D5.5 –Dedicated training for end users

Keywords
Crisis Governance, Epidemiological Modelling, Medical Supply Chain, Social Media Analytics

Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

History			
Author	Date	Reason for change	Release
Sudipa Sarker	15.06.2022	Draft of the structure	V0
Grzegorz Trzeciak	15.09.2022	Develop content	V1
Grzegorz Trzeciak	19.09.2022	Develop content	V2
Mikhail Sirenko	20.09.2022	Develop content	V3

Ira Haavisto	20.09.2022	Content	V4
Mikhail Sirenko	20.09.2022	Content	V5
Lianne Cremers	20.09.2022	Content	V6
Tracie Farrell	20.09.2022	Content	V7
Sudipa Sarker	28.09.2022	Content	V8
Sudipa Sarker	29.09.2022	Edit and review content	V8
Gyöngyi Kovács	17.10.2022	Review	V9
Anna Radecka	18.10.2022	Review	V9
Sudipa Sarker	20.10.2022	Incorporate reviewers' comments	V10
Mikhail Sirenko	20.10.2022	Incorporate reviewers' comments	V10
Grzegorz Trzeciak	25.10.2022	Incorporate reviewers' comments	V10
Cato Janssen	27.10.2022	Incorporate reviewers' comments	V10
Gregoire.Burel	27.10.2022	Incorporate reviewers' comments	V10
Sudipa Sarker	27.10.2022	Incorporate reviewers' comments	V11
Sudipa Sarker	27.10.2022	Final edits	V12

Executive Summary

The Health Emergency Response in Interconnected Systems (HERoS) project integrates behavioural dynamics in epidemiological models under the resource constraints of public health providers and brings together governance, information, and logistics support to prepare for and respond to the COVID-19 pandemic. HERoS consists of three phases: a rapid response phase (M1-M6), lessons learned phase (M7-M30) and a dissemination phase (M31-M36). This deliverable (D5.5) is the first report pertaining to a task in the dissemination phase.

Task 5.5 consists of trainings of end users and other stakeholders. The task combines the results of HERoS phases 1 & 2 to develop a dedicated training on health emergency response in interconnected systems. All previous tasks of the project feed into the development of this training package. The first deliverable (D5.5) of this task reports on a dedicated training that is tailored to the specific needs of HERoS end users. By disseminating project results to project end users, it also builds up a network of early adopters of the project.

The training is based on close collaboration with end users to determine realistic and relevant scenarios, as well as co-define key learning objectives. The following three end users have been part of the HERoS project: Associazione Della Croce Rossa Italiana (CRI), Project HOPE – The People to People Health Foundation, and Polish Center for International Aid (PCPM). This training consists of modules for humanitarian organisations and civil protection that cover the complexity and dynamics of the response and prepare decision-makers to manage complex supply chains and highly uncertain information.

The training in Task 5.5 was carried out on the 21st and 22nd of June 2022 at the campus of Vrije Universiteit (VU) Amsterdam. The agenda of the training is in the Appendix of this report. The training had four sessions represented by the four content work packages (WPs) of the HERoS project. The first session was on Governance (WP1) and was conducted by VU Amsterdam. The second session was conducted jointly by Technische Universiteit Delft (TUD) and Nordic Healthcare Group (NGH). It was about the behavioural model in epidemics (WP2). The third session was on social media analytics (WP4) and was managed by Open University (OU). The fourth and final session was on supply chain management (WP3) and was again conducted jointly by Hanken School of Economics (Hanken) and Squadron (SQU).

A total of 11 participants from CRI, Project HOPE, PCPM, and Centrum Badan Kosmicznych Polskiej Akademii Nauk (CBK) participated in the in-person training sessions. Many more from end users' organisations joined online. Overall, the combined number of participants in different sessions was 33, including trainers and project members. All the training sessions were interactive and required participants to engage with the training content. In the end, participants filled up an online feedback form for the training.

The training session was well appreciated by the end-users and Project HOPE showed their interest in organising the training again during the next consortium meeting in Skopje, North Macedonia from 28 to 29th November 2022. The next step in Task 5.5 will be to further develop the training materials for a wider audience to a massive open online course (MOOC).

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List of acronyms

Abbreviation / acronym	Description
COVID-19	Novel Coronavirus Disease
EU	European Union
HAN	Hanken School of Economics
HERoS	Health Emergency Response in Interconnected Systems
HOPE	Project HOPE – The People to People Health Foundation
MOOC	Massive open online course
NHG	Nordic Healthcare Group
OU	Open University
PCPM	Polish Center for International Aid
SQU	Squadron sp. Z o.o.
TUD	Technische Universiteit Delft
VUA	Vrije Universiteit Amsterdam
WP	Work Package

1. Introduction

The Health Emergency Response in Interconnected Systems (HERoS) project integrates behavioural dynamics in epidemiological models under the resource constraints of public health providers and brings together governance, information, and logistics support to prepare for and respond to the COVID-19 pandemic. The overall objective of HERoS is to improve the effectiveness and efficiency of the response to the COVID-19 outbreak.

HERoS consists of three phases: a rapid response phase (M1-M6), lessons learned phase (M7-M30) and a dissemination phase (M31-M36). This deliverable (D5.5) is the first report pertaining to a task in the dissemination phase.

Task 5.5 consists of training end users and other stakeholders. The task combines the results of HERoS phases 1 & 2 to develop a dedicated training session on health emergency response in interconnected systems. All previous tasks of the project feed into the development of this training package. The first deliverable (D5.5) of this task reports on a dedicated training session that is tailored to the specific needs of HERoS end users. By disseminating project results to project end users, it also builds up a network of early adopters of the project.

The training is based on close collaboration with end users to determine realistic and relevant scenarios, as well as co-define key learning objectives. The following three end users have been part of the HERoS project: Associazione Della Croce Rossa Italiana (CRI), Project HOPE – The People to People Health Foundation, and Polish Center for International Aid (PCPM). This training consists of modules for humanitarian organisations and civil protection that cover the complexity and dynamics of the response and prepare decision-makers to manage complex supply chains and highly uncertain information.

The training in Task 5.5 was carried out on the 21st and 22nd of June 2022 at the campus of Vrije Universiteit (VU) Amsterdam. The training had four sessions represented by the four content work packages (WPs) of the HERoS project. The first session was on Governance (WP1) and was conducted by VU Amsterdam. The second session was conducted jointly by Technische Universiteit Delft (TUD) and Nordic Healthcare Group (NGH). It was about the behavioural model in epidemics (WP2). The third session was on social media analytics (WP4) and was managed by Open University (OU). The fourth and final session was on supply chain management (WP3) and was again conducted jointly by Hanken School of Economics (Hanken) and Squadron (SQU).

