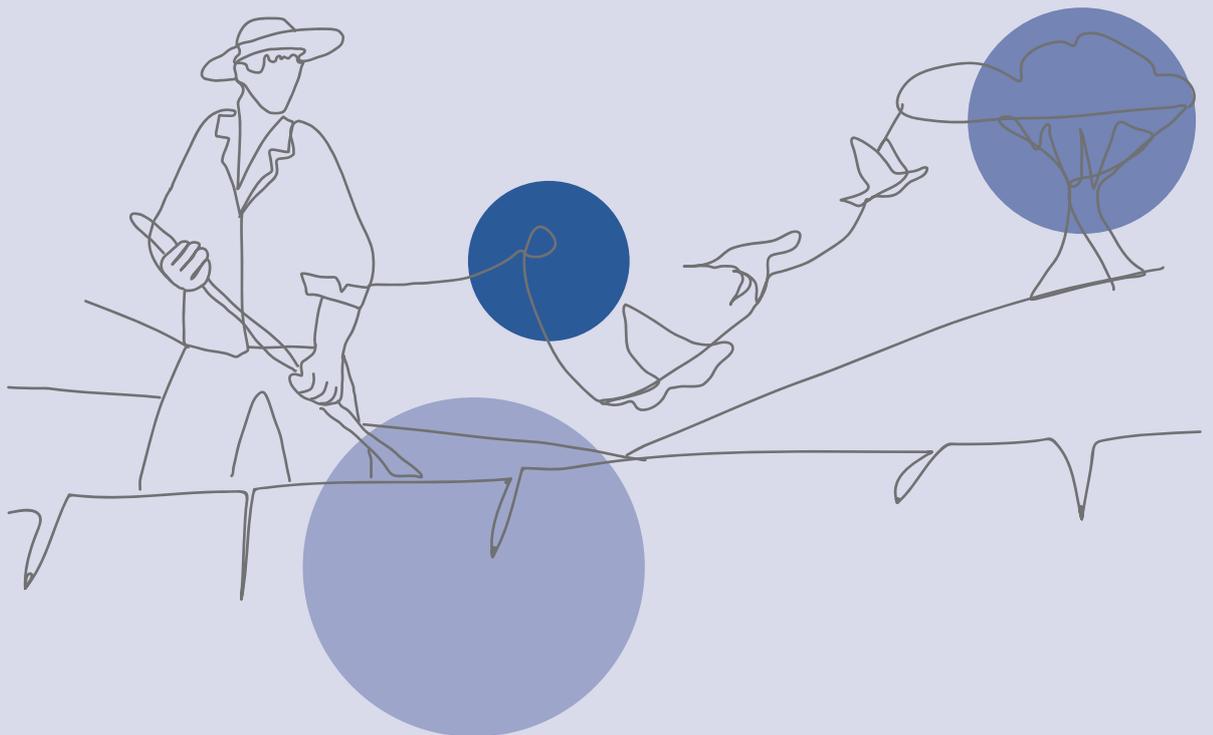
In this context, training certification requirements refers to the collection of requirements required to be successfully completed by training participants prior to programme completion. Successful execution of required practice activities and production of outputs provides participants with a portfolio of work with which to demonstrate their knowledge, skills and competencies. In addition to practice activities and outputs, some programmes require monthly and final reports or mentor and supervisor evaluations, while others prefer to use quantifiable metrics such as attendance, which does not allow participants to demonstrate learning, or examination scores that focus mainly on knowledge acquisition. Many programmes use a combination of these methods to create a list of certification requirements.

Some existing FETPs partner with universities to issue a master's degree to their graduates. In some contexts, this may promote programme sustainability and attract stronger candidates to apply. Partnering with a university, however, may impact the curriculum and programme completion requirements: for example, some universities require additional coursework, examinations, or a written dissertation or thesis. Experience has shown that links with academia shift the programme away from a curriculum focused on learning-by-doing (2). Koo and Thacker (20) compared the characteristics of applied epidemiology and academic epidemiology, suggesting that for applied epidemiologists, competencies in communication and community engagement are as important as analytical competencies. Programme leadership and government ministries hosting training participants have to balance their needs based on their given setting.

