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Testing the Functionality of Joint Zoonotic Disease Electronic Surveillance and Reporting Systems through a Pandemic Influenza Full-Scale Simulation Exercise in Jordan

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Simple Summary: Zoonotic diseases pose the greatest health threat to both animal and human populations and cannot be successfully handled by any one sector on its own. In Jordan, zoonoses pose a major threat to humans and animals due to the human–livestock–wildlife interaction. The One Health approach is increasingly gaining the attention of all stakeholders in Jordan. The Jordanian One Health platform seeks to connect the Ministries of Health and Agriculture's electronic surveillance systems for zoonotic disease surveillance in a way that ensures the sharing of information between the ministries in a timely manner, allowing a rapid joint response. To evaluate the linkage between their electronic surveillance and response systems, a 10-day full-scale simulation exercise was conducted in Amman, Jordan. Gaps were identified. Recommendations were issued and used to develop an action plan agreed to by the stakeholder organizations.

Abstract: Zoonotic disease surveillance and response simulation exercises are an important tool to assess national infrastructures and mechanisms supporting joint zoonotic disease surveillance and information sharing across sectors. In December 2022, the Jordanian Ministries of Health and Agriculture, supported by the World Health Organization Country Office, conducted a 10-day full-scale simulation exercise in Amman, Jordan, to evaluate the linkage between their electronic surveillance and response systems. An exercise management team designed a realistic fictitious scenario of an outbreak of avian influenza on a poultry farm that subsequently led to human infections. The functions and actions tested included all aspects of outbreak management, from initial reporting to conclusion. Debriefings and an after-action review were conducted after the activities were completed. Gaps in both ministries' surveillance systems, epidemiological investigations, biosafety and biosecurity, sample collection, sample transport, laboratories, interventions, and coordination were identified. This simulation exercise was a unique exercise focusing on multiple technical and operational capacities that related to the joint response to potential zoonotic disease outbreaks and real-time information sharing between the sectors under the One Health approach. This exercise is a step towards the operationalization of the One Health approach in Jordan, building on the coordination mechanisms already in place.

Keywords: avian influenza; pandemic; full-scale simulation exercise; Jordan; One Health; joint response

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1. Introduction

Zoonotic diseases pose a major health threat to both animal and human populations [1,2]. While surveillance is a crucial component of zoonotic disease prevention and control [3,4], it cannot be successfully handled by any one sector on its own [5]. A collaborative One Health approach [6,7], integrating the actions of the human and animal health, security, and environmental sectors [8,9], and a coordinated multi-sectoral surveillance system are required for rapid detection and responses to zoonotic disease events within a country [10].

In Jordan, zoonoses pose a major threat to humans and animals due to the human–livestock–wildlife interaction [11]. Avian influenza viruses are of great socioeconomical and public health concern and are listed among the highest-priority zoonotic diseases [12,13]. In 2006, Jordan reported the first outbreak of the highly pathogenic avian influenza (HPAI) virus, subtype H5N1, in poultry, with more than 8000 susceptible birds [14]. Stamping out, quarantine, movement control, screening, zoning, and disinfection were undertaken. Surveillance and vaccination were applied within a 10 km radius zone.

The Joint External Evaluation (JEE) of International Health Regulations (IHR) core capacities of Jordan, conducted in 2016, showed that intersectoral information and data sharing on zoonotic events only occurs during zoonotic outbreaks. The report indicated that formal processes are needed for coordinated cooperation and systematic information exchange between the different health sectors [15]. Gaps in the national laboratory system, reporting, preparedness, and emergency response were identified [15]. Consolidating data into a One Health platform notification system was recommended to improve the rapid detection of public health events and enhance the One Health surveillance capabilities. The World Organization for Animal Health (WOAH)'s final report on Jordan's Performance of Veterinary Services (PVS) Evaluation follow-up mission, conducted in May 2016, highlighted the importance of sharing information regarding zoonotic diseases between the Ministry of Health (MOH) and Ministry of Agriculture (MOA) [16]. In 2018, a thorough assessment of Jordan's Pandemic Preparedness Plan (PIP) was performed using the National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response tool developed by the U.S. Centers for Disease Control and Prevention (CDC) [17]. The assessment showed gaps in the timeliness of data sharing under the One Health approach and in communicating data-related messages among stakeholders. Irregular inter-ministerial zoonotic disease reporting and notification between the MOH and MOA was observed [12,18]. A communication channel between the ministries of Health, Agriculture, and the Environment is lacking [18]. While Jordan's outbreak response teams are multidisciplinary and involve epidemiologists, clinicians, and infection control experts, no drills, simulations, or tabletop exercises testing specific functions have been adequately conducted [18].

