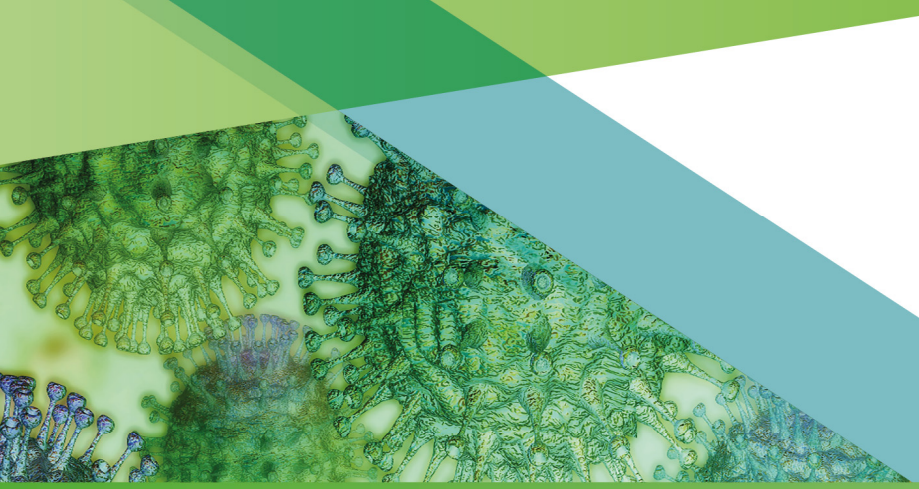


TECHNICAL REPORT

Conducting after-action reviews of the public health response to COVID-19: second update

December 2023

1. About this document

This document aims to support countries in designing after-action reviews (AARs) of the public health response to COVID-19. It has been designed to draw upon pre-existing ECDC guidance [1-4] and follows a methodological approach combining interactive workshops and interviews. The annexes feature practical implementation tools.

The production of this report involved a series of online meetings with ECDC National Focal Points for Preparedness and Response. An online consultation took place on 6 July 2021, and two online pilot workshops to assess an earlier version of the methods presented in this report took place on 14 and 28 March 2022.

This document updates and builds upon previous ECDC guidance focused on conducting AARs focused on COVID-19. In the early phases of the COVID-19 pandemic, in June 2020, ECDC published guidance on conducting in-action reviews (IARs) and AARs of the public health response to COVID-19 [3]. In recognition of the increased need to conduct IARs during the protracted response to COVID-19, ECDC published a detailed one-day IAR protocol in March 2021 [5]. Additionally, in recognition of the importance of the topic, ECDC published a protocol for conducting AARs focused on evidence-based decision-making in September 2021 [6]. Building on each of these documents, this report provides further details and tools (see Annexes) to support the implementation of robust AARs focused on the response to COVID-19.

As explained in our previous guidance [3,7], an AAR seeks to review actions undertaken during the response to an event of public health concern by objectively observing, analysing gaps and/or best practices and identifying areas for improvement in preparedness and response activities. An AAR does not seek to apportion blame but rather to identify learning opportunities and to contribute to the cycle of continuous quality improvement in emergency preparedness and response planning. AARs typically seek to address five common questions:

- What happened during the response (and what was supposed to have happened)?
- Why did it happen?
- What can be learned?
- What should change?
- Have changes taken place?

The approach we advocate here identifies the possibility of combining prioritised response areas into modules. The COVID-19 pandemic has been an unprecedented event in size, scope, and duration. Due to this, the design of an

Suggested citation: European Centre for Disease Prevention and Control. Conducting after-action reviews of the public health response to COVID-19: second update – December 2023. Stockholm: ECDC; 2023.

Stockholm, December 2023

ISBN 978-92-9498-669-6
doi: 10.2900/852374
Catalogue number TQ-03-23-467-EN-N

AAR for this event may differ from smaller events [1], as it will not be feasible to address all aspects of response in one AAR. It may be beneficial, therefore, to conduct multiple AARs to focus on different areas of the public health response and/or different jurisdictional levels.

The guidance presented here adheres to and draws upon previously identified best practices and covers all the phases of conducting an AAR, including dissemination strategies. In addition, this document has been informed by feedback from two online consultations about this topic among ECDC National Focal Points for Preparedness and Response.

The protocol and methodology proposed are fully adaptable across national and sub-national contexts The target audience of this protocol is public health experts from EU/EEA Member States, EU candidate and potential candidate countries, and European Neighbourhood Policy countries.

2. Defining the scope and purpose of an AAR of the response to COVID-19

2.1 Scope and objectives

The scope of this document covers AARs addressing the public health response to COVID-19 at national and sub-national levels. AARs encourage participants to prioritise aspects of an emergency response that were the most challenging and where improvement would be most rewarding from a health system perspective. Another aim of AARs is the identification and documentation of good practices and innovations that occurred during an emergency response.

This document aims to support the design of AARs focused on COVID-19 by helping AAR organisers to:

- identify questions to answer;
- review what went well;
- summarise what needs improvement;
- identify how to improve through a priority action plan; and
- share experiences.

The objectives for doing so are to:

- improve coordination and communication;
- support pandemic preparedness and response planning; and
- address key preparedness and/or research gaps.

2.2 Refining the focus of an AAR addressing the public health response to COVID-19

The topics that could be considered as part of an AAR have been identified in relation to existing World Health Organization (WHO) and ECDC groupings, as well as the core capacities noted in the International Health Regulations (IHR) [4]. In all, 13 topics were identified as particularly relevant for an AAR of the public health response to COVID-19 (Table 1), although this list is not exhaustive.

Table 1. Relevant operational topics for an AAR of the public health response to COVID-19

Operational response areas	
1.	Laboratory systems, diagnostics (including testing policies)
2.	Risk and crisis communication and community engagement (including social media)
3.	Special settings (e.g. points of entry, schools, prisons, migrant reception centres, clubs)
4.	Surveillance (e.g. epidemiological, microbiological, clinical)
5.	Outbreak investigation, including contact tracing
6.	Clinical management and hospital infection, prevention and control (IPC)
7.	Community IPC measures and non-pharmaceutical interventions (NPIs)
8.	Public health and biomedical research
9.	Vaccination deployment
10.	Planning, legislation, coordination, decision-making (including international collaborations)
11.	Human resources
12.	Logistics and incident management, including operational use of information and communications technology (ICT)
13.	Public health intelligence and risk assessment

Due to the complexity of the COVID-19 pandemic and the large number of topics identified, addressing all issues in a single AAR is not feasible. Instead, a modular approach can be utilised, whereby specific areas of focus are identified. Of the topics listed in Table 1, some are more operational subjects/activities while others are more cross-cutting in nature.

A matrix format to facilitate the selection of targeted areas to focus on in the AAR may be useful (Table 2). The number of vertical topics selected for a given AAR module should be deliberated; fewer topics allow for a more detailed and thorough insight, while more topics enable a greater breadth of scope.

Table 2. Matrix framework for refining the focus of an AAR addressing the response to the COVID-19 pandemic

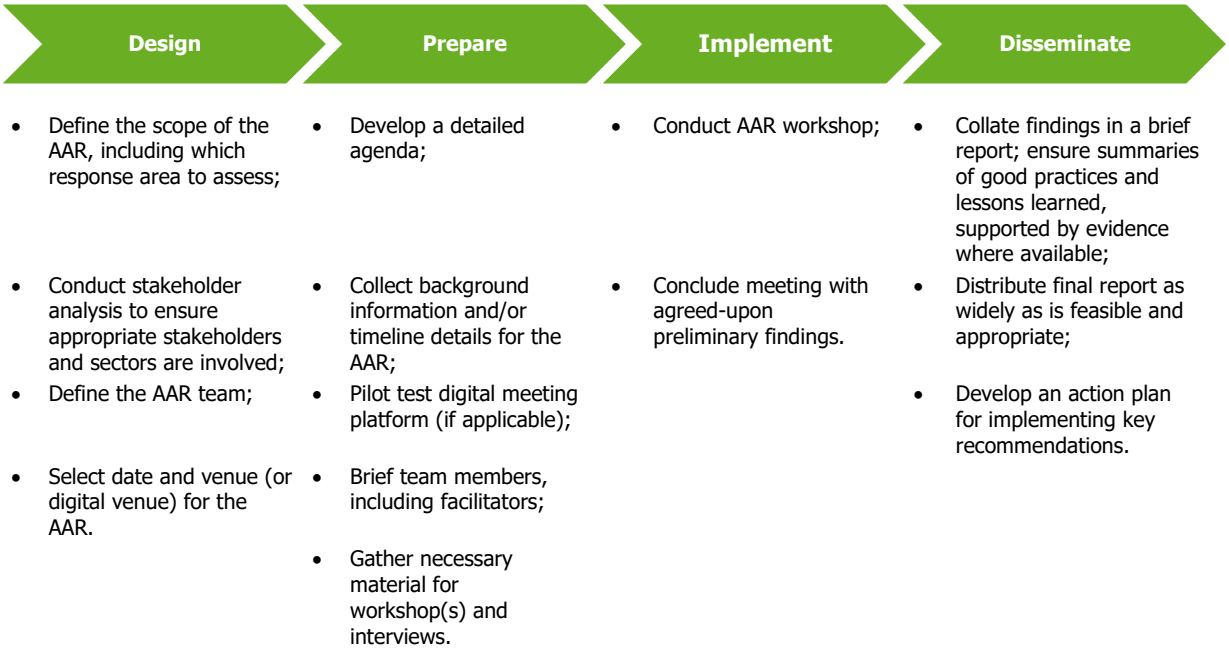
		Operational topics								
		Laboratory systems, diagnostics (including testing policies)	Risk and crisis communication and community engagement (including social media)	Public health intelligence and risk assessment	Surveillance (e.g. epidemiological, microbiological, clinical)	Outbreak investigation, contact tracing	Clinical management and hospital IPC	Community IPC and NPI measures	Public health and biomedical research	Vaccination deployment
Cross-cutting topics	Planning, legislation, coordination, decision-making including international collaborations									
	Human resources									
	Logistics and incident management including operational use of ICT									
	Special settings (e.g. points of entry, schools, prisons, migrant reception centres, clubs)									

3. Steps in implementing AARs

The discussion from section 2.2 provides a modular approach for conducting an AAR of the public health response to COVID-19. This means that multiple AARs can be conducted that focus on different areas and/or jurisdictions and/or pandemic timeframes.

