EPIET & EUPHEM

Summary of work activities
Marie Jansson Mörk
Intervention Epidemiology path (EPIET), 2019 cohort

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 in acknowledged training sites across European Union (EU) and European Economic Area (EEA) Member States.

According to Articles 5 and 9 of ECDC's founding regulation (EC No 851/2004) 'the Centre shall, encourage cooperation between expert and reference laboratories, foster the development of sufficient capacity within the community for the diagnosis, detection, identification and characterisation of infectious agents which may threaten public health' and 'as appropriate, support and coordinate training programmes in order to assist Member States and the Commission to have sufficient numbers of trained specialists, in particular in epidemiological surveillance and field investigations, and to have a capability to define health measures to control disease outbreaks'.

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 report summarises the work activities undertaken by Marie Jansson Mörk, cohort 2019 of the Intervention Epidemiology path (EPIET) at the Public Health Agency of Sweden (PHAS, Folkhälsomyndigheten).

Pre-fellowship short biography

Marie Jansson Mörk has a PhD in Agricultural Sciences focusing on Veterinary Epidemiology and an MSc in Agricultural Sciences and Animal Husbandry. Marie has worked with the veterinary programme at the University of Agricultural Sciences, and she has been employed by the Public Health Agency of Sweden (PHAS) since 2017, and is currently at the Unit for Coordination and Surveillance COVID-19. Prior to the fellowship she primarily worked with surveillance of zoonotic diseases and outbreak management.

The views expressed in this publication do not necessarily reflect the views of the European Centre for Disease Prevention and Control (ECDC).

Stockholm, November 2021

Methods

This report accompanies a portfolio that demonstrates the competencies acquired during the EPIET fellowship by working on various projects, activities and theoretical training modules.

Projects included epidemiological contributions to public health event detection and investigation (surveillance and outbreaks); applied epidemiology field research; teaching epidemiology; summarising and communicating scientific evidence and activities with a specific epidemiology focus.

The outcomes include publications, presentations, posters, reports and teaching materials prepared by the fellow. The portfolio presents a summary of all work activities conducted by the fellow, unless prohibited due to confidentiality regulations.

Results

The objectives of these core competency domains were achieved partly through project or activity work and partly through participation 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

Outbreak investigations
1.1 Outbreak of Salmonella *Newport linked to imported crayfish, Sweden, 2019*
Supervisors: Moa Rehn, Anette Hansen

In October 2019, PHAS identified a cluster of *Salmonella* Newport cases by whole genome sequencing (WGS). Cases' dispersion in place and time indicated a nation-wide ongoing outbreak. Swedish authorities started an investigation to identify the source and prevent further cases.

We identified cases and their demographic information through the electronic notification system. Cases' food exposures were collected using a trawling questionnaire. We compared 20 outbreak cases to 139 domestic cases of salmonellosis with serovars other than *S.* Newport, with disease onset in corresponding season 2017-2019 and not belonging to another large outbreak. Food exposures were compared by adjusted odds ratios (aOR, adjusting for gender, age and county) with 95% confidence interval (CI) using logistic regression. Implicated foods were sampled by a retail chain and at border control. Isolates from positive samples were compared by WGS.

Thirty-three cases from 12 counties were confirmed, 20 cases were women and the median age was 55 years (range 1-82). Onset of disease ranged from 31 July to 2 November 2019. Outbreak cases were more likely to have consumed crayfish compared to control cases (aOR: 26, 95% CI 6.3-105). The investigation identified one specific brand of imported frozen crayfish in dill brine. The retail chain recalled all remaining packages. *S.* Newport was detected in 6/84 samples from different batches from retail and in one sample from border control. Isolates from all food samples clustered with the outbreak strain by WGS.

Our investigation confirmed crayfish as the vehicle in this outbreak. Crayfish in dill brine is a ready-to-eat food product requiring strict microbiological control. The epidemiological evidence led to immediate extensive product recall, which prevented further exposure.

Role: Principal investigator. Marie participated in the outbreak meetings with the regional Departments of Communicable Disease Control and Prevention (CDC-departments) and the National Food Agency and created the additional questionnaire. She processed and analysed the data for the case study, interpreted the results and wrote the report (2). She prepared the abstract and poster for ESCAIDE 2020 (13) and drafted the manuscript submitted to Eurosurveillance (1).

