

MediPIET Summary report of work activities

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Lebanon, Cohort 6 (2023)

Background

1. About MediPIET

The Mediterranean and Black Sea Programme for Intervention Epidemiology Training (MediPIET) aims to enhance health security in the Mediterranean and the Black Sea region by supporting capacity building for prevention and control of natural or man-made threats to health posed by communicable diseases. It is a competency-based **in-service two-year fellowship** during which selected fellows conduct projects and field investigations at a MediPIET Training Site in their home country and attend MediPIET modules.

Since mid-2021, MediPIET is implemented by ECDC as a part of the [EU Initiative on Health Security](https://www.ecdc.europa.eu/en/training-and-tools/training-programmes/fellowships/medi Piet). You can find more information about the programme at: <https://www.ecdc.europa.eu/en/training-and-tools/training-programmes/fellowships/medi Piet>.

2. Pre-fellowship short biography

Hawraa Sweidan holds a Bachelor's degree in Computer Science and a Master's degree in Business Computer Science, and is currently pursuing a Master's in Geospatial Artificial Intelligence. Since 2019, she has worked at the Epidemiological Surveillance Unit of the Lebanese Ministry of Public Health. Since 2022, she served as Data Manager and IT Coordinator. Her work focused on IT coordination, metadata management, geospatial and data analysis of outbreaks, national reporting, and building the ESU team's technical capacity.

Fellowship

In September 2023, Hawraa began her MediPIET fellowship at the Epidemiological Surveillance Program, Ministry of Public Health, Beirut, Lebanon. This report summarises the work performed during the fellowship.

National supervisor(s): Dr Nada Ghosn

Scientific coordinator: Pawel Stefanoff, Katie Palmer

Fellowship projects

3. Surveillance

Implementation of the casualties surveillance system, Lebanon, 2023-2025

Introduction: The war in Lebanon in October 2023 led to a significant rise in casualties, creating urgent public health challenges. Effective surveillance of casualties, including injuries, deaths, and hospital admissions, was essential to support emergency response, resource allocation, and policy decisions. The Lebanese Ministry of Public Health implemented a structured electronic system to track and document casualties, focusing on demographics, injury mechanisms, triage status, and hospital outcomes.

Methods: In September 2023, the Ministry of Public Health established a combined passive and active surveillance system. As a data manager, I implemented the case-based reporting form on the District Health Information System (DHIS2) platform. This form captured two main sets of data: Profile variables (including demographics and reporting hospital) and Stage 1 variables (including mechanism of injury, triage status, and final destination). Hospitals reported case-based data directly to the system. We coordinated data collection, provided IT support, and conducted training of hospital focal points. Our team also cleaned the raw data using R, analysed them, and visualised the output via dashboards and daily national reports. The Public Health Emergency Operations Centre (PHEOC) defined key variables and indicators, including tracking healthcare worker casualties. We managed the iterative updates to the form to ensure completeness and usability.

Results: Between 2023 and 2025, 24 359 casualty records were captured. Data completeness varied: Profile variables averaged 92%, while Stage 1 variables (injury mechanism, triage, destination) averaged 80%. The form was updated twice, allowing the system to remain adaptable and flexible to evolving field needs without any data loss. Surveillance facilitated daily monitoring of casualty trends, epi curves, and hospital admissions, enabling timely decision-making. Dashboards and national reports provided actionable information to PHEOC, hospitals, and policymakers.

Conclusions: The Lebanese casualty surveillance system demonstrated that a well-structured, electronic, and iterative approach could provide timely and reliable data during conflict. Despite challenges, including reporting delays during intense attacks and incomplete location data, the system strengthened situational awareness, supported resource allocation, and informed public health responses. Lessons learned can guide improvements for future conflict-related casualty surveillance.

Role and outputs: Principal investigator; developed metadata, DHIS2 forms, dashboards, and national reports; trained hospital staff; conducted data analysis.

Supervisor: Dr. Nada Ghosn

Status: Completed

Enhancing Genomic Surveillance for COVID-19 and influenza in Lebanon: surveillance protocol

Background and justification: The COVID-19 pandemic underscored the critical need for integrating genomic surveillance into routine public health systems to track viral evolution, detect Variants of Concern (VOCs), and inform timely interventions. While global and regional efforts have accelerated, Lebanon's capacity to translate sequence data into actionable public health decisions remains underdeveloped. The existing epidemiological surveillance system required enhancement with genomic data to provide a view of pathogen transmission and virulence shifts. This protocol was developed to establish routine procedures for analysing publicly-available SARS-CoV-2 and influenza genomic sequences from Lebanon in GISAID.