The key steps to be taken for the implementation of an AAR include designing, preparing, implementing, and then proposing and disseminating findings (Figure 1). For each step, actions are defined that should be facilitated by specific implementation materials and tools. The AAR should be organised in a way to minimise the time commitment required from stakeholders, as they will likely have multiple demands. Based on previous experience of AARs [1], the AAR implementing team should be distinct from the stakeholders engaged to avoid overlapping roles.

Figure 1. Phases for designing and conducting an after-action review (AAR)



3.1 Phase 1: Design

3.1.1 Identifying the AAR lead and facilitators

An overall AAR lead should be appointed, belonging to the organisation responsible for organising the AAR. The overall AAR lead for defining the scope and objectives of the AAR, linking to senior management and to key stakeholders, identifying and instructing the lead facilitator and note-takers, overseeing the AAR workshop logistics, and developing the final report and action plan [7].

As noted in previous guidance [6], regardless of the length and type of AAR, discussions should be led by an experienced facilitator. As WHO suggests, a Lead Facilitator should be appointed [7]. The role of the Lead Facilitator is to support the AAR lead, develop trigger questions, brief any supporting facilitators or interviewers, lead the discussion during the AAR workshop, and to coordinate the final report writing.

Facilitators should be external to the agencies involved in the AAR. Ideally, facilitators would have strong understandings of public health systems, crisis management, and/or experience with relevant social science methodologies, such as in conducting qualitative interviews and focus groups. Facilitators should also have experience with self-reflexivity and positionality, be sensitive to power relationships and be as neutral as possible. They should thoroughly understand a constructivist approach to research and reporting so as to not take 'sides' between contrasting versions of events but rather to help to foster constructive discussion [8]. Note-takers should also be recruited to support the documentation and report-writing process.

3.1.2 Defining the scope

Once the decision to conduct an AAR has been made, a common understanding of the elements of the COVID-19 response that could be addressed in the AAR should be established (for example, through referring to the matrix presented in Table 2). This is the first phase (design) of the AAR process. This selection can be performed through

a prioritisation exercise during an interactive meeting organised by the experts planning the AAR and, ideally, high-level stakeholders interested in the outcomes from the AAR.

During this planning meeting, the following aspects should be addressed:

- Discussion on the scope of the AAR, selecting which response areas including what combination of vertical/horizontal areas will be prioritised (if applicable), timeframes, etc. to focus upon. Should it be helpful, some guidance for conducting a prioritisation exercise for the scope of an AAR is provided in Annex 1.
- Development of a roadmap for the implementation of the AAR in EU/EEA Member States, including defining the implementation team, identifying participants (through the AAR stakeholder matrix), setting the time and location of the AAR, and defining the desired outputs.

3.1.3 Identifying stakeholders

The second step in the design phase consists of identifying the stakeholders that will be involved, as well as those responsible for planning the AAR itself.

Based on past experiences of AARs [1], a standardised approach can be helpful in defining a comprehensive list of stakeholders to engage in the AAR. Once the response areas that will be focussed on have been identified, it is then possible to define potential participants in the AAR through the identification of relevant institutions at national/subnational level; the stakeholder matrix presented in Annex 2 can be a supporting tool. Following the mapping of stakeholders, a prioritisation of stakeholders could also be conducted.

3.1.4 Identifying a date and venue

An AAR for COVID-19 should be conducted during a period in which the epidemiologic situation is stable. Planning should start at least one month before the AAR takes place – additional time may be required depending on the AAR's scope.

AARs are most effective when conducted in-person. If this is not an option, consider the possibility of conducting the AAR virtually, e.g. by means of video or teleconferences and phone interviews. If being conducted in person, the team should ensure the venue is appropriate for the size and structure of the AAR, considering the need for plenary and group sessions and the requirement to present information as and when needed.

3.2 Phase 2: Prepare

The prepare phase of the AAR involves sorting out all the required logistical details, including sending out meeting invitations, ensuring the venue is appropriate, selecting and pilot testing any online or hybrid platforms that might be used during the AAR, and preparing and finalising a detailed agenda for the AAR.

During this phase the AAR project team should work in parallel to conduct background reading related to the specific response in question and prepare a provisional timeline of events and key discussion points. In addition, during this phase an assessment of which additional types of data will be used should be conducted, and necessary arrangements made to collect and analyse such data (Table 3).

It is recognised that people participating in in the AAR may be more comfortable and effective communicating in their native language during the discussions. Therefore, during the preparations for the AAR it is important to discuss the potential language barriers and ensure that interpreters and bilingual note-takers are part of the AAR team as needed.

Table 3. Forms of data collection

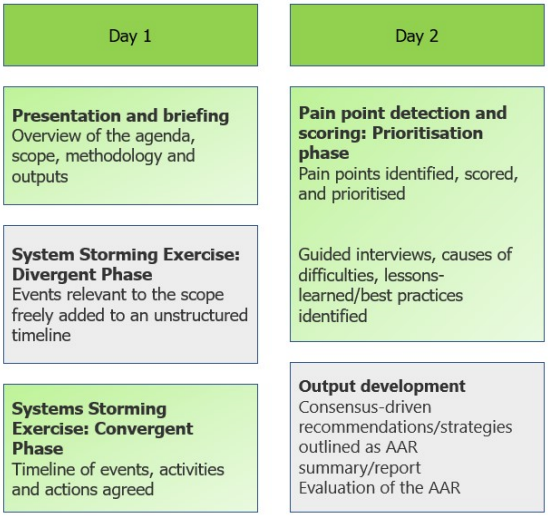
Data source	Examples	Key considerations
Documents	• Preparedness and response plans; • Standard operating procedures and protocols; • Technical briefings; • Meeting minutes; • Policy documents; • Response action reports that indicate lessons learned.	• Confidentiality of documents may not allow for all information to be used; • Keep track of sources; • Treat documents like interview transcripts in the analysis phase.
Stakeholder mapping	• Preliminary stakeholder map; • Expansion of preliminary stakeholder map after further data collection; • Lists of contacts (from participants); • Review of linkages from documents.	• Various techniques are possible, but will depend on capacity and the facilitator; • Formal social network analysis is time-consuming.
Timeline of events	• Events plotted onto a timeline and linked to the evidence available at the time, alongside the decisions introduced at each point in the response actions.	• Identifying the exact timeline of the decision-making process can be difficult if multiple factors have played a role.
Participatory consultation	• Participant observation in meetings; • Informal conversations; • Online exchange of information.	• Keeping notes is key; • Participants need to be aware of the purpose.
Complementary interviews	• Interviews with key stakeholders who could not attend the participatory consultation; • Formal stakeholder interviews, • External expert interviews.	• Semi-structured interview instrument is needed; • Informed consent required; • Making notes during the interview versus audio recording.
Focus groups	• Group discussions (with a maximum of eight people).	• Pay attention to hierarchies in group discussions; • Always include another observer who takes notes; • Record audio; • Focus on interaction, as well as content.

3.3 Phase 3: Implement

3.3.1 Two-day workshop structure

This implementation protocol is built on methodological elements described in the ECDC IAR one-day implementation protocol [6]. However, given that more in-depth analysis is required in an AAR, a two-day format is needed and is presented here (Figure 2).

Figure 2. General structure of the AAR COVID-19 workshop in a two-day format



3.3.2 Workshop methodology

Day 1

Presentation and briefing

During the opening session of the AAR workshop, the implementing team should welcome participants and ensure that there is clear understanding of the AAR process and everyone's individual roles. The implementing team should also present the agenda, scope of the AAR, the response areas being covered, an overview of the methodology and explain the expected outputs from the AAR. Participants should introduce themselves and which organisation/department they represent.

Plenary participatory exercise: divergent and convergent phases

Following the welcome and briefing, participants will conduct an activity adapted from the event-storming approach [3], which is a workshop-based method that provides a participative and dynamic integration of different points of view and reflections on actions that were undertaken to prepare for and respond to complex events, such as the COVID-19 pandemic [6]. Through this process, current best practices, gaps, and lessons learned can be identified. The sectors prioritised in the AAR design phase (Step 1)[i] should be included in this exercise.

An advantage of this approach is that it is interactive, which provides an opportunity for participants to re-think how they usually interact with each other while coming to a better understanding of each other's work. Such interactions may also facilitate the sharing of different perspectives. For this to be successful, enough time should be allocated for the internal discussions allowing participants to freely express opinions (divergent phase) and gradually come to consensus (convergent phase).

In this phase or at a later stage, it might be necessary to divide the group into smaller parallel working groups so that multiple topics can be addressed during the AAR. Parallel working groups can also create a more conducive environment for open communication and in-depth discussions resulting in more focused deliberations. To ensure the open discussion of all findings, each working group should present a summary of their findings to the whole AAR group during plenary sessions. Thus, if it is anticipated that there will be a need for parallel working groups during the planning of the AAR, then it may be beneficial to incorporate multiple parallel group sessions alternated with plenary sessions in the agenda ahead of the AAR.

