

TECHNICAL REPORT

Simulation exercises in public health settings

Step-by-step exercise design

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This report was commissioned by the European Centre for Disease Prevention and Control (ECDC) Public Health England through a framework service contract ECD.9140, coordinated by Agoritsa Baka, and produced by Hilary Mouldsdale and Elena Skryabina, Public Health England.

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Abbreviations

COMMS	Communications
CONOP	Concept of operations
EOC	Emergency operations centre
ENDEX	End of exercise
ENP	European neighbourhood policy countries
EXCON	Exercise control/exercise team
FX	Functional exercise
MEL	Master events list
PHE	Public health emergency
PHE UK	Public Health England
SitRep	Situation report
STARTEX	Start of exercise
SME	Subject matter experts
TTX	Tabletop exercise
WHO/Europe	World Health Organization Regional Office for Europe
WHO EMRO	World Health Organization for the Eastern Mediterranean

Glossary

Functional exercise	A functional exercise (FX) explores the coordination within and between various emergency operation centres (EOCs) when challenged by a fictitious scenario. This form of exercise enables the validation of response plans and processes under simulated yet realistic conditions, which tends to generate realistic learning. FXs are also known as command post exercises.
Cold debrief	A cold debrief is a facilitated discussion held a few weeks after an exercise so that stakeholders have a chance to fully consider the feedback they would like to give, as well as agree upon the lessons identified.
Controllers	In an operation-based functional exercise, controllers plan, set up and operate the exercise, managing the exercise play locally. They are effectively the eyes and ears of the exercise control/exercise team (EXCON) at the individual EOCs and play a key role in maintaining the smooth delivery of the exercise material to the participants. They also ensure the safety of all exercise participants, monitor the exercise timeline and provide EXCON with updates, as requested.
Debrief	A debrief is a forum for planners, facilitators, controllers, evaluators and participants to review and provide feedback after the exercise is held. It should be a facilitated discussion that allows each person an opportunity to provide an overview of the functional area they observed and to comment both on strengths and opportunities for improvement. A debrief is different from a hot debrief, in that a hot debrief is intended to capture feedback from participants only.
Design and development	Building on the exercise foundation, the design and development process should: identify capabilities, tasks, and objectives; design the scenario; create documentation; coordinate logistics; plan exercise conduct and select an evaluation methodology.

Emergency operations centre	An emergency operations centre (EOC) is a central command and/or coordination facility that carries out management and/or coordination functions during emergencies. An EOC will typically need to operate for extended hours or even 24 hours a day, 7 days a week, during an emergency. EOCs can be established at all levels within organisations, institutions and sectors at the regional, national and cross-border/international levels. In this case, they routinely operate as a network.
Emergency plans	Emergency plans are documents that describe how an organisation will address an emergency. They typically include components on mitigation or prevention, preparation, response management and recovery.
Evaluation	Evaluation is the cornerstone of the exercise process. The evaluation identifies strengths and opportunities for further improvement in an organisation's preparedness. Evaluation considers all participants' observations, using evaluation criteria, and compiles the observations and evidence gathered during the exercise and in post-exercise debriefs to substantiate them.
Evaluation plan	The evaluation plan describes what and how the exercise will be evaluated and by whom. It should describe the evaluation criteria, as well as the tools and procedures the evaluators will use.
Evaluators	Evaluators must be able to competently and confidently evaluate participants' actions and decisions during a simulation exercise. Evaluators do not interact with exercise participants during the exercise. Their role is to collect objective and evidential information on participants' decisions and actions and to complete an evaluation report.
Exercise director	The exercise director oversees all exercise functions and is assigned overall management responsibility and authority for an exercise. They oversee the setup before and during the exercise and remain in contact with the controllers and evaluators, as well as the debriefing controllers and evaluators following the exercise. The exercise director may also assume additional roles within the exercise structure and process, depending on their skills and the size and/or scope of the exercise. In a small exercise it is possible for the exercise director to also be the sponsor, facilitator and/or an evaluator.
Exercise manager	An exercise manager is responsible for driving the overall process of design, development, conduct and evaluation of the exercise, with input from the planning team. This includes venue logistics, drafting all exercise materials (e.g. scenario and injects) and participant documents (e.g. invitations and briefings), as well as the evaluation strategy, and ensuring there are a sufficient number of exercise facilitators/evaluators. The exercise manager could be supported by an exercise coordinator, who can lead the logistic requirements, including the management of participants (registration, travel, accommodation, etc.).
Exercise control/exercise team	Exercise control/exercise team (EXCON) runs/conducts the exercise and controls exercise timing, use of injects and provision of background information by adhering to the MEL. EXCON can also simulate the outside world by playing the roles of individuals and agencies not actually participating in the exercise. One designated person in EXCON should also be the venue liaison, ensuring that all venue requirements are met when a venue is used for an exercise.
Facilitator	During a discussion-based exercise, the facilitator is responsible for keeping discussions on track and in line with the exercise objectives. This includes making sure all issues and objectives are explored as thoroughly as possible within the time available.

Group facilitators	The role of a group facilitator is to manage group discussions, guide participants through the exercise and keep up with the exercise timing. A facilitator needs to be experienced in public health emergency preparedness and be aware of appropriate plans and procedures to manage group discussions competently and confidently. Good facilitator skills are essential to promote engagement from all participants and maintain a safe learning environment during a tabletop exercise (TTX).
Hot debrief	A hot debrief is a facilitated discussion held immediately after an exercise with participants from each functional area. It captures feedback about issues or concerns that participants identify during the exercise.
Improvement plan	The improvement plan identifies specific corrective measures, assigns them to responsible parties, and establishes target dates for their completion.
Injects	Injects are pieces of information about the next stage or event in the scenario; they should be designed to stimulate activity. Injects are distributed by controllers or simulated by participants and include directives, instructions and decisions. Injects can be written, oral, televised, and/or transmitted by any means (e.g. phone, email, pseudo media).
Lead facilitator	The lead facilitator should be a senior expert with a vested interest in the outcomes of the exercise. Lead facilitators should be authoritative and competent to manage plenary discussions around exercise objectives.
Logistics	The logistics refers to the supplies, materials, facilities and services that enable the exercise to function smoothly.
Master events list	The master events list (MEL) serves as a guide to EXCON and consists of a chronological listing of events that drive the exercise play. A typical MEL states time of inject, method of delivery, recipient, event information, anticipated participant action and any special delivery actions.
Objectives	Objectives should be stated in such a way as to be observable and measurable in order to support the exercise evaluation process. Exercise objectives should be established for every exercise. Well-defined objectives help the exercise planning process, as they provide a framework for scenario development, support the development of objectives at other levels (e.g. individual organisations), and inform exercise evaluation criteria. Objectives should reflect specific capabilities that the organisation regards as priorities, as well as the tasks associated with those capabilities. Planners should limit the number of objectives to enable timely execution and facilitate the design of a realistic scenario.
Observers	Observers are usually authorities, experts, or others invited to witness the conduct of the exercise without playing an active role.
Participants	Participants (sometimes referred to as 'players') for a simulation exercise should be identified in accordance with the aim and objectives of the exercise and selected from senior staff and/or their deputies on the basis of their function and role. The typical audience is inter-sectoral decision makers, policymakers and emergency preparedness experts, representing government and health emergency response partners from different organisations.
Purpose	An exercise's purpose is to consider the impact of a potential health emergency on existing plans, procedures and capacities.

Scenario	The scenario is a description of a series of hypothetical, but plausible, fictional events that tell a story designed to make the participants discuss or take actions to respond. The scenario is designed to achieve the agreed exercise aim and objectives. The scenario can be introduced with background information or narrative describing the events leading up to the exercise's start. The scenario must be realistic and accurate, otherwise it may be challenged by some participants. If the scenario does not provide precise and specific details, participants must be encouraged to use their experience and judgement to fill in any necessary details, rather than challenge the scenario.
Scope	The scope is the size of an exercise, as determined by the extent of the plans being validated and the number of agencies and organisations participating. Scope levels include local, regional, national, EU-wide and international.
Simulation	Simulation is an imitation of the conditions of reality.
Subject matter experts	Subject matter experts (SMEs) should be on hand to offer advice to participants in areas outside the participants' area of understanding. SMEs can include experts from other responding agencies outside the public health sector, if appropriate to support the exercise.
Tabletop exercise	A tabletop exercise (TTX) is a facilitated discussion of a simulated emergency situation, carried out in an informal environment to stimulate deep, collaborative and constructive group discussions with the aim of resolving problems. It is based on existing plans and processes. Typically, a TTX exercise is conducted with participants sitting cabaret-style around a table in groups of 8 to 10.

How to use this companion guide

In 2014, the European Centre for Disease Control and Prevention (ECDC) published a handbook on developing simulation exercises (SIMEXs) in public health settings. The 'Handbook on simulation exercises in EU public health settings' [1] was designed for use by experts in the field of general preparedness who are responsible for simulation exercise planning; it is considered a best practice manual within the European Union (EU) setting.

The purpose of this new companion guide is to complement the handbook by offering practical, operational guidance on how to design, develop, conduct and evaluate tabletop and functional exercises to help an organisation develop and improve its emergency preparedness.

Users of this companion guide should be familiar with the general principles of conducting health simulation exercises, as described in the handbook.

Throughout this companion guide the reader will find **essential** points that should be followed, as well as useful **Tips** for advice and **checklists** on how to conduct a simulation exercise. This publication also provides several examples from two illustrative EU exercises, both conducted in a public health setting; information relating to these examples are presented in green text boxes.

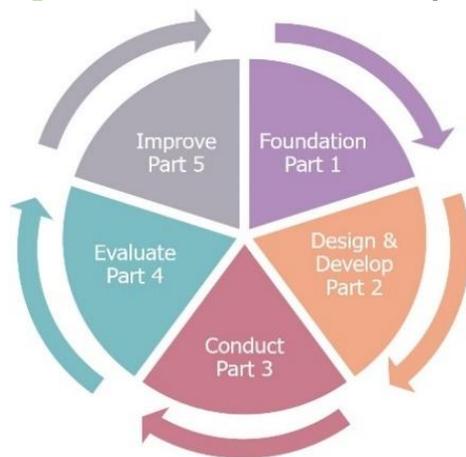
This companion guide also includes a comprehensive set of annexes with specific examples. Several types of example documents are provided (e.g. exercise reports, MELs, etc.). These are provided in PDF format. A number of templates that users might find helpful for their own exercise projects are also included. These templates are in editable text format for general use. All the examples and templates provided can be freely used and adapted.

The companion material is structured in two independent sections:

- **Section 1.** How to design, develop, conduct and evaluate a tabletop exercise (TTX)
- **Section 2.** How to design, develop, conduct and evaluate a functional exercise (FX)

Each section is divided into the five parts of the simulation exercise cycle (Figure 1).

Figure 1. The simulation exercise cycle



Source: ECDC [1]

Part 1. Foundation: The pre-planning steps.

Part 2. Design and develop: The process of planning a simulation exercise.

Part 3. Conduct: Setting-up and conducting an exercise.

Part 4. Evaluate: Planning, conducting and reporting exercise evaluation data to support further improvements.

Part 5. Improvement: Translating lessons identified into improvement measures.

The following EU simulation exercises are used to illustrate the five different elements of the exercise cycle:

The Exercise Vector simulation was a tabletop exercise (TTX) delivered in May 2016. It was conducted in English. The 26 participants came from EU Member States and Enlargement and European Neighbourhood Policy (ENP) countries. The aim was to exercise public health emergency preparedness for a major outbreak of mosquito-borne viral disease with national and international dimensions. The Directorate-General for Health and Food Safety, the WHO Regional Office for Europe (WHO/Europe), the WHO Regional Office for the Eastern Mediterranean (WHO EMRO) and ECDC also participated in the exercise. Although this TTX was designed as a pan-European exercise, it can also be adapted for use within a country to practise outbreak control plans.

Exercise Artemis was a functional exercise (FX) delivered in September 2013 for ECDC's Emergency Operations Centre (EOC). The aim of the exercise was to provide ECDC staff with the opportunity to use and implement the organisation's Public Health Emergency Operational Plan and test supporting documents, tools and templates. Although this FX was designed specifically for ECDC's EOC, it can also be adapted for countries or regions to exercise their national or regional EOC emergency plans.

1. Tabletop exercise (TTX)

Figure 2. The tabletop exercise (TTX) project timeline in relation to the simulation exercise cycle



Overview: tabletop simulation exercise

Definition

A tabletop exercise (TTX) is a facilitated discussion of a simulated emergency situation, carried out in an informal environment to stimulate deep, collaborative and constructive group discussions with the aim of resolving problems. It is based on existing plans and processes. Typically, no operational systems are used or tested. TTX can be stand-alone or an early step along the way to functional and full-scale exercises. A TTX is typically led by a senior expert who acts as lead facilitator.

Purpose

The purpose of a TTX is to consider the impact of a potential health emergency on existing plans, procedures and capacities through facilitated group discussions.

A TTX can be used to:

- Enhance general awareness and facilitate conceptual understanding.
- Validate and refine existing plans and procedures.
- Assess processes and systems needed to guide the prevention of, protection from, mitigation of, response to, and recovery from a defined public health incident.
- Identify strengths, gaps and areas for improvement.
- Better understand each other's roles, responsibilities, and resources.
- Share experiences and build common approaches.

Participants

Participants are comprised of senior staff and/or their deputies and other key staff in specialist roles. Typical participants are intersectoral decision makers, policymakers and subject matter experts (SMEs) representing government and health emergency response partners from different organisations. Involving participants at the government level reinforces the importance of conducting regular emergency preparedness exercises and provides an opportunity to alert the government to pressing topics.

Exercise conduct time frame

Simulation exercises can last a few hours or several days, depending on the complexity and objectives. The typical duration of a TTX is one working day, including time for breaks and refreshments; 75% of the allotted time is spent on the exercise and the remaining 25% is spent on briefing/debriefing.

Location/venue

A TTX can be held in any conference-style venue large enough for participants to sit cabaret-style in groups of eight (ideally) with a table, break-out rooms and designated areas for exercise control, registration, and lunch/refreshments. The venue needs reliable Wi-Fi and IT systems.

Process overview

- Appoint a project manager and a coordinator (during foundation stage).
- Set up planning team (during foundation stage) and agree on the number of planning meetings needed.
- Review progress of exercise design and development at each planning meeting.

An exercise project manager/coordinator is responsible for driving the overall process of design, development, conduct and evaluation of the TTX. They will receive input from the planning team. This includes venue logistics; drafting all exercise materials (e.g. scenario and injects), participant documents (e.g. invitations and briefings) and the evaluation strategy; and ensuring that a sufficient number of exercise facilitators/evaluators assist at the TTX.

TTX project time frame

Planning a TTX typically lasts three to five months. One day is needed for TTX delivery, plus four to six weeks for evaluation and report writing, as most exercises are bespoke. This can be shortened if an off-the-shelf (reusable format) TTX is available.

Key success factors

- Clearly defined aim for the TTX and achievable, relevant objectives.
- Effective exercise evaluation strategy and conduct.
- Early engagement of participants, especially senior staff, to ensure the date is scheduled in their diary; government ministers and officials may require many months advance notice.
- Participants need to be familiar with plans, procedures and software to be used in the exercise.
- Key response agencies encouraged to take part.
- Right mix of participants, with key roles present.
- Multi-agency representation in each discussion group.
- Group size of 8 to 10 to facilitate productive discussions.
- Quality of facilitation (both lead facilitator and group facilitators).
- Allocated time for briefing and debriefing.
- Suitable venue with good logistics and IT support.
- Commitment to make improvements identified by the TTX.

1.1 Foundation

TTXs are part of a broader preparedness cycle. Other key elements of this cycle are planning, resources, equipment, training activities, and multi-year plans that take these issues into consideration. As the purpose of this companion guide is to provide practical, operational guidance on the development, delivery and evaluation of individual health SIMEXs, it has been assumed that the more strategic foundation stage has been completed. Additional details on the foundation stage are provided in the ECDC handbook on simulation exercises [1].