A total of 11 participants from CRI, Project HOPE, PCPM, and Centrum Badan Kosmicznych Polskiej Akademii Nauk (CBK) participated in the in-person training sessions. Many more from end users' organisations joined online. Overall, the combined number of participants in different sessions was 33, including trainers and project members. All the training sessions were interactive and required participants to engage with the training content. In the end, participants filled up an online feedback form for the training.

The project has six interconnected objectives feeding into the overall objective. Deliverable 5.5 (D5.5) is the outcome of objective six, which is to develop training modules for pandemic response and disseminate project results to build up a network of early adopters. D5.5 builds on the first and the fourth objectives. The first objective is to extract, understand and model different coordination structures and governance arrangements, determine bottlenecks, and develop policies and procedures for efficient information-sharing across countries and hierarchical levels. The fourth objective is to reduce the impacts of cascading effects across globalised supply chains.

HERoS created and provided policies and guidelines for improved crisis governance, with a core focus on responders to public health emergencies. This aim was achieved by enabling information-driven self-organisation and coordination that considers behaviour, as well as rapid adaptation, to dynamic situations. HERoS project also intended to foster organisational and technical innovations. To this end, the HERoS project has already developed accurate, validated, enriched, high-quality, and actionable knowledge.

The purpose of the training is to share the knowledge gathered over the lifetime of the HERoS project with the end-users: Associazione Della Croce Rossa Italiana (CRI), Project HOPE – The People to People Health Foundation, and Polish Center for International Aid (PCPM). The training deliverable is part of the training and dissemination phase of the HERoS project, which promised to deliver a dedicated training package for end users. The training is developed in close collaboration with end-user partners to determine realistic and relevant scenarios and critical learning objectives. It covers the complexity and dynamics of the response and prepares decision-makers to manage complex supply chains and highly uncertain information.

The training is carried out on the 21st and 22nd of June on Vrije Universiteit (VU) Amsterdam campus. The training had four sessions represented by four work packages (WPs). The first session was on Governance (WP1) and was conducted by VU Amsterdam. The second session was conducted jointly by Technische Universiteit Delft (TUD) and Nordic Healthcare Group (NHG). It was about the behavioural model in epidemics (WP2). The third session was on social media analytics (WP4) and was managed by Open University (OU). The fourth and final session was on supply chain management (WP3).

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The rest of the report is organised as follows. Sections 2, 3, 4, and 5 summarise and describe in detail different training sessions and give an overview of how the training was conducted and what was shared. Section 6 summarises the report, discusses limitations, and sketches out the next steps.

2. Training Session 1 Governance (WP1)

2.1.   Summary

This interactive session explained the COVID-19 crisis response through a whole-of-society framework, helping to understand the involvement of different stakeholders in the formal and informal decision-making processes in times of crisis. Using our visual ethnographic study in nursing homes, we presented best practices and lessons learned related to the governance of the COVID-19 crisis within social organisations in Europe. We demonstrate how national, regional, and local stakeholders act and interact while dealing with different target groups, risks, and priorities that hence require variations in crisis response. Using two exercises, we enhance our knowledge of stakeholder management and different approach to mitigating crisis situations. Overall, this training helped the project team to understand the complexity of the crisis response, its unintended consequences, and varying challenges in different social settings.

2.2.   Purpose

The purpose of this training was to inform stakeholders on the consideration of diverging vulnerabilities in different phases of crisis response in the context of a creeping, slow-burning crisis. Taking the COVID-19 crisis as a case study, we presented examples through which stakeholders could understand how effective crisis response can benefit from collective sensemaking. Working together on examples from their respective fields, challenged stakeholders to look at ways they can implement lessons learned about collaborative and community-based decision-making.

2.3.   Learning outcomes

The learning outcomes of the session were as follows:

- How to consider diverging vulnerabilities, risks, and priorities in effective crisis response?
- How to enhance community engagement and bottom-up decision-making?
- How to collectively make sense of formal and informal processes of decision-making?
- How to effectively build capacity through collective governance and societal response?
- Using visuals to communicate research findings and best practices to a wider audience?

2.4.   What was presented

A theoretical framework that was developed in deliverable 1.1 on effective crisis governance and an explanation of the whole-of-society governance approach reveals the COVID-19 crisis is a wicked problem and a slow-burning crisis compared to an acute crisis situation (Boersma et al., 2020). A case study that was performed for deliverable 1.2 on European nursing homes was presented to illustrate how these elements of crisis governance can be translated to real life (Boersma et al., 2022). Through this example, we explain the importance of societal resilience and citizen participation in effectively

responding to acute and long-lasting challenges. Lastly, we looked at what we can learn from the COVID-19 crisis response to better prepare for future crises.

2.5.   How it was presented

We used two exercises stakeholder mapping and response mitigation. The first exercise, which was stakeholder mapping, required the following steps:

- Forming a group with the people in the participant's own organisation.
- Writing the name of their organisation in the middle of a sheet of paper (flip-over).
- Writing down stakeholders they have collaborated with during the COVID-19 crisis (take a specific task in mind if there are too many).
- Thinking of stakeholders on an international, national, regional, and local level.
- Connecting the stakeholders using different types of lines
    - o Continuous line: strong ties,
    - o Dotted line: weak ties,
    - o Missing line/question mark: missing ties.
- Marking yellow for new ties developed since the COVID-19 crisis response.

Afterward, participants presented each other's stakeholder maps to make a clear map. Pictures from the participants' work are presented in the figure 1. This was followed by a discussion about the challenges of collaborative governance in a crisis.

Figure 1: Participants' stakeholder maps

The second exercise (as depicted in figure 2) was entitled response and mitigation and had the following steps.

- Thinking about one major challenge participants encountered during the COVID-19 crisis.
- Thinking about the best practices and lessons learned related to this challenge.

- Answering questions such as did this lead to reconsideration of procedures or the development of new guidelines?
- Drawing the above three topics in clear pictograms on a sheet of paper
- Making drawings as easy as possible to clearly and directly communicate lessons learned to a broad audience.

Figure 2: Response mitigation exercise

The participants then presented the results to different groups. The presentation was followed by a plenary discussion. During the plenary discussion of the presentations, it was apparent how lessons learned linked to the stakeholder maps of the first exercise as well as who was needed to take action. It also answered the questions of who is missing and what next steps should be taken. The WP1 team collected the necessary feedback to incorporate into the Massive Open Online Course (MOOC).

2.6.   Next course of actions

Two ethnographic films about the experiences during the COVID-19 crisis in nursing homes and secondary schools are currently being developed. For the ethnographic film about the COVID-19 crisis in secondary schools, you can find the trailer here: https://vimeo.com/761153939/28fff0574a. In the future, these films will be presented to involved stakeholders through an impact campaign aimed at fuelling a dialogue. Ultimately, this will lead to a better understanding on how to consider diverging vulnerabilities in times of crisis.