1.2 Outbreak of Cryptosporidium IIdA20G1e
Supervisor: Moa Rehn

An outbreak of Cryptosporidiosis linked to the canteen at a workplace with 120 employees in Västerbotten county was investigated by the regional CDC-department. A cohort study was carried out by the CDC-department to identify a potential source of infection. The hypothesis was that a dish served in the workplace canteen caused the outbreak. The CDC-department asked the Swedish Public Health Agency for assistance with analysing the cohort survey data.

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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

Responses from 107 respondents could be used in the analysis and of these, 49 (46%) were defined as cases according to the outbreak case definition. The analysis of the outbreak survey shows that people who ate winter salad at the Christmas buffet that were served December 11-12 had a four times higher risk of falling ill compared to people who had not eaten winter salad. The cohort study results suggested that some foodstuff in the winter salad (including kale, apples, onion and sour cream) was the vehicle of infection. The source of the infection could not be confirmed.

Role: Marie assisted the CDC-department with the analysis of the cohort study. She processed and analysed the data for the case-case study, interpreted the results, wrote the report (3) and communicated the results to the infectious disease doctor in Västerbotten.

1.3 Outbreak of Cryptosporidium IIdA22G1c
Supervisors: Moa Rehn, Anette Hansen

In the autumn 2019, several regions in Sweden experienced a large increase of cryptosporidiosis cases. The Public Health Agency of Sweden declared a national outbreak on November 11. An outbreak investigation was initiated with the objective to describe the outbreak and identify the source to prevent further cases. Clinical laboratories were asked to send laboratory-confirmed Cryptosporidium samples to PHAS where the samples were analysed to identify species and subtypes. Local CDC-departments performed trawling interviews with cases by phone and/or paper questionnaires.

Two large clusters of cases with Cryptosporidium parvum subtype IIdA22G1c (n=122) and Cryptosporidium parvum subtype IIdA24G1 (n=67), respectively, were identified. For cases with subtype IIdA22G1c, regional investigations identified consumption of an unpasteurised juice containing spinach as a possible vehicle of infection. Using responses from the trawling questionnaire, we conducted a case-case study. We compared food exposures for 53 cases with subtype IIdA22G1c and 35 cases with subtype IIdA24G1 using multivariable logistic regression, adjusting for age, sex and region. Descriptive and analytical analyses was performed in Stata (version 16.0, Stata Corp., College Station, Texas, United States). We estimated odds ratios (OR) with 95% confidence intervals (CI) and p-values for univariable models and adjusted odds ratios (aOR), 95% CI and p-values for the multivariable analysis.

We found that cases with subtype IIdA22G1c were more likely to have consumed unpasteurised juice containing spinach (aOR 7.8, 95% CI 2.7-22.7) compared to cases with subtype IIdA24G1. Trace-back investigations revealed that no contaminated juice batches were left in stores and no withdrawal was needed. For cases with subtype IIdA24G1, we could not identify a suspect vehicle of infection.

Role: Marie participated in the outbreak meetings with the regional CDC-departments and the National Food Agency. She processed and analysed the data for the case-case study, interpreted the results and wrote the report (4). She co-authored the abstract presented at ESCAIDE 2020 (14).

Training modules related to assignment/projects
EPIET/EUPHEM Introductory Course - gave an introduction to basic concepts of outbreak investigations, including the 10 steps of an outbreak investigation, study design and analysis. The concepts introduced in lectures was practices in case studies.

Outbreak Investigation Module -followed up on the topics introduced in the Introductory course and strengthened the fellows' knowledge of outbreak investigations. Fellows' were given the chance to practice the ten steps individually and in groups. The module also gave an introduction to basic tools for bioinformatics and phylogenetic analysis.

Educational outcome
The outbreaks Marie was involved in taught her the importance of different roles in the outbreak team and also the importance of having incorporated standard operating procedures in order not to lose momentum. The outbreaks gave her the opportunity to work both with case-case and cohort studies, deepening the lessons learnt from the modules. Furthermore, the increase of Cryptosporidium in 2019 highlighted the need for species and subtype identification to distinguish between the different outbreaks that occurred simultaneously.