Considered indicators: The surveillance system will focus on a defined set of genomic indicators that will be calculated using a custom script to automate data workflows. We defined mutation frequency as the average calculated for a set of mutations determined in a genome, or for an individual mutation at a defined genomic site. We defined lineage prevalence as the proportion of sequences assigned to a specific viral lineage among all collected sequences. We defined sequencing coverage as the proportion of confirmed cases for which genomic sequences are available. We defined the variant replacement rate as the number of months needed for one lineage to replace another. We defined data quality as the proportion of non-missing essential metadata.

Surveillance procedures: We outlined four stages of the genomic surveillance implementation. First, the genomic sequences and metadata for SARS-CoV-2 and influenza from Lebanon (February 21, 2020–December 22, 2023) will be extracted from the GISAID public database. This will be followed by data cleaning (excluding incomplete, duplicate, or sequences with missing essential metadata). Secondly, the ESU team will calculate surveillance indicators through custom R scripts developed and applied to the cleaned data. We will analyse trends and replacement rates using time-series analysis methods. Thirdly, we will create automated reports (HTML output) to visualise the calculated indicators. Finally,, we will share the results with stakeholders to validate the relevance of the new indicators and establish a routine mechanism for integrating genomic analysis with existing epidemiological data.

Next steps: With the protocol finalised, the immediate next steps will be to execute the automated data analysis and reporting scripts on the historical GISAID data to generate the initial output (HTML). Crucially, this involves training and capacity building for ESU staff on the interpretation of genomic indicators and leading discussions with national stakeholders on standardising these indicators for routine reporting. The protocol itself will require periodic review and updates to remain aligned with the dynamic nature of bioinformatics tools (R packages) and emerging public health needs.

Role and outputs: Principal investigator. Hawraa developed the protocol for integrating genomic data surveillance into Lebanon's national surveillance system. She submitted the protocol to the Ministry of Public Health for consultation and future implementation.

Supervisor: Dr. Nada Ghosn

Status: Completed

4. Outbreaks

Epidemiological investigation of a large Trichinellosis outbreak in Lebanon, October 2023 – February 2024

Introduction: On 4 December 2023, the Epidemiological Surveillance Unit (ESU) of the Lebanese Ministry of Public Health was notified of a suspected trichinellosis outbreak in Jahliyah (Mount-Lebanon, approximately 6 000 residents). The investigation aimed to identify the outbreak source, estimate magnitude, and implement preventive measures.

Methods: Suspected cases were defined as residents with ≥ 3 symptoms (fever, myalgia, oedema, hypereosinophilia) or physician-diagnosed trichinellosis after 1 October 2023. Case finding combined passive and active surveillance, supplemented by a household survey. Data on demographics, symptoms, and meat consumption habits were collected via DHIS2/Survey123. Multivariable logistic regression assessed associations between exposures and illness. Environmental investigations included inspections of local butcheries and laboratory testing of meat samples using the digestion method for *Trichinella* detection.

Results: We identified 290 cases, of which 268 (92%) were suspected, 21 (7.2%) probable, and one (0.3%) was confirmed. The median age was 35 years (range 2–85); 34% required hospitalisation. Consuming meat purchased from Butchery A (RR = 8.2; 95%CI: 5.6–12.1) and consuming uncooked meat (RR = 1.9; 95%CI: 1.4–2.6) was associated with illness, while freezing and cooking were protective. Food inspection revealed major hygiene breaches at Butchery A, and detection of *Trichinella* larvae in minced beef and sausage samples.

Conclusions: The outbreak was linked to contaminated meat from a non-compliant local butchery and consumption of raw or undercooked meat. Strengthening food safety inspections, educating the community on safe meat practices, and enhancing intersectoral outbreak response are critical to prevent future trichinellosis outbreaks.

Role and outputs: Principal investigator; developed data collection tools, performed data entry and analysis, coordinated household surveys, conducted environmental investigations, contributed to the outbreak report and submitted the manuscript to a peer-reviewed journal.