The One Health approach, recognizing the interdependence of humans, animals, and environmental health [19], is increasingly gaining the attention of all stakeholders in Jordan [12]. The MOH has developed a new interactive real-time case-based reporting system, the "Jordan Integrated Electronic Reporting System" (JIERS) [20], that recognizes the epidemiological situation at a health center level in a timely manner. Moreover, the MOH has established the Department of Zoonotic Diseases and One Health with defined roles and responsibilities in collaboration with the relevant national authorities and international organizations. To improve the quality of the collected data and avoid the paper-based data collection issues, the MOA has launched an "Electronic Integrated Disease Surveillance System" (EIDSS) [12]. The goal under the Jordanian One Health platform is to connect the MOH and MOA electronic surveillance systems for zoonotic disease surveillance in a way that ensures the sharing of information between the ministries in a timely manner, allowing a rapid joint response. Additionally, the MOH and MOA have signed a Memorandum of Understanding that regulates and facilitates data and information sharing.

To evaluate the electronic linkage between the MOA and MOH reporting systems (EIDSS and JIERS) and their operational capability in reporting and detecting an epidemiological situation at the animal and public health levels in a timely manner, and to identify

areas for enhancement, a full-scale simulation exercise (SIMEX) was designed. The functions and actions tested included all aspects of outbreak management, from reporting to closure. This exercise led to the development of a roadmap and action plan to bridge existing structures and strengthen the country's coordinated surveillance system. In this manuscript, we describe the planning and execution of the SIMEX with a focus on the identified gaps and lessons learned from this experience.

2. Materials and Methods

2.1. Planning the SIMEX

An exercise management team was formed and was composed of the exercise director, the exercise controller, the lead evaluator, the lead facilitator, and representatives from the MOH and MOA of Jordan, who played the role of coordinators. The exercise management team was responsible for the overall planning, conduct, and evaluation of the exercise. The exercise director conducted mission trips and face-to-face meetings with stakeholders to finalize the objectives of the SIMEX and discuss the feasibility of the scenario. Reference documents and data were collected and underwent a thorough comprehensive review using WHO tools and checklists [21]. The review allowed the identification of gaps and challenges and provided guidance in the development of the SIMEX materials.

2.2. Selection of SIMEX Site

The exercise used a simulated scenario of highly pathogenic avian influenza H5N1 on a farm in the Ajloun Governorate, Jordan, where an outbreak of the H5N1 HPAI virus was reported in 2006 [14].

2.3. Organization of the SIMEX

The organization phase allowed the coordinated development of the exercise and the integration of the current standard operating procedures (SOPs) followed by the MOA and MOH teams. The process was led by the exercise director and coordinators and included the determination of logistical requirements (such as exercise materials, the physical space, furniture and equipment, supporting materials, a communication system, transport, accommodation, travel expenses, meeting facilities), the selection of participants, and the selection of observers.

2.4. Participants, Roles, and Responsibilities

The participants involved in the SIMEX are shown in Table 1: up to twelve participants from the MOH, up to twelve participants from the MOA, three facilitators and coordinators from MOH and MOA, controllers and observers from the exercise management team, and a group of external observers from the WHO Jordan Country Office, the WHO Regional Office, the Jordanian Center for Disease Control, the United States Defense Threat Reduction Agency, the National Center for Security and Crisis Management, and the Eastern Mediterranean Public Health Network.

2.5. Materials Developed for the Exercise

The exercise management team developed the SIMEX materials using the WHO guidelines, tools, and checklists and were shared with the WHO Jordan Country Office and the SIMEX coordinators to approve and validate the content and facilitate coordination. Furthermore, other SIMEX materials were developed following WHO templates (Table 2).

2.6. Technical Design

A full-scale simulation exercise was conducted in Amman, Jordan, from 20 November to 2 December 2022. The SIMEX was expanded to include refresher training on avian influenza ecology, biosafety and biosecurity, sample collection, sample transport, and personal protective equipment (PPE) use. The MOH and MOA staff typically involved in outbreak management at the regional and central levels were role players.

Table 1. Participants involved in Jordan SIMEX, with their roles and responsibilities.