2. Surveillance

2.1 The Public Health Agency of Sweden's COVID-19 surveillance team
Supervisor: Moa Rehn

On 1 February 2020, cases of COVID-19 became notifiable in Sweden according to the Communicable Diseases Act. COVID-19 cases are notified in the Swedish notification system for notifiable diseases (SmiNet). Daily processing and analysis of the data was needed to inform fast decision making, and to communicate daily on the situation to the public. The aim of this project was to understand the need for surveillance data in an emergency situation and to interpret and communicate the data in a timely manner.

Case data were extracted from SmiNet and Stata was used to clean the data, create a linelist, run descriptive analyses and automatically create reports for different purposes. We developed the STATA do files continuously as needed. The linelist was linked to external registers to receive data on admissions to intensive care units (ICU), residential care and deaths, to better follow the situation. We validated any unexpected result, for example deaths among children and adolescents, with the responsible regional CDC-department.

On a daily basis, COVID-19 cases, cases admitted to ICU and deaths were summarised with regards to person, place and time. An internal report was compiled and sent out by email. In addition, data was reported to Tessy and published on the Public Health Agency (PHAS) dashboard. On days that PHAS held press conference concerning COVID-19, we prepared figures and graphs on the global and national situation. A public COVID-19 situation report was compiled weekly (5), giving an overall assessment of the situation and describing the trends in testing, case numbers, hospitalisation and ICU admission, deaths and excess mortality.

Role: Marie participated in all activities mentioned above. Specifically, she contributed to further development of the Stata files, and to the interpretation of the surveillance data.

2.2 COVID-19 clusters in Sweden – national data collection of outbreaks of COVID-19 in healthcare and elderly care, and in public spaces

Supervisor: Moa Rehn

In July 2020, as part of a government commission, PHAS was instructed to plan control measures and other initiatives relevant for increasing transmission of COVID-19. This initiated an event-based surveillance system for COVID-19 outbreaks. The objectives of the surveillance system were to identify where transmission took place, to identify at-risk environments, identify transmission across national and regional borders and identify outbreaks. The results should inform the assessment of the epidemic situation and target control measures/recommendations to prevent transmission.

A project group with national and region-level representatives was formed, with the task of producing a proposal for a reporting system where the regional CDC-departments could report outbreaks to PHAS. We developed an online questionnaire to enable weekly reporting of outbreak data in healthcare and residential care settings and in public places. During week 39-46 2020, detailed information on each outbreak was reported. During week 47-53, following a decision to change the level of reporting, the number of outbreaks in different healthcare and residential care settings and public places were reported.

Data was processed at PHAS and results were shared at weekly telephone conferences with the regional CDC-departments and published in the weekly situation report on COVID-19 on several occasions during the autumn. In-depth summaries were produced, focusing on specific settings, to inform decisions on general guidelines to prevent COVID-19 infections.

Role: Marie developed the questionnaire and data entry mask, performed descriptive analysis, presented the results at weekly telephone conferences with the regional CDC-departments, wrote in-depth internal reports focusing on specific settings and published the results in weekly situations report on COVID-19 (6,7).

2.3 Evaluation of the effect of age on admission to intensive care and death in confirmed COVID-19 cases in Sweden

Supervisors: Hatef Darabi and Maria Axelsson

The Public Health Agency of Sweden's regulations and general guidelines relating to everyone's responsibility to prevent COVID-19 infections entered into force on 1 April 2020. The regulation included, among other things, people's personal responsibility to take precautionary measures to protect themselves and others from COVID-19. People aged 70 or older and people with medical risk factors were advised to limit close contact and stay at home as much as possible. As this strongly limited daily life, PHAS initiated a review of this recommendation in the spring of 2020. The aim of our study was to evaluate the association between age and severe outcome (severe illness or death) in COVID-19 cases, to inform the decision of at what age the more restrictive recommendation would take effect.

We included data on 9 617 people aged 50-79 with a laboratory-confirmed diagnosis of COVID-19. Data were obtained from PHAS, the National Board of Health and Welfare and the Swedish Intensive Care Register. In addition to age, gender, residential care and the number of underlying diseases were included in the analysis as adjusting variables.