Supervisor: Dr Nada Ghosn

Status: Completed

5. Research

Geospatial analysis of cholera outbreak – Bebnine, Akkar in 2022 – 2023

Introduction: Following Lebanon's first cholera case in a Syrian refugee camp in nearly three decades, confirmed in October 2022, the disease spread rapidly across the country. Bebnine, a locality in Akkar Governorate, emerged as a key transmission hotspot due to its high population density, widespread informal settlements, and severely deteriorated WASH infrastructure. This study aimed to characterise the spatiotemporal distribution of cholera cases in Bebnine and identify high-risk zones and environmental risk factors to inform future outbreak response.

Methods: We conducted a retrospective spatiotemporal analysis using suspected and confirmed cholera case data reported to the Ministry of Public Health between October 2022 and June 2023. Kernel Density Estimation (KDE) was used to generate a continuous risk surface, while DBSCAN clustering identified micro-clusters of transmission.

Results: A total of 354 cholera cases were analysed, with the epidemic curve showing a biphasic pattern and extended community transmission. KDE analysis identified a dominant hyper-endemic zone of sustained transmission, while DBSCAN revealed persistent micro-clusters within 100-meter radii.

Conclusion: The study showed that cholera transmission in Bebnine was not generalised but driven by localised environmental vulnerabilities. The dual use of KDE and DBSCAN provides a replicable model for guiding both long-term infrastructure investment and rapid outbreak response in similar high-risk settings. These findings support the institutionalisation of geospatial tools in public health surveillance and targeted intervention strategies.

Role and outputs:

Principal Investigator. Hawraa wrote the research protocol, conducted the full geospatial and temporal data analysis, developed and georeferenced environmental GIS layers, interpreted findings, wrote the first draft of the manuscript.

Supervisors: Dr. Nada Ghosn

Status: Completed

6. Scientific communication

Conference presentations

- Sweidan H, Stefanoff P, Chaito L, Ghosn N. Unveiling the Trichinellosis Outbreak: Pork Contamination in a Butcher's Shop in Jahliyah, Lebanon, November 2023 – February 2024. Oral presentation at: European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE); 20-22 November 2024, Stockholm, Sweden.
- Sweidan H, Jouny A, Ghosn N, Abbood A. Noise classification in Epidemic Intelligence from Open Sources articles using natural language processing: A random forest approach. Poster presented at: European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE); 19-21 November 2025, Warsaw, Poland

Publications and outputs

- Sweidan H, Omeirat N, Chaito L, El Hagge J, Ghosn N. Epidemiological investigation of a large trichinellosis outbreak in Lebanon, October 2023 – February 2024. Submitted to *Epidemiology and Infection* in October 2025.
- Chaito L, Stefanoff P, Albuaeni M, Sweidan H, Youness M, Ghosn N. How is Lebanon progressing towards measles elimination? Review of measles surveillance performance indicators in Lebanon, 2013–2024. Submitted to the *International Journal of Infectious Diseases Regions* in October 2025.
- Jouny A, Sweidan H, Baaklany M, Ghosn N. Integrating DHIS2 and R for enhanced cholera surveillance in Lebanon: A case study on improving data quality and public health decision-making. *International Journal of Environmental Research and Public Health* 2025, 22(11), 1684; <https://doi.org/10.3390/ijerph22111684>
- Sweidan H, Ghosn N. A trichinellosis outbreak: a teaching case-study. *Pan African Medical Journal*, accepted for publication.

7. Teaching activities

Training course on capacity development of data analytics and dissemination using R, Beirut, January 2024

On 23–25 January 2024, Hawraa organised a 1.5-day training course for employees of the Epidemiology Surveillance Unit staff at the Ministry of Public Health (Beirut, Lebanon). The course covered data analytics and dissemination using R and spanned over three half-day sessions. Hawraa developed training materials including presentations, live demonstrations, and hands-on exercises, with a focus on data import, processing, analysis automation, and report generation. She evaluated the course through assignments, discussions, and feedback forms, achieving high participant satisfaction and improved confidence in applying R skills. The activity enhanced her instructional design, communication, and facilitation abilities while highlighting areas for further development in follow-up training.

