Background

The ECDC Fellowship Programme is a two-year competency-based training with two paths: the field epidemiology path (EPIET) and the public health microbiology path (EUPHEM). After the two-year training, EPIET and EUPHEM graduates are considered experts in applying epidemiological or microbiological methods to provide evidence to guide public health interventions for communicable disease prevention and control.

Both curriculum paths provide training and practical experience using the 'learning by doing' approach at acknowledged training sites across European Union (EU) and European Economic Area (EEA) Member States.

According to Article 9 (6), Article 5 (8) and Article 11a (1) of Regulation (EU) 2022/2370 of the European Parliament and of the Council of 23 November 2022 amending Regulation (EC) No 851/2004 establishing a European centre for disease prevention and control (the ECDC Founding Regulation):

Article 9 (6) 'The Centre shall, as appropriate, support and coordinate training programmes, in particular in relation to epidemiological surveillance, field investigations, preparedness and prevention, response to public health emergencies, public health research and risk communication. Those programmes shall take into consideration the need for training to be kept up-to-date, take into account the training needs of Member States and shall respect the principle of proportionality.'

Article 5 (8) 'By encouraging cooperation between experts and reference laboratories, the Centre shall foster the development of sufficient capacity within the Union for the diagnosis, detection, identification and characterisation of infectious agents that have the potential to pose a threat to public health. The Centre shall maintain and extend such cooperation and support the implementation of quality assurance schemes'.

Article 11a (1) 'The Centre shall establish a EU Health Task Force and ensure that there is a permanent capacity and an enhanced emergency capacity to mobilise and use it. The EU Health Task Force shall provide assistance with regard to requests for prevention, preparedness and response planning, local responses to outbreaks of communicable diseases and after-action reviews in Member States and in third countries, in cooperation with the WHO. The EU Health Task Force shall include the Centre's staff and experts from Member States, fellowship programmes and international and non-profit organisations'.

Moreover, Article 47 of the Lisbon Treaty states that 'Member States shall, within the framework of a joint programme, encourage the exchange of young workers.' Therefore, ECDC initiated the two-year EUPHEM training programme in 2008. EUPHEM is closely linked to the European Programme for Intervention Epidemiology Training (EPIET). Both EUPHEM and EPIET are considered 'specialist pathways' of the two-year ECDC fellowship programme for applied disease prevention and control.

This final report describes the output of the fellow and the competencies they acquired by working on various projects, activities, theoretical fellowship training modules, other modules or trainings and international assignments or exchanges during the fellowship.

Pre-fellowship short biography

Sabrina Nothdurfter holds a Bachelor's degree in Health and Nursing Science from the Medical University of Graz, Austria, and a Master's degree in Public Health from Umeå University, Sweden. Following on from this, Sabrina then worked for a non-governmental organisation providing assistance to refugees, followed by an education project for refugees, both in Austria. She then joined *Eurosurveillance* at ECDC and became part of the ECDC Epidemic Intelligence Team as a project officer during the COVID-19 pandemic. In addition to COVID-19 related tasks and other epidemic intelligence duties, she was responsible for monthly updates on cholera, polio and dengue and established a collaboration with the WHO Public Health Intelligence Team to better navigate COVID-19 activities. In September 2021, she moved to Stuttgart, Germany, to start her EPIET fellowship at the Baden-Wuerttemberg State Health Office.

Results

The objectives of these core competency domains were achieved partly through project and activity work and partly by participating in the training modules. Results are presented in accordance with the EPIET core competencies, as set out in the ECDC Fellowship Manual[1].

1. Epidemiological investigations

1.1.   Outbreak investigations

Mumps outbreak in a high-capacity refugee facility in Esslingen, Baden-Wuerttemberg, Germany, July 2022 to December 2022

Supervisors: Christiane Wagner-Wiening, Maylin Meincke

Category: Vaccine-preventable diseases

An outbreak of mumps was reported on 21 July 2022 in a large-capacity facility primarily housing Ukrainian nationals. The facility is designed for short-term stays, so there is a high turnover of residents.