We found that the risk of severe outcome in COVID-19 increased with increasing age, but that the increase was relatively small in the ages around 70. Compared with people 65-69 years old, the risk was higher for people 70-74 years but not for people 70-72 years. The results supported the specific advice that applied to people 70 years and older and suggested that advice should remain. Based on these findings, PHAS prolonged the specific advice to people 70 years and older. The report was published on the agency's website in Swedish.

Role: Marie wrote the project proposal, performed data editing and data analysis, wrote the report (8) and communicated with researchers and the public regarding the results.

2.4 Evaluation of differences in age and household type between COVID-19 cases with B.1.1.7 and wild type variants
Supervisor: Moa Rehn

Since the original viral strain of SARS-CoV-2 was first sequenced, several variants have been identified. Variants of concern (VOC) are variants that cause more severe symptoms in patients or have higher transmissibility, and for which vaccines and treatments may be less effective. The Public Health Agency of Sweden initiated enhanced surveillance of virus variants, using variant-typing-PCR in week 5-13 2021. This was done, in addition to whole-genome sequencing, to get a national overview of the occurrence of VOC in Sweden. There was a concern that children were more susceptible and more often led to onward transmission if infected with a VOC compared to children infected with a non-VOC. Therefore, we analysed surveillance data with the aim of comparing age distribution and family structures in cases infected with variant B.1.1.7 or with non-VOC variants.

We compared age distribution and family structure in 43 000 confirmed cases of COVID-19, notified in week 5-12 2021 and with information on SARS-CoV-2 variant from variant-typing-PCR. Using logistic regression, we analysed the association between variants (B.1.1.7/non-VOC) and age and family structure. We found that cases with B.1.1.7 were more likely to be 10-19 years old compared to cases with non-VOC. Adult cases with variant B.1.1.7 were not more likely to be part of a family with children.

These results could indicate that B.1.1.7 spreads more easily among children 10-19 years old but does not support the concern of higher onward transmission from children to adult family members. This study is based on surveillance data and we could not take into account any differences in testing and tracing around cases with known variants.

Role: Marie performed data editing and data analysis and wrote the report (9).

2.5 Epidemic intelligence for COVID-19
Supervisor: Anders Wallensten

COVID-19 emerged in December 2019 in China. In January, an epidemic intelligence team was set up at PHAS. Initially, before the epidemic started in Sweden, the role of the epidemic intelligence team included weekly risk assessments to assess the risk of importation and spread of SARS-CoV-2 in Sweden, and daily assessments of the global situation and screening of scientific papers. The current epidemiological situation worldwide, new recommendations from ECDC and WHO and references to newly published articles were summarised in a daily basis. The summaries were shared internally and to the regional CDC-departments by email and telephone conferences.

Role: Marie participated in the daily assessment of the global situation and contributed to writing Standard Operations Procedures for the daily summarising and sharing of worldwide information. She also reported this information in twice a week telephone conferences with the regional CDC-departments. Marie also participated in the first risk assessment, providing insight as an epidemiologist.

Training modules related to assignment/projects
EPIET/EUPHEM introductory course - gave an introduction to the core concepts of surveillance, covering different surveillance systems, development and evaluation of surveillance systems, and introduced fellows to the analysis of surveillance data. The concepts introduced in lectures were practiced in case studies.

Outbreak Investigation Module - familiarised the fellows to epidemic intelligence, development of questionnaires and data entry.

Multivariable Analysis Module - introduced the fellows to different regressions models and their application in analysis of surveillance data. An important element during the module were the case studies where the fellows practised different analytical methods with supervision.

Educational outcome
Although all surveillance projects concerned COVID-19, Marie worked with various aspects of surveillance. The size, duration and the changing prerequisites, e.g. increasing test capacity in the COVID-19 pandemic enabled Marie to improve data handling and presentation skills and provided a challenge on assessing the situation. The surveillance of COVID-19 outbreaks introduced Marie to event-based surveillance and the evaluations enabled Marie to work with different statistical methods. The interest from the media and the public, and the sometimes harsh criticism, contributed to an improved understanding of crisis communication.