3. Training Session 2 Behavioural Models in Epidemics (WP2)

3.1. Summary

Work package two (WP2) studied the COVID-19 virus spread with data and models. Governments worldwide used various data and models during the pandemic to support decisions and policymaking processes. For instance, the United Kingdom government used a simulation model made by the Imperial College COVID-19 Response Team. A collaboration of French, Vietnamese, and Chinese scholars proposed another simulation model called COMOKIT to the Vietnamese government. The models built in WP2 are aimed at supporting policymaking by providing them with a piece of advice on what robust strategies are and how the virus spreads, given intense travel within and outside Europe. However, not only governments used data and models, but they also benefitted from using data and models. End users of the HERoS project got exposed to all sorts of new data as well as the ways to visualise them. The data were illustrated by using Excel sheets and dashboards. One critical use of data and models was to plan the upcoming intake of patients at hospitals and ICUs. However, this data was new to the end users, and the models were highly complex to understand. Thus, one of the challenges of the training session was how end users could be helped to utilise new data and complex models as well as how to make end users aware of potential limitations and pitfalls of data and models.

3.2. Purpose

The purpose of the training session by WP2 is to help participants understand and find ways to understand and use data and complex models.

3.3. Learning outcomes

The learning outcomes of the session were as follows:

- Get to know what a model is,
- Understand different types of models: machine learning, simulation,
- Know why building computer models,
- Know the specifics of Covid models,
- Be able to question assumptions of Covid models at each of the modelling steps.

The learning outcomes were also to

- Understand different forms and different sources of data,
- Identify different data needs,
- Get an overview of the healthcare data,
- Understand how to utilise healthcare data as information and in decision making.

3.4.   What was presented

The 1-hour session consisted of 30-minute two parts. The first one was dedicated to modelling and the second one was to data. During the first 30-minute session, the team of WP2 and participants dived into each learning outcome. First, they discussed how complex Covid dashboards could be. Participants indicated that by now (July 2022), they have gotten familiar with those but still experiencing issues when there is too much information. They also stressed that the data behind visualisations was incomplete at the beginning of the pandemic, which made it challenging to analyse. Remarkably, participants have only had a few experiences using Covid (computer) models. They indicated that they often got information from someone else on the team and did not use such models directly.

Further, the discussion shifted to the models: conceptual and then computer ones. Participants got to know one of the fundamental definitions of a model: "simplification of reality/system." Next, they learned about the "black box" model, a handy and easy way to think about computer models. Information about types of computer models was new to participants. They learned what a machine learning model is and how it differs from a simulation model: learning from the past versus modelling causal relations explicitly. Further, participants learned how the model's purpose varies by type. We are trying to predict the future with machine learning models, and with simulation models, we conduct experiments and test policies.

Finally, the session reached its last part: "How to Covid models." First, participants tried to formulate what a Covid model is. They managed to read a time series chart (as depicted in figure 3) with an interval. Importantly, participants understood the "interval" concept perfectly.
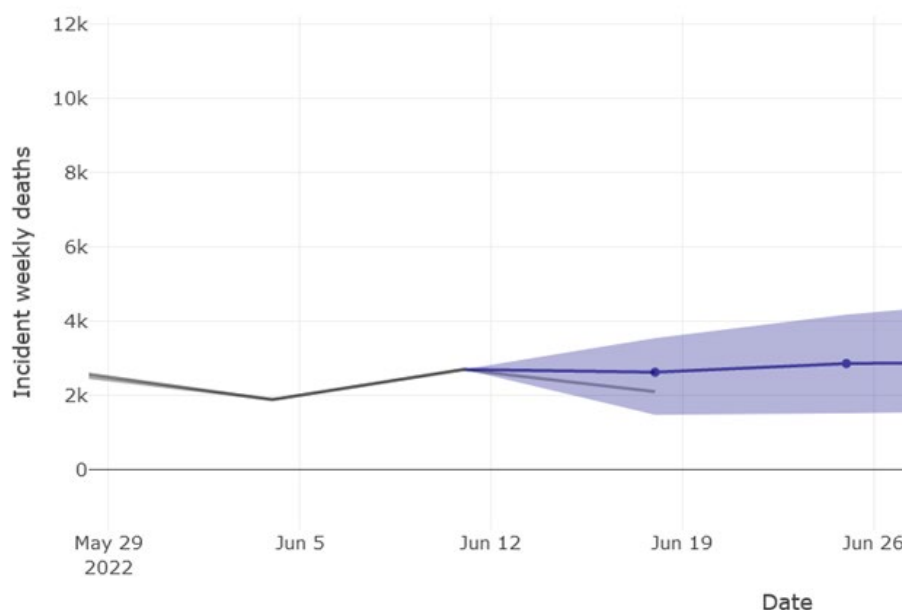

Figure 3: An example of a Covid chart

A participant from PCPM said that if a model an interval instead of a single data point, they would prepare for the worst-case scenario. Another participant noted that preparing for the worst case is costly and can be difficult when resources are limited. They would like more precise forecasts to allocate their resources better. When looking at the following figure: infections over a map, participants demonstrated a good understanding of the spatial heterogeneity of infections. They recognised the concept of a "hotspot" and would like to use this information. Next, participants learned what they could "question" in a Covid model: input data, model relations and model outputs. They got a set of typical assumptions and an example question that can help to stress the model. At the end of the session, participants discovered about two modelling camps: "replication of the past" and "fit for purpose." We wrapped up the first part of the session with the George Box quote: "All models are wrong, but some of them are useful."

The second part of the session discussed possibilities and challenges in utilising. First, the WP2 team and participants discussed different forms and levels of data. Going further, they explored different data sources and considerations behind these data sources. As an exercise, participants tried to identify and formulate their data needs. Further, they covered another critical aspect of working with (healthcare) data: its regulatory environment. Finally, the WP2 gave examples of how healthcare data was utilised in decision-making during Covid. For example, "Interactive tool to view hospital intensive care unit (ICU) utilisation" was developed in task 2.1 of WP2. Check out the interactive tool here: https://nhg.fi/en/covid19map/.

3.5.   How it was presented

The WP2 team prepared a PowerPoint presentation. It starts with a slide with a famous quote from George Box (Figure 4) and ends with a set of practical and useful questions for the model users (Figure 5 & Figure 6). They went over the learning outcomes with participants and set up a discussion. During the session, participants had a chance to share their experience with using data and models to fight Covid. Remarkably, there were differences between the participants' experiences depending on the exact job of the end users. The WP2 team collected the necessary feedback to incorporate into the Massive Open Online Course (MOOC).