Outbreak data were obtained from the electronic notification system. A semi-structured interview guide was developed for two in-depth interviews to collect data on implemented control measures, compliance, and limitations. Cases were defined as any person who developed symptoms of mumps with a laboratory-confirmed infection or an epidemiological link to the refugee facility. Twenty-five confirmed cases with mild mumps infection, mainly reporting swollen salivary glands, and seven suspected cases were identified. The first case had onset of symptoms on 17 July 2022 and the last case on 27 November 2022. Most cases were reported in weeks 29 and 30 (n= 15). The last confirmed case occurred in week 48. The median age of cases was 15 years (IQR: 9-31). The vaccination status of most cases (n=15; 60%) was unknown. Information leaflets in national language of residents were distributed to raise awareness. Active case finding was not in place, but contact tracing identified 43 close contacts. Structural barriers, such as absent staff and outdated occupancy lists, made contact tracing difficult. The MMR vaccination was offered to all close contacts via a vaccination bus, but uptake was low (n=14). Compliance with control measures, such as contact reduction and isolation, was low among Ukrainians.

This work highlights the challenge of implementing outbreak control measures in high-capacity settings. Involving representatives of affected communicates as peers in awareness raising and education about vaccine-preventable diseases may be the key to increasing vaccine acceptance and uptake, as well as compliance for control measures.

Role: Sabrina conducted the retrospective outbreak investigation using previously collected quantitative outbreak data in collaboration with the local health office in Esslingen, Germany. The local health office was responsible for leading the outbreak investigation and ensuring that all the measures were in place. Sabrina also developed the semi-structured interview used to obtain additional qualitative data on the outbreak, accompanied a field visit and conducted descriptive epidemiology using the R software. She also wrote the outbreak report [4.1.2] and submitted an abstract to the 2023 ESCAIDE conference.

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[1] European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2020. Available from: https://www.ecdc.europa.eu/en/publications-data/ecdc-fellowship-programme-manual-cohort-2021

Norovirus outbreak among a group of guests after a restaurant visit, Ludwigsburg Baden-Wuerttemberg, January 2023

Supervisor: Florian Burckhardt

Category: Food- and waterborne diseases

An outbreak of acute gastroenteritis was reported among guests who attended a dinner at a restaurant on 14 January 2023. The outbreak was suspected to have been caused by one of the food items on the set menu, consumed only by adults, and served that evening.

An online structured questionnaire was emailed to the restaurant guests and to staff members to collect data. The questionnaire included demographic information, onset and duration of symptoms, sick household members and consumed food items. A total of 35 guests responded, but only one staff member responded, hence staff were excluded from analysis. Cases were defined as guests who ate a meal at the restaurant and developed gastrointestinal illness within 6-50 hours. Fifteen cases were identified (attack rate: 43%), mainly reporting nausea and diarrhoea, abdominal pain and vomiting. Six stool samples tested positive for norovirus (4 guests and 2 staff members). Most cases (n=11%;73.3%) developed gastroenteritis on 16 January 2023. Staff members were asymptomatic, according to local health authorities. The calculated relative risk (RR) for all food items were above 2.3 and statistically significant. The highest risk ratio was calculated for mussels (RR: 14.82, 95% CI: 2.18-100.85, p<0.001). Adults had 11.79 times the risk of becoming ill than children. Eating any food from a shared plate increased the risk of getting sick by a factor of three compared to not eating any food from a shared plate.

This point-source norovirus outbreak probably started with a contaminated kitchen leading to multiple exposures of food items. Another possibility is that the outbreak was caused by an asymptomatic staff member. The findings underline the importance of strict adherence to hygiene regulations in restaurants and the exclusion of sick staff from the workplace.