Regardless of the specific requirements selected, establishing a clear, minimum set of certification requirements ensures that participants and their mentors know what is expected and can track progress towards programme completion.

3.1
Types of certification requirements

Existing programmes use a variety of metrics as minimum requirements for participants to receive a certificate of programme completion (Annex 2). Here we present a summary of options for establishing certification requirements and describe their usefulness and limitations with regard to evaluating learning.

Practice activities and outputs

Certification should be largely based on the successful completion of the practice activities and outputs described above and listed in Table 2. Most of the training period for the participants (70–75%) should be spent on projects related to their field assignment or an emergency investigation or response. Self-evaluation and evaluations by mentors, supervisors, peers or an evaluation committee may be used to verify the successful completion of practice activities and outputs at a specified level of independence or competency.

Usefulness:

- allows for evaluation of the participant during the majority of the training period (70–75%)
- measurable if based on tasks, practice activities or outputs
- demonstrates integrated use of knowledge, skills, and competencies across domains of learning
- programmes may set minimum standards for practice activities to be conducted across sectors, ensuring multisectoral training experience
- evaluations performed by an external committee can ensure a more standardized and less biased approach.

Limitations:

- self, mentor, supervisor, and peer evaluations may be subjective or biased; difficult to compare among mentor/participant pairs
- evaluation committees may not be feasible for all programmes
- may be viewed as a checklist of minimum requirements, leading some participants to leave the training programme early (for example, to start a new job).

Examinations

Passing examination scores serve as a certification requirement in a number of existing programmes. Exams are frequently used to evaluate knowledge acquisition during and following an individual didactic course, particularly in programmes associated with a university degree. They can be oral but are most often written, with questions ranging in type from multiple choice to open ended essays. The majority of exam questions assess knowledge, but some skills may also be assessed, for example through the performance of statistical tasks. Some programmes compare the results of pre-course and post-course test results, while others require a minimum score on a post-test to fulfill the requirement. Other programmes require that participants pass a written or oral final exam at the end of the training period.

Usefulness:

- effective method for demonstrating knowledge, and some skills
- allows instructors to assess cross-sectoral knowledge among participants from sector specific backgrounds
- an objective metric on which to base evaluation.

Limitation:

- ineffective way to evaluate competencies and performance of practice activities.

Attendance and participation

Attendance is essential for learning and can serve as an objective and easy to measure indicator of commitment and professionalism. Presence alone, however, is not an indicator of learning acquisition. Programmes may require attendance at mandatory training events or courses, or virtual attendance at events or courses that participants may not otherwise have another opportunity to attend. Measuring attendance may be more important for part-time fellows (usually at frontline or intermediate levels) than full-time fellows (intermediate or advanced-level). Advanced and some intermediate level programmes function as employment, with associated maximum allowances for personal or sick leave. Regarding the overall training period, full-time training programmes may wish to specify the number of weeks or months that participants are expected to

stay in the programme before starting another job. To help prevent graduates from missing potential opportunities, the programme should advocate with employers to ensure that they respect the end-date of training so that the participants are able to fully complete the training period before starting a new employment opportunity.

If attendance is used as a certification requirement, programmes may want to create ways to assess participation as well, for example by giving scores for engagement in small group discussions or case studies. Participation is particularly important to measure during online learning sessions, case studies and simulation exercises.

To ensure a multisectoral training experience, One Health field epidemiology training programmes may want to set a minimum standard for time spent working within the human health, animal health and environmental health sectors. This could vary from equal time spent within each of the three sectors to a situation where the majority of time is spent in one sector and a shorter amount of time is spent in the other two. This practice could be compared to rotations through difference services that are required during medical or veterinary training. Learning objectives for the time spent within each sector should be developed by the programme to ensure that both mentors and participants are clear on the expected outcomes for participants working in less familiar sectors based on their backgrounds.