Divergent phase

For the scope and scale that is being assessed (e.g. the prioritised response area and time perimeter decided in the planning phase, e.g. the first year) in the divergent phase, participants are encouraged to brainstorm and freely discuss relevant events that happened[ii]. Participants are guided to add (physically or digitally) events relevant to the prioritised response areas to an unstructured timeline (e.g. with yellow sticky notes).

[i] Tips for facilitation: To facilitate a spontaneous reconstruction of the defined timeline, including alternative perspectives based on the participant experiences, it is advised that facilitators refrain from preparing a pre-defined timeline or too much guiding materials in advance. Doing this, or guiding the discussion too forcibly, would limit the reconstruction of subjective experiences.

[ii] Tips for facilitation: Should facilitators not be overly familiar with the dynamics of the events being discussed, it is advised that they should prepare in advance studying national documentation or internationally available evidence (e.g. the joint ECDC-JRC response measures database) in order to be able, when needed, to interact to smoothen and facilitate discussions.

Figure 3. Example of a timeline of 'events' developed by participants for a COVID-19 AAR prioritising the following response areas: surveillance and public health intelligence/risk assessment with a timeline covering from the start of the epidemic until the end of the first acute phase

Convergent phase

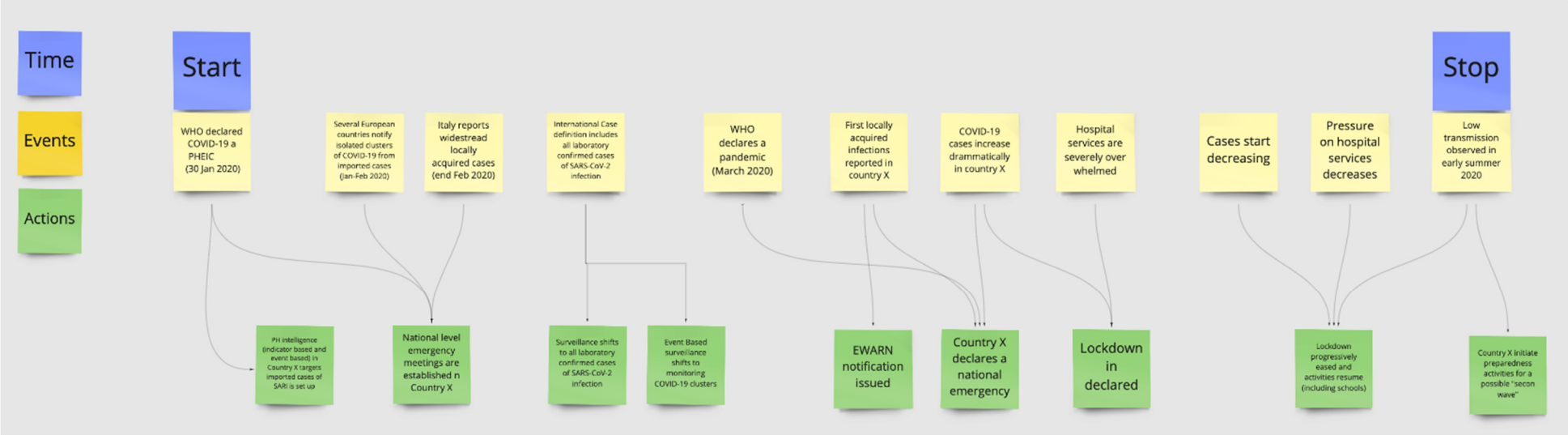
Following the compilation of the unstructured timeline, the exercise follows a convergent phase where participants are left free to propose and adopt changes to the timeline, until through collective revisions, participants reach an agreement on a common view of the event without external influence (Figure 3).

The purpose of this activity is twofold:

- At a tangible level it aims to understand which events, activities or problems have been recognised as crucial by: (i) all the stakeholders; (ii) subset of participants; and (iii) specific actors. It also provides insights about which activities or moments should be discussed and addressed through specific recommendations in the subsequent 'Propose' phase of the AAR workshop (section 3.4 below). Moreover, this activity provides a first opportunity to build a common timeline of the whole process triggered during the COVID-19 pandemic.
- At an intangible level, the activity is crucial to set the AAR as a participatory and open process where all the experiences and opinions are fairly treated and collected, and divergent perspectives are encouraged.

Following the same divergent to convergent approach, participants are then asked to map in relation to the 'events' (i.e. the yellow sticky notes) the 'Actions' that took place, in other words the activities that were put in place in response to an event, or actions that triggered an event on the timeline (e.g. with green sticky notes), as shown in Figure 4.

Figure 4. Example of a timeline of 'events' and 'actions' developed by participants for a COVID-19 AAR prioritising the following response areas: surveillance and public health intelligence/risk assessment with a timeline covering from the start of the epidemic until the end of the first acute phase



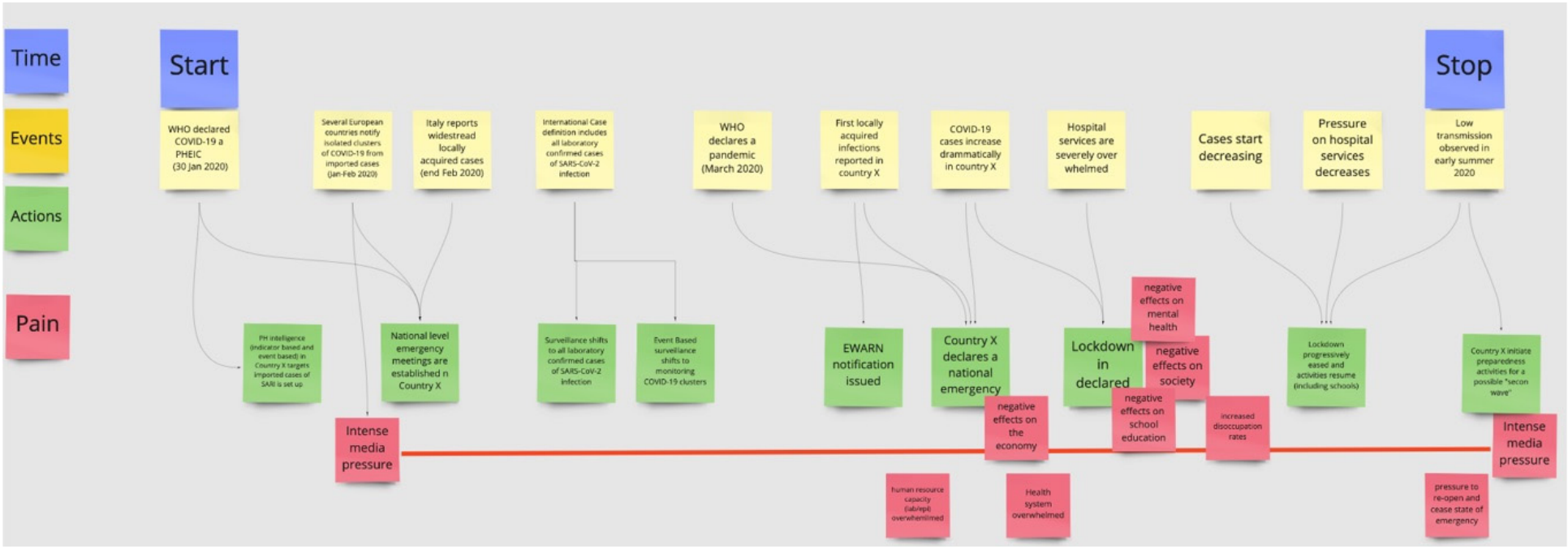
Day 2

Pain point detection and scoring: Prioritisation phase

Once the common timeline highlighting the main events that happened and actions performed has been constructed on Day 1 (Figure 4), participants are guided through the prioritisation phase, where issues or challenges named 'pain points' are identified and prioritised. Although this phase is primarily to identify challenges, it is possible that good practices may also be identified through the discussions and these should also be captured and summarised in the final report; best practices should be collected using a different coloured sticky note to events, actions, or pain points.