Checklist: TTX foundation stage

The following should be undertaken during the foundation stage of a TTX:

- Adopt/agree upon a concise overall strategy for simulation exercises as part of the preparedness cycle.
- Clearly identify the need for conducting a TTX.
- Agree upon a clear purpose and aim.
- Ensure high-level support and participation, with early engagement.
- Allocate sufficient time, resources, and budget to design, develop, conduct and evaluate the TTX.
- Secure a high-level commitment to make the improvements identified by the TTX and to share the learning outcomes, as appropriate.
- Clearly define the target audience.
- Designate a project manager and a coordinator for the whole process (from initiation to closing).
- Establish a planning team.

Exercise Vector: key characteristics

- **Aim:** To exercise the public health emergency preparedness of the participating countries for a major outbreak of a mosquito-borne viral disease, of both national and international dimensions.
- **Level of support:** High-level support from ECDC and the European Commission's Directorate-General for Health and Food Safety.
- **Time and resources:** Planning period of five months, with dedicated planning team and exercise team, and six weeks to collate and write a report.
- **Commitment to improve:** Outlined in final TTX report.
- **Target audience:** Senior experts from Member States, the European Commission's Directorate-General for Health and Food Safety, WHO/Europe, WHO EMRO, and ECDC.
- **Lead organisers:** ECDC and Public Health England.

1.2 Design and develop

1.2.1 Planning

Exercise planning meetings serve as the principle mechanism for executing the major steps of exercise design. Core components include: establishing the scope, setting objectives, creating a scenario, and developing exercise materials such as exercise injects, scenario overviews, relevant technical publications, pseudo media, etc. A project manager/logistics coordinator is responsible for driving the whole planning process, from design and development to conduct and evaluation. During all stages, the members of the planning team contribute to the process.

The planning team typically includes a TTX project manager and a coordinator, as well as planners from the involved key organisations. The planning team should be as small as possible; if needed, the team will seek advice and guidance from external technical experts.

Planning for a TTX typically takes three to five months, plus an additional four to six weeks for evaluating, report writing, and developing an action plan based on lessons identified. Planning can be drastically reduced to a few weeks if a less complex exercise format is selected.

Essential. Planning time should not be underestimated. The examples and templates provided in the annexes will help speed-up the process, but the participants and key stakeholders should be informed about the proposed schedule well in advance.

Monthly planning meetings should have a precise agenda to ensure that all required outcomes are met at each stage. At the first planning meeting, the scoping document (which includes purpose, background, aim, objectives, scope, scenario outline, date, location, and key references) must be agreed upon to ensure that the exercise planning is coherent and consistent with expectations. Suggested checklists for each planning meeting are provided below.

Tip. Have a concise agenda so you know what outcomes you want from every meeting.

Tip. Provide the meeting decisions and actions record within three to five working days after the meeting so the planning team can review them.

Checklist: kick-off meeting

The following should be planned:

- Aim and scope
- Date and location
- Scenario outline
- Target audience
- Planning lead and planning team
- Scoping document.

See **Annex 1.2** for the planning meeting template used in Exercise Vector.

Checklist: first planning meeting

The following should be planned:

- Scoping document, including objectives
- Terms of reference for planning team
- Schedule of planning meetings
- Lead evaluator and evaluation strategy
- TTX date and invitation to participants
- Target audience to invite (senior staff and/or their deputies and other key staff in specialist roles).
- TTX day format (outline of the exercise day and number of sessions)
- Scenario outline.

Documents to review:

- Scoping document
- Save-the-date notification
- Invitation with brief details of the day
- Basic information, including date, time, venue details and travel advice
- Scoping document.

See **Annex 1.1** for the first invitation to Exercise Vector and **Annex 1.3** for the scoping document used.

Essential. A scoping document (or project protocol) needs to be agreed upon and finalised as early as possible. It can be refined as the exercise planning progresses; however, once the scope, aim and objectives have been agreed upon, no further changes should be made to these elements without the explicit agreement of the exercise sponsor. The scoping document includes the background and aim of the TTX, plans to be tested, proposed participants, date and location, and members of the planning team.

Tip. A 'save the date' notification should be sent out as early as possible (at least two months ahead of time); it should contain only basic information, such as the exercise's aim, dates, location, invited organisations, outline agenda, and – importantly – an indication of when further details will be provided.

Checklist: second planning meeting

The following should be planned:

- Programme of the exercise day
- Schedule for developing scenario and background materials (pseudo-media, maps, fact sheets, patient data)
- Evaluation criteria and evaluation team
- Scheduling for development of MEL and injects
- List of nominated participants, including contact details
- Participant management workflow.

Documents to review:

- Outline of scenario
- Outline of MEL
- Suggestions for injects
- List of participants (confirmed, possible, declined).

Checklist: third planning meeting

The following should be planned:

- Near-final MEL and injects
- Briefing documents (for evaluators, facilitators, and participants]
- Evaluation documents
- Final list of participants
- Roles of planners during TTX
- Presentations and presenters.

Documents to review:

- Programme of the day
- Evaluation template.

See **Annex 1.8** for the programme of the day from Exercise Vector and **Annex 1.10** for the evaluation documents.

Checklist: final planning meeting

The following should be planned:

- Final confirmation of participants
- Final confirmation of planners' roles
- Group structures (ideally seated cabaret-style in groups of 8 to 10 participants)
- Cold debrief date and time.

Checklist: final documents

- Scoping document
- Exercise materials (scenario, injects, MEL)
- Participant briefing
- Facilitator briefing
- Participant questionnaires
- Observation checklist
- Evaluation report template
- Reference materials (e.g. plans, maps, fake news articles)
- Exercise brief (opening presentation)
- Exercise closing presentation
- Expert presentation
- Cold debrief template.

Essential. Add the organisations' logos, the name of the TTX, and 'Exercise – Exercise – Exercise' at the top of all exercise materials to prevent confusion with actual incidents.

1.2.2 Aim, objectives, scope

Aim

The aim of a TTX should be agreed upon first. The exercise aim is a statement of intent that gives direction to what will be, or is desired to be, achieved by the exercise. Given that the overarching goal of all exercises is improved preparedness, identifying the aim for any one exercise is a process centred on one question: Why does this agency/organisation/country, etc. need to conduct a simulation exercise?

The aim statement can be as generic or as specific as required to meet this need. The essential components of an exercise aim are purpose and context. The aim should begin with a verb and be clear, concise and achievable. A clear aim leads to a series of objectives that will suggest the most appropriate style, size and level of complexity of the exercise.

Essential. Have only one aim for an exercise.

Essential. Use verbs such as the following to express the TTX's aim: assess, develop, explore, practise, review, validate.

Essential. Do not use a TTX as a means to write an emergency plan. Draft the plan first, perhaps during a workshop, and then exercise this plan in a TTX. The plan should be circulated well before the exercise, either as a final version so that the TTX provides assurance that the plan works, or as a working draft to assist in its further development.

Tip. An example of a poor aim is: 'Conduct a public health emergency preparedness exercise'. This describes neither purpose nor context. Conducting an exercise should not be an aim in itself. The aim points directly towards outcomes you want to achieve through a simulation exercise in order to improve preparedness.

Exercise Vector: aim

To practise participating countries' public health emergency preparedness plans in response to a major outbreak of a mosquito-borne viral disease with both national and international dimensions.

- **Purpose:** To practise the public health emergency preparedness plans of the participating countries.
- **Context:** A major outbreak of mosquito-borne viral disease with national and international dimensions.

Objectives

Once the aim of the exercise has been established, the objectives– which are the strategies implemented to achieve the exercise aim – are formulated. Setting appropriate objectives is essential to running a successful and effective exercise. As such, objectives should be determined very early in the exercise planning process, ideally at the kick-off meeting, as most other aspects of the exercise depend on the chosen objectives.

Objectives should be challenging but achievable. Continuous incremental improvement should be the ultimate goal of conducting simulation exercises in public health settings. Pass/fail objectives are not conducive to achieving this goal; instead, having a reasonable number of SMART exercise objectives may facilitate scenario design, conduct, and evaluation.

SMART stands for:

- **Specific** – simple, clearly phrased
- **Measurable** – observable, based on agreed performance criteria/standards
- **Achievable** – can be achieved within the exercise, taking into account available resources and constraints
- **Relevant** – links to organisational goals or strategic intent
- **Task oriented** – focuses on a specific emergency function.

Tip. You may align exercise objectives to core response capabilities that your organisation wishes to focus on in a TTX. Core response capabilities are the activities that should be accomplished in incident response and are set up as a reference framework by your organisation. *Public health emergency preparedness – Core competencies for EU Member States* can also be referred to as a framework [2].

Tip. Representatives from all organisations or parts of the organisation involved in the exercise should agree on objectives to ensure they are relevant to the needs of all participants. In multi-organisational, multi-sectoral TTXs, experience shows that organisations achieve greater learning when they are able to incorporate their own specific exercise objectives. These must, however, be agreed upon by the planning group as being within the scope of the exercise.

Tip. The objectives need to be complementary. It is not necessary for all participants to set the same objectives; two different organisations can take part in the same exercise but choose to examine different aspects of their response plans, as long as they are complementary.

Tip. Poor communication between emergency response organisations, professionals and the public is the most common recurring problem identified from real events and simulation exercises. Including a TTX objective regarding communication is recommended, as well as inviting communications officers to the exercise.

Tip. Four to six objectives are normally sufficient for a one-day TTX.

Exercise Vector: objectives

1. Practise in-country emergency recognition and management of a disease outbreak.
2. Assess intersectoral collaboration between the health sector and key related sectors with respect to risk and emergency management.
3. Practise international collaboration to address, mitigate and resolve an international emergency.
4. Practise risk communication between stakeholders, professionals and the public.

Scope

The exercise objectives help to define the scope of the exercise; they also clarify what is out of scope (i.e. what should not be part of the exercise.)

Key elements in defining the exercise scope of a TTX include:

- type of emergency,
- level to be exercised (e.g. international, national, regional, local),
- participation level (i.e. who needs to attend the exercise to make it work),
- functions that the participants will practise,
- exercise duration, and
- exercise location.

See **Annex 1.3** for the scoping document used for Exercise Vector.

Once the aim, objectives and scope of the exercise have been established, the exercise scenario and injects can be designed.

Essential. Make the scope broad enough to achieve the exercise objectives.

Tip. Include a paragraph on what is out of scope.

1.2.3 Scenario, injects, MEL and background materials

Scenario

The scenario should be realistic, designed around the objectives, and contain enough background detail to support a clear narrative during the TTX. The scenario should be challenging but not so complicated that it overwhelms participants.

The scenario describes one event (e.g. disease outbreak) or multiple events (e.g. disease outbreak, flooding, chemical spill), depending on the objectives of the exercise. It may be inspired by real-life events and incidents, or a fictitious or previously unknown disease can be used. As part of quality insurance, an SME should check the scenario with regard to scientific/technical correctness and peer-review the scenario to ensure the aim and objectives are met.

A TTX scenario should, if possible, be divided into discrete episodes that require response actions. These discrete episodes can form the basis of an inject.

Information introducing the TTX scenario can be distributed to participants in advance of the exercise (soft start/read-in material). For example, read-in material for a simulation exercise on pandemic influenza may include a global overview of the current outbreaks and issues around avian influenza.

Essential. The scenario must be realistic and accurate or it will be challenged by the participants. If the scenario does not replicate real-world situations in precise and specific detail, participants must be encouraged to use their experience and judgement to compensate for deficiencies in the scenario. In these situations, they should be encouraged not to fight the scenario.

Tip. Make use of internal knowledge and consult experts (who should not participate in the TTX) for information on key areas. This may generate interesting material for injects.

Tip. Exercise realism will be enhanced by including pseudo media as part of a TTX. This can include news presentations, newspaper articles, a dedicated newsfeed website, and social media feeds.

Injects

Injects are an essential feature of an exercise. They are used to provide information to participants to develop and move the scenario forward. Additional information from injects – including challenges, problem statements, questions and additional messages related to the changing situation – facilitate the progression of the exercise by stimulating interaction and information exchange.

Essential. To ensure that all exercise objectives are achieved, the planning team must develop and then cross check each inject against the objectives. This will help to ensure that all objectives are addressed and will make it easier to evaluate the participants' learning using the injects.

See **Annex 1.5** for the scenario and injects from Exercise Vector, as well as a sample in **Figure 3**.

As for the initial scenario, it is essential that injects are written realistically, look realistic, and contain information that challenges the participants. The following questions should be considered when writing injects:

- Who is the inject for? EXCON will require this information, which should also be added to the MEL.
- What information does the inject provide and how does this information relate to the development of the scenario in accordance with the overall exercise aim and objectives?
- What actions are expected from the participant? The inject might include hints and tips (e.g. 'have you considered...?', etc.) to assist the participants; this approach is helpful if the aim is 'to develop'.

Figure 3. Sample inject from the Exercise Vector simulation



EXERCISE – EXERCISE – EXERCISE

Simulation: Exercise Vector

Inject	
Scenario Date:	19 May
Inject Number:	1
Inject title:	Outbreak in neighbouring country
Inject sent to:	All participating Member States
<p>A suspected outbreak of dengue fever has been reported in a neighbouring country in an area with known presence of a competent vector. The outbreak was first reported in the local media and was then quickly followed up by a statement from the Health Ministry containing the following information:</p> <p style="padding-left: 20px;">‘Today we can confirm we are following up an alert of a suspected outbreak of dengue in a small town 100 km from the border. There are a total of 5 probable cases and a further 100 suspected cases. Patients are showing symptoms of acute febrile illness, such as headache, fever, abdominal pain, body aches, diarrhoea and vomiting, some with a rash. The five probable cases have been identified based on symptoms and serology only and further confirmation is awaited’.</p> <p>Required action:</p> <ul style="list-style-type: none"> Consider the questions below and then discuss key issues with other countries at the table. After 45 minutes there will be a feedback session, during which each table will report three key points to the group. Please make sure you complete the green inject response sheet with the table key issues. Please note these will be collected after the session. <p>Please consider: What are the key issues/actions for your country at this stage? The points below should be considered as a guide, but there might be further issues you want to consider:</p> <ul style="list-style-type: none"> Do you need more information? If so, from whom and how will you obtain it? What other key related sectors would collaborate? Risk assessment? Is there an alerting mechanism? Should you send an Early Warning and Response System (EWRS) report? 	

Injects can contain information sheets, news reports, phone calls, radio recordings, newspaper articles or social media posts. Injects can also promote activity by requesting information, encouraging sharing of information, or suggesting an activity (e.g. a teleconference). Each inject may be followed by a series of questions or prompts to stimulate discussion that targets weaknesses or gaps in response arrangements, capabilities or processes. However, a balance needs to be struck, as more directions in the injects lead to fewer opportunities for free play, which could restrict the realism and value of the simulation exercise.

Injects should keep participants busy without overwhelming them. They should be handed out at regular intervals and clearly state the sender, intended recipient and, if required, a deadline for response. They should be paced to allow plenty of time for discussion.

Tip. Achieving the right number of injects is key. Remember, the more injects the participants need to read and respond to, the less time they will have to discuss and interact with each other. A few well-crafted, longer injects are preferable over many shorter injects of only a few lines.

Additional 'hot injects' may be created during the exercise and inserted if required to maintain momentum, steer the exercise back on course, or jump-start actions that are delayed. Pseudo media injects are particularly helpful in this context. Injects may be withdrawn if required by exercise play or if they become irrelevant. Changes or amendments should be noted on the MEL.

The final inject should confirm the end of the exercise (ENDEX) and allow additional time for participants to prepare key issues identified during the TTX, in preparation for the hot debrief.

Tip. It is helpful if injects targeting specific groups or issues can be written or reviewed by people with specialist knowledge because this will ensure accuracy and realism.