Usefulness:

- attendance is essential for learning, especially when participation is also considered
- easily monitored by instructors (e.g., attendance lists, participation scores)
- allows participants to gain multisectoral experience by requiring time spent working in different sectors
- encourages participants to remain in the training programme throughout the duration of the training period, even after all other certification requirements have been met.

Limitations:

- attendance does not indicate the acquisition of knowledge, skill, or competencies
- participation scores may benefit individuals with more outgoing personality traits.

3.2
Establishing certification requirements

The specific contribution that each of these three types of requirements make towards certification needs to be weighed according to their usefulness and limitations. Recommendations for establishing certification requirements based on practice activities and outputs, examinations, attendance and participation can be found in Table 4. Individual programmes should determine their completion requirements based on their own context. Establishing clear and agreed upon minimum requirements ensures everyone involved knows what is expected and helps reduce misunderstandings and conflict.

Table 4
Recommendations for establishing certification requirements based on practice activities and outputs, examinations, attendance and participation

Certification requirement	Item	Recommended contribution (%)	Example indicators	Comment
Practice Activities and Outputs	Portfolio of practice activities & outputs	70–100%	• Evaluation forms completed and signed by a mentor/supervisor for each required practice activity and output. • A complete set of interim and final mentor/supervisor evaluation reports showing progress and development of competencies. • Final approval of the practice activity and output portfolio and a passing score on an exit interview with the certification committee. • Involvement of a minimum of two sectors across all practice activities. • Evidence of working with all three sectors at least once during the training period.	• Evaluation of practice activities and outputs as a certification requirement is essential because it allows for assessment of job performance, knowledge, skill and competency development, and multisectoral coordination. The minimum contribution of practice activities and outputs towards certification should reflect the time spent in in-service training (70–75%). • Completion and committee defense of a thesis or dissertation would contribute towards this portion of the certification requirements for programmes that require one.
Examinations	Course exams	0–10%	• A minimum of 75% on each post-test following a course. • A minimum improvement of 10% between pre- and post-test scores for a specific course.	• This certification requirement is optional and may be used differently by each programme to meet their needs. Knowledge-based evaluations such as examinations may be more important to programmes providing a university degree upon certification.
	Final exam	0–15%	• A minimum score of 75% on a final certification exam.	

Certification requirement	Item	Recommended contribution (%)	Example indicators	Comment
Attendance and participation	Attendance	0–10%	A minimum of 90% of classes attended, excluding excused absences approved by programme managers	This certification requirement is optional and may be used differently by each programme to meet their needs.
			Working full-time for a minimum of 23 out of 24 months.	
			At least 25% of field time spent working in each sector (public health, animal health or environmental health)	
	Participation	0–5%	Active participation in small-group or online activities according to the instructor evaluation.	

3.3
Certification bodies and procedures

Certification of graduates should be conducted according to the governance of the field epidemiology training programme. Review the *Guidance for One Health field epidemiology continuing education programmes* for additional guidance on programme governance. Any One Health field epidemiology training programme, however, should ensure representation across leadership positions from all relevant government sectors, and involve mentors, alumni, and other important sources of expertise. See the guidance on evaluation committees for further information on establishing a One Health committee. In addition, an individual or group of individuals in programme leadership should be designated to track and confirm that participants have achieved all certification requirements and to coordinate activities associated with programme completion.

During and throughout the training period, participants and their supervisors should track progress toward achievement of programme completion requirements (See Annex 5 for an example certification tracking form). At the end of the training period, a portfolio of work performed by the participant, along with all attendance, examination, and evaluation forms should be gathered and submitted to a designated individual or group of individuals in the programme leadership. These individuals identify any problems or gaps and attempt to resolve them with the participant and their supervisor. Once complete, the portfolio should be submitted to the certification body for approval. All certification procedures should take into account relevant institutional and regulatory requirements.