Role: Sabrina was the principal investigator and collected the outbreak data. The local health office in Ludwigsburg, Germany, provided the guest's contact information and the restaurant's menu. Sabrina developed the questionnaires, organised online data gathering and performed descriptive epidemiology and univariable and multivariable analysis using the R software. She also wrote the outbreak report [4.1.2].

Educational outcome

The fellow had the opportunity to go out into the field and participated in all ten steps of an outbreak investigation. She also gained an understanding of outbreak management in Germany at the local and state level. She had the opportunity to apply qualitative and quantitative methods. She also developed analytical skills needed in an outbreak investigation. The fellow also strengthened her management, leadership and communication skills.

1.2.   Surveillance

Epidemiological situation of tularaemia infections in Baden-Wuerttemberg, Germany, 2021

Supervisors: Christiane Wagner-Wiening

Tularaemia is endemic in Germany, frequently occurring in the southwest. In 2021, a sharp increase in human tularaemia infections was observed in Baden-Wuerttemberg, with the number of cases tripling compared to the previous year.

We provided an overview of the epidemiological situation of tularaemia in Baden-Wuerttemberg, with a particular focus on the 2021 transmission season, to gain a better understanding of this increase. Data was extracted from the electronic notification system. In 2021, 35 human tularaemia infections (incidence: 3.2 per 1 000 000 population), including one death were reported Baden-Wuerttemberg. Only one infection was travel-associated. The time lag between onset of symptoms and date of reporting ranged from six to 69 days (median: 26 days). The median age of cases was 48 years (IQR: 26–61). The most commonly reported symptoms were swollen lymph nodes and fever. However, pneumonic tularaemia (n=8) increased compared to previous years. Nineteen of the patients with exposure information available reported to have had contact to animals. Among those, eight patients were exposed to arthropod bites (42%). Eleven patients reported exposure to environmental sources, with soil and mud being the most common source of exposure (n=9; 82%).

The reason for this sharp increase could not be identified. Surveillance data are often incomplete and it is difficult to assess the exact location of exposure. Data on risk exposures are often missing. Tularaemia infections present with a wide range of symptoms; which may have led to underdiagnosis and late reporting. The COVID-19 may explain the increase in pneumonic tularaemia, due to an increased focus on pneumonia diagnosis. Moreover, people may have spent more time outdoors due to lockdowns, increasing their exposure to certain sources of infection. Further research is needed to investigate the underlying reasons for this increase in cases and to understand the disease burden of tularaemia in Baden-Wuerttemberg.

Role: The fellow performed a quality assessment of notified tularaemia infections and contacted the local health authorities to obtain missing data if available. She performed descriptive data analysis and wrote a surveillance report [4.1.2].

Tularaemia on the rise – Integrating One Health Surveillance and Genome Data in Baden-Wuerttemberg, Germany, 2012-2022

Supervisors: Christiane Wagner-Wiening, Maylin Meincke

Tularaemia is endemic in Germany, and Baden-Wuerttemberg is among the German states with the highest incidence of human tularaemia. Both human and animal tularaemia infections in Baden-Wuerttemberg have been increasing in previous years.

We linked human and veterinary surveillance, as well as genome data from 2012 to 2022, to provide an overview of the epidemiological situation in Baden-Wurttemberg. One Health initiatives are crucial for a better understanding of this disease. During the observed period, 152 tularaemia infections, including five deaths, were reported, with glandular (n=53) and ulceroglandular (n=35) forms being the most common, mainly caused by arthropod bites. Poisson regression showed a statistically significant upward trend in human tularaemia infections, indicating an increase of 18% every year (p<0.001, 95% CI 0.13 to 0.24). Seasonal patterns could not be identified, but the lowest case numbers were reported in winter. Tularaemia is highly sensitive to even small temperature changes and may impact the spread of this disease considering climate change. From 2012 to 2022, Veterinary Analysis Agencies received 2 145 animal samples for tularaemia testing, with brown hares contributing most (86%). Since 2017, positivity rates steadily increased from 16% to 33%, with brown hares being the primary carriers. Tularaemia is geographically widespread in Baden-Wuerttemberg, with 37 out of 44 notifying districts reporting human and/or animal infections. A geographical link between human and animal tularaemia cases could not be established. Clusters of *Francisella tularensis* found in humans and animals highlight the role of hares as a reservoir for human tularaemia cases. Isolates from human cases with reported exposure to hares often cluster with hare-derived strains, although the route of transmission is frequently unclear.