Tip. Inject response sheets for participants to record their actions/decisions can be provided electronically or printed on a particular colour of paper for easy identification.

Tip. Once injects have been written, a simple objectives/injects cross-check (Table 1) should be undertaken to ensure that all objectives are addressed. It may be necessary to revise or create additional injects to cover all objectives.

Table. Exercise Vector: injects and objectives

Inject	Exercise Vector: objectives			
	1. Practise in-country emergency recognition	2. Assess intersectoral collaboration	3. Practise international collaboration	4. Practise risk communication
1	✓	✓		
2		✓	✓	✓
3	✓	✓		
4				✓
5	✓	✓	✓	✓
6			✓	
Total	3	4	3	4

Check marks indicate that the inject addresses the objective in question, allowing one to easily tally how many injects address each objective (as indicated in the Total column).

Constructing an exercise – designing injects to address specific objectives

The scenario for Exercise Vector covers a 19-day period during early summer and is delivered to participants sequentially through the injects. The scenario and the injects can be found in **Annex 1.5**, which may be useful to consult alongside this overview. Objectives can be found in Section 1.2.2.

Inject 1 describes a suspected outbreak of dengue in a neighbouring country. This inject is designed to meet objective 1 (as it prompts participants to detect and risk assess the situation, activate emergency organisation and plans, and manage and monitor the emergency) as well as objective 2 (to consider the intersectoral collaboration required between public health agencies and other relevant sectors). To support discussion and decision-making, the WHO dengue fact sheet, WHO vector control strategies, ECDC fact sheet for health professionals, ECDC case definition (for the purposes of this TTX), and mosquito maps with actual data showing where *Aedes albopictus* and *Aedes aegypti* are established, introduced or absent are appended to inject 1. Inject 1.2 includes questions for international agencies and can be omitted for a national TTX.

Inject 2 confirms the outbreak of dengue in a neighbouring country, with unconfirmed reports of cases in the participant's country. It is designed to address objective 2, objective 3 (international collaboration, as it will require participants to interact effectively and work collaboratively with contiguous and other countries in the wider region – as well as international authorities – to assess, manage, communicate, address, mitigate and resolve the international emergency), and objective 4 (risk communication, especially with the public).

Inject 3 confirms dengue in the participant's country, with hundreds of suspected cases. This inject addresses aspects of objective 1 (particularly with regard to national plans), objective 2, and objective 4. Inject 3.1 (a variant of Inject 3) includes questions for international agencies and can be omitted for a national TTX.

Injects 4 to 4.4 contain supporting news reports and social media posts, and also address objective 4. These injects encourage participants to consider media strategies, develop lines to take, support communications officers, and draft a press release.

Inject 5 requests a situation report to review the situation, describe measures taken, summarise communication activities, describe advice given and characterise coordination efforts. This addresses objectives 1 to 4. Collecting this type of written feedback during the exercise may also support the writing of the final report.

Inject 6 shows the international dimension of dengue in several countries, including vaccine supply problems and insecticide shortages. This primarily addresses objective 3. Inject 6 could also be useful in a smaller, national exercise to stimulate discussion on wider collaboration.

Master events list (MEL)

The MEL is a chronological list of events that drive exercise play. It is populated as the injects are developed, with each inject occupying an individual line on the MEL. Periodic review and revision of the MEL is necessary to ensure that the exercise will flow smoothly, that injects are in chronological order and that there are not too many injects.

The MEL states the time of delivery, method of delivery, recipient, event information, anticipated participant action, as well as any special delivery actions for each inject. The MEL is therefore a guide for EXCON, indicating when and to whom each inject should be delivered. It also indicates expected participant actions. If these actions are not taken or are not taken quickly enough, hot injects can be written and released into the exercise to realign it or drive it forward to regain momentum.

The MEL is a vital tool for EXCON because it ensures that the exercise stays on track and progresses in the expected direction and at the required pace. 'Time jumps' are when the scenario moves forward by days or weeks and must be clearly indicated in the MEL; participants have to be informed accordingly, either during the introductory briefing or at the time of inject delivery.

Tip. A refreshment break is an ideal time for a time jump. This is often needed in scenarios about infectious disease outbreaks that take time to spread. Always remind participants about the time jump when they return from their break.

Tip. Anticipated participant actions (critical tasks) can be used to develop an evaluation checklist.

See **Annex 1.4** for the MEL used in Exercise Vector. An extract is shown in **Figure 4**.

Figure 4. Master event list (MEL) extract from Exercise Vector

SIMULATION EXERCISE				
Inject No	Time CEST	Insert to	Inject Content / Event	Prompts for controllers and evaluators ; procedures & templates used
19 May 2016				
	08:30		Registration	Facilitators to register promptly
	09:00		Opening Presentation	
0	09:30	All	Background	
1	09:35	All	Outbreak in a neighbour country	Feedback per table, green response sheet to be given to facilitators for them to ensure completion after each inject
1.1	09:35	All	Supporting information	
1.2	09:35	WHO, EC and ECDC	Questions for WHO, ECDC and EC	Agency to consider same questions for every inject
1.3	09:35	1 per country	WHO Fact sheet	
1.4	09:35	1 per country	ECDC Fact sheet	
1.5	09:35	1 per country	Vector control	
1.6	09:35	1 per country	Mosquito map 1	
1.7	09:35	1 per country	Mosquito map 2	
	10:45		COFFEE BREAK	
2	11:05	All	Confirmed outbreak in a neighbour country	Feedback per table
	12:30		LUNCH	
3	13:30	All	Dengue in your country	Feedback per table
3.1	13:30	WHO, EC and ECDC	Questions for WHO, ECDC and EC	Agency to consider same questions for every inject
	15:00		COFFEE BREAK	
4	15:30	All	Communication	Press release. Feedback per table
4.1/4.2/4.3/4.4	15:30	All	2 x Media articles (national) , twister, answer sheet	1 answer sheet per table. Feedback per table
	17:00		End	
20 May 2016				
	09:00		Welcome back	
5/5.1	09:15	All	Country situation report & answer sheet	Feedback per country

SIMULATION EXERCISE - 1

Background materials

A week before the start of the TTX, send the necessary background materials to all participants, along with joining instructions. Background materials must include the plans to be exercised and can also include soft-start reading material to introduce the scenario.

Background information in addition to the injects also needs to be prepared and ready for distribution during the TTX. This can include maps, disease fact sheets, fact sheets for health professionals, pre-prepared risk assessments, and mitigation strategies (e.g. vector control).

Essential. Participants must come to the TTX prepared; this includes a good knowledge of the emergency plans to be tested.

Tip. Send the plans to be tested to all participants well ahead of the exercise; ask participants to familiarise themselves with the plans before the simulation exercise begins.

1.2.4 Evaluation strategy

Evaluation is one of the cornerstones of the exercise process. Developing an exercise evaluation plan is an extremely important part of designing a simulation exercise. Evaluation strategy and evaluation documents for a TTX are prepared in the planning stages.

Please see Section 1.4 (Evaluate) for details.

1.2.5 Venue and logistics

The purpose and scope of a TTX will dictate the venue selected for the exercise. The venue should be booked as early as possible, once the date and location have been decided.

Essential. Visit the venue before confirming the booking to ensure it meets your requirements.

The venue can be any conference-style room large enough for participants to sit cabaret-style around a table in groups of 8 to 10 participants (ideally), with meeting rooms for breakout sessions and separate discussions, as well as areas for exercise control, registration, and lunch/refreshments. It is important that the venue has reliable Wi-Fi and IT systems with enough bandwidth for all participants.

Checklist: venue assessment

To assess whether a venue is suitable, the following elements should be considered:

- Rooms and facilities
- Audiovisual equipment
- Seating and room arrangements
- Internet access
- Food and refreshments.

Please see Section 1.3 for instructions on venue set-up.

1.2.6 Exercise attendees

Participants

Participants of a TTX exercise typically include the following groups and individuals:

- Participants from Member States
- Lead facilitator
- Group facilitators
- Evaluators
- Subject matter experts (SMEs)
- Observers
- Exercise control/exercise team (EXCON).

TTX participants should be identified in accordance with the aim and objectives of the simulation exercise. They are often selected from senior staff and/or their deputies on the basis of their function and role, although this depends on the aim and objectives of the exercise. Typical participants are decision makers from involved sectors (preferably at the same/similar administrative level), policymakers and emergency preparedness experts representing government and health emergency response partners from different organisations. Involving participants at the government level reinforces the importance of conducting regular emergency preparedness exercises and provides an opportunity to alert the government to pressing topics.

The size of the venue and budget will dictate how many participants can be invited.

For Exercise Vector, three participants (senior experts in health, preparedness and response, and vector-borne diseases) were invited from each of the 27 participating countries. Additional participants came from the European Commission's Directorate-General for Health and Food Safety, WHO/ Europe, WHO EMRO and ECDC.

Essential. Identify and invite participants early, ensuring that key participants can save the date as soon as possible.

Essential. Participants must come to the TTX prepared and familiar with the emergency plans and processes to be tested.

Facilitators

Lead facilitators should be senior experts who are authoritative and competent to manage plenary discussions around the exercise objectives.

Group facilitators have a different role. The role of a group facilitator is to manage small group discussions around the TTX objectives, guide participants through the exercise, and keep the exercise on time. A group facilitator needs to be experienced in public health emergency preparedness and have a solid knowledge of the relevant plans and procedures to competently manage group discussions. It is good practice to have group facilitators to manage small group discussions, but not essential to the success of an exercise.

Tip. To enhance TTX fidelity, an experienced communications officer could be requested to facilitate discussions on risk communication with the public (they should also participate in the exercise).

Essential. Effective group facilitation is critical. The expertise of a facilitator directly affects how and what participants learn during a TTX.

Evaluators

Evaluators should be experienced in the field of health emergency preparedness and confident to evaluate participants' actions and decisions during a TTX. Evaluators should have minimal interaction with participants during the exercise. Their role is to collect objective and evidential information on participants' decisions and actions and to complete an evaluation report.

Subject matter experts (SMEs)

SMEs should be on hand to offer advice on topics outside of participants' area of understanding. SMEs often include experts from other responding agencies outside the public health sector.

Observers

Observers are usually authorities, experts, or others who request to attend the exercise without necessarily having an active role.

Tip. Keep observers to a minimum. Try to give them an active role in the exercise as a participant, facilitator, evaluator or SME, instead.

Exercise control/exercise team (EXCON)

EXCON controls exercise time and issues injects and background information according to the MEL. One designated person in EXCON should also be the liaison with the venue for all venue requirements.

Exercise Vector required four staff members to run EXCON: a TTX project manager (PHE), who followed the MEL and reviewed the TTX progress; a TTX coordinator (PHE), who liaised with the venue and issued injects; an administrator (ECDC), who ran registration and assisted the coordinator; a manager (ECDC), who reviewed the TTX progress and liaised with the TTX project manager to ensure smooth conduct of the TTX.

1.3 Conduct

1.3.1 Venue set-up

The venue is set up by EXCON. Before arriving to set up the venue (preferably on the day before the exercise), EXCON should establish a relationship with the venue staff and discuss any special requests with them (e.g. concerning access, diet, religious needs, hearing loops, etc.). Note that the audiovisual system for presentations may require outsourced equipment and personnel that needs to be booked in advance.

Checklist: venue set-up

EXCON should include the following elements and activities as part of venue set-up:

- Registration area
- EXCON area
- Exercise room with cabaret-style tables for use by groups of ideally 8 to 10 people
- Additional rooms for breakout groups (e.g. for communications officers)
- Appropriate signage for the registration area, plenary room, refreshment/lunch area, washrooms, separate meeting rooms, etc.
- Risk assessment with venue staff (e.g. make sure cables/leads are taped down, review emergency evacuation arrangements, check access points for people with special requirements)
- Audiovisual equipment set up and tested
- Wi-Fi and IT facilities tested
- Presentations and video clips tested
- Table arrangements finalised.

Registration

Registration allows for a smooth start to the TTX and is important to ensure that all participants are accounted for. It is advisable to request national identification documents (photo ID) at registration to ensure security.

Checklist: registration

The following documents need to be ready for delegate registration:

- Complete list of attendees, to be signed at registration.
- A blank list to register additional/unregistered delegates on the day of the exercise.
- Group lists to help participants locate their discussion groups.

All attendees should wear a badge, which is issued at registration. Badges should include name, organisation and assigned group. Different lanyards can be used to identify groups:

- Participant
- Evaluator
- Facilitator
- Subject matter expert (SME)
- Communications officer
- Observer
- EXCON.

Additional roles may be identified at the tables by tent cards (e.g. chairperson, note taker).

Tip. Provide refreshments on arrival as an opportunity for participants to network.

Tip. Print badges on both sides so details are always visible.

Tip. All participants are required to wear some form of identification for security purposes and to aid networking.

Documentation

So-called 'EXCON packs' containing all exercise materials/documentation are kept in the EXCON area for reference. These packs are also provided to facilitators, evaluators and observers ahead of the TTX. Additional copies are available on the day of the exercise, for reference.

Checklist: EXCON pack

The EXCON pack should include the following documents:

- Programme of the day
- Participant presentation
- MEL
- Scenario, injects and response sheets (if used)
- Participant list
- Evaluation template
- Participant feedback questionnaire
- Organisational plans
- Maps, fact sheets and background materials
- Additional relevant data (e.g. hospital bed availability).

Checklist: documents shared with participants ahead of a TTX

The following documents should be shared with participants ahead of a TTX:

- Joining instructions
- Participant briefing details
- Programme of the day
- Plans to be exercised
- Background and/or read-in materials required in advance of the exercise.

1.3.2 Briefings

A briefing for facilitators, evaluators and observers should be conducted by audio conference in the week before the TTX. It is good practice to also meet at the venue the day before or the morning of the exercise to review the exercise materials, run through the agenda, and finalise the set-up.

The TTX project manager and the coordinator should meet with EXCON to confirm final arrangements and clarify any changes before the exercise begins.

Tip. EXCON, facilitators and evaluators should get together during the lunch break to discuss the exercise's progress and identify any problems that need to be addressed.

See **Annex 1.6** for the participant briefing document from Exercise Vector and **Annex 1.7** for the facilitator briefing document.

1.3.3 TTX day

Infectious disease scenarios are typically divided into discrete sessions, each representing a different day in the scenario timeline. This allows for a detailed discussion of the outbreak as it develops over days and weeks, giving participants the opportunity to respond to the different stages of the (simulated) outbreak. However, some TTXs run in real time to simulate a real-time response to an incident. Here the exercise play is far less structured and needs to be carefully monitored to ensure it stays on track and meets all objectives.

Regardless of the format of the TTX, sufficient time should be allocated for the initial briefing, group discussions, feedback in plenary, and hot debrief. Generally, a quarter of the total time is allocated to briefing/debriefing, with the remainder of the time reserved for exercise play.

The exact timing of the exercise should appear in the programme of the day.

See **Annex 1.8** for the programme of the day from Exercise Vector.

Welcome

A lead facilitator or a senior official should welcome the participants and officially open the TTX. Guest speakers are introduced.

Tip. Ask participants to introduce themselves to their groups.

Expert presentation

An introductory lecture by an expert, held before the participant briefing, could be used to provide disease background and reinforce key concepts and competencies.

Tip. Inform your expert what you expect from their presentation (topic, duration, number of slides, etc.). Let the expert design it, but review it beforehand if possible.

Participant briefing

All participants must understand the purpose of the TTX and how the exercise works. This includes understanding the exercise aim and objectives, how to participate, how the exercise is managed and evaluated, and which post-exercise activities will be held.

Checklist: participant briefing

The following elements should be included in the participant briefing:

- Introduction to the importance of emergency preparedness (can reference recent events or the country risk register)
- Overview of the aim, objectives and scope of the exercise
- Core capabilities that will be addressed in the exercise
- How simulations work (including artificialities of the scenario, time jumps, and differences from computer simulations)
- Exercise ground rules and administrative information
- Debrief process
- Post-exercise activities and follow-up.