Participants	Roles and Responsibilities
Exercise Management Team	The exercise management team designed, developed, and carried out the simulation exercise. The exercise management team of this SIMEX was composed of the exercise director, the exercise controller, the lead evaluator, and two lead facilitators.
Exercise Director	The exercise director was responsible for the coordination of the exercise management team. He was in charge of the overall preparation, execution, and evaluation of the exercise. The exercise director developed the main concept and design of the exercise, and he approved the aim, objectives, and other materials needed for the exercise.
Exercise Controller	The exercise controller checked all logistics and technical details with the WHO Country Office, the coordinators, and the lead facilitators to ensure that all resources (venue, supplies, communication tools) were in place prior to the launching of the exercise. The exercise controller oversaw and adapted the exercise based on the master scenario to ensure that the exercise met its objectives. The exercise controller also assisted in the drafting of the after-action report.
Lead Evaluator	The lead evaluator monitored the players and documented their performance to determine how effectively they met the exercise objectives. In addition to the development of the evaluation strategy, the lead evaluator collaborated with the facilitators and the exercise director to lead the debriefs and wrote the draft after-action report.
Lead Facilitators	The lead facilitators supervised the conduct of the exercise to ensure that the exercise's aim and objectives were met. They also assisted participants and answered their questions.
Facilitator	The role of the facilitator was to assist participants, clarify their roles, and facilitate the conduct of the exercise.
Role Players (actors)	The role players were assigned to initiate the JIERS and EIDSS according to the pre-defined scenario, to initiate a response.
Field Participants	The field participants were responsible for initiating actions in response to the scenario by performing their regular roles and responsibilities as rapid response team members.
Field and Laboratory Trainers	The field and laboratory trainers were responsible for training the Central Public Health Laboratory (CPHL) and the Central Veterinary Laboratory (CVL) participants on collecting samples pertaining to the project from animals and humans, HA/HI techniques, and avian influenza subtyping by PCR, and on working safely with hazardous materials.
Observers	The observers had no official role in the conduct of the exercise. Observers are key supporters who wish to see the response system in action.
Logistics Coordinator	The logistics coordination was provided by the WHO Country Office. The logistics coordinator arranged adequate transportation for the management team, evaluators, and observers to the field in Ajloun and to the CPHL and CVL laboratories. The logistics coordinator helped to organize and support the exercise by arranging the facilities, venue, transport, and equipment.
IT Support	This service was provided by the venue administration and ensured the smooth operation of IT equipment (projector, sound system, screen).
Administrative Support	The administrative support was provided by the WHO Country Office to oversee the production of the exercise materials and invite participants.

Table 2. Materials developed for the exercise.

Material Developed	Description
Concept Note	The concept note is the key reference document of the exercise and is used throughout the exercise, from planning to evaluation. It clearly describes the purpose, scope, objectives, participants, project management team, overview of the scenario, methodology, and timeline.
Exercise Agenda	The agenda lists the timeline of the exercise and activities to be performed over time.
Master Scenario	The master scenario describes the narrative of the exercise, an initial message to be followed by a series of incidents presented through injects designed to stimulate participants to act, followed by the timeline.
Exercise Handbook	The exercise handbook is a document providing all the information that the participants or project management team require to take part in the exercise. The exercise handbook is provided in advance of the exercise.
Avian Influenza Protocol	The avian influenza protocol is prepared to be used during the training of CPHL and CVL participants on avian influenza PCR and subtyping in addition to HA/HI assays.
Participant List	The participant list identifies all exercise participants in advance of the exercise.
Slide Deck	The PowerPoint slide deck is prepared to be used during the exercise. It includes a presentation of the SIMEX and its objectives, overview of the activities, and summary of the master scenario.
Opening Remarks Guidance Note	The opening remarks guidance notes for the exercise are written by the exercise director and the WHO Country Office that deliver them.
Evaluation Guidance Note	This guidance provides some tips and key steps to ensure that evaluation is built into the exercise, from the design phase to the reporting phase.
Guidance on Media, PR, and Communication	This guidance provides some tips on the media and communication, which need to be properly planned to ensure clear, effective, and appropriate messaging to specific audiences.
Security Considerations/Checklist	This checklist provides some tips to ensure that the exercise is conducted in a safe learning environment and that the exercise activities do not endanger any of the exercise management team, participants, or members of the public.
Evaluation Observation Form	This form is used for the evaluation of key operations during the exercise, referring to the exercise objectives and expected outcomes.
Control Room Guidance	The simulation exercise requires a dedicated space from which the exercise management team can manage and stage the exercise.
Exercise Controller Guidance Note	The purpose of the exercise controller guidance note is to guide the work of the exercise controller.
Exercise Management Team Debriefing Guidance Note	This guidance note describes the exercise management team debriefing session to be conducted to review the processes of the exercise and reflect on lessons for future exercises.
Exercise Management Team Briefing Guidance Note	This guidance note describes the exercise management team briefing on the final agenda, any relevant logistics arrangements, and their roles and responsibilities during the implementation of the exercise.
Participant Feedback Form	This form is used at the end of the event to collect feedback from participants on the conduct of the simulation exercise and its pertinence. It aims to evaluate the organization and implementation of the exercise, and to capture lessons for future missions and exercises.
Debriefing Workshop Guidance Note	The debrief workshop guidance note provides direction for the exercise debrief.
After-Action Report Template	The after-action report template is to be used after the exercise by the facilitation team and exercise director to describe and analyze the exercise based on debriefs and reports from observers and derive lessons from it.
Executive Summary Template	This summary provides an overview of the main findings of the exercise. It summarizes the after-action report.