3.4
Graduate database and alumni association

Each training programme should create and maintain a database of graduates, as an essential tool for monitoring and evaluation of the training programme and for reporting. A database of graduates allows recruiters to identify candidates for positions and employers to verify credentials. The data may be used for programme evaluation or accreditation to verify graduate numbers. Access to the information (publicly available, voluntary, or upon-request) is up to the training programme to determine. A minimum set of variables to include in a graduate database could include: name, date of birth, nationality, contact information, national identification number, date programme started, date of certification, supervisor name and contact information, and other mentors names and contact information. In addition, programmes may wish to create a catalog of outputs created by training programme participants, such as

abstracts, reports or recordings of oral presentations. This catalog would allow existing training participants to better understand the expectations associated with these outputs and could allow employers to see examples of applicants work, if they were given access.

Programmes should encourage active communication with alumni through a community of graduates and mentor-participant relationships. A culture of service towards the training programme and the training community will help maintain and boost a sense of collegiality and a commitment to share their experience with new training participants. The relationships developed during training may last beyond the programme completion and promote usage of the One Health approach and multisectoral coordination throughout the career of graduates. An alumni association may also serve as a rich source of continuing education, as graduates progress in their careers.

Some possible tasks and roles of an alumni association include:

- facilitating and maintaining alumni networking across sectors
- contributing to continuing education and professional development after programme completion
- facilitating career pathways by linking to job announcements and postgraduate training
- showcasing postgraduate field experiences and career development and tracking alumni career pathways
- linking to global training communities such as TEPHINET
- facilitating alumni participation in mentorship of current training participants
- continuous update to programmes on new developments in the field.

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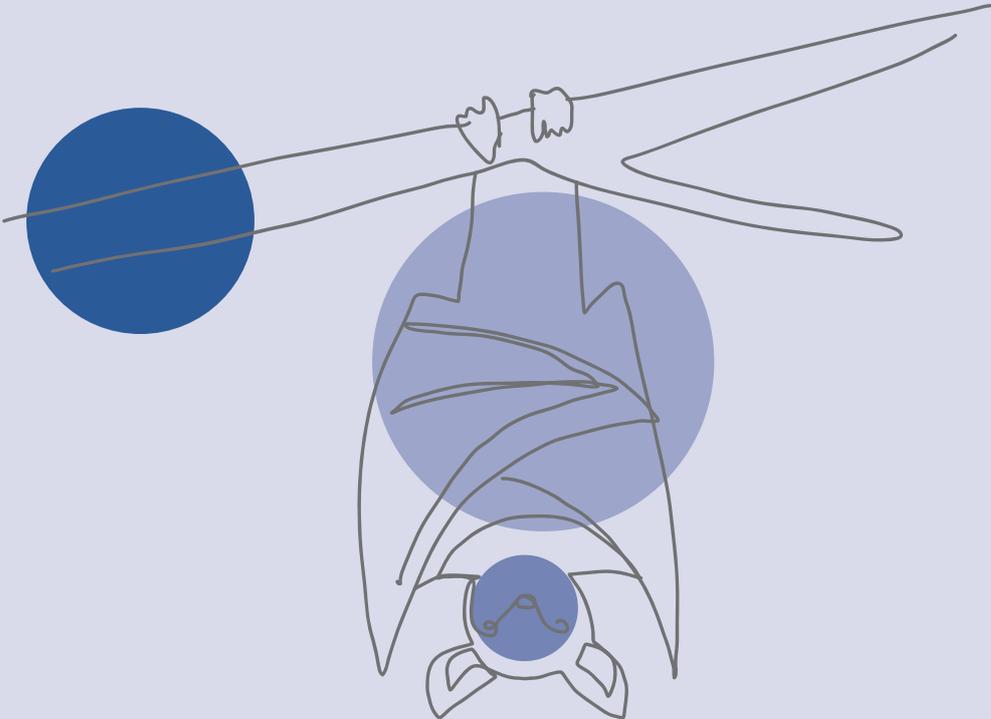
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Annexes

Annex 1

COHFE framework technical advisory group and reviewers

The core technical team from FAO, WHO and WOAH would like to thank the following individuals for contributing their time and expertise for reviewing the *COHFE framework* and the associated guidance documents.