3. Applied public health research

3.1 Effect of age and comorbidities on death and severe illness among COVID-19 cases in Sweden.

Supervisors: Leah Martin and Hatef Darabi

Older age and comorbidities have been shown to be associated with higher risk of severe illness or death in COVID-19 cases. It is common to use indexes to classify comorbidities according to their severity and a Charlson comorbidity index (CCI) adapted to the Swedish setting was recently published. The overall aim of this study was to investigate relationships among age, this adapted CCI and the specific comorbidities it includes, and severe illness and death among COVID-19 cases in Sweden.

We conducted a retrospective cohort study of laboratory-confirmed COVID-19 cases notified in Sweden in 2020. Comorbidity data for 2019 were assessed via the national patient register (ICD-10 codes). Severe illness was defined as admission to the ICU. Multivariable Cox proportional hazards regression was used to model mortality and multivariable logistic regression was used to model admission to the ICU. The exposure variables of interest were age, the CCI score, and the comorbidities included in the CCI. We adjusted for sex, country of birth, receipt of social services for people with certain functional impairments (LSS), home help services or residential care, pandemic period (February-May vs. June-December) and pandemic week. The two latter variables were included to adjust for differences in testing capacity and treatment during the study period. Cases 20-69 years old and cases 70 years and older were analysed separately. Cases younger than 20 were excluded because few died or were admitted to the ICU.

Of the 396 879 cases included in the study, 3% died and 1% were admitted to the ICU. The hazard of death increased with increasing age and was positively associated with CCI. Admission to the ICU was positively associated with increasing age and CCI score for cases 20-69 years old. For those 70 years and older, admission to the ICU was negatively associated with age and with a CCI ≥3.

The results of this study will help to inform national public health strategies against COVID-19 in Sweden, including ongoing COVID-19 vaccination strategies.

Role: Marie wrote the protocol (10), edited the data, performed the statistical analysis and drafted the report (11).

3.2 COVID-19 vaccination prioritisation: factors associated with mortality among COVID-19 cases in Sweden in 2020

Supervisors: Leah Martin and Hatef Darabi

Sweden's COVID-19 vaccination recommendations aim to protect individuals at increased risk of serious outcomes. Individuals living/working in long-term care or receiving/giving home care were given highest priority for vaccination. Based on the literature, individuals ≥70 years old were initially planned for the second highest priority group (Phase 2). However, to inform vaccination prioritisation based on Swedish data, we investigated how age, sex, and comorbidities were related to mortality among COVID-19 cases.

We conducted a retrospective cohort study of all laboratory-confirmed COVID-19 cases aged 50-69 years notified in Sweden (02/2020-12/2020). Comorbidity data for 2019 were assessed via the national patient register (ICD-10 codes) and via proxy definition using the drug prescription register (ATC codes). Multivariable Cox proportional hazards regression was used to model mortality ≤30 days from COVID-19 diagnosis. Independent variables included comorbidities, age, sex, pandemic period (February-May vs. June-December), and the interaction between age and sex.

We included 91 541 cases, 576 of whom died (0.63%). Most cases (53%) were female. Mortality increased with age and was higher for males. Compared to the reference group (females aged 50-54), the adjusted hazard ratio (aHR) was 28 (95% confidence interval [CI]=16-48) for males aged 65-69 and 13 (95% CI=7.2-23) for females aged 65-69. Compared to the absence of each comorbidity, liver disease (aHR=3.2, 95% CI=1.8-5.4), neuromuscular disease (aHR=2.2, 95% CI=1.4-3.4), and pulmonary disease (aHR=2.1, 95% CI=1.5-3.0) were most strongly associated with mortality.

Older age and male sex were strongly positively associated with mortality, as previous studies have shown; these relationships were stronger than for any comorbidity. These results contributed to COVID-19 vaccine prioritisation in Sweden, extending Phase 2 to include individuals ≥65 years of age.

Role: This study was a subanalysis in the project 'Effect of age and comorbidities on death and severe illness among COVID-19 cases in Sweden'. Marie edited and analysed the, drafted the report (12) and the abstract submitted to ESCAIDE (15).

Training modules related to assignment/projects

EPIET/EUPHEM Introductory Course- covered the core concepts of applied public health research. It gave a basis of development of study protocols, data analysis and presentation techniques.