2.7. Master Scenario and Injects

The initial message that started the exercise was the detection of a number of chickens with influenza-like symptoms on a farm in Ajloun. A poultry grower in Ajloun, Jordan, witnessed a number of chickens with influenza-like symptoms within his farm. He also reported that he found several of the birds dead in his flock. He consulted a veterinarian from the Governorate Agriculture Directorate, who visited the farm, assessed the history, examined the animals, and conducted an autopsy on some of the dead birds. An outbreak of highly pathogenic avian influenza was suspected. The veterinarian informed the owner to take precautions. Immediately, data from the local veterinarian's investigation were entered into the EIDSS and an event was opened, as avian influenza is one of the priority diseases that requires immediate reporting. A notification of the creation of this new event was sent to the MOA. A joint MOH–MOA investigation ensued, with MOH investigators interviewing and collecting samples from farm workers and MOA investigators collecting samples from the poultry. Animal samples were transported to the Central Veterinary Laboratory (CVL) and human samples were transported to the Central Public Health Laboratory (CPHL). The laboratory testing of samples from farm workers and poultry confirmed HPAI H5N1.

Over time, more injects were introduced to provoke action among participants in response to the alert and to the range of issues arising from the outbreak of HPAI. The sessions were structured to build an evolving scenario that generated a real-life intervention and response from the participants, from the deployment of an investigation team up until the declaration of the end of the outbreak. The first inject was that thirty-seven contacts were identified and followed, and three were found to be positive. A few days later, the MOA received a notification of influenza-like symptoms in a nearby farm. The following day, multiple individuals, including women, young adults, and children, presented at local clinics exhibiting influenza-like illness. The final inject was that the applied interventions controlled the spread of HPAI. However, there had been human deaths and the large-scale culling of birds from local flocks. Both the MOH and MOA closed the event on the EIDSS and JIERS systems.

2.8. Exercise Evaluation

At every exercise location, evaluators were positioned to monitor and record exercise activities, including role player actions. The evaluators used evaluation forms to note their observations. During the debriefing workshop, participants had the opportunity to evaluate their current capabilities to perform the critical tasks required to respond to an outbreak of a zoonotic disease through a SWOT analysis that allowed them to identify strengths, weaknesses, opportunities, and threats. They were also allowed to identify gaps in different tested functions and operations and suggest corresponding actions. Additionally, a participant feedback form was distributed to each participant to evaluate the execution of the exercise. After the exercise, the exercise team conducted an exercise evaluation meeting to issue a list of recommendations for improvement actions and highlight key areas of emphasis for future planning. In line with the exercise's no-fault approach, the evaluation consisted of reviewing the plans, practices, and response mechanisms employed. The evaluators focused their observations on the overall response rather than on individual players.

2.9. After-Action Report

An after-action report (AAR) was generated, summarizing the simulation exercise flow and its execution. It included information about current practices, needs, challenges, and priorities for linking both surveillance systems between the MOA and MOH. Specifically, the report included the evaluation findings and recommendations that could be used to develop an action plan defining how the recommendations will be put into action and agreed to by the stakeholder organizations. The AAR was circulated to the participating organizations for input and for transfer to senior-level authorities for endorsement.