See **Annex 1.9** for the participant briefing presentation from Exercise Vector.

Tip. Emphasise that a TTX offers a safe learning environment that stimulates the development of new knowledge through facilitated group discussions.

Tip. Tell participants to accept the scenario (i.e. suspend their disbelief), however artificial, as it was specifically designed to achieve the objectives. This is to avoid wasting valuable time questioning the scenario's realism.

Starting the exercise (STARTEX)

Following the participant briefing, the exercise is started in accordance with the timing indicated in the MEL. A TTX typically starts by introducing the exercise scenario, providing background information, and replying to questions from participants.

Tip. A good way to start an exercise is with a pseudo media inject, such as a short news bulletin that sets the scene and ensures everybody has the same initial understanding of the event.

Group discussions

The participants take part in facilitated group discussions driven by the injects and discuss possible response actions. Discussions are overseen by the group facilitator.

Essential. Effective group facilitation promotes engagement from all participants and maintains a safe learning environment during the TTX.

Essential. Group discussions are supported by the relevant plans and procedures and are not based on assumptions. Each group should have an evaluator who keeps a record of group discussions, decisions, key actions and recommendations.

Tip. Group facilitators can help evaluators collect useful data for exercise evaluation by keeping discussions focused on exercise objectives, core capabilities and critical tasks.

Plenary sessions

Plenary sessions are led by the lead facilitator, who is a senior expert with a vested interest in the exercise outcomes. Plenary sessions can be conducted at the end of each session and are an opportunity for groups to share their main findings with the rest of the participants. A small-scale TTX plenary can be led by a member of the planning team.

Ending the exercise (ENDEX)

The exercise will be ended by the lead facilitator when the time allocated to the exercise is up, all objectives have been met, or an unexpected interruption has occurred.

Hot debrief

The lead facilitator holds a hot debrief immediately after the TTX. This is an important part of the exercise evaluation and promotes the participants' learning through reflection on their experiences during the TTX. Sufficient time and attention must be given to the hot debrief.

Essential. Assign an EXCON member to take notes during the hot debrief.

Essential. Tell participants that they will receive a participant questionnaire at the end of the hot debrief.

Tip. Tell participants that they will receive a certificate of attendance upon completion of the participant questionnaire. This may lead to a much higher response rate.

Closing address

Close the exercise by summarising the main findings identified in the exercise and share the next steps related to exercise evaluation, improvement plan, exercise report and date of dissemination. Let participants know when the exercise report will be available.

Essential. Encourage participants to share the findings from the exercise with their organisations and colleagues.

Essential. Carefully store all paperwork required for evaluation and report-writing, including evaluator reports, inject response sheets, participant feedback forms, and plenary and hot debrief notes.

Tip. At the ENDEX, ensure timely closure of the exercise by having all tasks allocated to the EXCON team in advance. Use confidential garbage bags for sensitive materials that are no longer required.

Tip. Have a brief meeting with the lead facilitator to discuss key issues from the final summary and debrief.

Tip. Meet with venue staff to confirm billing procedures.

1.4 Evaluate

Effective TTX evaluation involves the following:

- Planning for exercise evaluation
- Observing the TTX and collecting exercise evaluation data
- Analysing evaluation data to identify strengths and areas for improvement
- Reporting TTX evaluation outcomes.

Tip. Good evaluation data makes it easier to write the TTX final report.

1.4.1 Planning for TTX evaluation

Evaluation is an essential part of a simulation exercise, as it elevates the whole process to a valuable organisational learning experience. Evaluation strategy should be agreed upon and prepared at the planning stage, as soon as the exercise objectives have been agreed upon, and needs to be allocated sufficient time.

Exercise objectives determine the outcomes an organisation wants to achieve by running a TTX. It is recommended that exercise objectives are aligned with core response capabilities. In the exercise, core response capabilities are expressed as a broad range of response activities. It is these response activities that are practised and evaluated during a TTX.

A lead evaluator should be appointed at the planning stage. The exercise planning team and the lead evaluator should appoint the members of the exercise evaluation team and determine the stages of the evaluation process. The level of evaluation can vary between exercises. Small exercises may not need an evaluation team, as a single evaluator is usually sufficient.

TTX evaluators:

- are selected according to their knowledge and experience and are expected to be experienced in the field of health emergency preparedness;
- need to be competent to evaluate participants' actions and decisions, especially when they deviate from the guidance provided in a response plan
- need to be selected well in advance; and
- must receive sufficient training by the exercise team regarding their roles and appropriate use of evaluation tools to collect the required evidence during the exercise.

Enough time should be allocated to train all evaluators. Evaluators need to understand the exercise's objectives in order to correctly evaluate the participants' response actions.

TTX observers can also take part in the evaluation. Observers are usually representatives of relevant organisations or experts, invited to witness the conduct of the exercise without having an active role. They are not part of the evaluation team but may give their opinions and observations during the evaluation period.

Tip. It is important not to have too many non-participants at an exercise, as that can prove distracting. In order to keep numbers down, ask observers – for example – to take on the role of an evaluator.

Checklist: evaluation strategy

The evaluation strategy should include the following:

- Lead evaluator
- Structure of the exercise evaluation
- Observation checklist or evaluator template
- Participant questionnaire
- The aim, objectives and structure for hot debrief
- The aim, objectives, structure, facilitator and date for cold debrief
- Evaluation report template
- Evaluation team (should be appointed and trained)
- Observers (but keep to a minimum).

1.4.2 Evaluation data collection

Essential. Best practise is to collect evaluation data from as many different sources as is practical to enhance the quality of the exercise evaluation. This should include the following:

- Evaluator observations
- Participant feedback
- Hot debrief notes
- Cold debrief notes
- Plenary session notes.

Open observation

Open observation is a common approach used for the evaluation of a TTX. Exercise evaluators collect evidence of what takes place during an exercise in chronological order. This involves recording decisions and activities relevant to exercise objectives that were performed during the exercise, as well as collecting all additional supporting materials. This is done to ensure that observations are factual and evidential.

Tip. An ORCE (observe, record, consider, evaluate) strategy can be used for open observation. Information is observed and recorded first at the exercise and is later evaluated (when all evidence has been considered).

Structured observation

Evaluators record observations against pre-selected performance criteria (e.g. performance of critical tasks) by using an evaluation checklist. The checklist can also include the assessment of the quality of actions taken during the exercise, in addition to registering whether the expected actions were performed.

Tip. Anticipated participant actions indicated in the MEL can be used to set up an observation checklist.

Checklist: observation

Observation should consist of the following:

- Observations are recorded in chronological order against exercise objectives.
- All supporting documents are collected (decisions, statements, etc.).
- Observation checklist is completed (if used).

See **Annex 1.11** for the evaluation report from Exercise Vector.

Participant feedback

Exercise participants contribute feedback to exercise evaluation by completing a post-exercise questionnaire. This includes participants':

- feedback on the exercise,
- perceptions of their organisation's emergency preparedness, and
- main lessons identified from the exercise.

Essential. It is essential to collect exercise evaluation data from exercise participants.

Tip. A pre-exercise questionnaire can also be used before the exercise to check participants' understanding of the exercise purpose and objectives. It can also be used to make participants think about their personal objectives for the exercise, as well as assess the participants' perceived level of emergency preparedness.

Tip. Participant questionnaires should include a mixture of open and closed questions.

Tip. Online tools can be used to gather participant feedback.

See **Annex 1.12** for the participant feedback questionnaire from Exercise Vector.

Hot debrief

A TTX is followed by a hot debrief, which is held immediately after completion of the exercise and is led by the lead facilitator. The participants can be organised into groups to discuss feedback, reach consensus on key learning points and present their learning in the plenary.

A hot debrief is an opportunity for participants to reflect on their experience of the exercise and to share their learning points while the experience is still fresh in their minds. At the start of the debrief the facilitator should clearly state the aim and objectives of the debrief. It is advisable to structure the hot debrief around three key points:

- What has gone well? (Practices that need to be reinforced and shared)
- What did not work well? (Practices that need to be improved)
- What are the three key recommendations to improve the current level of emergency preparedness?

The hot debrief serves an important educational purpose by providing an opportunity for participants to reflect on performance and experiences; reflection enhances learning from the exercise in addition to contributing to exercise evaluation.

Essential. Sufficient time should be allocated to conduct the hot debrief.

Tip. It might be helpful to use a note taker to capture the points as they are raised and then project them on a screen for members of other groups to comment on during the plenary.

Checklist: hot debrief

To conduct a successful hot debrief, ensure that:

- The activity is well organised and structured around questions that maximise the ability to capture key participant feedback.
- Sufficient materials are available for the chosen method of information capture in the groups (flip charts, markers, pens, sticky notes, pre-formatted handouts, etc.). Each group then nominates a chair to share feedback verbally in plenary.
- Lessons identified are captured and included as part of the exercise evaluation.

Cold debrief

A cold debrief is a facilitated discussion held a few weeks after the exercise so that stakeholders have a chance to fully consider the feedback they would like to give on the exercise, as well as consolidate the lessons identified. The main purpose of the cold debrief is to gain a clear understanding of all issues noted in the exercise evaluation, understand why the issues have occurred, and decide on the appropriate corrective organisational measures.

Cold debriefs should be run by an experienced facilitator and follow an agreed structure. At the start of the cold debrief, its aim and objectives should be clearly stated.

Conducting a cold debrief is best practice and supplements all the evaluation data collected on the day. Ensure that key participants attend. Do not let too much time pass after the exercise, as interest may decline.

Essential. Participants should complete a cold debrief questionnaire before the cold debrief.

Tip. A cold debrief can be structured around TTX objectives or specific themes (e.g. coordination, communication, command, etc.).

Checklist: cold debrief

To conduct a successful cold debrief, ensure that:

- the activity is well organised (send the cold debrief questionnaire out in advance) and has the necessary representation from organisations/exercise participants.
- Sufficient materials are available for your chosen method of information capture (flip charts, markers, pens, sticky notes, pre-formatted handouts, etc.).
- Lessons learned are captured and included as part of the exercise evaluation.

See **Annex 1.13** for an example of a cold debrief participant questionnaire and **Annex 1.14** for a cold debrief report structure template.

1.4.3 Evaluation data analysis

The goal of data analysis is to identify issues and gaps, as well as what worked well, and to determine if exercise objectives were met. All of the collected information described in Section 1.4.2 should be considered and weighted in order to demonstrate both strengths and areas for improvement.

Checklist: questions for the evaluator

- Were the objectives of the exercise achieved?
- Did discussions show that participants were appropriately trained to complete their tasks successfully in the event of a real crisis?
- Was any resource deficit or gap identified that might impede the ability to perform the task?
- Do existing plans, policies and procedures support the participants' actions?
- What were the main lessons identified from this exercise, including strengths and areas for improvement?

1.4.4 Reporting TTX evaluation outcomes

The main focus of the exercise evaluation is on the analysis of core capabilities and lessons identified.

The lesson identification process involves reviewing the following aspects:

- Degree to which the exercise objectives were attained in the exercise.
- Differences between actual and expected performance of the plan and the procedures.
- Major observations and recommendations recorded to address observed weaknesses.

Based on the lessons identified, the evaluation report should include recommendations of corrective measures that the organisation can take in the short, medium and long term. Therefore, lessons identified from exercises are a starting point from which to further improve emergency plans and procedures.

Essential. Lessons identified should never be referred to as 'lessons learned', as this implies that no further work is needed to correct the issues that arose during the exercise.

1.5 Improve

The purpose of an effective and successful exercise is not only to identify areas for improvement, but also to stimulate further improvement. Only by implementing lessons identified can an exercise be considered truly successful and the cycle of preparedness be truly closed. For this reason, the Improve stage is an integral part of the simulation exercise cycle and provides further guidance on translating the areas for improvement identified from the TTX evaluation into distinct corrective measures to be undertaken by the organisation to achieve improvement. This follow-up (improvement) stage is essential to obtain effective outcomes from the TTX.

1.5.1 Areas for improvement

After the lessons from the TTX are identified, organisations should reach consensus on identified strengths and areas for improvement and develop a set of improvements that directly address core capability gaps.

The most effective approach to identifying areas for improvement and suggesting possible solutions is posing a series of questions:

- What happened?
- Why did it happen?
- What was the actual course of events?
- What would have been a desired course of events/result?
- What measures need to be taken in order to achieve the desired result?

This process is similar to an after-action review (AAR), which is usually conducted in the recovery period after an actual event or crisis in order to improve preparedness and response planning by learning from experience.

Tip. ECDC's Technical Report *Best practice recommendations for conducting after-action reviews to enhance public health preparedness* [3] identifies the common features of AARs, presents a validity assessment tool for appraising AARs, and proposes a set of best practice recommendations for conducting AARs.

Tip. The WHO guidance for AARs [4] presents the methodology for planning and implementing a successful AAR to review actions taken in response to public health events. It also serves as a routine management tool for continuous learning and improvement. Four formats of AARs are described, including the debrief, working group, key informant interview, and mixed-method AAR. WHO provides accompanying toolkits containing materials to support the design, preparation, execution and follow-up for each AAR format.

Essential. Areas for improvement that require action are those that will continue to impede capability performance if left unresolved.

Tip. To suggest effective corrective measures, undertaking a root cause analysis is recommended to understand the reasons behind an issue.

1.5.2 Improvement plan

After areas for improvement and corrective measures have been identified, it is important to ensure that they are implemented. The improvement plan contains specific measures that will be taken by organisations or individuals to correct the issue identified to improve preparedness.

Improvement plans should include the corrective measure; the person, office or agency responsible; and a deadline for when each measure should be implemented. The status of the improvement plan should be reviewed and follow-up should be encouraged at a higher level.

Essential. The improvement plan must be based on the evaluation evidence provided by the participants' actions/comments and not the views and opinions of the exercise facilitators and/or exercise planners.

Tip. To check on progress and maintain momentum, it is recommended that an improvement plan implementation meeting is held three and/or six months after the TTX.

Checklist: improvement plan

The improvement plan document should describe the following:

- The corrective measures that have been identified and agreed upon.
- The person, agency or organisation responsible.
- The deadline for implementation of each measure.

1.5.3 Exercise report

In addition to providing an overview of the TTX, the exercise report should focus on the analysis of core capabilities and lessons identified, as well as include recommendations for corrective measures that the organisation can take in the short, medium and long term to improve emergency preparedness.

Essential. Be aware of any data protection regulations that you must comply with when writing the report.

Essential. The exercise report should be written as soon as possible once the exercise debriefs have been completed. Circulate the report and improvement plan as widely and as early as possible (within four to six weeks after the exercise).

Checklist: exercise report

The exercise report should include:

- Background
- Exercise participants
- Purpose, aim and objectives
- Type of exercise and scenario
- Evaluation process
- Overview of performance related to each objective and associated core capabilities
- Challenges (lessons identified)
- Agreed corrective measures (areas for improvement)
- Responsibilities for implementation (improvement plan).

See **Annex 1.15** for the exercise report from Exercise Vector.

1.5.4 Implementation and follow-up

In order to ensure that the measures outlined in the improvement plan are implemented, support at the strategic level should be secured at the foundation stage to commit the required resources. Corrective actions that have been set up in the improvement plan should be tracked to completion and reported on.

To check if the exercise project has been successful, the following question should be answered: Did the exercise result in an improvement in performance for the organisation, unit or individual (for example, has the emergency preparedness plan been updated and has this been validated in another exercise)?

Checklist: implementation

Implementation and follow-up should include:

- Implementation meeting dates are agreed upon
- Colleagues are informed about the changes and improvements that resulted from the exercise to sustain interest in the exercise programme
- Exercise materials are archived and added to a knowledge bank
- Lessons identified from the TTX are shared
- Lessons identified database is updated.