Multivariable Analysis Module - introduced the fellows to different regressions models, their application, interpretation and not least a basis of model evaluation.

Educational outcome:
Similar to the surveillance projects Marie's research project concerned COVID-19. Register-based research includes several challenges of with completeness and correctness of the registers used is maybe the most crucial. The project enabled Marie to work with different statistical methods and introduced her public health research.

4. Teaching and pedagogy

4.1 Lectures on surveillance and outbreak investigation for Masters students

On 8January 2020, Marie delivered two lectures on surveillance and outbreak investigation, with examples on food- and waterborne disease for twelve students in the Masters of Communicable Disease Control programme at Södertörn University. The lectures were based on existing lecture material. Along with EUPHEM Jessica Beser, Marie also facilitated a two-hour long case study 'Outbreak of gastrointestinal illness in Sweden'. As only one lecture hall was available and it was a small group of students, the case study was done in full class and each section was discussed first in beehives and then again in full class.

4.2 Outbreak investigation case study facilitation for veterinary students

On 27 January 2020, Marie facilitated a case study 'Outbreak of trichinosis in France in 1985' for two groups of about 10 veterinary students at the Swedish University of Agricultural Sciences in Uppsala. The students were in their last year of the veterinary programme and had basic training in epidemiology, including study design and measures of association. As a facilitator, Marie encouraged discussions and provided guidance in their discussions.

Training modules related to assignment/projects

EPIET/EUPHEM Introductory Course - Fellows were given basic training in teaching during the Introductory Course. The lectures I gave were covered by the topics discussed in the EPIET/EUPHEM Introductory Course and the Outbreak investigation module. Having participated in several case studies during the EPIET/EUPHEM Introductory Course and the Outbreak investigation module, I felt comfortable to step into the role of facilitator.

Educational outcome:
I have a background in teaching at university level. Having recently participated in the modules made me reflect on my teaching, and work harder to engage the participants.

5. Communication

Publications related to the EPIET fellowship

1. Jansson Mörk M, Karamehmedovic N, Hansen A, Jernberg C, Nederby-Öhd J, Lindblad M, Östlund E, Rehn M. Outbreak of Salmonella Newport linked to imported crayfish, Sweden, July to November 2019. *Submitted to Eurosurveillance*.

Reports

2. Jansson Mörk M. Salmonella Newport Outbreak Investigation Report. Solna: Public Health Agency; 2021. Internal report.

3. Jansson Mörk M. Utbrott av Cryptosporidium i Västerbotten, december 2019 -sammanställning och analys av utbrottsenkät (In Swedish). Solna: Public Health Agency; 2020. Internal report.

4. Jansson Mörk M. Utbrott av Cryptosporidium parvum subtyp IIdA22G1c - Preliminära resultat av epidemiologisk utredning (In Swedish). Solna: Public Health Agency; 2020. Internal report.

5. Public Health Agency of Sweden. Veckorapport om covid-19, vecka 28 (in Swedish). Solna: Public Health Agency of Sweden; 2020. Available from https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/statistik-a-o/sjukdomsstatistik/covid-19-veckorapporter/

6. Public Health Agency of Sweden. Veckorapport om covid-19, vecka 45 (in Swedish). Solna: Public Health Agency of Sweden; 2020. Available from https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/statistik-a-o/sjukdomsstatistik/covid-19-veckorapporter/

7. Public Health Agency of Sweden. Veckorapport om covid-19, vecka 50 (in Swedish). Solna: Public Health Agency of Sweden; 2020. Available from https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/statistik-a-o/sjukdomsstatistik/covid-19-veckorapporter/

8. Public Health Agency of Sweden. Utvärdering av åldersgräns för särskilda råd till personer 70 år eller äldre (In Swedish). Solna: Public Health Agency of Sweden; 2020. Available from https://www.folkhalsomyndigheten.se/publicerat-material/publikationsarkiv/u/utvardering-av-aldersgrans-for-sarskilda-rad-till-personer-70-ar-eller-aldre/

9. Jansson Mörk M. Jämförelse av fall med misstänkt variant B.1.1.7 och fall med andra virusvarianter påvisade med typnings-PCR. Solna: Public Health Agency; 2021. Internal report.