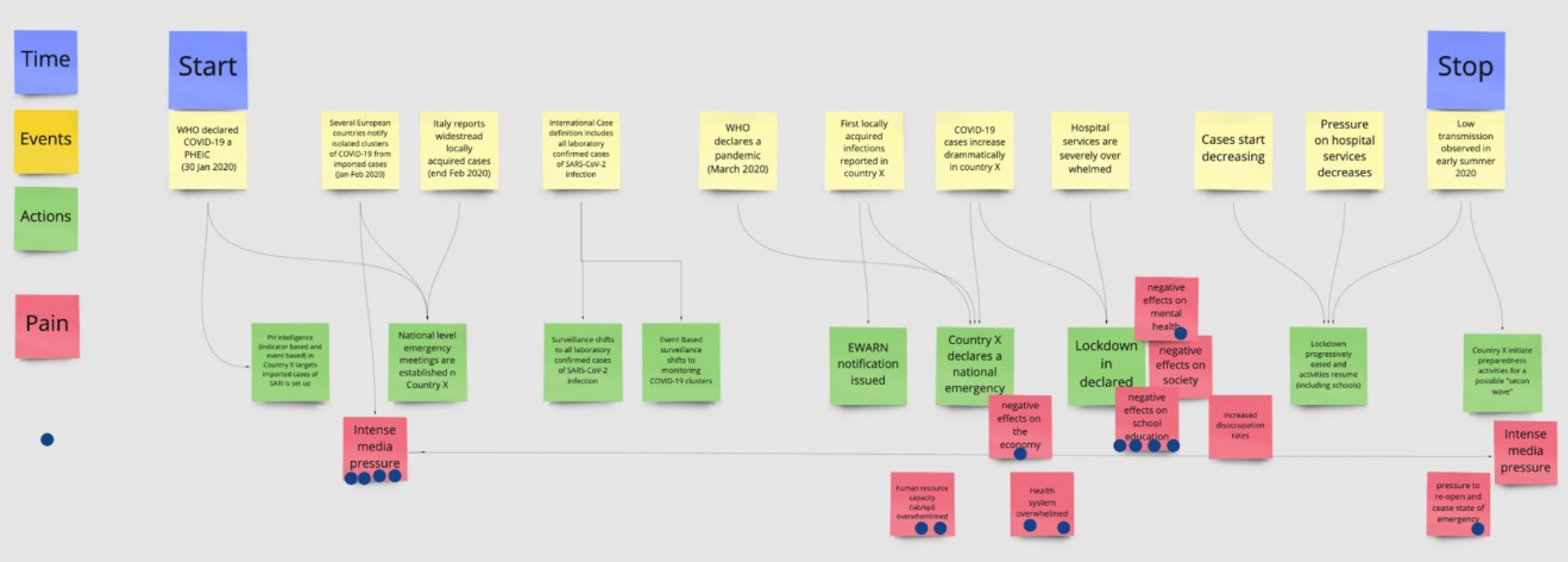
For this exercise, participants are first asked to consider what didn't go as planned and why. Once an issue is identified, they are asked to place it (e.g. using a red sticky note) in relation to the events and/or activities that have been mapped (Figure 5), explaining the problems identified. Any best practices that are identified during discussions can also be placed in relation to the events and/or activities that have been mapped.

Figure 5. Example of a timeline of 'events', 'actions' and 'pain points' developed by participants for a COVID-19 AAR prioritising the following response area: surveillance and public health intelligence/risk assessment with a timeline covering from the start of the epidemic until the end of the first acute phase



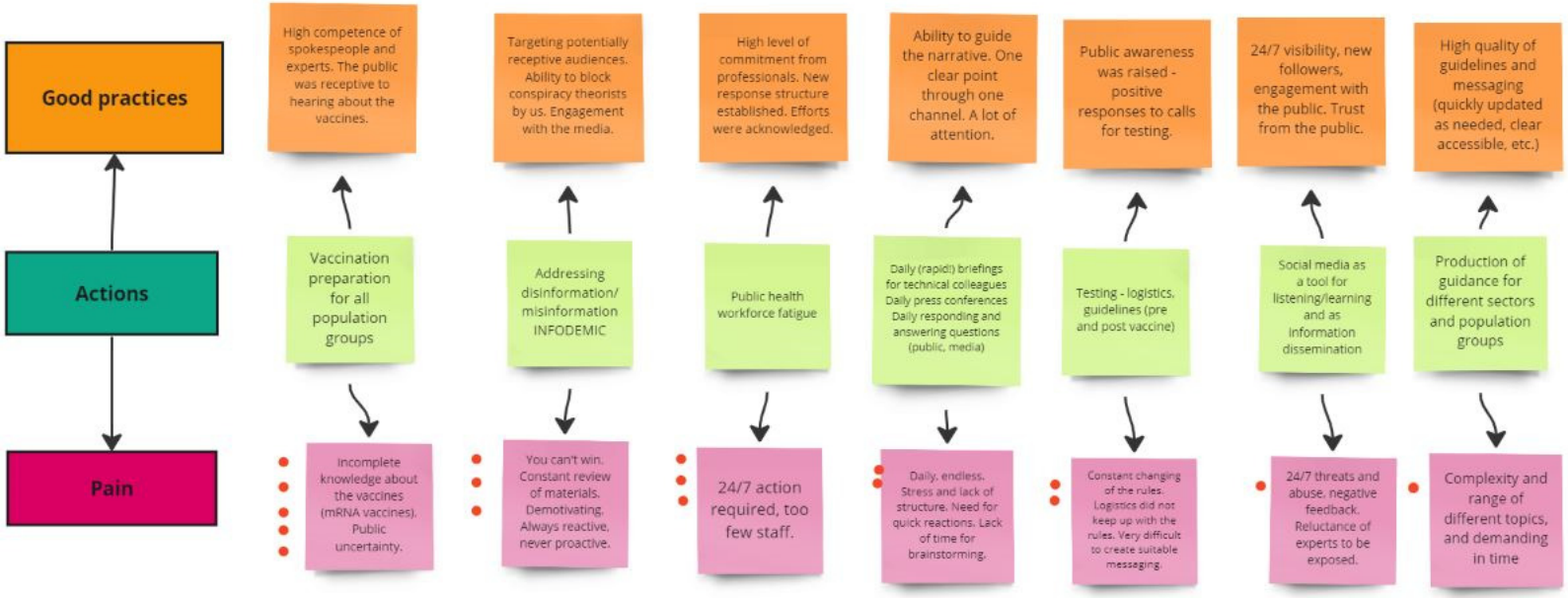
These issues (or 'pain' points) are then scored [3] by participants using sticky dots. Each participant will have a small number that they can place on one or more pain points that they felt were most relevant and on which to focus subsequent discussion (Figure 6). Participants can choose to put all the dots on one pain point or spread them across different ones.

Figure 6. Example of a timeline of 'events', 'actions' and scored 'pain points' developed by participants during an online COVID-19 AAR prioritising the following response areas: surveillance and public health intelligence/risk assessment with a timeline covering from the start of the epidemic until the end of the first acute phase



An example of what a timeline may look like with 'events', 'actions', 'pain points' and 'good practices' included can be seen in Figure 7.

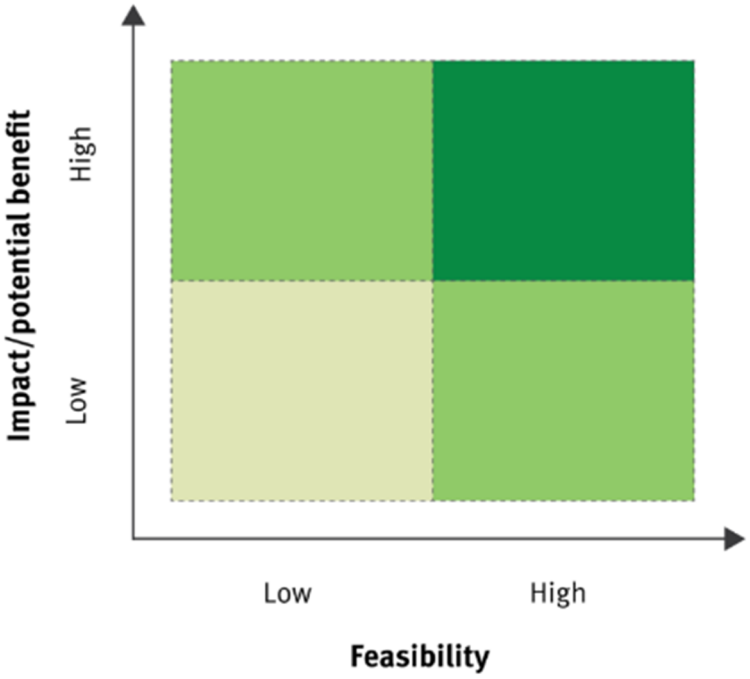
Figure 7. Example of 'actions', scored 'pain points', and 'good practices' developed by participants during a COVID-19 AAR prioritising the risk communication and community engagement response areas



A final step in this exercise is to categorise the issues to be taken forward. This involves a 'pain point' mapping. Participants place the prioritised 'pain points', identified in a matrix, with the public health benefit from addressing the measure on one axis, and the feasibility of addressing the 'pain point' and/or extending good practices on the other axis (Figure 8). For example, using this method, activities identified in the top right quadrant would be items that may allow for 'quick wins' to optimise the public health response.

Participants take each issue and map it on the 'pain point' matrix (Figure 8 below). It is important to capture any rationale for placing the issue in a particular place on the matrix, as this will feed into the final step. The advantage of using this approach is that it enables all participants to reach a consensus in a very short time. It also makes it possible to identify and prioritise the main issues to address in the next step, while also highlighting some quick wins (top right quadrant). Best practices, once identified, could be collected in a separate reporting form (**Annex 5**) to ensure that they are documented alongside pain points.

Figure 8. Example of a 'pain point' matrix



Guided interviews

The focus of this phase is to establish – starting from the negative outlooks prioritised by participants in the previous step – the root causes of the difficulties encountered, the solutions adopted, and the lessons-learned/best practices that subsequently emerged. This exercise supports the gathering of data that can be helpful in consolidating successful solutions and planning actions to address remaining elements of concern.

To this aim, the trigger questions proposed for the AAR (**Annex 6**) are structured consistently across three timespans: prior to the response, during the response, and learning from the response.

Participants are therefore encouraged to reflect not only on what happened during the defined timeframe of the AAR but also on a broader scale, to gauge the elements of change and innovation that the pandemic event has triggered.

3.4 Propose and disseminate

Among the most important outputs that an AAR of the public health response should produce to support the work of Member States are consensus-driven recommendations/strategies, best practices/success factors, a report of lessons identified, and action plans.

The facilitators in the 'propose and disseminate' phase will gather data in a standardised fashion to facilitate the development of the desired AAR outputs. The reporting templates (Table 4, or an alternate version in Annex 4) are designed to facilitate the achievement of these outputs.