1.6 Close the TTX

To close the TTX, conduct a debrief with EXCON and the planning team to identify lessons for improving or streamlining the whole planning process. This should be done as soon as possible after the cold debrief. An expenditure and budget reconciliation should also be conducted. Drafts of all exercise documents should be deleted and final versions should be archived and added to a knowledge bank.

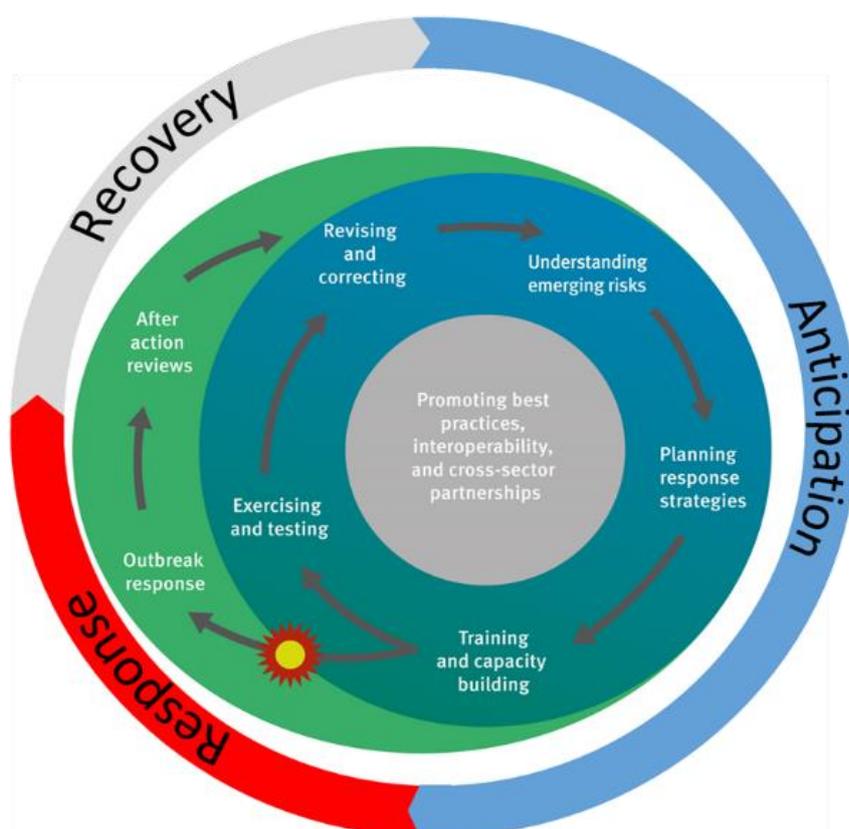
At this point in time, the next steps in the preparedness cycle should be considered, depending on the outcomes of the TTX. This could be in the form of:

- redrafting of plans,
- addressing training needs identified during the TTX,
- initiating a further TTX based on the lessons identified, or
- planning a functional exercise based on the lessons identified.

Essential. It is important that the preparedness cycle continues, which includes training and further exercises, in order to validate any improvements made after an exercise or a real event (Figure 4).

Tip. Consider compiling all lessons identified in a central repository. This will make it easier to recognise when similar lessons have been identified in different exercises, emphasising the importance of addressing them.

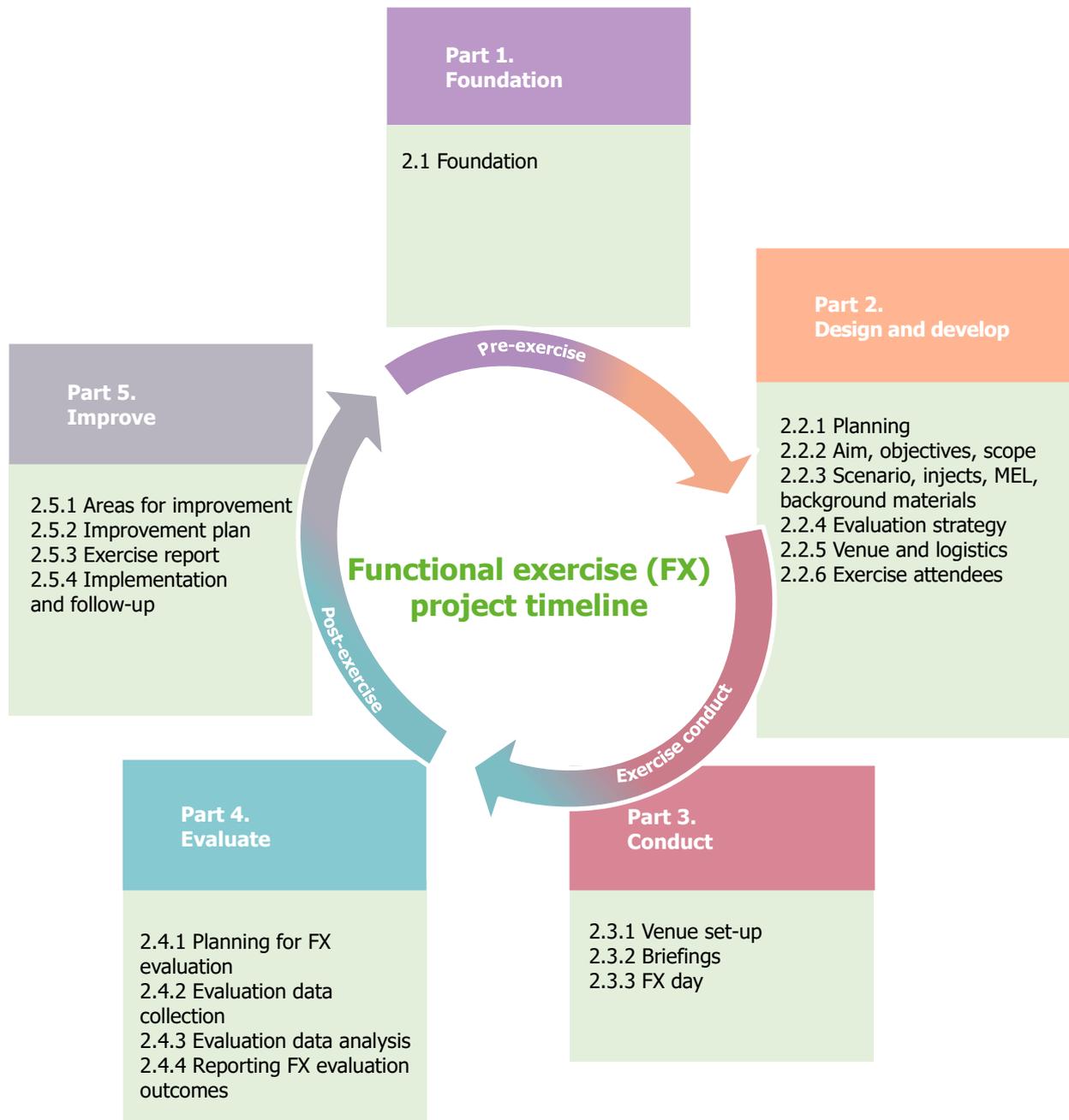
Figure 5. The preparedness cycle



Source: ECDC

2. Functional exercises (FX)

Figure 6. Functional exercise project timeline in relation to the simulation exercise cycle



Overview: functional exercise (FX)

Definition

A functional exercise (FX) is an effective exercise format to validate the coordination between various emergency operation centres (EOC) to test and evaluate the capabilities of an emergency response system that requires participants to perform the functions of their roles in accordance with emergency and other such preparedness plans. An FX is typically conducted from the same control centre that the organisation would use in a real public health incident (i.e. the EOC) and provides an excellent opportunity to realistically simulate the flow of information in a network of EOCs located at other bodies and sectors, both at the regional, national and cross-border/international levels.

An FX is intended to create a situation as close to an actual event as possible to fully engage participants. This type of exercise can be very effective, as it reproduces the stress (but in a controlled manner) and time pressure, which tends to evoke more realistic responses from the participants.

Purpose

The purpose of an FX is to test and evaluate the capabilities of an emergency response system. The focus is on coordination, command and control between various emergency coordination centres.

An FX can be used to:

- test multiple functions of the organisation's operational plan (coordination, integration and interaction of organisation's policies, procedures, roles and responsibilities before, during or after an event),
- test the chain of command, and
- test communication between various responding organisations.

Participants

Participants of an FX include senior staff and/or their deputies and key operational staff who work or support an EOC during an incident.

Exercise conduct time frame

An FX can take from a few hours to several days, depending on the complexity and objectives.

Location/venue

Typically, an FX is delivered from the organisers' EOC to the respective EOCs of participating organisations.

Process overview

At the foundation stage, a project manager and a coordinator should be appointed and a planning team established. The number of planning meetings should be agreed upon at the outset and the progress of the FX design and development can be assessed at each meeting. The project manager and coordinator are responsible for managing the process of design, development, conduct and evaluation of the FX, with direction and guidance from the planning team. This includes drafting exercise materials (e.g. scenario and injects), participant documents (e.g. invitations and briefings), and the evaluation strategy. They are also responsible for ensuring that a sufficient number of exercise facilitators/evaluators are available to assist at the FX. An FX can be preceded by a less complex exercise as part of an exercise programme (e.g. a TTX can set a good foundation for what is to be explored in the FX).

Exercise planning time frame

Planning may last 6 to 18 months, depending on the scale and complexity of the exercise.

Key success factors

- Clear aim and achievable, relevant objectives
- An effective EXCON supported by local exercise controllers co-located with the exercise participants in their EOC
- Effective exercise evaluation strategy and conduct
- Early invitation of participants, especially senior staff, to maximise attendance
- The right type and number of participants needed to effectively manage the crisis
- Key agencies encouraged to take part
- Realistic scenario and exercise design to support how the participants will operate/interact from their EOCs (this may require detailed logistic planning to activate the EOC in accordance with an organisation's plans and processes)
- Sufficient time allocated for briefing and debriefing
- Commitment to make the improvements identified by the FX.

2.1 Foundation

Exercises should be used as part of a broader preparedness cycle. Other key elements of this cycle are planning, resources, and equipment and training activities. Multi-year planning cycles are necessary to give sufficient individual consideration to each of these elements. As the purpose of this companion is to provide practical, operational guidance on the development, delivery and evaluation of individual health SIMEXs, it has been assumed that the more 'strategic' Foundation Stage has been completed; additional detail on the Foundation Stage is provided in the ECDC Handbook on simulation exercises [1]. Hence only a minimal amount of information on the foundation stage is provided here.

Checklist: FX foundation stage

The following should be undertaken during the foundation stage of an FX:

- Adopt/agree upon an overall strategy for simulation exercises as part of the preparedness cycle.
- Clearly identify the need for conducting an FX.
- Agree upon a clear purpose and aim.
- Ensure high-level support and participation, with early engagement.
- Allocate sufficient time, resources, and budget to design, develop, conduct and evaluate the FX.
- Secure a high-level commitment to make improvements identified from the FX and share learning outcomes as widely as appropriate.
- Clearly define the participating organisations and determine the locations for the FX.
- Designate a project manager and a coordinator for the whole process (from initiation to closing).
- Establish a planning team and EXCON.

Exercise Artemis: key characteristics

- **Aim:** To provide ECDC staff with a training opportunity to test, use and implement the revised public health emergency operational plan and to test supporting documents, tools and templates in response to two overlapping public health emergency scenarios.
- **Level of support:** High-level support from ECDC.
- **Time and resources:** Planning period of five months, with dedicated planning team and exercise team, and six weeks to collate and write a report.
- **Commitment to improve:** Outlined in final FX report.
- **Target audience:** Senior experts and operational staff at ECDC.
- **Lead organisers:** ECDC and Public Health England.

2.2 Design and develop

2.2.1 Planning

Exercise planning meetings serve as the principal mechanism for executing the major steps of exercise design. Core components include: establishing the scope, setting objectives, creating a scenario and developing exercise materials, such as exercise injects, scenario overviews, relevant technical documents, pseudo media, etc. A project manager and a logistics coordinator are responsible for driving the whole planning process, from design and development to conduct and evaluation of the FX, with input from members of the planning team.

The planning team typically includes a dedicated FX project manager, a coordinator and planners from the key organisations involved. The planning team should be as small as possible and should seek advice and guidance from technical experts outside of the planning meetings, as required.

Planning for an FX typically lasts four to six months, plus another four to six weeks for evaluation, report writing, identifying lessons and implementing actions. Planning can be much shorter for a simpler exercise (a few weeks) or longer (up to 18 months for complex, large-scale exercises).

Essential. Do not underestimate the planning time for developing an FX. The examples and templates provided in the Annexes will help speed up the process, but participants and key stakeholders should be informed about the proposed schedule well in advance.

Monthly planning meetings should have a clear agenda to ensure that all required outcomes are met at each stage.

At the first planning meeting, the scoping document must be agreed upon to ensure that the exercise planning is coherent and consistent with expectations. The scoping document includes the purpose, background, aim, objectives, scope, scenario outline, date, location (usually EOCs), key references, outline design, delivery plan, media plan, evaluation strategy, and people to invite. Suggested checklists for each planning meeting are provided below.

Tip. Have a concise agenda so you know what outcomes you want from every meeting.

Tip. Provide the meeting decisions and actions record to the planning team within three to five working days after the meeting for review and further distribution.

Checklist: kick-off meeting

The following should be planned:

- Aim and scope
- Date and time
- Scenario outline
- Target audience and locations of participating organisations
- Planning lead and planning team
- Scoping document.

Documents to be reviewed:

- Agenda template
- First version of the scoping document.

See **Annex 2.1** for the agenda template for planning meetings used during Exercise Artemis and **Annex 2.2** for the scoping document used.

Checklist: first planning meeting

The following should be planned:

- Terms of reference for the planning team
- Schedule of planning meetings
- Scoping document, including objectives
- Lead evaluator and outline evaluation strategy
- FX date and invitation to participating organisations
- Target audience to invite (senior staff and/or deputies and other key operational staff)
- FX day format (outline of the day, including scheduled teleconferences)
- Scenario development.

Documents to be finalised:

- Save the date notification
- Invitation with brief details about the day
- Joining instructions, including date and time
- Scoping document.

See **Annex 2.2** for the Exercise Artemis scoping document.

Essential. The scoping document (also referred to as a 'project protocol') needs to be agreed upon and finalised as early as possible. It can be refined as the exercise project develops; however, once the scope, aim and objectives have been agreed they should not be changed without the agreement of the exercise sponsor. The scoping document includes the background and aim of the FX, plans to be tested, proposed participating organisations, key participants, date, location, and planning team members.

Tip. The 'save the date' notification should be sent out as early as possible (at least three to four months ahead of time). It should contain only basic information, such as the exercise aim, dates, location, invited organisations, outline agenda, and – most importantly – a note indicating when detailed information will be provided.

Checklist: second planning meeting

The following should be planned:

- Programme of the exercise day (including scheduled teleconferences and episode start and end times)
- Schedule for developing scenario and background materials (pseudo media reports, maps, fact sheets, patient data)
- Evaluation criteria and evaluation team
- Schedule for development of MEL and injects
- Lead participants, facilitator and evaluator (including contact details) at each participating EOC.

Documents to be finalised:

- Outline scenario
- Outline of MEL
- Inject ideas.

Checklist: third planning meeting

The following should be planned:

- Near-final MEL and injects
- Briefing documents (evaluator, facilitator, participant)
- Evaluation documents
- Final list of lead participants and EOCs
- Roles of planners during FX
- Presentations and presenters.

Documents to be finalised:

- Programme of the day (outline of the day, including scheduled teleconferences).

See **Annex 2.10** for the evaluator report template from Exercise Artemis.

Checklist: final planning meeting

The following should be planned:

- Final confirmation of lead participants and EOCs
- Final confirmation of planners' roles in the FX
- Directory with telephone numbers and email addresses of EOCs, lead participants, facilitators, and evaluators at each location
- Date and time of communications check
- Cold debrief date and time.