3. Results

3.1. Identified Gaps

This simulation exercise allowed the identification of areas with limited capacities. SOPs covering most aspects of surveillance and response were lacking. There was no direct electronic data sharing between the JIERS and EIDSS systems. Checklists of the required materials, supplies, and PPE for use during the epidemiological investigation were missing. Operational skills and competences in sample handling, the use of PPE, disinfection, waste management, and the chain of custody were lacking. The CPHL was not connected to the JIERS. There was no Laboratory Management Information System in both laboratories. The Rapid Response Team's (RRT) composition and function at the national and local level were not clear. The National Pandemic Influenza Preparedness Plan (NPIPP) was not referred to throughout the exercise.

3.2. SWOT Analysis

A SWOT analysis was conducted by the participants and observers during the last day of the exercise (Figure 1). The MOU covering data sharing and collaboration between the MOA and MOH, signed in November 2022, the existence of electronic systems, the continuous international support, and the new department for zoonotic diseases launched at the MOA were considered important strengths by participants. Many weaknesses were identified by participants, related to communication, the documented procedures, and weaknesses in biosafety and biosecurity practices, training programs, and infection prevention and control practices. Five opportunities were identified, with a particular focus on taking advantage of the lessons learned from the COVID-19 response, making use of the available technical guidance and support, and taking advantage of the continuous collaboration between the MOH and MOA. Threats identified by the participants included flyway and migratory birds, transboundary animal diseases and newly emerging diseases, regional conflicts, legal and illegal trade, and a lack of coordination between law enforcement and other technical authorities.

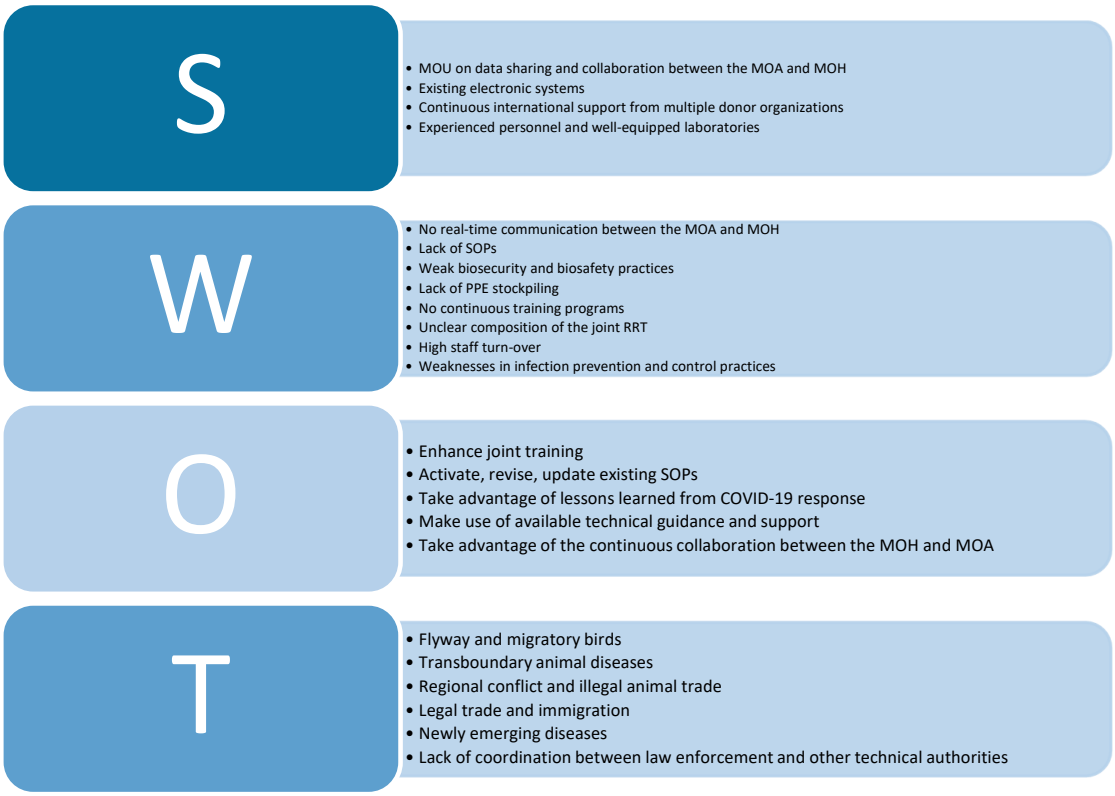

Figure 1. Summary of SWOT analysis.

