

FINAL REPORT

Tjede Funk

The European Programme for Intervention Epidemiology Training (EPIET), Cohort 2021

STATENS SERUM INSTITUT (SSI), Denmark

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.

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Stockholm, November 2023

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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

Since graduating with a Master's in Global Health from Karolinska Institute, Stockholm, Sweden, Tjede Funk has worked in different roles and areas within public health and epidemiology. She has conducted research on global child health at the Karolinska Institute, Sweden, worked on healthcare planning for Stockholm's health care administration and on surveillance and response in relation to COVID-19 at the European Centre for Disease Prevention and Control (ECDC).

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 Manual¹.

1. Epidemiological investigations

1.1. Outbreak investigations

Outbreak of *Yersinia enterocolitica* ST18, September to October 2021

Supervisor: Luise Müller

Category: Food and waterborne diseases

This was a national outbreak of a *Yersinia enterocolitica* cluster ST18 involving 16 cases. The cases were reported between 14 September and 18 October 2021, and a couple of additional cases were identified in December 2021 and February 2022. No reported link to other countries was identified, suggesting that the cases were probably infected in Denmark. Cases were predominantly female (63%) and young/middle-aged (median age 27 years). Fourteen of the 16 cases were interviewed but the source of this outbreak could not be identified.

Role: Tjede was the lead investigator in this outbreak investigation from the epidemiology side. Her responsibilities involved creating and updating the line list, compiling descriptive epidemiology, preparing and going through the interviews and writing an outbreak report (see 4.1.2).

Outbreak of *Salmonella* Enteritidis ST11, March to September 2022

Supervisors: Luise Müller

Category: Food and waterborne diseases

On 13 June 2022, a signal of five cases of *Salmonella* Enteritidis ST11 in the Copenhagen Capital Region and Zealand Region was reported by the laboratory to the epidemiology department at Statens Serum Institut (SSI). The cases did not report any travel history. By the end of the outbreak investigation, the outbreak comprised a total of 24 confirmed cases, reported between 31 March and 28 September 2022. Seventeen of the cases were male and the median age was 28 years. Nineteen of the cases were interviewed. Through the interviews, kebab and/or chicken from one European country was identified as a suspected source. However, this could not be proven.

Role: Tjede was the lead investigator in this outbreak investigation from the epidemiology side. Her responsibilities involved creating and updating the line list, performing descriptive analysis, preparing the trawling questionnaires as well as going through the interviews and writing an outbreak report (see 4.1.2). In addition, she compiled different overviews and mind maps of potential food items and sources to link cases.

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>

Outbreak of *Salmonella* Jukestown, March to June 2022

Supervisors: Luise Müller

Category: Food and waterborne diseases

This was the first outbreak of the rare serovar *Salmonella* Jukestown identified in Denmark. In total, six cases were reported between March and June 2022. Cases did not have a travel history prior to disease onset, however a match to a case, possibly two cases, in another European country was found through EpiPulse. The cases in the other country occurred around three months prior to the first case in Denmark. Five of the six Danish cases were female with an age range between 46 and 97 years. Hypothesis-generating interviews were conducted with three cases, but the source of the outbreak was not identified.

Role: Tjede was the lead investigator in this outbreak investigation from the epidemiology side. Her responsibilities involved creating and updating the line list, performing descriptive analysis, compiling a literature search of previous reported outbreaks and vehicles of infection, preparing the trawling questionnaires as well as going through the interviews and writing an outbreak report (see 4.1.2).

Outbreak of unknown aetiology at Company X, September 2022

Supervisors: Charlotte Kjelsø, Luise Müller

Category: Food and waterborne diseases

On 6 September 2022, SSI was contacted by the local Food Inspection Unit in Copenhagen in connection with an outbreak of gastroenteritis among employees at Company X. The outbreak was presumed to have been caused by food from the canteen. Norovirus was initially suspected. However, the symptoms displayed by the cases (i.e. rapid onset and of short duration), reconstructions of the Company X canteen and the possibly insufficient incubation conditions changed this suspicion to a toxin-producing bacteria such as *Clostridium perfringens* or *Bacillus cereus*. We conducted a cohort study in collaboration with the local food authority in Copenhagen and SSI. A hypothesis-generating questionnaire was sent to all employees asking about aspects such as their food consumption at the canteen on a specific day and their symptoms. An overall attack rate of 24.1% and a RR of 5.74 (95% CI: 2.9-11.1) supported the hypothesis that chili con carne with rice was the food item associated with the outbreak. The identified incubation period (median: 14 hours; IQR 11-25 hours) and the symptoms (predominantly diarrhoea) supported the suspicion that the outbreak could have been caused by a toxin-producing bacteria such as *Clostridium perfringens* or *Bacillus cereus*. Unfortunately, no sample results were available to confirm this.