Routine genome sequencing of human and animal isolates is necessary for source attribution. The impact of climate change on transmission patterns and the increased case numbers needs to be further assessed.

Role: The fellow initiated multi-sectoral collaborations and coordinated meetings and communication with the collaborating partners to obtain all the necessary data. She wrote a proposal and identified research questions. She also analysed human and animal surveillance data using the R software and wrote a scientific manuscript to be published. [4.1.1.].

Evaluation of timeliness, internal completeness and flexibility of selected COVID-19 data reported to the electronic notification system SurvNet, Baden-Wuerttemberg, Germany, 2020-2023

Supervisor: Florian Burckhardt

We evaluated timeliness, internal completeness and flexibility of the German electronic notification system (SurvNet) for Baden-Wuerttemberg based on COVID-19 data in order to assess its performance during the COVID-19 pandemic.

All COVID-19 case notifications from Baden-Wuerttemberg between 25 February 2020 and 31 March 2023 were included in analysis, totalling 5 533 998 case records. These attributes were assessed for key variables and stratified per pandemic phase, calendar week, and region. We performed descriptive analysis for all three attributes. Additionally, we applied linear and/or logistic regression for timeliness and internal completeness, and CHI-square for flexibility to test for statistical significance at a p-value <0.05. Timeliness improved over time, with a decrease of 0.18 days in mean time difference in days for every increase in log (weekly cases). Regional differences were identified, with mean notification delays in days ranging from 0.1 to 2.6. While internal completeness on demographic information was high (>95%), completeness on other variables, such as hospitalisation and vaccination status, as well as variant information was low. Increasing case numbers led to a decrease in internal completeness. Initially, proportions of complete data on these three variables exceeded 72%, but dropped below 25% with the arrival of the variant Omicron and subsequent surge in cases. The system demonstrated flexibility in adapting to implemented changes concerning timeliness, but not internal completeness. Despite implemented changes, timeliness continued to improve over time (p<0.001), while changes led to a significant decrease (p<0.001) in internal completeness. A qualitative assessment is needed to better understand the system's flexibility. Data entry occurs at the local level, and therefore data quality relies on local health authorities. Information on their experiences with the system's change is crucial. To ensure better internal completeness, amendments in the notification system are necessary, such as implementing simpler data entry fields as well as record linkage of electronic hospitalisation notifications.

Role: Sabrina wrote the study protocol, identified research questions and hypotheses, used the R software to analyse a large dataset with over five million records, and wrote the report [4.1.2].

Educational outcome

Sabrina designed the COVID-19 project and initiated multi-sectoral collaborations for the One-Health tularaemia project. She also contributed to COVID-19 reporting in day-to-day activities, participated in the weekly meetings of the infection control unit and filled in for duty weeks. She was also responsible for tularaemia surveillance throughout the fellowship. She gained skills in management, leadership and communication and improved her analytical skills. She gained experience with working on big data as well improved her skills in R.

2. Applied public health research

Risk assessment and preparedness plan development for West Nile Virus transmission in the State of Baden-Wuerttemberg, Germany, 2022

Supervisor: Maylin Meincke

West Nile virus (WNV) was first detected in Germany in a wild bird in 2018, with the first autochthonous human case reported the following year. Currently, WNV is circulating in four out of 16 German states, located in the eastern part of the country.