3.3. Participant Feedback Evaluation

Participants strongly supported that the exercise allowed them to test their response plans and systems and positively scored this aspect with an average score of 4.75 on a rating scale of 1 to 5 (one: do not agree to five: strongly agree). Overall, the participants agreed that the exercise was well-structured, organized, and realistic, with a score of 4.5, and that the briefing before the exercise was useful and prepared them for the exercise. The data also showed that the participants felt that the exercise improved their understanding of their role and function during an emergency response. They emphasized the importance of improving the linkage between the EIDSS and JIERS and highlighted the role of the exercise in identifying some of the strengths and gaps in their understanding of the response systems, plans, and procedures. Participants explained that more commitment and collaboration from the participating ministries was needed. They expressed their interest in having a similar full-scale simulation exercise twice a year.

4. Discussion

The findings of the SIMEX revealed some areas for improvement. For the electronic reporting systems, updating the systems to allow the sending of notifications to concerned stakeholders when new events are created, when new cases are added, and when updates and results are entered is recommended, in addition to providing continuous training to users. For epidemiological investigations, it is recommended to draft SOPs and checklists and switch all paper-based reporting to electronic reporting, which has shown promising outcomes in many countries [22–24]. Furthermore, training RRT on proper risk communication skills, drafting SOPs on the chain of custody of samples [25], and enhancing the documentation of epidemiological investigations were also highlighted. As for the biosafety and biosecurity component, it is highly recommended to prepare kits for field investigation, draft SOPs for the use of PPE, conduct training on PPE use, conduct training on proper practices in farms to avoid risks to the external environment, conduct training on the proper transport and delivery of samples, follow infection control measures, prepare guidelines of instruction for veterinarians and RRTs to use in the field and training on it twice a year, draft SOPs for the receiving and delivering of samples to the laboratory, identify the roles and responsibilities of each entity involved from both the MOA and MOH, enhance the cooperation between the MOA and MOH teams, prepare SOPs for the storage of samples, restrict access for biohazard samples in facilities [26], and conduct regular training and simulation exercises [27]. It is also important to establish a Laboratory Management Information System [28] in the CPHL and integrate it into the JIERS, enhance the human resources, establish an inventory management system, and allocate a budget for the purchasing of needed supplies for waste management.

Important actions were recommended for the intervention pillar. RRTs should be activated in both ministries with a clear composition and identified roles and responsibilities. Inventories of equipment, supplies, vaccines, kits, PPE, beds, and isolation rooms should be prepared [29]. Event-based surveillance should be included in the JIERS. The NPIPP should be applied. An SOP for the culling and disposal of dead animals and their residues should be drafted. A compensation program for farmers should be set. A budget for intervention should be considered in the government's capital budget. A vaccine stock management system should be established. Field investigators should be trained on the good practices of epidemiological investigations [30] to avoid delays and complications during field visits, and the capacity building of veterinarians of the MOA should be considered to improve their competencies.

5. Conclusions

Full-scale exercises are rarely performed, especially focusing on multiple technical and operational capacities that relate to the joint response to potential zoonotic disease outbreaks and real-time information sharing between sectors. Simulation exercises should be performed more frequently as they might be more efficient in delivering information

than regular training sessions. Several strengths were noticed over the course of the simulation exercise, especially related to the dedicated manpower in both ministries. Ministry leadership and technical staff should use the identified gaps to strengthen their outbreak response systems, in addition to referring to the recently updated pandemic influenza preparedness plan.

The gaps identified are not only related to surveillance but also coordination and cooperation inter- and intra-sector. Ministry leadership and technical staff should build on the progress so far, which is mostly reflected in the signing of the MOU between the MOA and MOH, and the findings of this exercise to enhance the outbreak response capacities in Jordan through improving the relevant health systems. The exercise identified opportunities to make the MOU active, especially in terms of coordination and communication and strengthening the rapid response teams to strengthen the joint response.

Upon completion of the simulation exercise, an after-action report was generated and shared with stakeholders. The report included recommendations that can be used by the stakeholders to develop an action plan defining how the recommendations will be put into action. The simulation exercise can be considered as a step to operationalize One Health in Jordan and build on the coordination mechanism already established. Additionally, it will be an opportunity to update the National Pandemic Preparedness and Response Plan for Respiratory Diseases of Pandemic Potential, including identifying a roster of national experts as functional Rapid Response Teams at the human–animal–environment interface, and to expand to involve other related sectors using the One Health approach. The simulation exercise participants expressed their interest in having similar full-scale simulation exercises routinely.