Table 4. AAR reporting form

Timing	Issue (pain point)	Proposed action to address this issue	Objectives of the proposed action	How to assure implementation of this action, and/or to increase feasibility?
For short-term implementation (1–2 years)	1.	-	-	-
	2.	-	-	-
	3.	-	-	-
For mid-term implementation (2–5 years)	1.	-	-	-
	2.	-	-	-
	3.	-	-	-
For long-term implementation (5–10 years)	1.	-	-	-
	2.	-	-	-
	3.	-	-	-

Propose: development of consensus-driven recommendations/ strategies, best practices/success factors, action plans

Building on all the elements that have emerged from the Reflect step, the facilitators will support participants in the distillation of best practices/success factors and in the development of consensus-driven recommendations/strategies.

Based on those findings, the participants will be led into roughly outlining the key elements of a mid to long term action plan for implementation of those recommendations (Table 4).

This step can be started at the end of the (face to face or online) AAR workshop (Figure 2), and then followed up in the following weeks with participants by requesting feedback to compile the one-page reporting and roadmap (Table 4). In this way, additional time can be allowed to consider, and reflect on, the issues and best practices identified, the potential solutions and support consensus among participants.

As the final step of the AAR, or shortly afterwards if there is a lack of time, an evaluation of the exercise itself is advised (AAR evaluation form Annex 3).

Disseminate: Produce a report of results

After the AAR, the notes and outputs should be collated by the implementing team into an AAR final report. Given the modular and focused nature these studies Member States that have conducted prior AARs on COVID-19 can use and cite the content of those reports, if relevant, to develop the latest AAR report.

Ideally, the AAR final report should be disseminated as widely as is feasible as appropriate, based on the scope and scale that is being assessed. As a good practice the project team may consider the appropriate means and recipients for the dissemination of the report in the planning phase and informed by the stakeholder matrix. The project team should ensure participants all participants are aware of the dissemination plan for the AAR final report.

Implement: convert findings into an action plan

To ensure that priority actions from AARs are implemented, it is suggested that the activities identified in the roadmap for next steps (Table 4) is integrated into institutional action plans and into processes such as National Action Planning for Health Security (NAPHS) [9]. This may require subsequent meetings with relevant stakeholders to further prioritise activities according to their potential impacts, timelines, and resources required. As activities are agreed upon and initiated, progress should be monitored and evaluated on a regular basis.

4. Conclusions and potential implications

AAR represent an important opportunity to improve public health preparedness, response and recovery capacities and systems. The COVID-19 pandemic was an unprecedented public health event in size, scope, and duration. It is not feasible to address all aspects of the public health response to COVID-19 in one AAR. To ensure focus and participation of relevant stakeholder, multiple AARs could be conducted. Following this approach, this document outlines a standardised modular format, to support countries to conduct multiple AARs, with each AAR focusing on different areas of the public health response, and/or different jurisdictional levels.

This modular format reflects the complexity of the public health response to COVID-19 and outlines a wide range of possible response areas for an AAR, including cross-border and cross-sectoral matters.

The protocol and methodology proposed in this document are adaptable across EU/EEA country contexts, and could also be applied to other public health events.

Any assistance needed or clarifications needed by from EU/EEA countries related to AAR in general and the implementation of the format outlined in this document can be directed to the Emergency Preparedness and Response Section at ECDC (preparedness.response@ecdc.europa.eu).

Authors and acknowledgments

This report was commissioned by the European Centre for Disease Prevention and Control (ECDC) to Istituto Superiore di Sanita (ISS) under service contract ECD.11911.

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Acknowledgements:

ECDC would like to thank its National Focal Points for Preparedness and Response and to our colleagues at the WHO Regional Office for Europe for providing very helpful input through the production of this report.

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Annex 1. Prioritisation tool for response areas to focus on during the AAR

This simple **prioritisation tool** has been developed to support Member States wishing to perform an AAR in the selection of the most relevant sectors to address in the AAR.

This tool was developed keeping in mind best practices in prioritisation processes [10] and the need for a simple scoring framework**.** This tool includes the following: Criteria for prioritisation, Scoring sheet, an Excel tool for rapid scoring.

Criteria for prioritisation

Three simple criteria are proposed to guide prioritisation of response areas to focus upon:

- Criterion 1. This response areas constitutes an area that represented a **challenge** to implementing a timely and effective COVID-19 response in the country.
- Criterion 2. Investment in activities targeting this response area would have a **high impact** in enhancing preparedness and response capacities (e.g. **generate sustainable results**).
- Criterion 3. Implementing activities targeted at increasing capacities and capabilities for this response area would be **feasible** in the current context.

Sample scoring sheet

Scoring sheet (score from 1 to 5 as follows: 1 – Strongly disagree; 2 – Disagree; 3 – Neither agree nor disagree; 4 – Agree; 5 – Strongly agree)

	Criterion 1. This response areas constitutes an area that represented a challenge to implementing a timely and effective COVID-19 response in the country	Criterion 2. Investment in activities targeting this response area would have a high impact in enhancing preparedness and response capacities (e.g. generate sustainable results)	Implementing activities targeted at increasing capacities and capabilities for this response area would be feasible in the current context	Final score (sum of all scorings for the same gap)
Prioritisation of vertical response areas				
Laboratory systems, diagnostics (including testing policies)				
Risk and crisis communication and community engagement (including social media)				
Special settings (e.g. points of entry, schools, prisons, migrant reception centres, clubs)				
Surveillance (e.g. epidemiological, microbiological, clinical)				
Outbreak investigation, contact tracing				
Clinical management and hospital IPC				
Community IPC and NPI measures				
Public health and biomedical research				
Vaccination deployment				
Prioritisation of horizontal response areas				
Planning, legislation, coordination, decision-making including international collaborations				
Human resources				
Logistics and incident management, including operational use of ICT				
Public health intelligence and risk assessment				

Annex 2. Stakeholder mapping matrix

Response area		Sectors (to fill in with relevant institutions related to the selected response areas of focus						
		Political/central government/relevant authority/civil protection (could include high-level scientific boards mainly supporting government decisions/law-making)	Public health decision-making (national e.g. high-level Ministry of health; sub-national eg state health authorities) including those in charge of vaccination	Epidemiology (e.g. technical level of the Ministry of Health; Institute of Public Health, sub-national state epidemiologists)	Microbiology (e.g. technical level of the Ministry of Health; national reference laboratory, subnational reference laboratories) including when appropriate both human and animal health	Clinical management (national clinical centres for infectious diseases, hospitals, national medicine agencies)	Research (public and private) and industry (including but not limited to pharmaceutical companies and main actors in the provision of PPE)	Other (include other relevant authorities/ institutions if needed)
1	Laboratory systems, diagnostics (including testing policies)							
2	Risk and crisis Communication and community engagement (including social media)							
3	Special settings (e.g. points of entry, schools, prisons, migrant reception centres, clubs)							
4	Surveillance (e.g. epidemiological, microbiological, clinical)							
5	Outbreak investigation, contact tracing							
6	Clinical management and hospital IPC							
7	Community IPC and NPI measures							
8	Public health and biomedical research							
9	Vaccination deployment							
10	Planning, legislation, coordination, decision-making including international collaborations							
11	Human resources							
12	Logistics and incident management including operational use of ICT							
13	Public health intelligence and risk assessment							

Annex 3. AAR evaluation form

This form can be used at the end of the participatory consultation to gather participants' views on the effectiveness of an AAR, in order to improve the process in the future. This form was adapted from WHO, 2019 [7].

1. To what extent do you agree that the focused AAR reached the following objectives? Please use a scale of 1 (fully disagree) to 5 (fully agree).

1 = Fully disagree to 5 = Fully agree	1	2	3	4	5
The AAR allowed participants to identify challenges and gaps encountered during the course of the response.					
The AAR allowed participants to share experiences and best practices encountered during the course of the response.					
The AAR contributed to strengthening interdisciplinary collaboration and coordination between relevant stakeholders involved in the response.					
The AAR contributed to strengthening collaboration and coordination between sectors (health, civil protection, environment, law enforcement, etc.) and governance levels (national/local) involved in the response.					

2. How effective were these aspects of the focused AAR in achieving the objectives? Please use a scale from 1 (low) to 5 (high).

1 = Low to 5 = High	1	2	3	4	5
Presentations on the methodology and process of the AAR					
Session 1: Introduction					
Session 2:					
Session 3:					
Session 4:					
Session 5:					
Session 6:					
The number of participants					
The profile of participants, as related to the function of the response examined					
The AAR methodology Please specify:					

3. Would you use this AAR methodology for other public health emergencies in your country?

Yes/no

Please specify:

4. Do you think the results of the AAR can contribute to the following objectives? Please use a scale from 1 (low) to 5 (high).

1 = Low to 5 = High	1	2	3	4	5
Strengthening preparedness and response capacity					
Strengthening coordination and collaboration mechanisms					
Strengthening preparedness and preparedness plans					
Empowering individuals to better appreciate the challenges of emergency response					
Other (please specify):					

5. Other comments/suggestions on the AAR methodology:

6. Other comments on the results of the AAR:

Thank you!