Role: Tjede conducted this outbreak investigation together with Charlotte Kjelsø in collaboration with the local food authority in Copenhagen. They both provided input for the survey questionnaire drafted by the local food authority which was sent to Company X employees. Tjede led the analytical part of the study, conducted the data cleaning and data analysis and wrote up the results in a summary report (see 4.1.2).

Outbreak of *Cryptosporidium* IIaA15G1R1 and *Cryptosporidium* IIaA15G2R1, July to August 2022

Supervisors: Stine Nielsen, Luise Müller

Category: Food and waterborne diseases

This involved two *Cryptosporidium* outbreaks reported to the SSI outbreak team. Outbreak 1 (IIaA15G1R1) involved 12 cases (reported in August 2022) and was mainly reported on Zealand, Denmark, while outbreak 2 (IIaA15G2R1) involved 17 cases (reported July/August 2022) and was mainly reported on the island of Funen. SSI conducted hypothesis-generating interviews, including questions on food consumption and exposure to animals and water sources, with the majority of cases. It was not possible to identify a possible source for this cluster. It cannot be ruled out that different exposures/sources were responsible as the same *Cryptosporidium* genotype does not necessarily indicate a common source.

Role: Tjede co-led this investigation together with Stine Nielsen. They shared responsibility for creating and updating the line list, performing descriptive analysis, preparing and going through the interviews and writing an outbreak report (see 4.1.2).

Outbreak of unknown aetiology at childcare facility, December 2022

Supervisors: Stine Nielsen

Category: Food and waterborne diseases

On the morning of 1 December 2022, SSI was contacted by the local Food Inspection Unit in Copenhagen and informed about a large outbreak in a daycare centre, where at least 70 children (<6 years) and staff members fell ill shortly after eating a bean and potato soup for lunch. A field visit to the facility was conducted. The visit started with a meeting with the educational leader of the institute, and a health nurse, describing the developments of the outbreak the previous day. Following the discussion, the kitchen was inspected and the kitchen staff interviewed. It was suspected that bean toxins could have caused this explosive outbreak. This could possibly have been lectins. It was suggested that the oven, in which the vegetables for the meal had been prepared overnight, may not have risen in temperature fast enough to keep the beans free of toxins and stop bacteria growth.

Role: Together with Stine Nielsen, Tjede joined the local Food Inspection Unit in Copenhagen for their site visit to the childcare facility. They observed and followed the processes of the local Food Inspection Unit in handling local outbreaks. Tjede wrote a report about the field visit and outbreak (see 4.1.2).

Outbreak of *Salmonella* Enteritidis ST11 linked to a New Year's party menu, January to February 2023

Supervisors: Charlotte Kjelsø, Luise Müller

Category: Food and waterborne diseases

This was an outbreak caused by *Salmonella* Enteritidis ST11. The first signal was received by the outbreak team on 23 January 2023. In total, 11 cases were identified as part of this outbreak, 10 of which had a sample date between 6 and 13 January. After conducting some hypothesis-generating interviews, it was discovered that all cases had received a New Year's menu from the same company. After further investigation, it was determined that the company had served around 700–800 people. Unfortunately, the company was not very cooperative. Thanks to the willingness of cases to help by contacting the friends and family that joined them for the New Year's party menu, a cohort study was conducted with a total of 40 participants. Based on the analytical study, certain food sources could be eliminated as a possible source of the outbreak. Since most of those who became ill and those who did not become ill in the cohort had eaten exactly the same food, it was not possible to conclude which part of the menu was contaminated. A significant limitation of the cohort study was that it was not possible to send the questionnaire to all individuals who received the menu, and it was therefore only possible to include 17 healthy people.

Role: Tjede developed the questionnaire for the cohort study together with Charlotte Kjelsø, and she entered the questionnaire into the online survey tool. She also supported the analytical study and provided methodological input.