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References

1. WHO; FAO; WOAH. Surveillance and Information Sharing Operational Tool—An operational tool of the Tripartite Zoonoses Guide. Geneva, Rome and Paris. Available online: https://www.fao.org/3/cc0716en/cc0716en.pdf (accessed on 5 December 2022).
2. Bidaisee, S.; Macpherson, C.N. Zoonoses and one health: A review of the literature. *J. Parasitol. Res.* **2014**, *2014*, 874345. [CrossRef] [PubMed]

3. Hayman, D.T.S.; Adisasmito, W.B.; Almuhairi, S.; Behravesh, C.B.; Bilivogui, P.; Bukachi, S.A.; Casas, N.; Becerra, N.C.; Charron, D.F.; Chaudhary, A.; et al. Developing One Health surveillance systems. *One Health* **2023**, *17*, 100617. [CrossRef] [PubMed]
4. Wendt, A.; Kreienbrock, L.; Campe, A. Zoonotic Disease Surveillance—Inventory of Systems Integrating Human and Animal Disease Information. *Zoonoses Public Health* **2015**, *62*, 61–74. [CrossRef] [PubMed]
5. Sharan, M.; Vijay, D.; Yadav, J.P.; Bedi, J.S.; Dhaka, P. Surveillance and response strategies for zoonotic diseases: A comprehensive review. *Sci. One Health* **2023**, *2*, 100050. [CrossRef]
6. FAO; UNEP; WHO; WOAH. Global Plan of Action on One Health. In *Towards a More Comprehensive One Health, Approach to Global Health Threats at the Human-Animal-Environment Interface*; WOAH: Rome, Italy, 2022.
7. European Centre for Disease Prevention and Control. *Towards One Health Preparedness*; ECDC: Stockholm, Sweden, 2018.
8. Rocque, S.D.L.; Errecaborde, K.M.M.; Belot, G.; Brand, T.; Shadomy, S.; Dobschuetz, S.v.; Aguanno, R.; Carron, M.; Caya, F.; Ding, S.; et al. One health systems strengthening in countries: Tripartite tools and approaches at the human-animal-environment interface. *BMJ Glob. Health* **2023**, *8*, e011236. [CrossRef] [PubMed]
9. Nzietchueng, S.; Kitua, A.; Nyatanyi, T.; Rwego, I.B. Facilitating implementation of the one health approach: A definition of a one health intervention. *One Health* **2023**, *16*, 100491. [CrossRef] [PubMed]
10. World Health Organization. Emerging Zoonotic Diseases and the One Health approach: An Overview. Available online: https://www.who.int/docs/default-source/coronaviruse/risk-comms-updates/epi_win_digest_4_one-health.pdf?sfvrsn=b9feef83_2&download=true (accessed on 5 December 2022).
11. Sorrell, E.M.; El Azhari, M.; Maswdeh, N.; Kornblet, S.; Standley, C.J.; Katz, R.L.; Ablan, I.; Fischer, J.E. Mapping of Networks to Detect Priority Zoonoses in Jordan. *Front. Public Health* **2015**, *3*, 219. [CrossRef] [PubMed]
12. Abutarbush, S.M.; Hamdallah, A.; Hawawsheh, M.; Alsawalha, L.; Elizz, N.A.; Dodeen, R. Implementation of One Health approach in Jordan: Review and mapping of ministerial mechanisms of zoonotic disease reporting and control, and inter-sectoral collaboration. *One Health* **2022**, *15*, 100406. [CrossRef] [PubMed]
13. Kheirallah, K.A.; Al-Mistarehi, A.-H.; Alsawalha, L.; Hijazeen, Z.; Mahrous, H.; Sheikali, S.; Al-Ramini, S.; Maayeh, M.; Dodeen, R.; Farajeh, M.; et al. Prioritizing zoonotic diseases utilizing the One Health approach: Jordan's experience. *One Health* **2021**, *13*, 100262. [CrossRef] [PubMed]
14. Al-Natour, M.; Abo-Shehada, M. H5N1 influenza outbreak during March 2006 in Jordan. *Health* **2012**, *4*, 1371–1379. [CrossRef]
15. World Health Organization. *Joint External Evaluation of IHR Core Capacities of the Hashemite Kingdom of Jordan: Mission Report, 28 August–1 September 2016*; World Health Organization: Geneva, Switzerland, 2017.
16. WOAH. PVS Gap Analysis: Status of Missions. Available online: https://www.woah.org/solidarity/pvs-evaluations/pvs-evaluation-reports/ (accessed on 5 December 2022).