Figure 4: The opening slide of the presentation

1.1) Question input data →

Assumption	Question
"Household size can be either 1,2,3,4 with an equal probability"	Is this legit? Let's us ask each other. And if not, ask what's going to be an impact if it is wrong.

2

Figure 5: Example questions about the input data

3) Question outputs →

Assumption	Question
"Our model predicted that in two weeks there will be 2,000 new infections"	Are you sure? What if a new variant will come?

5

Figure 6: Example questions about the model outputs

3.6. Next course of action

The next course of action is to incorporate the feedback collected from the training into the development of the MOOC, which is the next deliverable (D5.6) of the project.

4. Training Session 3 Social Media Analytics (WP4)

4.1. Summary

This interactive session explored ways how misinformation about COVID-19 is identified and managed on social media, both manually by the fact-checking community and supported by technology. We shared opportunities and challenges of standardising the way fact-checking is done, including possibilities to amplify fact-checkers' work and conduct large-scale analyses on misinformation trends. We also introduce some of the limitations of technical approaches for complex social subjects, like misinformation, that are difficult for humans to mitigate, let alone machines. By showing the participants many different approaches to misinformation and allowing them to explore different tools, stakeholders could identify technologies that might support them in their crisis response.

4.2. Purpose

The purpose of this training was to introduce stakeholders to the state-of-the-art in managing current and future "infodemics" around global events. Taking the COVID-19 crisis as a case study, we introduced participants to the work of the International Fact-checking Network and the Claim Review process that underpins many different technical approaches to understanding and mitigating harm from COVID-19 misinformation. We presented examples from our own work and the work of colleagues at other institutions that attempt to deal with the pandemic from slightly different perspectives, like information literacy, digital literacy, and inoculation theory. Stakeholders were given the opportunity to share possible use cases for different tools, which would allow them to enter crisis regions armed with more information about the local population, their information needs, and their currently held misconceptions or beliefs that may influence their actions relative to the crisis.

4.3. Learning outcomes

The learning outcomes of the session were as follows:

- How to spot misinformation online?
- How to encourage critical thinking about the information and its sources?
- How to use large scale-analysis to understand trends and patterns in information sharing?
- How to diversify approaches to mitigate different aspects of the misinformation problem before, during, and after encountering misinformation online?

4.4. What was presented

We started with a more general discussion of where the stakeholders have encountered misinformation about COVID-19, both personally and professionally. We discussed how encountering

misinformation could shape public perception of a crisis. We then introduced some existing research around the topics of misinformation about COVID-19 and the types of misinformation approaches one may see online. We presented the Claim Review Schema to the participants and had them participate in an annotation exercise that reflected one of the tasks that fact-checkers undertake when filling in the Claim Review (Figure 7). We wanted the stakeholders to understand the challenges of annotation as a backbone of large-scale analysis of COVID-19 misinformation.

Figure 7: Example claim classification annotation task

We then discussed several experiments we conducted in training an AI classifier to identify topics, demonstrating how those challenges in annotation impact the results of the classifier. For the second part of the presentation, we moved toward different types of tools that do not use AI specifically to amplify fact-checkers' work. We presented MisinfoMe[1], a platform for checking source credibility by searching an extensive database of fact-checks and source credibility from other websites, such as Media Bias[2] and Web of Trust[3]. We reported experiments using a bot to deliver this same information to users sharing misinformation on Twitter and the responses we received. Finally, we introduced the participants to the Fact Checking Observatory[4] and its reporting feature that shows trends and analysis by region. In terms of other projects, we did not develop, we used the last part of the presentation to

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1 MisinfoMe, https://misinfo.me/.

2 Media Bias, https://mediabiasfactcheck.com/.

3 Web Of Trust, http://www.mywot.com/.

4 The Fact-checking Observatory, https://fcobservatory.org/.

introduce TinEye[5], The Factual[6], Reality Defender[7], and the Go Viral misinformation game[8] to highlight other potentially effective approaches.

4.5.   How it was presented

For presenting the main concepts: We used PowerPoint and some reflection prompts to encourage participants to think about how the problem of misinformation presents itself in their own work. For demonstrating tools: We provided screenshots and summaries of analysis related to the deployment of different tools created by The Open University. We also provided direct links to any tools that are still currently supported (Figure 8 and Figure 9). For those tools not created within our lab, we created QR codes for any publicly available tools and gave the participants time to explore the tools and ask any relevant questions.
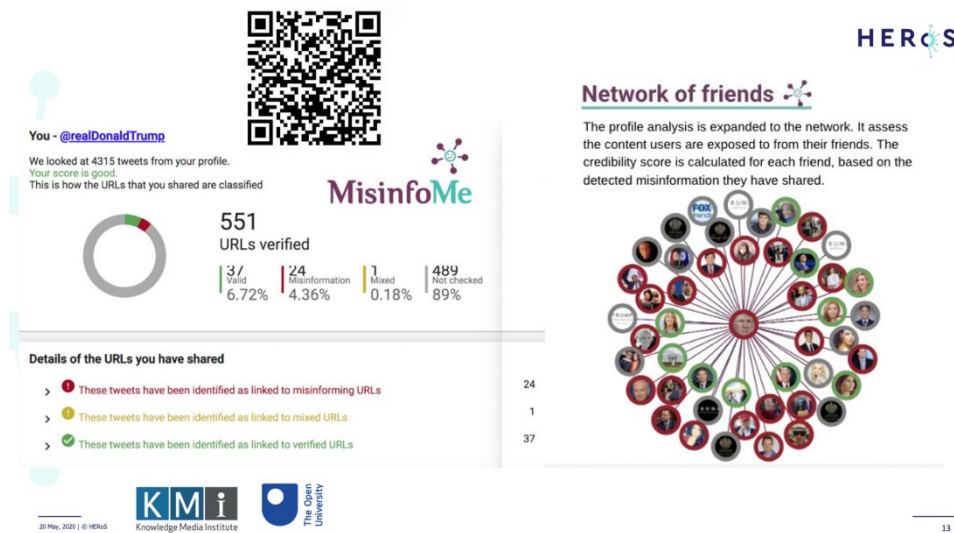

Figure 8: Example of analysis provided by the MisinfoMe Tool

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5 Tiny Eye, https://tineye.com/.