The risk assessment for WNV introduction in Baden-Wuerttemberg was guided by the ECDC risk assessment tool and the WHO's One Health framework. We conducted semi-structured interviews with purposely selected experts from different disciplines and levels. In these fourteen in-depth interviews we assessed the risk of WNV transmission, surveillance activities, control measures and multi-sectoral collaborations. Expert opinions, experiences, and lessons learned from affected states informed future preparedness planning for Baden-Wuerttemberg. Baden-Wuerttemberg is classified as pre-disposed area (risk level 1) with no known WNV circulation. Due to several risk factors, such as vector presence, mild climate and the already circulating Usutu virus, WNV introduction is likely in the future. As required for this risk level, the state has a passive human and animal surveillance system in place and blood donation samples are screened during transmission season. While there is no systematic vector management in Baden-Wuerttemberg, potential collaboration with the German Mosquito Control Association, active in some municipalities of the state, exists. The risk perception of WNV in Germany is low. Only one of the four affected states have implemented active surveillance activities. Two of the affected states implemented mosquito monitoring on a small scale due to unclear responsibilities and lack of additional funding. Multi-sectoral collaboration for One Health surveillance is well established on national level, but was described as challenging in some states.

Since WNV is not considered an urgent issue, few lessons learned could be drawn. However, the limitations mentioned can be addressed in the preparedness planning for Baden-Wuerttemberg. Clear responsibilities for vector management are crucial for effective preparedness planning.

Role: Sabrina was responsible for writing the study protocol and developing the interview guides. She also conducted the interviews and analysed the data. Additionally, she prepared an abstract for the 2022 ESCAIDE conference, which she presented in a poster presentation. Furthermore, Sabrina wrote the final report.

Educational outcome

The fellow gained in conducting applied research, from writing the proposal, identifying research questions, writing a study protocol and final report [4.1.2.]. She could also strengthen her communication skills.

3. Teaching and pedagogy

Lectures for the training for hygiene inspectors

The fellow conducted two teaching sessions at the workshop for hygiene inspectors, which was attended by 30 participants. The workshop was organised by the Baden-Wuerttemberg State Health Office. The first session was titled 'Introduction into Epidemiology' and the second was 'Surveillance Data – Data for Action', each lasting 60 minutes. This workshop was mandatory for all those in training to become a health inspector in the local health authorities. The fellow followed the curriculum and prepared the content for the lectures accordingly. She also prepared practical examples to enable hands-on practice for the participants on the lecture content.

Educational outcome

Through teaching assignments, Sabrina strengthened her skills in the topics she taught and applied different teaching strategies in adult education. Sabrina's teaching sessions included presentations and gave practical examples of the content.

4. Communication

4.1 Publications related to the EPIET fellowship

4.1.1 Manuscripts published in peer-reviewed journals

Nothdurfter S, Linde J, Sting R, Tomaso H, Brockmann S, Meincke M, Wagner-Wiening C. Tularaemia on the rise – Integrating One Health Surveillance and Genome Data in Baden-Wuerttemberg, Germany, 2012-2022

4.1.2 Other reports

Nothdurfter S, Wagner-Wiening C, Meincke M. Mumps outbreak in a large capacity refugee facility in Esslingen, Baden-Wuerttemberg, Germany, July 2022 to December 2022, Internal report

Nothdurfter S & Burckhardt F. Norovirus outbreak among a group of guests after a restaurant visit, Ludwigsburg Baden-Wuerttemberg, January 2023, internal report

Nothdurfter S & Wagner-Wiening C. Epidemiological situation of tularaemia infections Baden-Wuerttemberg, Germany, 2021, internal report

Nothdurfter S & Burckhardt F. Evaluation of, timeliness, internal completeness and flexibility of selected COVID-19 data reported to the electronic notification system SurvNet, Baden-Wuerttemberg, Germany, 2020-2023, study protocol & internal report, Master thesis

Nothdurfter S & Meincke M. Risk assessment and preparedness plan development for West Nile Virus (WNV) transmission in the State of Baden-Wuerttemberg, Germany, 2022, study protocol & internal report

4.2 Conference presentations

ESCAIDE 2022, Stockholm, Sweden. Risk assessment and preparedness plan development for West Nile Virus (WNV) transmission in the State of Baden-Wuerttemberg, Germany, 2022; poster presentation.