Tip. The final planning meeting should take place at least one month before the date of the FX. This will ensure sufficient time to create the exercise documents, ship any materials to the participating EOCs and local exercise controllers, and brief the evaluators.

Checklist: final documents

- Scoping document
- Exercise materials (scenario, injects, MEL)
- Participant briefing
- Facilitator briefing
- Participant questionnaires
- Observation checklist
- Evaluation report template
- Reference materials (e.g. plans, maps, news articles)
- Cold debrief template.

Essential. Mark all exercise materials with the organisations' logos, the name of the FX, and 'Exercise – Exercise – Exercise' at the top to prevent confusion with actual incidents.

2.2.2 Aim, objectives, scope

Aim

The aim of the FX should be agreed upon at the foundation stage. The exercise aim is a statement of intent that gives direction to what will be, or is intended to be, achieved by the exercise. Given that the overarching goal of all exercises is improved preparedness, identifying the aim for any one exercise is a process centred on one question: Why does this agency/organisation/department need to conduct a simulation exercise?

The aim statement can be as generic or as specific as required to meet the needs of the exercise. The essential components of an exercise aim are purpose and context. The aim should begin with a verb and be clear, concise and achievable. A clear aim leads to a series of objectives that will suggest the most appropriate style, size and level of complexity of the exercise.

Essential. Have only one aim for the exercise.

Essential. Use verbs such as the following for the FX exercise aim: assess, develop, explore, practise, review, validate, test.

Essential. Do not use an FX as a means to write an emergency plan. Draft the plan first, perhaps during a workshop, and then assess the plan in a TTX and revise as necessary before proceeding to an FX. The finalised plan should be circulated before the exercise.

Tip. An example of a poor aim is: 'Conduct a public health emergency preparedness exercise'. This describes neither exercise purpose nor context. Conducting an exercise should not be an aim in itself. The aim points directly towards outcomes you want to achieve through a simulation exercise in order to improve preparedness.

Exercise Artemis: aim

To provide ECDC staff with a training opportunity to implement a new public health emergency operational plan and test supporting documents, tools and templates.

- **Purpose:** To provide ECDC staff with a training opportunity and test supporting documents, tools and templates.
- **Context:** Public health emergency response within the EOC.

Objectives

Once the aim of the FX is established, the objectives – which are the strategies implemented to achieve the exercise aim – are formulated. Setting appropriate objectives is essential to running a successful and effective FX. As such, objectives should be determined very early in the planning process, ideally at the kick-off or first planning meeting, as most other aspects of the exercise will depend on the chosen objectives.

Objectives should be challenging but achievable. Having a reasonable number of SMART exercise objectives may facilitate scenario design, conduct, and evaluation.

SMART stands for:

- **Specific** – simple, clearly phrased
- **Measurable** – observable, based on agreed performance criteria/standards
- **Achievable** – can be achieved within the exercise, taking into account available resources and constraints
- **Relevant** – links to organisational goals or strategic intent
- **Task oriented** – focuses on a specific emergency function.

Tip. You may align exercise objectives to core response capabilities that your organisation wishes to focus on in an FX. Core response capabilities are the activities that should be accomplished in incident response and that are set up as a reference framework by your organisation.

Tip. Representatives from all organisations or parts of the organisation involved in the exercise should agree on objectives to ensure they are relevant to the needs of participants. In multi-organisational, multi-sectoral FXs, experience shows that organisations achieve greater learning when they are able to incorporate their own specific exercise objectives. These must, however, be agreed upon by the planning group and be included as part of the evaluation plan.

Tip. The objectives need to be complementary. It is not necessary for all participants to set the same objectives; two different organisations can take part in the same exercise but choose to examine different aspects of their response plans, as long as they are complementary.

Tip. An example of a poor objective is 'To identify any gaps in public health emergency response arrangements'. This objective is not based on SMART and is not aligned to a specific response capability. Identified limitations and gaps in public health emergency response arrangements are the outcomes of the exercise evaluation and should not be an exercise objective.

Tip. Poor communication between emergency response organisations, professionals and the public is the most common recurring problem identified from real events and simulation exercises. Including an FX objective regarding communication is recommended, as well as inviting communication officers to the exercise.

Tip. Three to five objectives are normally sufficient for a simple, one-day FX exercise.

Scope

The agreed exercise objectives help define the scope of the exercise; they also make clear what is out of scope (i.e. what should not be a part of the exercise).

Key elements in defining the exercise scope of an FX include:

- type of emergency
- level to be exercised (i.e. national, regional, local)
- number of participating EOCs
- participants (i.e. EOC staff)
- functions that the EOCs will practise
- exercise duration

See **Annex 2.2** for the scoping document from Exercise Artemis.

Once the aim, objectives and scope of the exercise have been established, the exercise scenario and injects are developed.

Essential. Make the scope broad enough to achieve the exercise objectives.

Tip. Include a paragraph on what is out of scope.

2.2.3 Scenario, injects, MEL and background materials

Scenario

The scenario should be realistic, designed around the objectives, and contain enough background detail to support a clear narrative during the FX. The scenario should be challenging, but not so complicated that it overwhelms participants.

The scenario may consist of one event (e.g. disease outbreak) or multiple events (e.g. disease outbreak, flooding, chemical spill), depending on the objectives of the exercise. It may be inspired by real-life events and incidents, or a fictitious or previously unknown disease can be used. As part of quality insurance, an SME checks the scenario with regard to scientific/technical correctness and peer-reviews the scenario to ensure the aim and objectives are met.

An FX scenario should, if possible, be divided into discrete episodes that require response actions that need to be dealt with in a clearly defined timeframe. These episodes will inform the development of injects.

Information introducing the FX scenario can be distributed to participants in advance of the exercise (soft start/read-in material). For example, read-in material for a simulation exercise on pandemic influenza may include a global overview of the current outbreaks and issues around avian influenza.

Essential: The scenario must be realistic and accurate, or it will be questioned by the participants. If the scenario does not replicate real-world situations in precise and specific detail (as might be the case in a complex FX), then participants must be encouraged to use their experience and judgement to compensate for deficiencies in the scenario. In these situations, participants should be encouraged not to fight the scenario, but to accept any deficiencies.

Tip. Make use of internal knowledge and consult experts (who should not participate in the FX) for information on the topic under consideration in the scenario. This may generate interesting material for injects.

Tip. Exercise realism will be enhanced by including specific communication tools as part of an FX. This can include news presentations, newspaper articles, a dedicated newsfeed website and social media feeds.

Injects

The injects are an essential feature of an exercise. They provide information to participants to develop and move the scenario forward during the FX. Additional information from injects – including challenges, problem statements, questions and additional messages related to the changing situation – facilitates the progression of the exercise by stimulating interactions and information exchange.

See **Annex 2.4** and **Annex 2.5** for the scenario and injects from Exercise Artemis.

As with the initial scenario, it is essential that injects are written realistically, look realistic, and contain information that challenges the participants. The following should be considered when writing an inject:

- Who is the inject for? EXCON will require this information, which should also be added to the MEL.
- What information does the inject provide to develop the scenario in accordance with the overall exercise aim and objectives?
- What actions are expected from the participants? As one of the benefits of an FX is to test/validate processes and arrangements (which cannot easily be done in a TTX), the injects must not include any 'tips and hints' as to what action is required; they may, however, include a note to remind the participant to inform EXCON of the action taken. EXCON should have two dedicated email addresses to be used throughout the exercise: one to send out material, the other to receive material.

Figure 7. Sample inject from Exercise Artemis simulation

  	
EXERCISE - EXERCISE – EXERCISE	
Scenario Date and Time:	10 September 2013 07:30
MEL Direction:	Email to: support@ecdc.europa.eu
Inject No:	3
Inject Title:	Update on VHF case in France
<p>To: ECDC Duty Officer</p> <p>Please be advised that the Service de Maladies Infectieuses et Tropical, Paris is treating one male patient (31y) with confirmed Ebola Viral Haemorrhagic Fever.</p> <p>Early laboratory results show low counts of white blood cells, very low platelets and elevated liver enzymes.</p> <p>ECDC and DG SANCO have been notified via EWRS and WHO via IHR.</p> <p>Nursing staff at the hospital and attending paramedics have been informed of the diagnosis. Contact tracing has been instigated.</p> <p>Dr Pierre Martinez L'Institut de Veille Sanitaire FRANCE</p> <p>Exercise Direction You should carry out the actions required of you by this inject. Please reply to Artemis.excon1@ecdc.europa.eu or request external organisational advice via EXCON.</p>	

Injects can be emails, phone calls, internet-based reporting systems (e.g. the Program for Monitoring Emerging Diseases (ProMed) or the Early Warning and Response System (EWRS)), news reports, radio clips, newspaper articles or consolidated social media posts. Injects can also request information via a situation report, encourage sharing of information, or encourage an activity (e.g. by issuing a teleconference agenda).

Injects should keep participants in the EOC busy without overwhelming them. They should be issued at regular intervals. If a response is required, a deadline should be clearly stated.

Tip. Achieving the right number of injects is key. The more injects the participants need to read and respond to, the less time they will have to discuss and interact with each other. A few well-crafted, longer injects are preferable over many shorter injects of only a few lines.

Additional 'hot injects' may be created during the exercise and inserted if required to maintain momentum, steer the exercise back on course, or jump-start actions that are delayed. Pseudo media injects are particularly helpful in this context. Injects may be withdrawn if required by exercise play or if they become irrelevant. Changes or amendments should be noted on the MEL.

Secondary incidents that participants must respond to – but that are not associated with the main incident – may be included as injects to reflect reality and test resilience.

It is helpful if injects targeting specific issues can be written or reviewed by people with specialist knowledge because this will ensure accuracy and realism.

The final inject should confirm the end of the exercise (ENDEX) and then ask participants – in preparation for the local hot debrief – to prepare key issues identified during the FX.

Tip. Every email issued from EXCON should request that EXCON receive a copy of all communications that occur during the FX (e.g. not just responses to injects, but also any communication between participating EOCs).

Essential. To ensure that all the exercise objectives are achieved, the planning team must cross-check each inject against the objectives. This will ensure at least one inject for each objective, which in turn will assist in an evaluation of the learning.

Constructing Exercise Artemis

This overview describes how the Exercise Artemis scenario and injects were developed to ensure the flow of the exercise, while also addressing the objectives.

The **objectives** for Exercise Artemis were generic because the FX was designed as an EOC training and awareness event: to increase the knowledge of the concept of a public health emergency (PHE) and the procedures and command structure connected to a PHE and to train ECDC staff to understand their roles and responsibilities during a PHE.

Essential. Have **Annex 2.5** (Exercise Artemis injects) available and refer to it throughout this section.

Exercise Artemis required a full day of exercise play in the EOC. However, to enable the exercise to flow smoothly, a number of pre-planned activities were introduced one day before the actual start of the exercise, with background information and pre-exercise materials provided to the duty officer. These injects are described below and include expected action as a result of the inject. Pseudo media/communication injects are indicated by the letter M.

Inject 1: A ProMed-like notification about a viral haemorrhagic fever outbreak in the Ivory Coast. No action expected from ECDC.

Inject 2: An EWRS message from France alerting ECDC of a case of Ebola in France. This should trigger response activities, including activation of the EOC.

Injects M1–4: Press releases from WHO and the French Minister of Health that provide background information prior to STARTEX. No response expected.

Pre-scripted activity: Duty officer and Director consider convening a meeting and moving to PHE level 1. This should prompt consultation of the SOPs (section on PHE levels) and the notification of all relevant parties.

Injects 3–5: Updated information from France, including clinical data, which should trigger the announcement of a PHE level 1 and elicit SitReps for communication internally and with the European Commission.

From this point onwards, the injects are part of the exercise day itself. Using this construct overcomes any delay in convening the team so that at 8:00 CET on FX day all participants are available and ready to begin.

Inject 6: Web streaming of a PHE managers team meeting at 8:00 CET. All FX participants watch this meeting at STARTEX. At this meeting, the Director declares the PHE level in accordance with the PHE activation SOP; the Director also informs all necessary international organisations and appoints EOC staff members to the PHE team. While a little artificial, this inject shortens a number of processes and provides an opportunity for all participants to have a common understanding of where the exercise is starting from. Using fake news bulletins would be another way of providing the same information to everybody at the start of the exercise.

Inject M5: Telephone calls from pseudo media enquiring about ECDC's role. This prompts discussion of ECDC's media strategy.

Pre-scripted activity: A PHE response team meeting is called to test the SOPs (including the SOP that assigns staff to the roster), PHE user manual and templates for agendas, minutes, and staff work schedules.

Inject 7: Directorate-General for Health and Food Safety request for a rapid risk assessment and SitRep to test the SOP and risk assessment template.

Inject 8: Request from the European Commission's Directorate-General for Health and Food Safety for a teleconference with ECDC and the French Ministry of Health.

Inject M6: A call from the European Commission's press office requesting a briefing and a Q&A on the French Ebola case for a lunchtime press briefing (deadline 11:00 CET).

Pre-scripted activity: Operational group leaders update their teams and the PHE manager.

Inject 9: EWRS message regarding suspected cases of Ebola in Belgium.

Injects M7–M9: Reports of the death of a patient in France and cited cases in Belgium.

Inject 10: A ProMed mail regarding possible water contamination in the Adriatic. Italy is signalling a second potential event that will be reported at the next pre-scripted round table meeting.

Injects M10–14: An increase in media pressure. ECDC's response to the media includes lines-to-take on the Ebola cases and the new PHE in Italy.

Inject 11: A notification from the Directorate-General for Health and Food Safety: 200 people in Italy experience breathing difficulties, rash, and conjunctivitis. This should trigger the consultation of the SOPs for multiple PHEs. Support staff should be assigned to key roles.

Inject 12: Reports from Member States on cases in Croatia and Slovenia, with the suspicion that the cases were caused by a chemical spill.

Inject 13: Notification from the French Ministry of Health: France promises an update on paramedics that fell ill, with blood test results to be confirmed by 20:30 CET. This inject is designed to prompt consideration of initiating an after-hours work schedule. This requires the involvement of human resources specialists and security personnel. The relevant SOPs must be consulted.

Injects M15 and M16: These injects were designed to increase media pressure and prompt actions from the communications team.

Inject 14: Slovenia requests technical and communication assistance. ECDC now has to consider staff deployment in Slovenia and needs to consult the SOPs. Other actions triggered by the Slovenian request may include a rapid risk assessment, consulting the ECDC guide to missions and meetings, and communicating with the Directorate-General for Health and Food Safety.

Inject 15: A Directorate-General for Health and Food Safety request for an update on the algal bloom in the Adriatic.

Inject M17: A request for a TV interview. Required actions include coming up with a spokesperson, briefing them, and putting together a set of questions and answers within 30 minutes.

Inject M18: An epidemiologist is writing an article for *Eurosurveillance* and asks for scientific assistance. This tests ECDC's communication strategy.

Inject 16: Notification of a second pre-scripted PHE managers team meeting to be streamed to all participants. This raises issues around multiple PHEs.

Inject 17: Announces a time jump of 20 days and provides updates on both scenarios that should lead to de-escalation and recovery. PHE materials should now be archived and the EOC deactivated, all in accordance with the SOPs.

Injects 18 and 19: The end of the exercise (ENDEX) is declared and participants are asked to prepare a few points for discussion at the hot debrief.

Master events list (MEL)

The MEL is a chronological listing of the events that drive the exercise. It is populated as the injects are developed, with each inject occupying an individual line on the MEL. Periodic review and revision of the MEL is necessary to ensure that the exercise will flow smoothly, that injects are in chronological order and that there are not too many injects.

A standard MEL states the time of inject, method of delivery, recipient, event information, anticipated participant action and any special delivery actions for each inject. The MEL is therefore a guide for EXCON, indicating when and to whom each inject should be delivered and the expected participant action. If an expected participant action that is vital to the flow of the exercise doesn't happen, hot injects may need to be developed to move the exercise in the right direction.