6 The Factual, https://www.thefactual.com/.

7 Reality Defender, https://www.realitydefender.ai/.
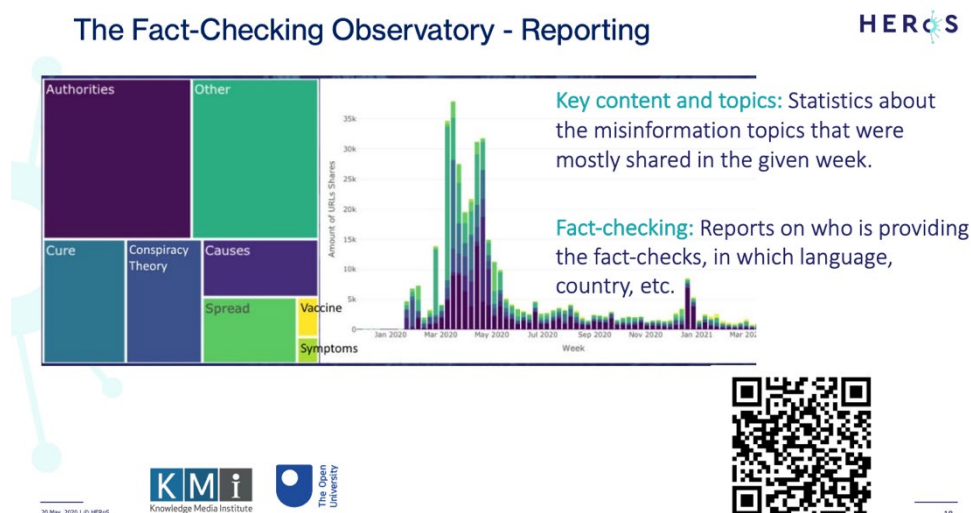
8 Go Viral, https://www.goviralgame.com/en.

Figure 9: Example of visualisation provided by the Fact-checking Observatory website

For interactive assignments: We provided the participants with a link to an online form[9] to conduct a joint annotation exercise on topics of misinformation about COVID-19. We then reflected on the challenges of this exercise by showing some of the responses. This illuminated difficulty in annotating topics that are semantically similar, mainly where there is no multi-class option (Figure 10). The WP4 team collected the necessary feedback to incorporate into the Massive Open Online Course (MOOC).
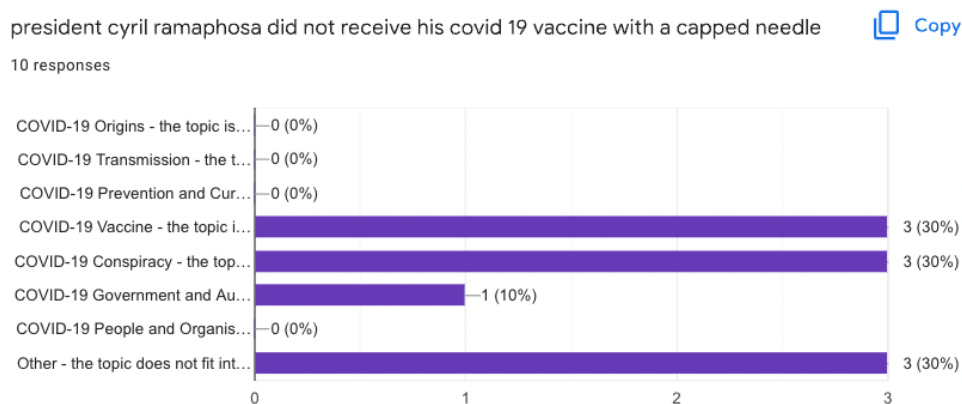

Figure 10: Example of conflicting annotation

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9 Annotation Exercise Form,
https://docs.google.com/forms/d/e/1FAIpQLSfuZF8gFN5RiSo9ksIVPEJ0A9kqnNUuC6Iw3OwpH0zGrsTKsA/viewform.

4.6.   Next course of actions

The Fact-checking Observatory (FCO) and MisinfoMe have both been redesigned and will continue to collect data from the International Fact-Checking Network. The FCO will continue to provide reports on misinformation trends. We are currently collecting and analysing the outcome of the Twitter bot and investigating new experiments that may allow us to use and test different intervention styles and strategies.

5. Training Session 4 Supply Chain Management (WP3)

5.1. Summary

The supply chain management training session conducted by WP3 was the last of the four training sessions. The session concentrated on sharing findings of all four deliverables i.e., D3.1 (Falagara Sigala et al., 2020), D3.2 (Falagara Sigala et al., 2021), D3.3 (Sarker et al., 2022) and D3.4 (Falagara Sigala et al., 2022) from the WP3 Consequently, this training session was a two-part session. In the first part, different types of disruptions experienced during the COVID-19 pandemic, mitigation strategies for these disruptions, and lessons learned were presented. In the second part, how medical deliveries using drones can be handled was discussed.

5.2. Purpose

The training aimed to bring forward the learnings from WP3 entitled supply chain management. WP3 had four interrelated tasks:

- Task 3.1 Medical supply chains for pandemic response
- Task 3.2 Secure delivery methods to quarantined environments in the last mile
- Task 3.3 Using drones for secure deliveries to quarantines
- Task 3.4 The economic impact of supply chain disruptions

The training focused on sharing findings of all the above tasks.

5.3. Learning outcomes

The learning outcomes were as follows:

- Understand, explain, and discuss the medical supply chain.
- Understand, explain, and discuss the disruptions in the medical supply chain.
- Understand, explain, and discuss different flows in the medical supply chain.
- Understand, explain, and discuss different mitigation strategies.
- Understand, explain, and discuss lessons learned during the COVID-19 pandemic.
- Understand the comparison of the HERoS project drone with a typical plane used for humanitarian aid delivery missions.
- Understand the advantages of using UAVs in humanitarian aid missions and the problem areas it generates.
- Understand the organization of airlifts using drones.
- Understand airspace management problems in drone delivery operations.
- Understand problems and solutions to ensure 24/7 flights during delivery operations.
- Understand the principles of operating on delivery point.

5.4.   What was presented

The session started with introducing the participants to the medical supply chain by discussing the flows and stakeholders of the medical supply chain. As presented in figure 11, the medical supply chain is as simple as having several suppliers who supply medical goods and services, healthcare providers, and patients. Figure 11 also shows flows in a typical supply chain consisting of goods and services that usually flows from suppliers to patients, cash that flows from patient to suppliers, and then the information that can travel in both directions.
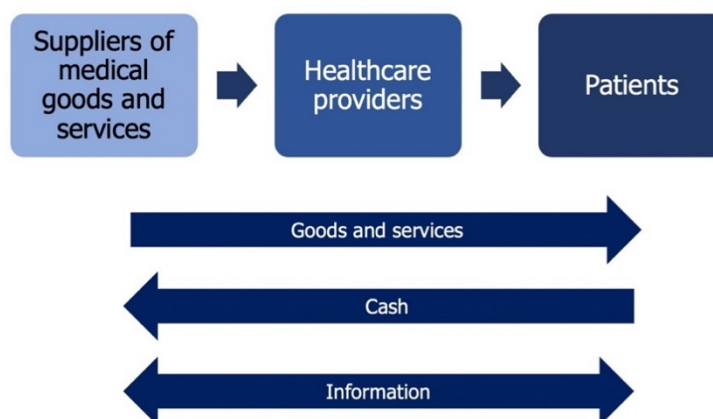