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Annex 2

Existing certification requirements by level
Data from TEPHINET 2021 FETP Survey

Frontline (N=43)	n	%
Write surveillance summary reports	38	88
Write a case and/or outbreak investigation report	35	81
Participate in an outbreak investigation	35	81
Write a data quality audit report (including SWOT analysis)	34	79
Deliver oral and/or poster presentation of field project(s)	32	74
Conduct problem analysis	32	74
Write an outbreak investigation report	28	65
Display charts and maps on office wall	18	42
Lead case and/or outbreak investigation	16	37

Intermediate (N=35)	n	%
Analyze public health surveillance data	34	97
Conduct at least one field investigation about a public health problem that requires an immediate response (outbreak investigation or other acute investigation)	32	91
Write a report of the field / outbreak investigation	31	89
Write a surveillance report	30	86
Conduct an evaluation of a surveillance system	29	83
Write an abstract or executive summary based on one of the field projects	29	83
Prepare and give an oral presentation	29	83
Participate in design, conduct, and analysis of group project	28	80
Serve as a teacher, trainer and/or mentor, e.g., to FETP-Frontline participants	15	43
Submit a report to the national epidemiological bulletin	12	34

Advanced (N=52)	n	%
Investigation of an outbreak or other acute health event	46	88
Evaluation of a surveillance system	44	85
Epidemiological study planned and conducted	44	85
Surveillance (data analysis) report	43	83
Oral presentation at a scientific conference	40	77
Public health analysis conducted	39	75
Article published in a peer reviewed scientific publication	35	67
Scientific protocol prepared	35	67
Poster presentation at a scientific conference	32	62
Dissertation or thesis for the university	26	50
Development or implementation of a surveillance system	23	44
Programme evaluation	22	42

Annex 3

Project evaluation form

Section 1: Project Description (to be completed by training participant as project lead)

Project title:

Name of project lead:

Name of supervisor:

Practice activities and/or outputs:

Surveillance

☐ Surveillance data analysis
☐ Surveillance summary report
☐ Surveillance system evaluation

Outbreak investigation

☐ Outbreak investigation design/implementation
☐ Outbreak investigation report

Epidemiologic study

☐ Scientific protocol
☐ Epidemiologic investigation

Communication

☐ Data visualization
☐ Scientific presentation
☐ Abstract
☐ Bulletin article
☐ Peer-reviewed manuscript
☐ Lay audience communication

Other

☐ Health situation analysis
☐ Service
☐ Training

Project description, objective and methods (<200 words):

Sectors involved: **Describe the role of the sector in the project:**

☐ Public Health

Name, title and contact of mentor:

☐ Animal Health

Name, title and contact of mentor:

☐ Environment

Name, title and contact of mentor:

Section 2: Knowledge, skills and competencies
(to be completed by training participant and reviewed by mentors)

Knowledge, skills and competencies demonstrated:	Justification (to be filled by training participant):	Mentor comments:
List the knowledge, skills and competencies that were demonstrated during project implementation		
More rows to be added as needed		

Section 3: Mentor summary

Section 3: Mentor summary
(to be completed by mentors)

Which practices, activities, and/or outputs were demonstrated and completed by the training participant through their implementation of the project:

Describe the overall performance of the training participant:

Did the training participant demonstrate a collaborative, multisectoral One Health approach? Provide examples.

Did the training participant demonstrate systems thinking? Provide examples.

Describe the training participant's professionalism and ability to work independently.

Describe the training participant's communication skills.