Outbreak of *Salmonella* Infantis ST603 linked to a secondary school, February 2023

Supervisors: Luise Müller

Category: Food and waterborne diseases

Students and teachers from a Danish secondary school travelled to an African country from the end of January until early February 2023. During the stay, several of the pupils fell ill. After returning to Denmark, some students became so ill that a doctor needed to be consulted, with some developing bacteraemia and needing hospitalisation. Twenty-two students tested positive for *Salmonella* Infantis, a type that is usually not very severe. Other pathogens, such as *Escherichia coli* bacteria and *Yersinia enterocolitica*, were also identified in some students. A cohort study was conducted among the travelling group to obtain a better picture of the outbreak and its extent. It was not possible to identify a specific source of the outbreak. However, grilled meat and poultry, which are risk products for *Salmonella* infection, had been consumed during the travel.

Role: Tjede supported this outbreak investigation by providing R advice and methodological input. She also provided comments on an abstract written about this outbreak for submission to ESCAIDE 2023.

Educational outcome

As a result of the various outbreak investigations that Tjede was involved in, she was able to gain experience of all the steps of an outbreak investigation. Tjede gained a thorough understanding of the importance of collaborating with different stakeholders and sectors during an outbreak investigation. She also learned about the challenges of investigating national-level food and waterborne disease outbreaks and the fact that often the source of these outbreaks may not be found. The work in the outbreak team also enabled her to develop her knowledge and practical skills in conducting and analysing case-control and cohort studies. Through her involvement in the outbreak team, Tjede obtained a detailed overview of the routines around signals and outbreaks, allowing her to systematise and automate the process of data analysis and reporting of genetic clusters (see 1.2).

1.2. Surveillance

Findings in Danish long-term care facilities during the first year of the SARS-CoV-2 pandemic

Supervisors: Brian Kristensen, Laura Espenhain

Using a newly established national automated registry-based surveillance system, this study describes SARS-CoV-2 infections, deaths and outbreaks among Danish long-term care facility (LTCF) residents in the first year of the COVID-19 pandemic 2020/2021. Furthermore, we aimed to assess the magnitude of SARS-CoV-2 transmission in these settings. Danish COVID-19 national register data from a newly implemented automated surveillance system was used to describe incidence rates and deaths (per 1 000 resident years), number of tests, SARS-CoV-2 infections and outbreaks among LTCF residents. A case was defined as a LTCF resident with a positive SARS-CoV-2 PCR test. An outbreak was defined as two or more cases in one LTCF within a 14-day period, and considered closed if no new cases occurred within 28 days. Death was defined as occurring within 30 days of a positive test. A total of 55 359 residents living in 948 LTCFs were included. The median age of the residents was 85 years and 63% were female. In total, 3 712 cases were found among residents across 43% of all LTCFs. Nearly all (94%) cases were linked to outbreaks. Higher numbers of cases and outbreaks were seen in Denmark's Capital Region (Copenhagen) than other regions. Overall, 22 SARS-CoV-2 deaths and 359 deaths (non-SARS-CoV-2) per 1 000 resident years were identified in the study period.

Role: Tjede joined the project after it had already begun. She familiarised herself with the data, contributed to the data analysis and was responsible for drafting the manuscript with inputs from all other authors.

International developments on the mpox epidemic

Supervisors: Anders Koch

During Spring 2022, mpox cases were reported from many countries where the disease is not endemic. In Denmark, the first mpox case was reported on 23 May 2022 and the numbers increased for some time. An mpox project group was set up at SSI to monitor developments.

Role: Tjede joined the internal SSI mpox group and monitored international developments in relation to mpox, by screening international websites and media articles. Based on the information collected, she compiled a weekly (later less frequent) summary email for the internal SSI mpox team for the period between May and October 2022.

Increasing incidence of invasive *Streptococcus* infections from November 2022 in Denmark

Supervisors: Peter H.S. Andersen, Stine Nielsen

An increased incidence rate of invasive (iGAS) and non-invasive (GAS) group A *Streptococcus* infections was reported by several European countries, including Denmark, during the winter season 2022/23. In Denmark, there is no statutory monitoring of *Streptococcus* infections, but for a long time, clinical microbiological departments have sent isolates from invasive infections to SSI on a voluntary basis. To monitor the developments and disease occurrence as well as the severity and epidemiology, a project group was initiated.