Figure 11: Flows in the medical supply chain

To emphasise the complexity of the medical supply chain, the flows and stakeholders of the supply chain are presented in the same figure as depicted in figure 12 (please see also deliverable 3.1 for a detailed description of the figure 12).
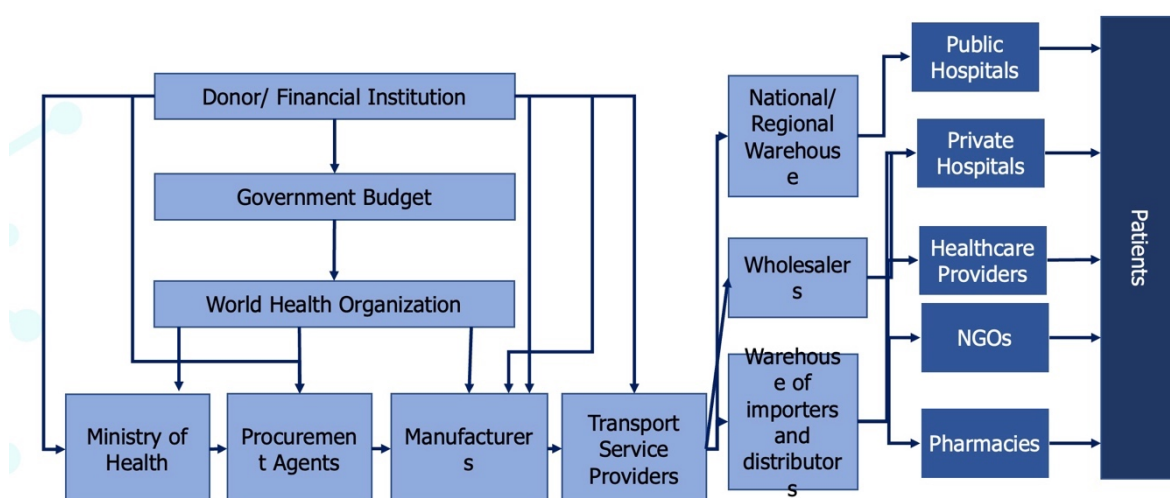

Figure 12: Medical Supply Chain Flows and Stakeholders

(Source: Falagara Sigala et al., 2020)

Different types of disruptions categorised under deliverable 3.1 were also presented. These disruptions are depicted in figure 13.
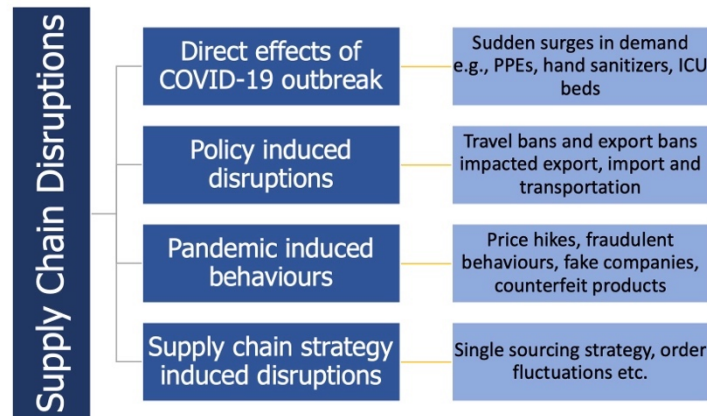

Figure 13: Supply chain disruptions due to COVID-19 chain

As depicted in figure 13 there are four kinds of disruptions (Falagara Sigala et al., 2020):

- Disruptions induced by direct effects of COVID-19 outbreak
- Policy induced disruptions
- Pandemic induced disruptions
- Supply chain strategy induced disruptions

Various mitigation strategies that worked during the pandemic were shared with the training participants. These mitigation strategies are as follows:

- Prepositioning of inventories
- Kitting
- Global standards
- Pre-qualified suppliers
- Multiple sourcing
- Joint procurement
- Production changeover

Some of the mitigation strategies that are hard to grasp were explained in the session. For instance, what does it mean to preposition inventories? As illustrated in figure 14, it is customary to preposition critical medical items in every stage of the supply chain.
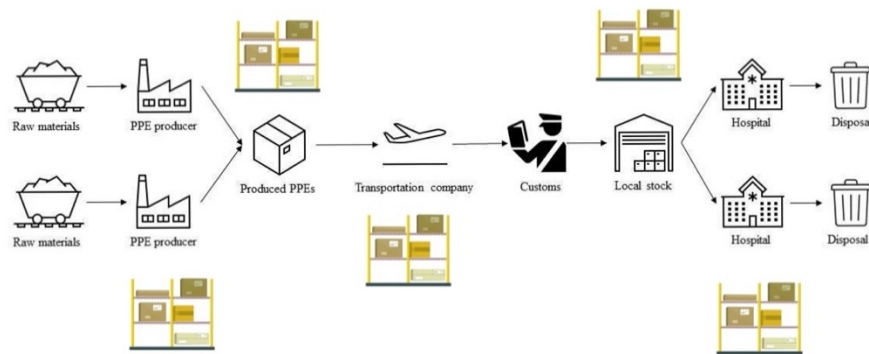
Figure 14: Schematic representation of the PPE supply chain

(Source: Falagara Sigala et al. 2022)

The mitigation strategy of kitting is also discussed. The concept of kitting is depicted in figure 15. As can be seen in figure 15, kitting is putting together items that will also be used together. For instance, when vaccines are administered, the medical staff must wear a mask and gloves which can go to the kit for vaccines along with the vaccine and syringes.
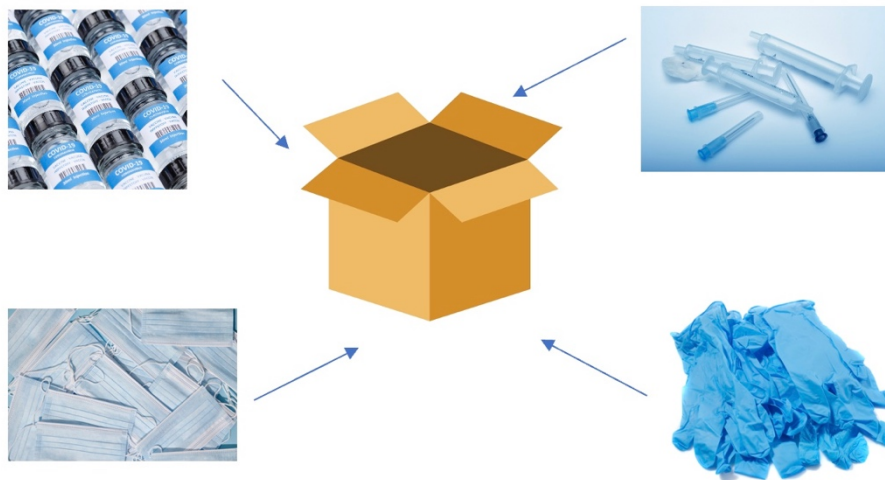

Figure 15: Kitting

Another mitigation strategy that was discussed in training was the multiple sourcing strategies. The training participants were also cautioned about using multiple sources from a single country which can be pandemic if the whole country is affected by disruptions. For instance, during the COVID-19 pandemic, many companies that had suppliers in China suffered because all the suppliers in China were affected by government regulations. In such cases, having sources in different countries (e.g., China and India) can be very effective.