Comments or recommendations:

	Mentor #1	Mentor #2	Mentor #3
Name			
Title/Position			
Signature			
Date			

Annex 4

Competency tracker

The competency tracker can be adapted for use as a paper-based form or spreadsheet. It can be used for self-evaluation by training participants or for mentor/supervisor tracking to ensure core and selected optional competencies have been demonstrated during the training period.

Knowledge, skills and competencies *The final list of required knowledge, skills and competencies will vary by program. It should include the recommended core One Health competencies and optional One Health and sector-specific competencies prioritized by the program*	Introductory course *Dates*	Course A: *Title* *Dates*	Course B: *Title* *Dates* *Add additional course columns as needed*	Project A: *Title*	Project B: *Title*	Project C: *Title* *Add additional project columns as needed*	Initials, date and comments from instructor, supervisor or mentor:
Practice activities/ outputs	*Not applicable*	*Not applicable*	*Not applicable*	• *Outbreak Investigation design/ implementation* • *Outbreak investigation report* • *Data visualization* • *Abstract* • *Lay audience communication*	• *Surveillance data analysis* • *Surveillance summary report* • *Surveillance system evaluation* • *Bulletin article*	• *Scientific protocol* • *Epidemiologic investigation* • *Peer-reviewed manuscript*	
Domain 1: Foundational knowledge							
Define epidemiology and field epidemiology (K)							
Define epidemiological terms including incubation period, infectious period, latency, immunity, vector, fomite, reservoir, etc. (K)							
Explain important mechanisms for transmission of infectious diseases (K)							

Knowledge, skills and competencies	Introductory course	Course A:	Course B:	Project A:	Project B:	Project C:	Initials, date and comments from instructor, supervisor or mentor:
Define zoonosis and anthroponotic diseases and list important (anthropo-) zoonotic diseases with epidemic potential (K)							
Describe the epidemiological characteristics of priority infectious diseases of humans and animals (K)							
Describe the link between environmental factors and some noncommunicable diseases (K)							
Explain the interaction between ecosystems change and human/animal health outcomes (C)							
Domain 2: Surveillance systems							
Describe the role and objectives of surveillance systems in public health, animal health and environmental health (K)							
Identify health threats (signals) from community and media sources (C)							

Knowledge, skills and competencies	Introductory course	Course A:	Course B:	Project A:	Project B:	Project C:	Initials, date and comments from instructor, supervisor or mentor:
Apply case definitions for priority diseases (S)							
Differentiate between types of surveillance (e.g., indicator-based, event-based, etc.) and types of surveillance systems (e.g., sentinel, hospital, lab, risk-based, community-based, etc.) (K)							
Perform signal detection from both indicator-based surveillance and event-based surveillance (C)							
Verify signals using signal-alert-event logic (S)							
Notify authorities of priority diseases that exceed thresholds (S)							
Analyse surveillance data using descriptive epidemiological and simple statistical methods (S)							
Prepare basic situation reports for potential health threats (S)							

Knowledge, skills and competencies	Introductory course	Course A:	Course B:	Project A:	Project B:	Project C:	Initials, date and comments from instructor, supervisor or mentor:
Ensure the timeliness, completeness and quality of reported data (S)							
Domain 3: Field investigations							
Continue according to the programme-specific competency framework							

ᶜKnowledge (K), Skill (S), Competence (C)

Annex 5

Certification tracking form

To be updated quarterly during the training period and signed by both the training participant and supervisor

Name:

Supervisor:

Practice activity/output	Project Title	Sectors involved:			Mentor initials	Date completed
		Public Health	Animal Health	Environment		
Surveillance						
Surveillance data analysis						
Surveillance summary report						
Surveillance system evaluation						
Outbreak Investigation						
Outbreak investigation design/implementation						
Outbreak investigation report						
Epidemiologic Study						
Scientific protocol						
Epidemiologic investigation						
Communication						
Data visualization						
Scientific presentation						
Abstract						
Bulletin article						
Peer-reviewed manuscript						
Lay audience communication						
Other						
Health situation analysis						
Service						
Training						

Comments:

Training participant signature and date

Supervisor signature and date