Annex 4. One-page AAR reporting form

Response area addressed in the AAR			
REFLECT: Summarising findings			
Best practices/success factors			
Issues			
Lessons identified			
PROPOSE: roadmap for the next steps			
• **Issue**	• **Action**	• **Objective**	• **How to increase feasibility**
For immediate implementation			
For mid-term implementation			
For long-term implementation			

Annex 5. Summary table for collecting best practices

Best practice	Details on how and why best practice was implemented	Activities required to maintain or incorporate this best practice into routine planning

Annex 6. Trigger questions to guide AARs focused on the public health response to COVID-19 in European settings

Trigger questions are used to guide discussions during an AAR. They are designed to be open-ended. Based on the scope and objectives of the AAR, the most appropriate response areas and trigger questions should be selected. The questions presented below are fairly comprehensive, and only a small subset would probably be appropriate for any given two-day AAR exercise.

The trigger questions presented here were originally published in ECDC's guidance 'Conducting in-action and after-action reviews of the public health response to COVID-19', but they have been slightly updated below, including introducing a series of trigger questions around vaccination.

Response area (ECDC)	Aspects addressed	COVID-19 AAR macro-grouping	Questions
Overall		**All**	• Overall, what were the major perceived successes during the emergency response? What went well and why did it go well? • What were some of the main challenges of the response? Why were they a challenge? • Where do you think improvements are still needed? What would be needed to make these improvements happen? • What lessons did you learn during the COVID-19 pandemic that would be applicable in future emergencies? • What are the specific actions to be taken now in order to improve future response capacity?
Emergency preparedness planning and national coordination	**Preparedness planning**	**Planning, legislation, coordination, decision-making including international collaborations**	**Prior to the response** • Were pandemic preparedness plans/emergency preparedness and response plans developed and regularly and systematically tested within the health sector and across other sectors? • Had preparedness plans incorporated lessons learned from recent relevant outbreaks? If so, had the lessons learned been communicated to relevant stakeholders? • When was the last time the plan had been updated and/or tested? • Did an emergency preparedness and response plan for responding to a novel viral respiratory threat exist? If yes, was it flexible enough to be applied during the COVID-19 pandemic? • Was hospital preparedness a main component of the emergency preparedness and response plan? Were health system contingency plans reviewed and updated in accordance with risk assessments for COVID-19? Were there plans to ensure the continuity of essential medical services (incl. emergency medical and surgical services and vaccinations)? • Were there plans for communicating and coordinating with other sectors? Were there lists of contacts for all relevant sectors in the country to identify actions and decision-making authorities and to ensure effective coordination and information exchange?

			• Were business continuity plans developed for non-healthcare settings? • Did emergency preparedness and response plans account for the phasing of public health strategies during a pandemic, such as threat containment and threat mitigation? **During the response** • If there was a plan, was it followed in the response to COVID-19? Why or why not? • Which were the most critical elements of the plan to guide response measures? • Which elements of the plan had to be modified and which were applied as planned? If response measures diverged from the plan, how was this justified? • Was the plan effective in ensuring a coordinated national response to COVID-19? **Learning from the response** • What do you see as your main institutional strength in terms of preparedness for a respiratory virus pandemic? • Which elements of preparedness were the main enablers of the response? • What could be done to improve emergency preparedness planning in the future? • Did the response to COVID-19 expose any good practices or gaps in the preparedness process and existing plans?
	Legislation and policy	**Planning, legislation, coordination, decision-making including international collaborations**	**Prior to the response** • Was a national/subnational legal framework available and sufficient to enforce measures decided at national committee level? • What national/subnational legislation and policies exist for enabling the response to COVID-19? Did they enable effective threat detection, assessment and response? **During the response** • What was the process for sharing scientific data and recommendations with policy-makers and national leaders? • Were new laws and policies adopted during the response? If yes, please describe the decision-making process (e.g. evidence and rationale, timing, influencing factors, etc.)? **Learning from the response** • How did the existing and/or newly adopted legislation and policies enable the response? • If applicable, what were the mechanisms for policy monitoring and evaluation? How did this knowledge improve policy efficiency and effectiveness? • Did the pandemic lead to long-term changes in legal frameworks and policies, if yes, how?
	National coordination	**Planning, legislation, coordination, decision-making including international collaborations**	**Prior to the response** • Was there a national planning committee or structure within the Ministry of Health or under another authority (such as Ministry of Interior, Civil Protection) that has a coordinating role for respiratory virus preparedness and response? Details? • Was there regional or district planning for pandemic preparedness? Were the plans intersectoral? Which institutions were involved?

			• To what extent is there national involvement in sub-national planning and coordination? • How was coordination managed at local and regional level and between local, regional and national level and how well did it work? Was two-way communication between local/regional and national authorities established and tested? • Were the lines of command and control for the COVID-19 response established and communicated to all relevant stakeholders? • Was the readiness and capacity of the public health and healthcare systems to implement response measures for COVID-19 assessed and monitored? Were the resources (human, financial and material) sufficient to adequately coordinate the response operations at each level? **During the response** • Was a national crisis team and/or emergency coordination mechanism (e.g. emergency operations centre, task force) for responding to COVID-19 established or activated and did it include public health authorities? • If so, when was it activated and on what basis? Was the team intersectoral/multi-disciplinary? Was there a coordinating role for preparedness/surveillance/response? Please provide details (e.g. lead institution, contributing institutions, means of communication, frequency of meetings, reasons for meetings). • How was subnational collaboration ensured throughout the response? • How were emergency response activities managed at subnational level? **Learning from the response** • If there was a coordination mechanism, was it effective? Why or why not? • Did the established coordination mechanism enable rapid information exchange between the national crisis team and stakeholders/sectors, and decision-makers? If not, what were the main challenges? • How could national coordination be improved?
International coordination and collaboration	**International coordination**	**Planning, legislation, coordination, decision-making including international collaborations**	**Prior to the response** • Were any plans in place for communicating and coordinating with neighbouring, EU, and other countries in the event of a pandemic or a Public Health Event of International Concern? Please provide details. • Had any joint work, training, or simulation exercises been conducted related to pandemic preparedness or respiratory viruses with neighbouring, EU, or other countries? • Did the Ministry of Foreign Affairs or Ministry of Health have a dedicated focal point for communicating and/or coordinating with neighbouring, EU or other countries during a pandemic or Public Health Event of International Concern? • To what extent had the Ministry of Foreign Affairs been involved in pandemic preparedness simulation exercises or training events with neighbouring, EU or other countries? • Were memorandums of understanding or other agreements in place between your national public health agency and other national public health agencies globally to exchange information during a health crisis?

			During the response • What international partners (e.g. WHO, ECDC, neighbouring, EU, other countries) did you coordinate with during the outbreak? On what topics? • How were the information flows and collaboration (both formal – e.g. IHR and EWRS, and informal) with international partners? • What epidemiological information was available from international partners? • Was information about potential response measures shared with neighbouring countries? • Were any arrangements in place in relation to issues such as enhancing or pooling the availability of laboratory support, hospital surge capacity and clinical case management, protective equipment? **Learning from the response** • How effective was the coordination between the Ministry of Health, Public Health Agency, and the Ministry of Foreign Affairs? • Was information sharing with international partners effective? Was information timely and relevant? • What dimensions in international coordination went well, and what could be improved?
Cross-sectoral coordination and collaboration	**Cross-sectoral coordination**	**Planning, legislation, coordination, decision-making including international collaborations**	**Prior to the response** • Were there pre-existing cross-sectoral arrangements in place relevant to pandemic preparedness, respiratory viruses, and/or Public Health Emergencies of International Concern? • Were there national coordinating structures within government for the maintenance of non-health-related essential services in the event of a severe pandemic (e.g. power supply, transport, civil protection, food distribution, tourism industry, education)? • Had designated points of entry and the transportation sector participated in pandemic preparedness planning, training, or simulation exercises where issues such as entry screening were discussed? **During the response** • Which sectors did the public health sector collaborate with in the response to COVID-19? On what topics? • Were any decisions taken to implement entry/exit screening measures, quarantine individuals, or close transportation links to certain countries? How were these decisions made and implemented? • Were any actions taken to ensure business continuity across sectors? How were these actions decided upon and implemented? • Were lines of responsibility clear in instances of cross-sectoral decision-making? **Learning from the response** • Are there any examples of effective cross-sectoral action taken in the response to COVID-19?

			• Are there any examples of sub-optimal cross-sectoral action in the response to COVID-19? • What can be improved upon?
Strategic national stockpiles	**stockpiles**	**Logistics and incident management, operational use of ICT**	**Prior to the response** • Was there a national inventory and mapping of the available resources for emergency response? Did this mapping address resources and capacities relevant to the response to COVID-19, including expertise, staff, logistics, medical equipment, finance, and facilities? • When was the last mapping of resources conducted? Which sectors participated? • What was the status of stockpiling with respect to pharmaceuticals, protective equipment and other equipment prior to COVID-19? • What provisions were made with respect to stocks of vaccinations, pre-ordering/licencing/import of drugs and vaccines and protective equipment? **During the response** • How were national stockpiles assessed, monitored and reported on during the COVID-19 pandemic? How was this assessed at subnational level? Who was in charge of assessments and who were shortages reported to? • How were shortages addressed and communicated to those affected (e.g. healthcare workers)? How was the availability of medical equipment (e.g. ICU equipment, personal protective equipment (PPE), vaccines and therapeutics, laboratory supplies) ensured during the pandemic? • Which procurement mechanisms and agreements (e.g. EU Joint Procurement Agreement, rescEU stockpile, existing bilateral and regional agreements) were used? How were resources distributed in the country? **Learning from the response** • What were the main challenges related to national stockpiles? Which were the most critical shortages and how did they affect the response to COVID-19? • Which were the most critical steps before or during the response to ensure the availability of strategic national stockpiles? • What could be improved?
Incident management	**Emergency Operations Centres**	**Logistics and incident management, operational use of ICT**	**Prior to the response** • Was there an incident management system in the health sector at the national and subnational level? • Had a national emergency operations centre or equivalent structure been established? If yes, had emergency operations centre plans, activation and functions at the national level been tested and updated in the past two years? Were emergency operations centres available at the subnational level with plans and standard operating procedures (SOPs), resources and staff trained in emergency operations centre SOPs? • Were exercises (e.g. table top exercises) conducted at least annually to test emergency response capabilities at all levels? If yes, were corrective actions to update plans and strengthen capacities developed and implemented following the exercises?