Lastly, lessons learned for the future are shared. As presented in figure 16, lessons learned were categorised into four categories preparedness, standardisation, innovation, and collaboration.

Preparedness	Standardisation	Innovation	Collaboration
• Pre-positioning (UNHRD,IFRC) • Joint procurement (IFRC, EU) • Framework agreements • Pre-trained staff on rosters • Deployable funds • Multiple sourcing strategies with geographical diversification • Pre-qualifying suppliers	• Kitting of interdependent items • Global certifications and quality standards of items • Assurance of cargo movements even in lockdown • Non-earmarked funding for disaster incl. pandemic response	• Non-person-dependent transportation (e.g., UAVs) • Structural flexibility in production, transportation, sourcing • Innovation in business models (collaborative versus competitive) • Financial forecasting tools	• Public-private sector partnerships • Collaborative initiatives for the regulations and legislations • Collaborative preparedness mechanism • Incentives for production changeover and transportation capacity

Figure 16: Lessons learned

(Source: Kovács & Falagara Sigala 2021)

As depicted in figure 16, preparedness will require the pre-positioning of inventories not only by the government but also by organisations such as United Nations (UN) in the United Nations Humanitarian Response Depot (UNHRD). Also, joint procurement helps to prepare because of the higher purchasing power of joint procurers. Standardisation involves kitting as well as developing certification for items such as personal protective equipment. Innovation can come in developing and using non-person-dependent transportation, such as Unmanned Aerial Vehicles (UAVs). Public-private partnerships and collaboration also work well in times of disruptions and crisis.

In the second part, participants are made aware of how to fly a cargo drone having a 150 kg payload over a long distance. Figure 17 depicts the simulation environment.

Figure 17: The HERoS plane flying over a region in a simulated environment

Source: (Sarker et al., 2022)

The need for having an accepted international regulation for drones is also emphasised. Airspace management for drones travelling between countries is highlighted. It is discussed that if drones will be operating 24/7, there is a need to consider the well-being of pilots and design the workspace more ergonomically. Necessary training for pilots as well as ground control staff is also critical for building a UAV system of delivery for medical goods. There is also a need to think about communication mechanisms between the UAV and ground control station because, in case of poor cellular connectivity, satellite connectivity might be required.

Additionally, the point of delivery for medical items delivery is critical because there may not be a dedicated person receiving these deliveries. Also, delivering sensitive items such as vaccines and blood samples; hence, there needs to have checks to verify the suitability of the person receiving the delivery. Lastly, a delivery point matrix (depicted in figure 18) was presented to demonstrate how to decide who should handle the delivery of a particular item (e.g., food or medicines).

Figure 18: Delivery point mix

5.5. How it was presented

The first part, where information is shared about disruptions, mitigation, and lessons learned, was performed using a power-point presentation. Then an exercise was performed where the participants were asked to discuss in groups the following questions.

- What disruptions have you encountered?
- What mitigation strategies have you used?
- What lessons have you learned?

Three groups were formed. During this exercise, the participants used large white paper sheets to note their answers. Then one of the group members presented the discussion summary to the others. Each group was given one question to discuss. The presentation of delivery 3.2, which involved drones, is

given using PowerPoint slides with key points. The WP3 team collected the necessary feedback to incorporate into the Massive Open Online Course (MOOC).

5.6. Next course of actions

The training materials will be transformed to share with a wide range of audiences in a MOOC entitled Health Emergency Response in Pandemics: An integrated social science perspective.

6. Feedback from participants

The participants provided feedback right after the training. The first question about the training was how they would rate it concerning the content, relevance, timeliness, delivery, and overall experience. Figure 19 depicts the rating of the training by the participants.
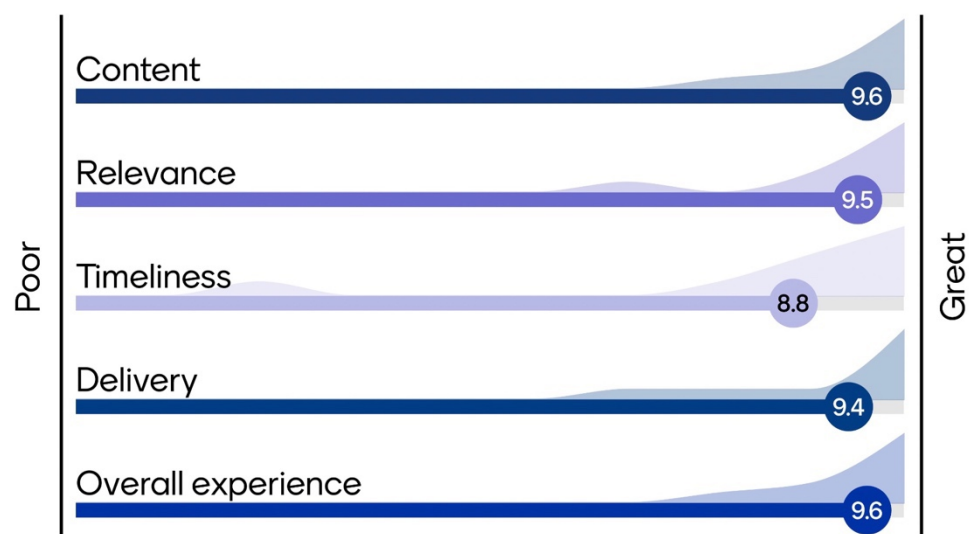
How will you rate the training?

Figure 19: Training rating by the end-users

The grading was between 1 to 10, where 1 refers to poor, and 10 represents great. As depicted in figure 19, the candidates rated the content, relevance, timeliness, and training delivery relatively high. Consequently, the overall experience of the training was graded as 9.6 out of 10.