Role: As part of the initiated project group, Tjede created an automated surveillance report to analyse surveillance data and follow the developments of incidence rates. The report was used as a basis for surveillance activities and has been run on a regular basis for many months. Some of the graphs that she created were used on the internal SSI website and cited in national news (see 4.1.2).

Setting up an automated data analysis and reporting system for the routine surveillance of national food- and waterborne disease outbreaks in Denmark

Supervisors: Luise Müller, Laura Espenhain

Surveillance and management of national food-and-waterborne outbreaks in Denmark is carried out as a collaboration between the SSI, the Danish Veterinary and Food Administration and the National Food Institute at the Technical University of Denmark. The role of the Outbreak Investigation Unit at SSI is to explore the epidemiology of cases involved in outbreaks, conduct and analyse hypothesis-generating interviews with cases, recognise patterns and coordinate with the laboratory and other authorities in the attempt to identify the source of an outbreak. When an outbreak signal is reported to the Outbreak Investigation Unit and accepted for further investigations, a variety of procedures are undertaken to initiate the investigation. Many of these procedures were done manually. This project focussed on improving the food-and waterborne outbreak investigation processes for the outbreak unit.

Role: Tjede evaluated the outbreak investigation processes and identified ways to improve them. She led this project by creating a new data analysis and reporting system, obtaining input from the entire team. The fellow conducted tests and piloted the outputs to make sure that everything worked smoothly. Multiple feedback sessions were arranged where members of the team had the opportunity to contribute and provide input on the planned content. In addition, she organised training sessions to facilitate the implementation process. The new methods and templates have now been implemented into the routine work of the Outbreak Investigation Unit (see 4.1.2).

Epidemiological characterisation of the first 785 SARS-CoV-2 Omicron variant cases in Denmark, December 2021

On 26 November 2021, the World Health Organization designated the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) Omicron variant (Phylogenetic Assignment of Named Global Outbreak (Pango) lineage designation B.1.1.529) as a variant of concern. This project analysed the first 785 SARS-CoV-2 Omicron cases reported in Denmark.

Role: Tjede contributed to the study protocol and communication, compiled a timeline of SARS-CoV-2 Omicron developments, and contributed to the graphs and tables, as well as writing and publishing a rapid communication on this project (see 4.1.1).

Tuberculosis drug resistance trends for tuberculosis cases in Denmark from 2000 through 2022

Supervisors: Maria Wessman, Anders Koch

In Denmark, tuberculosis (TB) is a notifiable disease. Denmark is a low TB incidence country. Although the number of drug-resistant TB cases is generally low in Denmark, local transmission has occurred and been reported and drug resistant TB remains a public health concern worldwide. This project aimed to describe TB drug resistance in Denmark for first and second line TB drugs between 2000 and 2011 and to analyse the demographic characteristics of cases affected with resistant TB.

Role: Tjede identified research questions together with the team and wrote the study outline and protocol for the study. The fellow was unfortunately not able to finalise this project.

Evaluation of a pro-active reminder system for childhood vaccinations in Denmark - Reminder project

Supervisors: Peter H.S. Andersen; Steen Ethelberg

In May 2015, Denmark implemented a reminder system for childhood vaccinations in order to increase vaccination coverage. Under this system, parents/guardians received a reminder to vaccinate their child if the child was missing one or more age-appropriate vaccinations at age 2, 6.5 and 14 years of age. A study conducted in Denmark in 2017 concluded that the written reminder, compared to no reminder, increased vaccination coverage in children. From 1 August 2019, a new reminder system was implemented, which also includes a pro-active component. Under this system, a letter to the parents/guardians is sent out two weeks prior to the planned vaccination time. In addition, a reminder letter is sent out one month after the planned time for vaccination if no vaccination has been recorded by this time. The aim of this study was to evaluate the childhood vaccination reminder system implemented in August 2019, compared to the reminder system in place since May 2015 to assess the effect on timeliness of vaccination.

Role: The fellow developed the research question together with the team, wrote a study protocol and analysis plan, managed the data and conducted the analyses. The fellow engaged in meetings and submitted an abstract on the preliminary results to ESCAIDE 2023. She is currently in the process of writing up the results and plans to communicate them to a wider audience.