			• Was there a dedicated coordination mechanism under the national health emergency operations centre for activation and coordination of emergency medical teams (EMTs) (such as an EMT Coordination Cell)? **During the response** • How long after the receipt of an early warning or information of an emergency did it take for the emergency operations centre to be activated? Was it activated within 120 minutes? • Were emergency operations centre operations sustained for the duration of the COVID-19 pandemic? • Describe scenarios or triggers for activation of emergency response. Are there multiple levels of emergency response activation? • What was the procedure for decision-making in the emergency operations centre? • Was the organisation able to convene participants from ministries and agencies of all relevant sectors and other national and multinational partners as appropriate? **Learning from the response** • What were the main challenges for the emergency operations centre during the response? What worked well? • Were the available resources (equipment, trained staff) sufficient to ensure effective and efficient management of emergency response operations during the COVID-19 pandemic?
Situational awareness	**Epidemic intelligence, early warning and epidemiologic modelling**	**Public Health Intelligence and Risk Assessment**	**Prior to the response** • Do you have a regular early detection activity at regional national and international level? • Who was responsible for early warning of emerging pathogens? • How is information from early warning and epidemic intelligence routinely disseminated and analysed? • Was there an epidemic intelligence system in place to detect potential threats? • What agreements were in place for exchanging early warning alerts and epidemic intelligence data with WHO, ECDC, neighbouring, EU and other countries? • Does your country have access to EWRS? • When did you first learn of cluster of atypical pneumonia in China and COVID-19? How? • In previous years, have you monitored an emerging disease at regional national and international level (e.g. Zika, Ebola)? • Was epidemiologic modelling capacity planned to be available during a pandemic? **During the response** • How was epidemic intelligence organised and conducted through the course of the pandemic? • How was epidemic intelligence supporting the collection and analyse of data during the epidemic? • Was epidemic intelligence information fed into the decision-making process of the response on a routine and timely basis?

			• Were early warning messages from neighbouring countries received and assessed? • What were your main sources of data at regional, national and international level? • Were epidemiological models of potential transmission scenarios available to decision-makers in a timely manner during the response to guide decision-making? **Learning from the response** • What were the main challenges for epidemic intelligence and early warning during the responses? What worked well? • Were resources sufficient to ensure continued epidemic intelligence activity throughout the pandemic? • Was early warning exchange with neighbouring and partner countries timely and useful? • Were some epidemic intelligence activities dropped or not implemented during the response?
Surveillance	**Surveillance**	**Surveillance (e.g. epidemiological, microbiological, clinical)**	**Prior to the response** • Were there general surveillance plans for emerging infectious diseases in place? Was there a plan to estimate the disease prevalence during all phases? • Were influenza surveillance plans and systems in place? • Was there a strategy to monitor mortality due to the new diseases (incl. subnational level/in specific population groups)? • Was there a strategy to monitor hospital beds and ICU beds and easily share such information? **During the response** • If there were any suspected or confirmed cases in your country, how were they detected? • Was an ad-hoc surveillance system (or multiple systems) for SARS-CoV-2/ COVID-19 established? • If so, how was it organised? What was the flow of epidemiological information? Was a database established? • Were surveillance objectives clearly defined to ensure that the system was fit-for-purpose? • Was guidance on case detection including sampling/testing policy provided? Did it evolve with time? • How was information provided to healthcare professionals for reporting cases? • What was the median time between detection and reporting of cases to public health authorities and, in the case of an EU Member State, to ECDC? • For EU Member States, what information was reported to TESSy? • What was the percentage of completeness for key variables related to COVID-19 surveillance? • Was regular analysis conducted of surveillance data/surveillance outputs related to COVID-19?

			• How was sentinel syndromic and virological surveillance for COVID-19 affected by lockdown measures and other recommendations which limited contact with general practitioners? • Were alternative sources of data (e.g. telephone helplines, centralised testing facilities etc.) included in surveillance? • Did you include sites with potentially high mortality rates (e.g. long-term care facilities (LTCF)) in surveillance? • How was surveillance for other priority diseases affected by the shift in focus to COVID? • How representative was surveillance for COVID? • Was it possible to obtain a sub-national view of the situation? • How was epidemiological data analysed and used to enable the response? • How was data collected (e.g. via paper, fax, email, surveillance software application) and shared (e.g. timeliness, automation, data protection)? • Did COVID-19 have an impact on other areas of public health (e.g. vaccination programmes, STI services, non-communicable diseases, including access to services)? How was this monitored? • How did the surveillance system detect the end of the COVID-19 outbreak? **Learning from the response** • Were there any challenges in analysing or gaps in receiving epidemiological or early warning data that would have enabled a better response during the initial response phase? • Were there any significant delays in detection/confirmation of suspect or confirmed cases that hindered the public health response? • What challenges were there in establishing a surveillance system for COVID-19? • What worked well? Which actions taken enabled an efficient and timely detection of the event?
Laboratory systems and testing strategies	**Laboratory systems**	**Laboratory systems, diagnostics (including testing policies)**	**Prior to the response** • How is the national laboratory system linked to public health epidemiology? • What processes were in place for the transport of samples to national reference laboratories? • What laboratory capacity was in place in your country to work with high-consequence respiratory viruses such as SARS and MERS-CoV? • Was there pre-existing guidance on testing strategies during pandemic situations? **During the response** • What role did national laboratories play in the establishment of a diagnostic (and eventually serologic) test for SARS-CoV-2? • Were assay validation tests performed? • How was testing capacity expanded (i.e. scaled-up)? • What guidance on testing strategies for COVID-19 was available and followed? Was the overall laboratory system able to conduct laboratory testing for SARS-CoV-2?

			• If so, when? • If so, what was the process for laboratory confirmation? • If so, was the laboratory system able to handle the volume of requests (sufficient financial and human resources)? • If no laboratory test for SARS-CoV-2 was developed in the country, was an effective test obtained from a partner country? • Did you achieve timeliness of results throughout the pandemic wave? • Where there any shortages of reagents? If so, what solutions were found? • How was the protection of laboratory staff ensured - i.e. access to appropriate PPE? • How was the supply of laboratory consumables secured and coordinated? • How was information on case confirmation shared with national public health authorities? • What networking activities took place with other EU/EEA countries, and did these assist with capacity-building and strengthening? **Learning from the response** • How did the capacity to test effect the overall response to the pandemic? • What worked well in establishing a system for laboratory confirmation of SARS-CoV-2? • Was scaling-up of testing for SARS-CoV-2 effective? What were the challenges and good practices that emerged through scaling-up? • What could be improved upon?
Case investigation and management	**Contact tracing**	**Outbreak investigation, contact tracing** **Clinical management and hospital IPC**	**Prior to the response** • What operational guidelines, resources, and arrangements were in place for contact tracing prior to the outbreak of COVID-19? • Were agreements in place with airlines, cruise ships, train operators, for obtaining public health passenger locator cards as needed? • Were arrangements in place with other countries to enable multi-country case investigation and contact tracing? **During the response** • How were COVID-19 contacts defined? Did this definition change with time? How? • Was an algorithm for managing contacts of probable or confirmed cases developed or followed? • Were any apps or other technology used for digital contact tracing? • Were volunteers form the community (e.g. retirees, final year medical students) engaged to support contact tracing if resources were scarce for implementing contact tracing? • How many contacts were followed during the response? • What information was provided to contacts about quarantine and. self-isolation? • How was the follow-up of contacts managed? • Was information about data for passengers who may have been on a flight with a confirmed COVID-19 case available from travel services? **Learning from the response**

			• How effective and efficient was contact tracing/management? If new technologies or volunteers were used/engaged, what were the best practices or challenges? • What was the maximum number of confirmed cases for which contact tracing has been performed? Was the capacity to conduct contact tracing an issue during the response? • What could have been done better?
	Patient referral and transfer	**Logistics and incident management, operational use of ICT**	**Prior to the response** • What procedures were in place for patient referral and transport for high consequence infectious disease (HCID)? • What surge capacity existed in designated hospitals for pandemic scenarios? • Did protocols exist to ensure potentially infected patients did not present to standard emergency rooms or other healthcare settings? **During the response** • How were suspect COVID-19 patients routed or transferred to designated healthcare facilities? Were there transfer arrangements between overburdened hospitals (including within cities, within a country or internationally)? • What guidance was provided to the general population in terms of accessing healthcare? • What protocols were established to direct suspect patients to appropriate healthcare facilities? **Learning from the response** • What best practices for patient referral and transfer were practiced/developed? • What were the main challenges?
Healthcare and long-term care facilities	**Infection prevention and control (IPC) in healthcare settings**	**Community IPC and NPI measures**	**Prior to the response** • What IPC guidance was available for high-consequence infectious disease? • Was there a national emergency stockpile supply of PPE (e.g. FFP respirators) and disinfectants? • Did a strategy exist for minimising infection risk among staff and citizens in healthcare facilities and long-term care facilities? **During the response** • Were IPC measures for COVID-19 implemented in designated hospitals? What were these measures? • Were the necessary personal protective measures and equipment, and human resources available for appropriate IPC and protection of healthcare workers? • Were there any documented instances of nosocomial SARS-CoV-2 transmission? If so, have the causes been investigated? **Learning from the response** • What best practices for IPC for COVID-19 were practiced/developed? • What were the challenges in implementing IPC measures in healthcare settings? • What challenges were there for IPC in healthcare settings during the COVID-19 pandemic?