17. MacDonald, G.; Moen, A.C.; St Louis, M.E. The national inventory of core capabilities for pandemic influenza preparedness and response: An instrument for planning and evaluation. *Influenza Other Respir. Viruses* **2014**, *8*, 189–193. [CrossRef] [PubMed]
18. Kheirallah, K.A.; Al-Nusair, M.; Aljabeiti, S.; Sheikali, N.; Alzoubi, A.; Alsulaiman, J.W.; Al-Mistarehi, A.H.; Alzoubi, H.; Bani Mousa, A.A.; Allouh, M.Z. Jordan's Pandemic Influenza Preparedness (PIP): A Reflection on COVID-19 Response. *Int. J. Environ. Res. Public Health* **2022**, *19*, 7200. [CrossRef] [PubMed]
19. World Health Organization. One Health. Available online: https://www.who.int/health-topics/one-health#tab=tab_1 (accessed on 5 December 2022).
20. Ministry of Health of the Hashemite Kingdom of Jordan. Health Information System Strategic Plan 2019–2023. Available online: https://moh.gov.jo/ebv4.0/root_storage/ar/eb_list_page/%D8%A7%D9%84%D8%AE%D8%B7%D8%A9_%D8%A7%D9%84%D8%A7%D8%B3%D8%AA%D8%B1%D8%A7%D8%AA%D9%8A%D8%AC%D9%8A%D8%A9_%D9%84%D9%82%D8%B3%D9%85_%D8%A7%D9%84%D8%AF%D8%B1%D8%A7%D8%B3%D8%A7%D8%AA_%D9%88%D8%A7%D9%84%D9%85%D8%B9%D9%84%D9%88%D9%85%D8%A7%D8%AA_(2019_-_2023).pdf (accessed on 5 December 2022).
21. WHO Simulation Exercise Manual. Available online: https://www.who.int/publications/i/item/WHO-WHE-CPI-2017.10 (accessed on 5 December 2022).
22. Bagherian, H.; Farahbakhsh, M.; Rabiei, R.; Moghaddasi, H.; Asadi, F. National Communicable Disease Surveillance System: A review on Information and Organizational Structures in Developed Countries. *Acta Inform. Medica AIM J. Soc. Med. Inform. Bosnia Herzeg. Cas. Drus. Za Med. Inform. BiH* **2017**, *25*, 271–276. [CrossRef] [PubMed]
23. Njeru, I.; Kareko, D.; Kisangau, N.; Langat, D.; Liku, N.; Owiso, G.; Dolan, S.; Rabinowitz, P.; Macharia, D.; Ekechi, C.; et al. Use of technology for public health surveillance reporting: Opportunities, challenges and lessons learnt from Kenya. *BMC Public Health* **2020**, *20*, 1101. [CrossRef] [PubMed]
24. Ibrahim, L.M.; Okudo, I.; Stephen, M.; Ogundiran, O.; Pantuvo, J.S.; Oyaole, D.R.; Tegegne, S.G.; Khalid, A.; Ilori, E.; Ojo, O.; et al. Electronic reporting of integrated disease surveillance and response: Lessons learned from northeast, Nigeria, 2019. *BMC Public Health* **2021**, *21*, 916. [CrossRef] [PubMed]
25. Tomlinson, J.J.; Elliott-Smith, W.; Radosta, T. Laboratory information management system chain of custody: Reliability and security. *J. Autom. Methods Manag. Chem.* **2006**, *2006*, 74907. [CrossRef] [PubMed]
26. Burnett, L.C.; Lunn, G.; Coico, R. Biosafety: Guidelines for working with pathogenic and infectious microorganisms. *Curr. Protoc. Microbiol.* **2009**, *13*, 1A.1.1–1A.1.14. [CrossRef] [PubMed]
27. World Health Organization: Simulation Exercises. Available online: https://www.who.int/emergencies/operations/simulation-exercises (accessed on 5 December 2022).

28. World Health Organization Eastern Mediterranean Region: Laboratory Information Management System. Available online: https://www.emro.who.int/health-topics/laboratory-information/index.html (accessed on 5 December 2022).
29. MedTech Europe: Stockpiling as an Instrument to Strengthen Public Health Emergency Preparedness and Healthcare Systems' Resilience. Available online: https://www.medtecheurope.org/wp-content/uploads/2020/09/2020_mte_reflection-paper-stockpiling_092020.pdf (accessed on 5 December 2022).
30. King, M.E.; Bensyl, D.M.; Goodman, R.A.; Rasmussen, S.A. *Conducting a Field Investigation*; Centers for Disease Control and Prevention: Atlanta, GA, USA, 2018.