Educational outcome

Tjede was able to work on different pathogens. She conducted analyses of different national surveillance data and became more familiar with the different types and aspects of surveillance. She also increased her knowledge of the Danish surveillance system in general. She greatly developed her skills in automating processes. Furthermore, her projects provided great opportunities for her to learn from and work with colleagues in different sections and departments.

2. Applied public health research

Factors associated with the formation of SARS-CoV-2 case-clusters in Danish schools: a nationwide register-based observational study

Supervisors: Steen Ethelberg, Laura Espenhain

This study aimed to describe SARS-CoV-2 cases and case-clusters in school children of all Danish primary and lower secondary schools and identify which factors were associated with the occurrence of case clusters in schools. This was a register-based retrospective observational study, linking individual-level information on SARS-CoV-2 tests and vaccination status of all school children with class-level and school-specific information in Denmark. The study period was the autumn school semester 2021: 9 August to 19 December 2021. Clusters were defined as three or more cases in a school-class level within 14 days. The assumed immunity level for every day during the study period was defined as the proportion of children within a class level having had a SARS-CoV-2 infection in the past (at any time) or having been vaccinated. Descriptive analysis was carried out and multivariable logistic regression analysis was performed to determine which factors were associated with case introductions (i.e. primary case) being linked to a cluster. More cases and clusters were identified in lower ($n = 4\,239$) than in higher class levels ($n = 3\,281$). Of 21 497 cases introduced into a school, 41.6% started a cluster. Overall, the majority (74.4%) of cases in schools were linked to clusters. Clusters ranged in size between three and 65 cases. A higher assumed immunity level in a class level significantly reduced the odds of a case introduction being linked to a cluster (e.g. assumed immunity of $\geq 80\%$ compared to $< 20\%$: OR: 0.28; 95%CI: 0.17-0.44). A previous infection (in the primary case) had a protective effect (OR: 0.58; 95%CI 0.33-0.99).

Role: Tjede was the lead investigator in this study. She wrote the research proposal and protocol, conducted the data management and the entire data analysis for the different parts of this study. She wrote an abstract for submission to ESCAIDE 2022 on this topic, which was accepted and subsequently presented as a poster presentation. She published a scientific article in a peer-review journal (see 4.1.1).

Identifying the epidemiological source of a methicillin-resistant *Staphylococcus aureus* t-4549 lineage in Denmark since 2018

Supervisors: Jesper Larsen, Andreas Petersen

In Denmark, methicillin-resistant *Staphylococcus aureus* (MRSA) infections are notifiable, and all clinical isolates are typed at SSI. The MRSA with the spa type t4549 and sequencing type 630 was first reported in 2012 by a person who had travelled to Asia, where the type is endemic. Today, this is one of the most commonly found types of MRSA in Denmark. The aim of the project was to identify potential risk factors associated with the emerging *S. aureus* t4549 lineage in humans in Denmark using data notified in 2022. The project started with the plan to conduct a case-control study, but it was later decided to start with a pilot study. During this pilot study, 10 to 15 cases will be interviewed to gain a better overview of the characteristics, behaviour and exposure of the cases. The results of the pilot study will be used for a larger case control study at a later date. A better understanding of the risk factors of MRSA t4549 infection will facilitate the implementation of public health measures to prevent MRSA infection of this type. The data collection for the study is about to start.

Role: Together with the EUPHEM fellow (c2020), Tjede wrote the initial case-control study proposal and developed a questionnaire. Tjede and another EPIET fellow (c2022), then changed the study proposal to a pilot study, adjusted the questionnaire and entered it into an online data collection tool. Tjede collaborated closely with the entire team and was involved in the application for ethical compliance for the study.

Educational outcome

Through the above projects, Tjede has expanded her research skills. She has considerably developed her ability to work with large national register databases and learned about the Danish context. She has experienced the challenges linked to working with and merging data from different large-scale databases. She also learned more about the processes of setting up a study in Denmark and designing larger case-control studies and she received an insight into the compliance processes.

3. Teaching and pedagogy

Infectious Disease Epidemiology course, years 2022 and 2023

Both in 2022 and 2023, Tjede taught on a week-long introductory infectious disease epidemiology course. The course was part of a Nordic educational programme 'Prevention and Control of Communicable Diseases and Health Care-Associated Infections' taught at the University of Gothenburg, Sweden. The audience was public health nurses from Denmark, Sweden and Norway. The main topic she covered was how to analyse research findings. She developed the teaching material based on ideas from previous years. Together with another EPIET fellow, she also updated and created teaching material on other concepts, such as prevalence and incidence and the concepts of chance, bias and confounding. She facilitated group exercises and supported the group work for the course.