	Intensive care unit (ICU) capacity and crisis standards of care (CSC)	**Clinical management and hospital IPC** **Logistics and incident management, operational use of ICT**	**Prior to the response** • Was comprehensive mapping of Intensive Care Unit (ICU) capacity available for the whole country? • Were plans in place for the pooling of hospital beds and for optimising ICU capacity usage across national sub-regions? • Were crisis standards of care (CSC) for pandemic situations available to guide clinical practice and the allocation of scarce resources (including ventilators)? • Were ethical guidelines established in relation to triage of medical care during a pandemic? • Were there plans and materials in place to establish a medical surge capacity? **During the response** • Were mechanisms identified to optimise the national usage of ICU capacity? How was surge capacity established and managed? • Were CSC for COVID-19 implemented in hospitals? How? • Was timely and accurate data available on ICU capacity during the COVID-19 pandemic? • Was ICU capacity data used to inform decision-making on societal-level control measures? • Was there a period where ICU beds and/or ventilators needed to be allocated through a triage algorithm? How long was this period, and was triage based upon pre-existing guidelines? **Learning from the response** • Was it feasible or productive to pool medical resources and ICU capacity? • Were CSC effectively implemented for COVID-19? • Were ethical guidelines able to provide clinicians with adequate support for making triage decisions? • How effective was national data on ICU capacity for informing decision-making? What worked well, and what did not, in terms of optimising ICU capacity usage throughout the COVID-19 pandemic? • What can be improved when it comes to optimising ICU capacity during public health emergencies?
Non-pharmaceutical interventions	**Quarantine and physical distancing**	**Community IPC and NPI measures**	**Prior to the response** • Were any national guidelines and/or regulations in place concerning quarantine during major infectious disease outbreaks? • Were any national guidelines and/or regulations in place concerning physical distancing measures, such as school or workplace closures, limits to gathering sizes, or otherwise? **During the response** • Was quarantine implemented for COVID-19? How? Why? Who was responsible for implementation? • Was a cordon sanitaire implemented for COVID-19? How? Why? Who was responsible for implementation?

			• Was self-isolation for suspected or confirmed COVID-19 cases implemented? Who was responsible for implementation and follow-up of cases? • Were physical distancing measures (e.g. school closures) implemented? How? Why? Who was responsible for implementation? • Which factors had an impact on the specific timing of the implementation of physical distancing measures? • Was a mechanism for assessing efficacy of physical distancing measures assessed during the response? • What triggered the relaxation or removal of physical distancing measures? **Learning from the response** • Were physical distancing measures effective in helping containment and/or mitigation strategies? • Did any legal issues arise in relation to implementing quarantine and/or physical distancing measures? • What challenges existed to implement quarantine and/or physical distancing measures? What good practices can be built upon going forward?
	Points of entry (PoE)	**Special settings (e.g. points of entry, schools, prisons, migrant reception centres, clubs)**	**Prior to the response** • Was there a designated point of entry (PoE) according to the International Health Regulations (IHR) in advance of the COVID-19 pandemic? • Was the PoE integrated into national emergency preparedness plans? Had PoE preparedness measures been tested? • Did the designated PoE have patient isolation facilities and arrangements for the safe transfer of patients to designated hospitals? • If your country is a Schengen country, what additional measures or agreements were in place to prevent the spread of high-risk infectious disease across borders? **During the response** • What role, if any, did a designated PoE play in the response to COVID-19? • Was the PoE resourced with appropriate staff and facilities to respond to COVID-19? • Did the PoE coordinate medical triage and management of suspected COVID-19 cases arriving at the PoE? • Did the PoE have a system and facilities in place for the safe transport of confirmed or suspect COVID-19 travellers? • Did the PoE carry out entry screening or public health messaging related to COVID-19? **Learning from the response** • How effective was coordination between the PoE and national public health authorities? What went well? What could be improved? • How effective was the PoE in the response to COVID-19? Were there any capacity gaps, and what could be improved?
	Entry screening	**Special settings (e.g. points of entry, schools, prisons, migrant reception centres, clubs)**	**Prior to the response**

		Laboratory systems, diagnostics (including testing policies)	• Was a protocol established for dealing with an ongoing, large-scale respiratory disease outbreak abroad that could lead to entry screening or even closing the border? • What guidelines existed for conducting entry screening at PoEs? **During the response** • Was entry screening implemented? How and why? • Was information available about flights/travellers entering from COVID-19 affected areas? • Were specific control measures, such as entry screening, information to passengers, or thermal screening implemented at airports as part of the response to COVID-19? **Learning from the response** • Did entry screening measures implemented fulfil their objectives? Why or why not?
Risk and crisis communication	**Communication to healthcare workers**	**Risk and crisis Communication and community engagement (including social media)**	**Prior to the response** • How should communication to healthcare workers be organised? • Was any pre-existing material related to pandemic influenza, or MERS-CoV available? **During the response** • What processes were in place for disseminating messages to healthcare workers? How was communication to healthcare workers implemented during the COVID-19 pandemic? **Learning from the response** • Was communication to healthcare workers timely and effective in ensuring they had a common and consistent approach to the response to COVID-19? • What challenges were there in communication to healthcare workers? What were good practices?
	Communication to the public and community engagement	**Risk and crisis Communication and community engagement (including social media)**	**Prior to the response** • Which is the lead authority for risk and crisis communication to the public during a health emergency? • Has a national risk communication strategy for pandemics been developed? Did it target different audiences? • Have health promotion materials already been developed? • Has a community engagement strategy been developed? How were vulnerable and at-risk populations identified and targeted in the response and risk communication strategies? • Were sufficient resources available to conduct risk communication and community engagement? Are responsibilities for health communication to the public clearly delineated for pandemic situations? • Has public communication from recent infectious disease outbreaks or other health emergencies been evaluated and improved upon? • Was there a monitoring system to observe public perceptions and opinions of both the outbreak, and the response to the outbreak? • Was there a strategy for tackling misinformation/disinformation (e.g. from online sources)?

			During the response • How was public communication coordinated during the response to COVID-19? Who was leading the risk communication strategy? • Were risk communication and community engagement approaches underpinned by insights from the social and behavioural sciences? • What was the process for the clearance of communication outputs? • How were communication outputs coordinated with other sectors within the country, and with neighbouring countries and partner institutions (e.g. WHO and ECDC)? • How was influential media (e.g. traditional media, bloggers, and influencers) identified and engaged with? • What were the main communication channels with the public? Which communication tools and technologies were used (e.g. new apps, social media, national television, dedicated websites)? • How was risk communication implemented at community level and how were communities engaged and mobilised? Were existing community networks engaged in response measures? • Were public perceptions monitored during the outbreak? If yes, how did this information affect the response? Was public communication consistent and transparent? • How was misinformation/disinformation dealt with and how did it impact the response? Were proactive steps taken to correct misinformation/disinformation? **Learning from the response** • Was public communication effective in conveying public health messages and establishing public trust? If so, how has this been assessed? • Were capacities sufficient to conduct social science and behavioural insights research to inform risk communication and community engagement activities? • What challenges were there in public communication? What were good practices from the outbreak of COVID-19?
Research and development	**Research**	**Public health and biomedical research**	**Prior to the response** • What arrangements were in place for the rapid development of vaccines during pandemics or public health events of international concern? • What vaccine and antiviral manufacturing capacity exists in your country that could be formally leveraged during a pandemic? • What international research and development agreements or partnerships did your country belong to? **During the response** • Was your country involved in efforts to develop a vaccine against SARS-CoV-2? If so, in what ways? • Was your country involved in any clinical trials for the safety or efficacy of a vaccine against SARS-CoV-2? • Did your country participate in clinical trials of pharmaceuticals for the treatment of COVID-19 cases?

			• While vaccines against SARS-CoV-2 were in development, did you develop a plan for its eventual distribution? • Did you participate in any public health research initiatives related to COVID-19, such as on the efficacy of various physical distancing measures? **Learning from the response** • What challenges existed in launching work to develop and/or procure a vaccine against SARS-CoV-2? • What worked, and what needs to be improved for a future pandemic?
Vaccination		**Vaccination deployment**	**Prior to the response** • What arrangements were in place for the rapid deployment of mass vaccination campaigns? • What barriers (formal/informal) to vaccination had been identified in your country prior to the pandemic? • Was disinformation related to vaccines an issue in your country, if so how was it addressed? **During the response** • How was the mass vaccination campaign managed (under ordinary procedures or not)? • How were vaccines purchased? • How were stock ruptures avoided? • Was the overall vaccination coverage reached for the primary cycle in line with the WHO target of 70%, if so was target coverage reached in timeframes your country considered acceptable? • Was it possible to reach at least 70% vaccination coverage for the primary cycle in more fragile/vulnerable population groups? • Were booster campaigns successful in reaching fragile/vulnerable population groups? • Were anti-vax movements present? • How was disinformation around vaccination contrasted? **Learning from the response** • What challenges existed in launching the mass vaccination campaign for the primary cycle of anti-COVID-19 vaccines? Did some of those challenges affect specific population groups? • What specific challenges were faced in promoting booster campaigns? • What worked, and what needs to be improved for a future pandemic and to manage COVID-19 vaccination after the emergency phase?