Workshop on artificial intelligence in epidemiology, Beirut, May 2025

On 30 May 2025, the Lebanese FETP organised a face-to-face workshop that consisted of lectures and exercises in an interactive learning environment. The workshop included a session on the safe, ethical, and effective application of Artificial Intelligence (AI) in epidemiology. The workshop was held at the Ministry of Public Health in Beirut. Hawraa developed and delivered an interactive session focused on effective prompting, data privacy, and critical evaluation of AI outputs. Materials were adapted from the ECDC PETAL Seminars and included a presentation, live demonstration, and a practical exercise requiring fellows to identify AI hallucinations (fabricated citations and data) in draft abstracts. Learning was evaluated through pre-training survey and post-session feedback survey, and in-session discussions, demonstrating high participant satisfaction and a significant enhancement in their sceptical and critical attitude toward using AI for scientific writing and data analysis. The activity strengthened her instructional design skills in scenario-based teaching.

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8. International assignments

Enhancing Lebanese event-based surveillance through noise reduction of EIOS articles using natural language processing models – visit at the Robert Koch Institute in Berlin

On 27 June 2023, Hawraa visited the Robert Koch Institute in Berlin, Germany, as part of the MediPIET fellowship. The primary objective was to enhance Lebanon's Event-Based Surveillance (EBS) by employing Natural Language Processing (NLP) models to filter 'noise' from the high volume of articles screened via the Epidemic Intelligence from Open Sources (EIOS) portal, where less than 1% of over 146 000 articles were found to be relevant since March 2022. The methodology involved labelling 348 EIOS articles for relevance and training a Random Forest classifier. The results showed two high-accuracy models: one excluding Arabic articles with tokenization (accuracy = 0.967) and one including all languages without tokenization (accuracy = 0.897). The project concluded that NLP models can substantially improve EBS efficiency by classifying irrelevant articles, with recommendations to automate translation, expand labelled datasets, and periodically update the models to strengthen Lebanon's public health surveillance capacity. The collaborative visit successfully demonstrated that integrating NLP models is a critical step toward a more efficient and targeted public health surveillance system in Lebanon.

Hosting country and institute: Germany, Robert Koch Institute

Supervisors: Auss Abbood, Alexander Ullrich

Development of training materials for ECDC and Africa CDC Partnership Project

On 10 January 2025, Hawraa participated remotely in the development of training materials for the ECDC and Africa CDC Partnership Project. This assignment supported the enhancement of regional epidemic intelligence by developing a practical, real-world R case study to strengthen participants' skills in core epidemiological tasks, including data analysis, visualisation, and standardised report production using R. The methodology involved the creation of the 'Mpox Surveillance Data Analysis Case Study' using R Markdown script, a fully functional, ready-to-use training module that provides a reusable framework for future capacity-building initiatives. Hawraa attended several meetings focused on reviewing, fine-tuning, and exchanging updates with her supervisors and other fellows to cover all project requirements. The successful remote development and handover of this practical training module underscored the effectiveness of flexible international collaboration in rapidly delivering essential public health capacity-building tools. The resulting case study should be standardised for subsequent regional 'R' training sessions to ensure reusability, with a commitment to periodic review to maintain educational functionality due to the dynamic nature of R packages.