R teaching in the outbreak team

Tjede organised two R training sessions for colleagues in the outbreak team on 24 August 2022 and 13 September 2022. During these sessions, the basics of working with R were presented and discussed. In addition, many ad-hoc coaching sessions and discussions were organised, whenever needed by one of the colleagues.

Organisation of Nordic Mini Project Review Module

Together with the two EPIET fellows at SSI (cohort 2022), Tjede organised the Nordic Mini Project Review Module (NMPRM) which took place on 13–14 March 2023 at SSI in Copenhagen, Denmark. There were 13 fellows and 16 facilitators participating in the module from Norway, Sweden, Finland and Denmark. Tjede and the other SSI EPIET fellows organised thirteen sessions over the two days. They were responsible for the entire planning, organisation, administration, communication and smooth execution of the module. In addition, they conducted an evaluation and handed over the organisational responsibility for the year 2024.

Educational outcome

During the preparation for these teaching sessions and exercises, Tjede was able to consolidate and refresh her own knowledge of the subjects being taught. She learnt to prepare teaching materials and adapt them to the appropriate audience. She learned a great deal by teaching to different audiences. Conducting the same teaching two years in a row (in Gothenburg) provided additional valuable input in how to improve the same teaching session and better adapt the material. The organisation of the Nordic Mini Project Review Module taught her how to organise an entire two-day module and helped her to enhance her skills in this area.

4. Communication

4.1. Publications related to the EPIET fellowship

4.1.1. Manuscripts published in peer-reviewed journals

- Espenhain L, Funk T, Overvad M, Edslev SM, Fonager J, Ingham AC, et al. 2021. Epidemiological characterisation of the first 785 SARS-CoV-2 Omicron variant cases in Denmark, December 2021. *Eurosurveillance*, 26(50), 2101146.
- Espenhain L, Funk T, Kunøe A, Chaine M, Lauenborg Møller K, Kristensen B. 2023. Findings in Danish long-term care facilities in the first year of the SARS-CoV-2 pandemic. *European Geriatric Medicine*, 14(3), 527-535.
- Johannesen TB, Munkstrup C, Edslev SM, Baig S, Nielsen S, Funk T, et al. 2023. Increase in invasive group A streptococcal infections and emergence of novel, rapidly expanding sub-lineage of the virulent *Streptococcus pyogenes* M1 clone, Denmark, 2023. *Eurosurveillance*, 28(26), 2300291.
- Funk T, Espenhain L, Møller K. 2023. Factors associated with the formation of SARS-CoV-2 case-clusters in Danish schools: a nationwide register-based observational study. *Epidemiology & Infection* [in production].

4.1.2. Other reports and contributions

- iGAS Epidemiological Group of Statens Serum Institut (2023). GAS and iGAS surveillance. [Regular internal surveillance reports in html format].
- **Funk T** (2023). Setting up an automated data analysis and reporting system for the routine surveillance of national food- and waterborne disease outbreaks in Denmark.
- Statens Serum Institut (2023). Udbrud med *Salmonella* Enteritidis i Danmark. SSI. Accessed 25/07/2023. Last updated 30/01/2023. Available from: <https://www.ssi.dk/sygdomme-beredskab-og-forskning/sygdomsudbrud/arkiv/udbrud-med-salmonella-enteritidis-i-danmark>
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- Statens Serum Institut (2022). *Risikovurdering: Udvikling i smitte med abekopper [Risk assessment on the development of infection with monkeypox]*. Statens Serum Institut. Available from: <https://www.ssi.dk/aktuelt/nyheder/2022/ssi-med-ny-risikovurdering-for-abekopper>
- **Funk T** and Nielsen S (2022). Outbreak report on *Cryptosporidium* cluster IIaA15G2R1. [Internal report]
- **Funk T** and Nielsen S (2022). Outbreak report on *Cryptosporidium* cluster IIaA15G1R1. [Internal report]
- **Funk T** and Nielsen S (2022). Report on field visit following an outbreak at a childcare facility. [Internal report]
- **Funk T** and Kjelsø C (2022). Outbreak of gastroenteritis in Company X - Results of a cohort study. [Internal report]
- **Funk T** (2022). Outbreak report on outbreak of *Salmonella* Enteritidis ST11. [Internal report]
- **Funk T** (2022). Outbreak report for Outbreak on *Salmonella* Jukestown. [Internal report]
- **Funk T** (2021). Outbreak report for Outbreak on *Yersinia enterocolitica* ST18. [Internal report].