The second question was what they liked about the training. The answers were as follows:

- "Interactive sessions"
- "Content"
- "I liked sharing experiences and interacting with other project members."
- "The interaction was great, and I have learned many things."
- "How important reliable information about the pandemic is"
- "Everything was great, all contents."
- "It was interesting and clearly explained."
- "I really liked the interactive components that triggered interesting end-user responses. I was most enthusiastic about the training on social media and misinformation of WP4 presenter and supply chain of WP3 presenter."

The third question was, how can we improve? The answers to the question were as follows:

- "I believe we could get deeper on some communications topic."
- "More discussions will be nice."

- "It was a bit short. It will be great to have access to a number of lessons and not just one."

We got the following answers to the question of what topics we have missed to cover.

- "More about drones"
- "All topics related to the project were covered."

The last question asked about rating some statements. The rating is shown in figure 20.

Rate the following statements
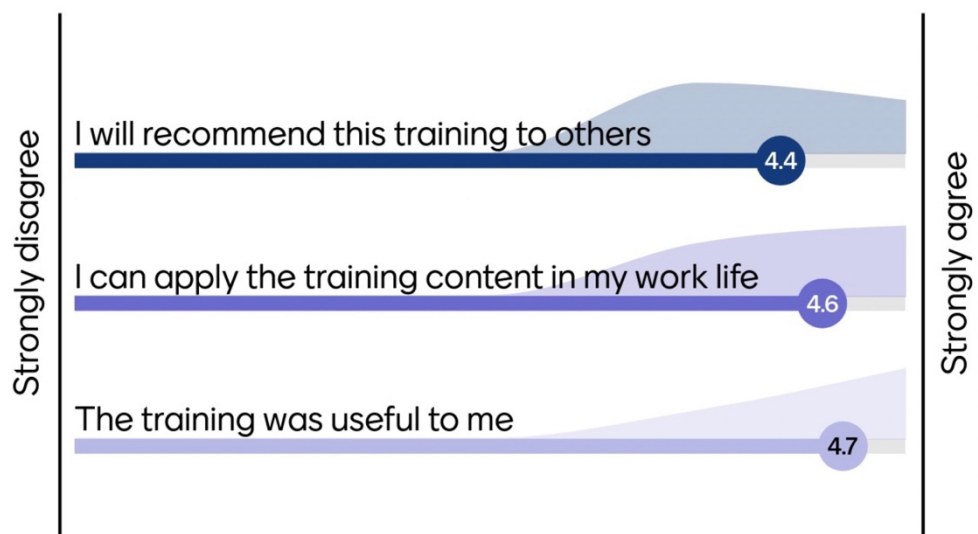

Figure 20: Rating statements about training

The rating was out of 5, where 1 meant respondents strongly disagreed with the statement, and 5 meant they strongly agreed with it. As depicted in figure 19, the participants would like to recommend the training to others. They also vocalised that they could apply the training content in their work life and that the training was helpful.

7. Conclusions

The Health Emergency Response in Interconnected Systems (HERoS) project aimed to integrate behavioural dynamics in epidemiological models under the resource constraints of public health providers and bring together governance, information, and logistics support to prepare for and respond to the COVID-19 pandemic. In this regard, the purpose of the training was to draw together all learning from the work packages and make them understandable to the end users. To fulfil this purpose, the training was developed in close collaboration with end-user partners to determine realistic and relevant scenarios and critical learning objectives. The training covered the complexity and dynamics of pandemic response with the aim of preparing decision-makers to manage complex supply chains and highly uncertain information.

To ensure that all learning from the HERoS project comes forward in a sensible manner, the four work package leaders, VU Amsterdam, TUD, Hanken and OU lead the training content. However, content development support was also received from task leaders such as NHG and Squadron. The end-users were interviewed before the training about what content from the project they would like to see as training materials. This step in the training development process helped to match the content of the training to end users' needs.

The feedback received from the end-users about the training illustrated that the training was a success and that the materials were relevant, timely, and useful. However, one limitation that came forward from the feedback was the length of the training. It is understood that the end-users would require more training on the material developed and research conducted under the HERoS project. One of the end-users (Project HOPE) showed interest in organising the training again during the next consortium meeting planned in November 2022 in Skopje, North Macedonia.

The next step in Task 5.5 will be to develop further the training materials for a boarder audience for a massive open online course (MOOC). This MOOC will also help the end-users to apply the knowledge developed under the project in their day-to-day activities.

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Appendix – Training Agenda

HERoS Training

Venue: Aurora Room, VU Amsterdam

Date: 21-22 June 2022

Table 1: HERoS Training Agenda

Date	Time	Topic	Summary	Responsible
Day 1				
21.06.2022	13:30 – 14:00	Introduction: meet & greet	Participants in the training will give a brief introduction about themselves.	Hanken
21.06.2022	14:00 – 15:30	Crisis Governance in pandemics	This interactive session will present our visual ethnographic evidence, best practices, and lessons learned related to the governance of the COVID-19 crisis within social organizations in Europe, e.g., nursing homes and secondary schools. We demonstrate how national, regional and local stakeholders act and interact whilst dealing with different target groups, risks, and priorities that hence require variations in crisis response. We address (cross boundary) collaboration, capacity building, and communication. Overall, this training will help to understand the complexity of the crisis response, its unintended consequences, and varying challenges in different social settings.	VU Amsterdam
21.0.2022	15:30-16:00		Coffee break	
21.06.2022	16:00 – 17:30	A guide on Covid data & models	COVID-19 dumped an enormous amount of the data into the world. From simple data, at first glance, on the number of tested positive individuals to the data on how the virus mutates. Moreover, it also brought computational models "predicting the future" that should assist with decision making. This training session will go over the main pitfalls and possibilities that these models and data bring. For example, can you see the model's assumptions as an end-user? Or what are the best ways to make sense of the hospitalization data?	NHG TU Delft

Date	Time	Topic	Summary	Responsible
Day 2				
22.06.2022	9:00 – 10:30	Social Media Analytics	This interactive session will present various informational environments in a pandemic and will demonstrate fact-checking and other approaches to handling misinformation online. We will consider credibility and trust in information online and highlight some trends, patterns, conspiracies and persistent misinformation. The session will also demonstrate the types of tools individuals are using to fight misinformation online.	Open University
22.06.2022	10:30 – 11:00		Coffee break	
22.06.2022	11:00 – 12:30	Disruptions and mitigation strategies in the medical supply chains during the COVID-19 pandemic: lessons learned for the future	This interactive session will concentrate on different types of disruptions experienced during the COVID-19 pandemic and mitigation strategies for these disruptions. The session will also demonstrate handling medical supplies in the forward operation base and explain the checklist for sending medical deliveries using drones.	Hanken Squadron