4.3 Other presentations

Assessment of services for HIV/STI testing and counselling in German local health offices (LHO) in the State of Baden-Wuerttemberg, Germany, Midterm Project Review Module, Spetses, Greece

Risk assessment and preparedness plan development for West Nile Virus (WNV) transmission in the State of Baden-Wuerttemberg, Germany, 2022, Epi-Rhin Network

Tularaemia on the rise – A first step towards integrated One Health Surveillance, Baden-Wuerttemberg, Germany, 2012-2022, "*IFSG-Dienstbesprechung*" (organised by the Baden-Wuerttemberg SHO for employees of the local health authorities)

Mumps outbreak in a large-capacity refugee facility, Esslingen, Baden-Wuerttemberg, Germany, July 2022 to December 2022, Project Review Module 2023

5. EPIET/EUPHEM modules attended

1. Introductory course, 20/09/2021 – 08/10/2021, online

2. Outbreak investigation*, 06/12/2021 – 10/12/2021,* online

3. Multivariable analysis*, 14/03/2022 – 18/03/2022,* online

4. Introductory course Part 2 & Mid-term project review, 19/04/2022 – 29/04/2022, Spetses, Greece

5. Rapid Assessment and Survey Methods, 06/06/2022 – 10/06/2022, Stockholm, Sweden

6. Project Review, 29/08/2022 -03/09/2022, Lisbon, Portugal

7. Time Series Analysis, 07/11/2022 – 11/11/2022, Bilthoven, Netherlands

8. Vaccinology, 13/02/2023 -17/02/2023, online

9. Management, Leadership and Communication in Public Health, 08/05/2023 -12/05/2023, Stockholm, Sweden

10. Project Review, 27/08/2023 -01/09/2023, Lisbon, Portugal

6. Other training

1. PAE (German FETP) Introductory week, 13/09/2021 – 17/09/2021, Robert Koch Institute, Berlin, Germany.

2. Module on "Causal inference with DAGs" provided by the Berlin School of Public Health/Institute of Public Health at Charité, 13/10/2021 – 15/12/2021(October to December 2021), online

3. Laboratory Module (theoretical part) organised by Robert Koch Institute, 20/03/2023 – 23/03/2023, online

4. Laboratory Module (practical part) at the Baden-Wuerttemberg State Health Office Laboratory, 18/04/2023 – 19/04/2023, Stuttgart, Germany

7. Other activities

1. Sabrina participated in the weekly meetings of PAE (German FETP) and contributed by giving presentations and engaging in discussions.

2. Sabrina was enrolled in the Master of Applied Epidemiology at the Charité – Universitätsmedizin in Berlin.

3. Sabrina was part of the zoonoses workgroup at the State Health Office and participated in the weekly meetings.

4. Sabrina developed a proposal for a surveillance project titled: 'Assessment of services for HIV/STI testing and counselling in German local health offices (LHO) in the State of Baden-Wuerttemberg, Germany'. HIV/STI testing in Germany is conducted at the local level, hence this project wanted to assess the services provided by the different LHOs in terms of HIV/STI testing in Baden-Wuerttemberg and to inform what data is being collected and available, particularly for non-notifiable STIs. For setting up the proposal Sabrina participated in regular meetings with colleagues at Robert-Koch-Institute (RKI), as it was a collaborating project, to discuss ideas and methodology. Moreover, she initiated contact and set up meetings with the department at the SHO Baden-Wuerttemberg that is handling data on STIs in Baden-Wuerttemberg.

Acknowledgements