4.2 Conference presentations

- Poster presentation: 'Majority of Danish schools experienced SARS-CoV-2 clusters between August and December 2021' – ESCAIDE conference 2022, 23–25 November 2022, Stockholm, Sweden.

4.3 Other presentations

- Oral presentation at the German FETP meeting (audience: Department of Infectious Disease Epidemiology at RKI and all German FETP fellows): 'The FWD Outbreak investigation process in Denmark' 20 July 2023, online.
- Oral presentation at the weekly German FETP meeting (audience: Department of Infectious Disease Epidemiology at RKI and all German FETP fellows): 'Using national registries to study SARS-CoV-2 clusters in Danish schools' 15 June 2023, online.
- Oral presentation at SSI Vaccine Day: 'Evaluering af den nye påmindelsesordning som en del af Det danske børnevaccinationsprogram' (in Danish), 31 May 2023, Aalborg, Denmark.
- Evaluation of reminder system under the Danish Childhood Vaccination Programme, Nordic Mini Project Review Module 2023, 13-14 March 2023, Copenhagen, Denmark.
- SARS-CoV-2 among primary and secondary schools in Denmark, Nordic Mini Project Review Module 2022, 7–8 March 2022, Oslo, Norway.
- Presenting and interpreting results in epidemiology, Nordic Course in Infection Prevention and Care Hygiene, 04 March 2022 and 03 March 2023, Gothenburg, Sweden.

4. EPIET/EUPHEM modules

1. Introduction course, 20/09 – 08/10/2021, online.
2. Inject Day: Operational Research, 27-28/10/2021, online.
3. Inject Day: Data Management, 10-11/11/2021, online.
4. Outbreak investigation, 06-10/12/2021, online.
5. Multivariable analysis, 14-18/03/2022 (+ Inject Day: 30/03/2022), online.
6. Mid-term Project Review & Introductory Course part 2, 20-29/04/2022, Spetses, Greece.
7. Rapid Assessment and survey methods, 06-10/06/2022, Stockholm, Sweden.
8. Project Review Module, 29/08-02/09/2022, Lisbon, Portugal.
9. Time Series Analysis, 07-11/2022, Utrecht, The Netherlands.
10. Vaccinology, 13-17/02/2023, online.
11. Management, Leadership and Communication in Public Health, 08-12/2023, Stockholm, Sweden.
12. Project Review Module, 28/08–01/09/2023, Lisbon, Portugal (planned).

5. Other training

1. Nordic Mini Project Review Module 2023, 13-14/03/2023, Copenhagen, Denmark
2. ESCAIDE Conference, 23.11.2022 – 25.11.2022, Stockholm, Sweden
3. SSI Lab for Epidemiology Day, 23/08/2022, Copenhagen, Denmark
4. PAE Lab module for epidemiologists, 27-29/06/2022, Berlin, Germany
5. Nordic Mini Project Review Module 2022, 7-8/03/2022, Oslo, Norway
6. Danish language courses and lessons (acquired level: B2)
7. ESCAIDE Conference, 16.11.2021 – 19.11.2021, online
8. Module on 'Causal inference with DAGs' provided by the Berlin School of Public Health/Institute of Public Health at Charité (different dates between October and December 2021), online.

6. Other activities

SSI EPIET and EUPHEM meetings

At SSI, weekly EPIET/EUPHEM meetings are organised during which the fellows can present their projects and receive input from other fellows and a small group of supervisors and colleagues. Tjede has actively contributed to these meetings and presented material on multiple occasions. During the second year of her fellowship, Tjede took over the coordination of these meetings.

Activities of the German FETP and Master of Science in Applied Epidemiology

Tjede participated regularly in the activities of the German FETP (PAE) programme. She contributed to the weekly meetings by giving presentations and contributing to discussions. She attended a two-day laboratory training course in Berlin. In addition, she is in the process of completing the Master of Science in Applied Epidemiology at the Institute of Public Health at Charité in Berlin, on the basis on one of her projects.

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