For an FX where the participating EOCs are likely to be geographically dispersed and operating in different time zones, the MEL is a vital tool for EXCON staff to ensure that the exercise stays on track and progresses at the right tempo, as planned.

Tip. Expected participant actions (critical tasks) can form the basis of the evaluation checklist.

See **Annex 2.3** for the MEL used in Exercise Artemis.

Figure 8. Master event list (MEL) extract from Exercise Artemis

Inject	Time CEST	Inject Sent to	Sent from	Inject Content / Event	Expected participant response / Controllers prompts / procedures & templates used
FX Day 1 = 9 September 2013					
	08:00	Exercise set up		Led by PHE delivery team	Function Room 2
	09:00			Final Communications test	Email test to generic email boxes; access to PHE intranet; streaming link
	10:00	Participant briefing		Led by PHE delivery team	Function Room 2
01	12:00	ECDC Duty Officer	EXCON	STARTEX – initial scenario	
02	13:00	ECDC Round Table Meeting	EXCON	Notification of VHF outbreak in Ivory Coast	Promed report Watching brief - no further action
03	13:30	support@ecdc.europa.eu	EWRS message	InVS (France) alerts ECDC of a case of Ebola in France	Prompt EI Duties SOP: PHEIC. EOC Activation SOP. Reminder that all actions taken must be notified/copied to EXCON
04	14:15	info@ecdc.europa.eu	EXCON	Press statement from French Ministry of Health	
05	15:00	info@ecdc.europa.eu	EXCON	Press statement from WHO	
06	15:30	info@ecdc.europa.eu	EXCON	Twister feed - onlookers reporting on incident in Paris street	
07	16:15	Call to Director	EI Duty Officer	Request Director to convene meeting or to consider move to PHE	EI Duty Officer informs Director using the Upgrading PHE SOP. Request permission to call PHE using request form. HoJ informs Internal Communication and Knowledge Services Director consults with SMT and AF. Internal Comms to email all staff
08	17:00	All	EXCON	SUSPENDIX	No overnight play. Exercise resumes at 07:30 on Day 2
FX Day 2 = 10 September 2013					
	07:00			Exercise Control Staff arrive	Boardroom ready for webstreaming of initial PHE MT mtg
	07:45	All participants	EXCON	Notification to log on to weblink for streaming of PHE MT meeting at 08:00	Exercise Players arrive. Tea/Coffee in Boardroom Ready for webstream of PHE MT meeting.

Background materials

In the days leading up to the start of the FX, send the necessary background materials to all participants and specify times when participants need to be available for the exercise. Background materials must include any plans to be exercised and can also include soft-start reading to introduce the scenario.

Background information in addition to the injects also needs to be prepared and ready for EXCON to distribute during the FX. This can include maps, disease factsheets, factsheets for health professionals, pre-prepared risk assessments and mitigation strategies. All of this additional material adds reality to the exercise, improving participant engagement.

Essential. Participants must come to the FX prepared, trained to work in an EOC environment and familiar with the plans to be tested.

Tip. Send the plans to be tested to all participants prior to the start of the exercise and ask them to make themselves familiar with the plans before participating in the FX.

2.2.4 Evaluation strategy

Evaluation is the cornerstone of the exercise process and the most important step in planning any exercise is developing an exercise evaluation plan. The evaluation strategy and evaluation documents for an FX are prepared in the planning stages.

2.2.5 Logistics

An FX is an operational exercise conducted in a realistic EOC environment to test and evaluate the capabilities of an emergency response system. It requires participants to perform the functions of their roles according to plans. The exercise is typically run from the EOC that the organisation would occupy during a real incident and may test various communication methods and channels (e.g. communication with other EOCs, organisations or countries via phone, email or video conference via such platforms as Microsoft Teams, Zoom, etc.).

An FX tests technologies, plans and procedures and involves ongoing communications from EXCON to and between the EOCs of participating organisations. It is assumed that the EOCs involved will already be functional, with seating and adequate room arrangements, as well as all the necessary telecommunications (internet, computer, and telephone networks), stationery and emergency plans in place. However, it should be remembered that some EOCs are not used very often and will need to be set up in a meeting room during an incident or exercise. It is therefore advisable to remind the lead participant, facilitator and evaluator to ensure that their EOC meets the organisational requirements and that they should practise set-up before the exercise.

Essential. Remind participating organisations to ensure that sufficiently trained EOC staff are available to participate during the FX.

Essential. Prepare an exercise directory that details all the telephone numbers (voice and fax) and email addresses of each participating EOC or functional area. For each EOC, this should include the participant roles indicated in the organisation's plans (e.g. duty officer, incident director, etc.) and the contact details of any exercise staff attached to the EOC, such as the exercise controller or exercise evaluator.

Essential. To validate the exercise directory, ensure that all email addresses are working and confirm that telephone numbers provided are correct, the exercise coordinator must complete a thorough and comprehensive communications check with each participating EOC at least two weeks in advance of the FX.

Tip. Send the final version of the exercise directory as the first inject on Day 1 and include the process for requesting amendments. Remember to use version control so that participants all have the same version of the exercise directory.

Tip. Remind lead participants to ensure that their EOC is fully operational, with functional telecommunications and an adequate stock of stationery (e.g. pens, paper, notebooks) well in advance of the exercise.

Tip. Suggest that participants consider the provision of food and refreshments throughout the day for the EOC team carrying out the exercise.

Checklist: EOC

The local exercise controller in each EOC should consider the following aspects when preparing for the exercise:

- Emergency response plans, including concept of operations (CONOPS), standard operating procedures (SOPs), templates for situation reporting and briefing, etc.
- Exercise directory
- Facility and rooms, including adequate seating
- Audiovisual requirements, including a laptop and printer
- Internet access
- Stationery (e.g. pens, paper, notebooks)
- Food and refreshments

2.2.6 Exercise attendees

The following groups of attendees take part in an FX exercise:

- Participants (generally participating from their EOC)
- Controllers (at each location)
- Evaluators (at each location)
- Subject matter experts (SMEs) (available in EXCON)
- Exercise staff (EXCON).

Participants

Participants are generally senior staff and/or their deputies and key operational staff who would work in the EOC of their organisation during an incident. If required, participants should be able to request advice from a group of SMEs based in EXCON.

Exercise Artemis: participants

For Exercise Artemis, ECDC invited staff who would be expected to work in or support the Centre's EOC during a public health emergency, including an incident director, key experts and operational personnel.

Essential. Ensure that key participants save the date in their calendars as soon as possible.

Essential. Participants must come to the FX prepared to work in their EOC and be familiar with the plans and processes to be tested.

Tip. To enhance FX fidelity, an experienced communications officer should participate in the exercise.

Controllers

Ideally, an experienced exercise controller (or, as a minimum, someone who is familiar with the operation of EOCs) is assigned to every participating EOC to be the eyes and ears of the exercise director, who is based in EXCON. Their role is to ensure that the participants understand what is required of them (the exercise controller routinely gives a participant briefing at the start of the exercise) and that they are receiving the assigned exercise materials, as detailed in the MEL. They may prompt or facilitate certain participant actions, as described in the MEL, to ensure

exercise continuity or ask EXCON to adjust the tempo of the injects (including the option to add extra hot injects). Controllers must monitor the exercise timeline and provide EXCON with updates, as requested.

Evaluators

Evaluators should be experienced in the field of health emergency preparedness and be competent to evaluate EOC actions and decisions during an FX. Evaluators should have minimal interaction with participants during the exercise. Their role is to collect objective and evidential information on EOC decisions and actions, as well as to complete an evaluation report.

Subject matter experts (SMEs)

SMEs should be on hand in EXCON to offer advice to participants in areas outside of participants' understanding. SMEs can include experts from other responding agencies outside the public health sector that may have an effect on health response (e.g. Transport, Meteorological Office, etc.).

Exercise control staff (EXCON)

EXCON will manage the MEL and ensure that all injects, and any agreed additional information, is sent to the participating EOCs in accordance with the exercise timeline. The EXCON team is led by the exercise director and may be required to adjust the tempo of the exercise, including calling ENDEX in the event of a significant live incident.

There should be designated staff in EXCON responsible for:

- issuing injects,
- logging responses,
- responding to queries, and
- liaising with evaluators and facilitators.

Tip. Observers are largely redundant in an FX; however, it is up to the discretion of the lead participant in each EOC at each location.

Exercise Artemis: EXCON

In Exercise Artemis, EXCON was composed of eight staff members from Public Health England and ECDC. The role of EXCON was to follow the MEL and review FX progress.

One or more members of EXCON were each responsible for:

- Issuing injects
- Issuing media/communications injects
- Logging responses
- Responding to queries
- Evaluators contact
- Facilitators contact

All EXCON staff liaised frequently with the rest of the delivery team and were supervised by the FX project manager and coordinator, with high-level oversight by an exercise director.

2.3 Conduct

The conduct of an FX is very different from a TTX in that the FX is typically run from the control centre that the organisation would occupy during a real incident (i.e. at each EOC, rather than all participants being at the same venue). Communication within a network of EOCs in other organisations, institutions and sectors – both at the regional, national and cross-border/international levels – is routine via telephone, email or official online collaborative tools, such as the EU's Early Warning and Response System (EWRS).

Tip. As collaborative online tools are usually operational, a test environment or simulated tool should be used during an exercise rather than risk introducing exercise material into a live tool.

2.3.1 EXCON

An FX requires a dedicated EXCON for the FX team to manage and deliver the exercise. It should contain all the equipment, materials and resources that the EXCON team requires and should be set up with similar requirements to an EOC.

Checklist: EXCON set-up

EXCON packs should include:

- Programme of the day
- MEL
- Scenario and injects
- List of participating EOCs
- Evaluation template
- Maps, factsheets, background materials and additional data (e.g. hospital bed availability)
- Participant feedback questionnaire
- Up-to-date exercise directory.
- workstations for each of the following:
 - Issuing injects
 - Logging responses
 - Responding to queries
 - Evaluator contact
 - Facilitator contact

Other aspects to be considered include:

- Audiovisual requirements, including a laptop and printer
- Internet access
- Stationery (e.g. pens, paper, notebooks)
- Food and refreshments.

Essential. Preface all exercise materials (emails, telephone calls, etc.) with the name of the FX and 'EXERCISE – EXERCISE – EXERCISE' to prevent any fictional exercise materials from being mistaken as a live incident.

Tip. Pre-load all injects that will be sent via email in advance of the FX day.

Tip. Remind participants in each email to copy EXCON in all responses. This is to ensure that EXCON is able to capture all the exercise traffic for evaluation and analysis.

Registration

It is recommended that each controller completes a registration list of all the participants in their area and sends this to EXCON.

Documentation

EXCON packs containing all exercise materials/documentation are kept in EXCON for reference and are also provided to facilitators and evaluators prior to the FX.

Facilitators and evaluators should also have copies of the plans, SOPs and CONOPs for the EOC where they are based.

2.3.2 Briefings

A final confirmatory briefing for all controllers and evaluators should be conducted during the week leading up to the FX. Ideally, this should be done face-to-face, but if this is not practical then an audio/video conference is a good substitute. The aim of the briefing is to review the exercise material and run through the roles and set-up for the day. Less experienced controllers and evaluators might benefit from additional training in their basic roles and responsibilities.

The FX project manager should meet with FX delivery staff (EXCON) to confirm final arrangements and clarify any changes before the exercise begins. This will help to ensure that each team member is clear on their roles and responsibilities during the FX.

Tip. On the FX day, conduct at least one teleconference between EXCON staff, facilitators and evaluators to discuss the progress of the exercise and whether there have been any problems that need to be addressed. Alternatively, maintain an open teleconference line throughout the FX day, whereby EXCON can quickly respond to issues as evaluators and facilitators report them.

Annex 2.8 contains the controller briefing document from Exercise Artemis and **Annex 2.9** the evaluator briefing document.

2.3.3 FX day

The FX is very different from a TTX in that the FX is typically played from organisations' EOCs in real time to simulate realistic and time-pressured operations from the EOC.

Welcome

A senior official can officially open the FX by introducing the exercise and welcoming the participants. This will have to be done by video conference, as participants will be at various locations. Alternatively, the welcome can be conducted by the facilitator at each separate EOC.

Participant briefing

The facilitator in each EOC will conduct the participant briefing so that all participants understand the purpose of the FX and how the exercise works. This includes understanding the aim and objectives of the exercise, how to participate, how the exercise will be facilitated and evaluated, and potential outcomes. This introduction takes the form of a pre-exercise briefing for participants.

Checklist: participant pre-exercise briefing

The pre-exercise briefing should cover:

- The importance of emergency preparedness (can relate to recent events or country risk register)
- The aim, objectives and scope of the exercise
- Core capabilities that will be addressed during the exercise
- How simulation works (including the artificialities of the scenario, the difference from a computer game)
- Exercise ground rules and administrative information
- Debrief process
- Post-exercise activities and follow-up.

Annex 2.6. contains the participant briefing from Exercise Artemis.

Tip. Re-emphasise that an FX offers a safe learning environment to test and evaluate the capabilities of an emergency response system and requires participants to perform the functions of their roles according to plans.

Tip. Advise participants to accept the scenario, however artificial, as it is designed to achieve the exercise objectives. This is to avoid wasting valuable time querying the realism. The scenario may also be written so as to ensure that the escalation trigger, as detailed in the organisation's response plan, is met.

Essential. Sufficient time should be allocated for initial briefing and a hot debrief at each location.

Starting the exercise (STARTEX)

Following the participant briefing, the exercise is started according to the timing indicated in the MEL. The FX typically starts by introducing the exercise scenario and any relevant background information.

Tip. A good way to start an FX is with a media inject such as a simulated short news bulletin or newspaper report that sets the fictional scene and ensures everybody has the same initial understanding of the event.

Conducting the exercise

Participants take part in the FX from their EOC, playing the role that they would play in a real emergency. They respond to injects supplied by EXCON, usually via email and telephone and from other participating organisations, requesting information or assistance. Their involvement is overseen by the facilitator in their EOC.

Each EOC also has an evaluator who keeps a record of key actions and decisions and notes recommendations.

Tip. As participant actions should be guided by their organisation's relevant plans and SOPs, it is helpful if the local exercise controller has a copy of these documents and is able to read them in advance of the FX.

Ending the exercise (ENDEX)

The exercise will be ended by EXCON when either:

- the time allowed for the exercise is reached;
- the objectives have been met; or
- an unexpected interruption has occurred.

A hot debrief is conducted by the facilitator at each location immediately following an FX. The hot debrief is an important part of the exercise evaluation and facilitates participants' learning by reflecting on their actions and experiences during the FX. Sufficient time and attention must be given to the hot debrief.

Essential. Make sure notes are taken at the hot debrief.

Essential. Ensure participants complete a participant questionnaire at the end of the hot debrief.

Tip. Explain to participants that they will receive a certificate of attendance on completion of a participant questionnaire.

A closing address can be given by a senior official to officially close the FX via video conference to the various locations. Alternatively, the facilitator can give a closing address at each separate EOC. The plan for next steps should be announced (FX evaluation, improvement plan and exercise report) and participants should be told when the exercise report will be available.

Essential. Encourage participants to share the findings from the FX with their organisation and colleagues.

Essential. Ensure that each facilitator keeps all the important paperwork required for evaluation and report writing safe, including evaluator reports, participant feedback forms and hot debrief notes. Ask for these to be sent to the report writer by a specific date, preferably within the week.

Tip. At ENDEX, ensure timely closing of the exercise, with tasks allocated to the EXCON team in advance. Use confidential garbage bags for any sensitive materials that are no longer required.

Tip. Have a brief teleconference as soon as possible after exercise closure with facilitators and evaluators to discuss key issues arising from hot debriefs.

2.4 Evaluate

Effective FX evaluation involves:

- Planning for exercise evaluation
- Observing the FX and collecting the exercise evaluation data from various sources
- Analysing evaluation data to identify strengths and areas for improvement
- Reporting FX evaluation outcomes.