Hosting country and institute: Remote/ECDC

Supervisor: Xanthi Andrianou

9. Other activities

- Developed and delivered case study: Mapping hepatitis A incidence in Lebanon by district, Lebanese FETP workshop, September 6, 2024.
 - Description:* Hands-on training using QGIS where participants learned to calculate incidence rates, join spatial data, and create choropleth maps for epidemiological analysis.
- Mentored: FETP Basic Cohort 4 (two fellows), Lebanese FETP, August 2024 – February 2025.
- Mentored: FETP Basic Cohort 5 (one fellow), Lebanese FETP, March – July 2025.
- Presented abstract (Lightning Talk): "DHIS2 for community surveillance: Lebanon insights," DHIS2 2025 Annual Conference, Online, June 10 – 13, 2025.
- Participated in technical exchange: PHI Technical Exchange, Robert Koch Institute (RKI), the WHO Hub, and WHO EMRO, Cairo, Egypt, August 17 – 21, 2025.
- Participated in training: Training for National Influenza Center and ESU on Genomics of Influenza Viruses using Nanopore Technology, WHO – AUBMC, Beirut, Lebanon, July 14 – 18, 2025.
- Participated in course: R Training on Time Series Analysis, RMD and Shiny, Applied EPI, Online, August 2025.
- Participated in workshop: Time Series Analysis and Outbreak Detection with R, Applied EPI, Online, July 22 & July 24, 2025.
- Participated in workshop: Shiny in R, Applied EPI, Online, August 9 & August 21, 2025.
- Participated in virtual training: GenEpi-BioTrain – Building basic bioinformatics workflows, Online, March 19 & 21, 2025.
- Participated in course: Mathematical modelling and infectious diseases, ECDC, Online, September 25, 2024.
- Participated in course: Data sciences for epidemic intelligence, University of California San Francisco, Online, October 27 – 31, 2024.
- Participated in workshop: Regional case studies workshop, EMPHNET, Online, October 6 – 8, 2024.
- Participated in training: Basic training on epidemic intelligence and Rapid Risk Assessment, ECDC, Sweden, February 12 – 16, 2024.
- Participated in training: Regional R training on capacity development of data analytics and dissemination using R, WHO/EMRO, Amman, Jordan, December 3 – 7, 2023.
- Participated in course: Advanced R markdown, Applied EPI, Online, December 2023.

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10. MediPIET modules attended

- Introductory Course 2023, 25 September – 13 October 2023, Spetses, Greece (face-to-face)
- Study protocol and scientific writing module, 26–27 October & 7–8 November 2023 (online)
- Multivariable analysis (MVA) module, 19–23 February 2024, Berlin, Germany (face-to-face)
- One-Health approaches to field epidemiology in practice in MediPIET countries, 3–7 June 2024, Belgrade, Serbia (online)
- Project review module, 25–29 August 2024, Lisbon, Portugal (face-to-face)
- ECDC Fellowship elective course – qualitative research (QR) module, 19 & 22 March 2024 (online)
- Vaccinology Inject Day, 2 April 2024 (online)
- Time Series Analysis (TSA) module, 9–13 December 2024, Bilthoven, the Netherlands (face-to-face)
- Chemical, Biological, Radiological and Nuclear Awareness and Mitigation (CBRN) module, 7–11 April 2025, Budva, Montenegro (face-to-face)
- Rapid Assessment and Survey Methods (RAS) module, 9–13 June 2025, Athens, Greece (face-to-face)
- Project review module, 26–30 August 2024, Lisbon, Portugal (face-to-face)

11. Personal conclusions of fellow

Completing the MediPIET fellowship has been a transformative experience, providing me with advanced skills in field epidemiology, outbreak investigation, and data analysis. The hands-on approach of the programme enabled me to apply these skills directly to real-world public health challenges in Lebanon, strengthening my technical expertise and decision-making abilities in the field. Collaborating with national and international colleagues expanded my perspective, enhanced my teamwork, and deepened my practical understanding of field epidemiology. This fellowship has reinforced my dedication to strengthening epidemiological surveillance and outbreak response and has prepared me to take on greater responsibilities in advancing public health in Lebanon.

12. Acknowledgements

I would like to express my deepest gratitude to my frontline coordinator, Dr. Pawel Stefanoff, for his trust, guidance, and support throughout my fellowship. Also, I would like to express my gratitude to the Lebanese Ministry of Public Health, and to the head of the Epidemiological Surveillance Program, Dr Nada Ghosn, for the opportunity to join the MediPIET program and support provided. My sincere appreciation also goes to Dr. Katie Palmer, Dr. Kostas Danis, Xanthi Andrianou, Lina Chaito, and all colleagues at the Epidemiological Surveillance Program (ESU) for their collaboration, especially those who worked closely with me during outbreak investigations. I am equally thankful to Alexander Ulrich, Auss Abbood, Justice Agbadu, Beltus Nkwawir, Olivier Cecchi, and Olov Svartstrom for their valuable guidance and support. Finally, I extend my heartfelt thanks to my family for their continuous encouragement and belief in my journey. This fellowship has been both empowering and rewarding, and I remain deeply grateful to everyone who contributed to its success despite the challenging circumstances in Lebanon. I also wish to express my sincere appreciation to ECDC and the MediPIET programme for offering this invaluable fellowship opportunity.