Essential. Effective exercise evaluation (strength of evidence) will drive further improvements in emergency preparedness.

2.4.1 Planning for FX evaluation

Evaluation is an essential part of an FX. It makes the whole process a valuable learning experience and therefore needs to be allocated sufficient time. The evaluation planning starts at the earliest planning stage, as soon as the exercise objectives are agreed upon.

Exercise objectives set up the outcomes the organisation wishes to achieve during an FX. For accountability purposes, it is most effective to align exercise objectives to core response capabilities for evaluation during the exercise. Core response capabilities are the activities that should be accomplished in incident response and that are being evaluated at an FX.

Tip. Organisations should refer to their own sources for response capabilities or use the *European Centre for Disease Prevention and Control (ECDC). Public health emergency preparedness – Core competencies for EU Member States* document [2]. Once exercise objectives are set up and aligned to core capabilities, decide which critical tasks are being addressed by the FX for each capability. These tasks can then be specifically evaluated to ascertain:

- whether the task was performed (Yes/No) and
- how well it was performed (e.g. poor: process lacking, serious problems; average: identified elements of the process, but with gaps; fair: identified the process as a whole, but gaps observed; good: identified the entire process; excellent: additional actions taken to complement the established guidelines).

The aim of the evaluation is to determine whether critical tasks were performed and capabilities demonstrated (i.e. FX evaluation assesses the ability to meet objectives and capabilities by documenting strengths and areas for improvement).

A lead evaluator should be appointed at the planning stage. The exercise planning team and lead evaluator should determine the structure of the exercise evaluation team and evaluation process. The structure of evaluation can vary for different exercises and it is at the discretion of the exercise planning team.

Exercise Artemis: evaluation structure example

Objective 1: To increase the knowledge of the PHE concept, procedures and command structure.

Core capability: emergency operation coordination

Critical tasks:

- Activation of a crisis management plan
- Crisis management plan activation communication
- Identified staff requirements for EOC (skills, availability)
- Assignment of leadership
- Incident assessment
- Situation updates
- Resource assessment (needs, availability)
- Risk communication.

FX evaluators

FX evaluators are selected according to their knowledge and experience in the field of health emergency preparedness. They need to be competent to evaluate participants' actions and decisions and, if these are different from reasonable expectations, to analyse why. Evaluators should be selected well in advance and must receive sufficient training by the exercise team to ensure appropriate use of evaluation tools to collect the required evidence during the exercise.

Checklist: evaluation planning

The following need to be agreed upon in advance:

- Exercise objectives aligned to core capabilities and critical tasks to be evaluated
- Lead evaluator
- Structure of the exercise evaluation
- Observation checklist (evaluator report)
- Participant questionnaire
- The aim, objectives and structure for hot debrief
- The aim, objectives, structure, facilitator and date for cold debrief
- Evaluation report template
- Evaluation team appointed and trained
- Observers' role in evaluation (if any).

2.4.2 Evaluation data collection

Best practise is to collect evaluation data from as many different sources as is practical to enhance the quality of exercise evaluation, including:

- observations collected by evaluators,
- participant feedback,
- hot debrief notes, and
- cold debrief notes.

Annex 1.12 contains a sample participant feedback questionnaire from the tabletop exercise (TTX) Exercise Vector. This can be modified accordingly for use in an FX.

Observations by FX evaluators

Open observation is when exercise evaluators collect evidence of what took place during an exercise in chronological order. This involves recording decisions and activities relevant to exercise objectives that have been performed during the exercise, as well as collecting all additional supporting materials to ensure that observations are factual and evidential.

Structured observation is the most common way of conducting evaluation of FX. Evaluators record observations against pre-selected performance criteria (e.g. performance of critical tasks) using an evaluation checklist or observation template. The checklist can also include the assessment of quality and timeliness of actions taken during the exercise, in addition to registering whether the expected actions were performed.

Tip. For each critical task, a set of critical activities can be defined. A critical activity is an action that must be performed to fulfil the directives outlined in a plan and/or protocol. The critical activities become the items in the evaluation checklists, enabling the evaluators to track the expected outcomes or actions.

Tip. Anticipated participant actions indicated in the MEL can be used to set up an observation checklist.

Checklist: Observations by FX evaluators

- Observations are recorded against exercise objectives.
- All supporting documents are collected (decisions, statements, etc.).
- Observation checklist is completed.
- Evaluator's report is completed (using provided template).
- Participant questionnaire is completed and collected.

Annex 2.10 contains the evaluator report template for open observations from Exercise Artemis.

Participant feedback

Exercise participants contribute to exercise evaluation by completing a post-exercise questionnaire. This includes:

- participants' perceptions of their organisation's emergency preparedness,
- what the participant has learned from the exercise, and
- participants' feedback on the exercise organisation and conduct.

A pre-exercise questionnaire can also be offered to check participants' understanding of the exercise purpose and objectives. It can also prompt participants to think about their personal objectives from the exercise, as well as assess participants' perceived level of emergency preparedness before the exercise.

Data collected from pre-exercise questionnaires can contribute to participants' exercise feedback, as well as serve an educational role in preparing participants for an exercise.

To measure whether the exercise has improved knowledge, two similar questionnaires would need to be offered to participants before and after the exercise. Positive change in pre-to-post-exercise scores indicates improved knowledge.

Tip. Participant questionnaires can include a mixture of open and closed questions.

Tip. Online tools can be used to gather participant responses.

The Exercise Artemis participant evaluation workbook, which combines a participant's feedback questionnaire with a review of work during the exercise, can be found in **Annex 2.11**.

Hot debrief

An FX is followed by a hot debrief that is held by the local facilitator immediately after completion of the exercise. The hot debrief is an opportunity for participants to reflect on their experience and to share their learning points while the exercise is still fresh in their minds. At the start of the hot debrief the facilitator should clearly state the aim and objectives of the discussion. It is advisable to structure the hot debrief around three key questions:

- What went well? (practices that need to be reinforced and shared)
- What did not go well? (practices that need to be improved)
- What are the three key recommendations to improve the current level of emergency preparedness?

Essential. The hot debrief serves an important educational purpose by providing an opportunity for participants to reflect on performance and experiences. Reflection enhances learning from the exercise in addition to contributing to exercise evaluation. Sufficient time should be allocated to conduct the hot debrief.

Checklist: hot debrief

To conduct an effective hot debrief, ensure that:

- Participants are organised into groups that each discuss their learning, then present in plenary.
- Sufficient materials are available for groups to prepare their feedback (e.g. flip charts, pens, Post-it notes, pre-formatted handouts, etc.).
- Feedback is captured as part of the exercise evaluation.

Cold debrief

A cold debrief is a facilitated discussion held a few weeks after the exercise so that stakeholders have a chance to consider the feedback they would like to give on the exercise, as well as consolidate lessons identified. The main purpose of the cold debrief is to gain a clear understanding of all problems noted in the exercise evaluation and why the problems occurred, as well as to decide on the appropriate corrective organisational measures.

It is good practice to conduct a cold debrief, as it supplements all the evaluation data collected on the day. A cold debrief should be conducted a few weeks after the FX. Ensure that key participants attend. Do not schedule it too long after the exercise, as interest may wane. The cold debrief should be run by an experienced facilitator and follow an agreed structure. At the start of the cold debrief, the aim and objectives of the discussion should be clearly stated. Cold debriefs should be conducted locally at each EOC.

Essential. Outcomes from a cold debrief should be captured and fed into the evaluation process.

Essential. Participants should complete a cold debrief questionnaire before the cold debrief.

Tip. A cold debrief can be structured around FX objectives or specific themes (e.g. coordination, communication, command and control, etc.).

Annex 1.13 and **1.14** contain a cold debrief participant questionnaire and a cold debrief report structure template from the tabletop exercise (TTX) Exercise Vector. These can be modified accordingly for use in an FX.

2.4.3 Evaluation data analysis

The goal of data analysis is to identify issues and gaps, as well as practices that worked well, and to determine if the exercise objectives were met. All information collected during evaluation should be taken into consideration in order to demonstrate both strengths and areas for improvement.

As part of data analysis, the evaluator should ask the following questions:

- Were the objectives of the exercise achieved?
- Did the exercise show that participants were appropriately trained to be able to complete their tasks successfully in the event of a real crisis?
- Was any resource deficit or gap identified that might impede on the ability to perform the task?
- Do existing plans, policies and procedures support the participants' actions?
- What were the main lessons identified from this exercise, including strengths and areas for improvement?

2.4.4 Reporting FX evaluation outcomes

The main focus of the exercise evaluation is on the analysis of core capabilities and lessons identified. The identification process involves reviewing the:

- degree to which the exercise objectives were attained in the exercise,
- differences between actual and expected performance of the systems in place, and
- major observations and recommendations recorded to address observed weaknesses.

The evaluation report should include recommendations for corrective measures that the organisation can take in the short, medium and long term. Therefore, lessons identified from exercises are a starting point for improvement of emergency plans and procedures.

Essential. Lessons identified should never be referred to as 'lessons learned', as this implies that no further work is needed to correct the issues which arose during the exercise.

2.5 Improve

The purpose of an effective and successful exercise is not only to identify areas for improvement, but also to stimulate further improvement. Only by implementing lessons identified can an exercise be considered truly successful and the cycle of preparedness closed. For this reason, the Improve stage is an integral part of the simulation exercise cycle and provides further guidance on translating the areas for improvement identified in the FX evaluation into distinct corrective measures to be undertaken by the organisation. This follow-up is essential to achieve effective outcomes from the FX.

2.5.1 Areas for improvement

After the lessons from the FX are identified, organisations should reach consensus on their strengths and areas for improvement and develop a set of improvements that directly address core capability gaps.

The most effective approach to identifying areas for improvement and suggesting possible solutions is to pose the following series of questions:

- What happened?
- Why did it happen?
- What was the actual course of events?
- What would have been a desired course of events/result?
- What measures need to be taken in order to achieve the desired result?

This process resembles an after-action review (AAR), which is usually conducted in the recovery period after an actual event or crisis in order to improve preparedness and response planning by learning from experience. (Figure 4).

Tip. ECDC's technical report *Best practice recommendations for conducting after-action reviews to enhance public health preparedness* [3] identifies the common features of after-action reviews, offers a validity assessment tool for appraising after-action reviews, and proposes a set of best practice recommendations for conducting such reviews.

Tip. The World Health Organization (WHO) guidance on after-action reviews [4] presents the methodology for planning and implementing a successful after-action review to evaluate actions in response to a public health event, or as a routine management tool for continuous learning and improvement. Four formats of after-action reviews are described, including the debrief, working group, key informant interview and mixed-method after-action review. WHO provides accompanying toolkits containing materials to support the design, preparation, implementation and follow-up for each after-action review format.

Essential. Areas for improvement that require actions are those that will continue to impede capability performance if unresolved.

Tip. To suggest effective corrective measures, it is recommended that the root of the problem be identified by undertaking a root cause analysis to understand the reasons behind an issue.

2.5.2 Improvement plan

After areas for improvement and corrective measures have been identified, it is important to ensure that they are implemented. The improvement plan contains specific actions that will be taken by the organisation or the individual after the exercise in order to convert lessons identified into specific measurable steps to improve preparedness.

The improvement plan should include a corrective measure; a person, office or agency responsible; and a deadline for when each measure should be implemented.

Tip. The improvement plan must be based on the evaluation evidence provided by the participants' actions/comments and not the views and opinions of the exercise facilitators and/or exercise planners.

Checklist: improvement plan

During the creation of an improvement plan, the:

- Corrective measures are identified and agreed on
- Person, agency or responsible organisation is assigned
- Deadline for each measure's implementation is set
- All details are outlined in an improvement plan document.

2.5.3 Exercise report

As well as providing an overview of the FX, the report should focus on the analysis of core capabilities and lessons identified and include recommendations for corrective measures that the organisation can take in the short, medium and long term to improve emergency preparedness.

The exercise report should include the following sections:

- Background to the exercise
- Exercise participants
- Purpose, aim and objectives
- Type of exercise and scenario
- Evaluation process of the exercise project
- Overview of performance related to each objective and associated core capabilities
- Challenges (lessons identified)
- Agreed corrective measures (areas for improvement)
- Responsibilities for implementation (improvement plan).

Annex 2.12 contains the report from Exercise Artemis.

Essential. Be aware of any data protection regulations that you must comply with when writing the report.

Essential. The exercise report should be written as soon as possible after the exercise debriefs are complete.

Essential. Circulate the report and improvement plan as widely as possible and as early as possible (within four to six weeks).

2.5.4 Implementation and follow-up

In order to ensure the measures outlined in the improvement plan are implemented, strategic level support should be secured at the foundation stage to commit the required resources. Corrective actions set up in the improvement plan should be tracked to completion and reported.

Essential. Review the status of the improvement plan and encourage follow-up at a higher level.

Tip. To check on progress with the implementation and maintain momentum, it is recommended that an implementation meeting be organised three to six months after the FX.

Checklist: implementation

During the implementation stage, the following should be accomplished:

- Implementation meeting dates are agreed on
- Changes and improvements that result from the exercise are disseminated to sustain interest in the exercise programme
- Exercise materials are archived to add to a knowledge bank
- Lessons identified from the FX are shared
- Lessons identified database is updated

Tip. To check if the exercise project has been successful, the following question needs to be asked: 'Did the exercise result in any improvement in performance for the organisation, unit or individual (e.g. Was the emergency preparedness plan updated? Has this been validated in another exercise?)?'

2.6 Close the FX project

To close the FX project, conduct a debrief with the FX EXCON and planning team to identify lessons for improving or streamlining the whole planning process. This should be done as soon as possible after the cold debrief.

Conduct an expenditure and budget reconciliation.

Delete drafts and archive final versions of all exercise documents to add to a knowledge bank. Consider compiling all lessons identified in the FX in a central repository for planning and future reference.

Foundations for the next steps in the preparedness cycle should now be considered, depending on the outcomes of the FX. This could be:

- redrafting plans;
- identifying training needs from the FX;
- a further FX, building on lessons identified; or
- a tabletop exercise (TTX) based on lessons identified.

Essential. Even if real events have occurred in which lessons have been identified through an after-action review, continue with the preparedness cycle, which includes training and exercising, in order to validate any improvements made after the real event.

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Annex 1. Tabletop exercise (TTX) sample documents

- 1.1 Exercise Vector invitation letter
- 1.2 Exercise Vector planning meeting agenda
- 1.3 Exercise Vector scoping document
- 1.4 Exercise Vector MEL
- 1.5 Exercise Vector scenario and injects
- 1.6 Exercise Vector participant briefing
- 1.7 Exercise Vector facilitator briefing
- 1.8 Exercise Vector programme of the day
- 1.9 Exercise Vector exercise briefing presentation
- 1.10 Exercise Vector evaluation plan
- 1.11 Exercise Vector evaluation report template
- 1.12 Exercise Vector participant feedback questionnaire
- 1.13 Exercise Vector cold debrief (structured debrief) participant questionnaire
- 1.14 Exercise Vector cold debrief report template
- 1.15 Exercise Vector final report

Annex 1 documents are available for download from the ECDC Virtual Academy (EVA).

Annex 2. Functional exercise (FX) sample documents

- 2.1 Exercise Artemis planning meeting agenda
- 2.2 Exercise Artemis scoping doc
- 2.3 Exercise Artemis MEL
- 2.4 Exercise Artemis scenario
- 2.5 Exercise Artemis injects
- 2.6 Exercise Artemis participant briefing document
- 2.7 Exercise Artemis participant briefing presentation
- 2.8 Exercise Artemis controller briefing
- 2.9 Exercise Artemis evaluator briefing
- 2.10 Exercise Artemis evaluation report template
- 2.11 Exercise Artemis participant evaluation workbook
- 2.12 Exercise Artemis final report

Annex 2 documents are available for download from the ECDC Virtual Academy (EVA).

Annex 3. Bibliography on exercise design

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