10. Jansson Mörk M. Comorbidities and COVID-19: Relationships among underlying disease, age, and serious illness or death among COVID-19 cases. Solna: Public Health Agency; 2021. Research protocol.

11. Jansson Mörk M. Comorbidities and COVID-19: Relationships among underlying disease, age, and serious illness or death among COVID-19 cases. Solna: Public Health Agency; 2021. Research report.

12. Public Health Agency of Sweden. Faktorer associerade med dödlighet bland Covid-19-fall i Sverige – delrapport (In Swedish). Solna: Public Health Agency of Sweden; 2021. Available from https://www.folkhalsomyndigheten.se/publicerat-material/publikationsarkiv/f/faktorer-associerade-med-dodlighet-bland-covid-19-fall-i-sverige--delrapport/

Conference presentations

13. Jansson Mörk M, Hansen A, Beser J, Karamehmedovic N, Jernberg C, Nederby-Öhd J, Lindblad M, Rehn M. Outbreak of Salmonella Newport linked to imported crayfish, Sweden, 2019. Poster presentation at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), Virtual, 24-27 November 2020.

14. Beser J, Bujila I, Jansson Mörk M, Fischerström K, Nederby-Öhd J, Bragd M, Hall I, Åkerlind B, Lindroos N, Lindblad M, Killander G, Rehn M, Hansen A. Molecular typing as a tool to investigate the national increase of cryptosporidiosis cases in Sweden autumn/winter 2019. Oral presentation (by J Beser) at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), Virtual, 24-27 November 2020.

15. Jansson Mörk M, Darabi H, Martin L. COVID-19 vaccination prioritization: factors associated with mortality among COVID-19 cases in Sweden in 2020. Accepted oral, European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), Virtual, 16-19 November 2021.

Other presentations

16. Jansson Mörk M. Health-care associated outbreak of *Salmonella* Kentucky in Sweden, October 2017 to March 2018. Presentation during Outbreak module in Nicosia, 11/12/2020.

17. Jansson Mörk M. COVID-19 surveillance in Sweden. Think tank presentation, 03/08/2020, Virtual

Other training modules

1. Nordic Mini project review module, 05/03/2020 – 06/03/2020, Helsinki, Finland

2. Nordic Mini project review module, 23/03/2021 – 24/03/2021, Virtual

6. Other activities

Surveillance case to be used in the recruitment

Supervisor: Emma Löf

In the spring 2021, a position at the unit of Coordination and Surveillance of COVID-19 at PHAS was announced. In order to single out the most suitable candidate, the top candidates were given a case with the task to descriptively analyse surveillance data. The main objectives were to identify an outbreak and describe the outbreak cases in terms of time, place and person.

We wrote a case and created a dataset. The dataset was based on real surveillance data but changed so that the outbreak was more easily distinguishable and so that no person could be identified.

Marie wrote the case, created the dataset and provided an assessment guide.

Other activities

During the fellowship, Marie has been involved in routine duties at the unit of Surveillance and Preparedness (later unit of Zoonoses and Antibiotic Resistance), giving input on ongoing outbreaks, been involved in the work with developing the new electronic surveillance system, conducting routine surveillance and updating routine surveillance data management and analyses.

7. EPIET/EUPHEM modules attended

1. Introductory Course, 23/09/2019 – 11/10/2019, Spetses, Greece

2. Outbreak Investigation, 9/12/2019 – 13/12/2019, Nicosia, Cyprus

3. Multivariable Analysis, 20/04/2020 – 24/04/2020 and MVA inject day 18/03/2021, Virtual

4. Project Review 2020, 24/08/2020 – 28/08/2020, Virtual

5. Time Series Analysis, 25/01/2021 – 29/01/2019, Virtual

6. Rapid Assessment and Survey Methods, 27/04/2021 and 04/05/2021 – 06/05/2021, Virtual

7. Vaccinology, 14/06/2021 – 18/06/2021, Virtual

8. Project Review 2021, 23/08/2021 – 27/08/2021, Virtual

Discussion

Coordinator's conclusions

One of the main goals of the EPIET programme is for Fellows to develop core competencies in field epidemiology, mainly through project or activity work, but also partly through participation in training modules, and apply epidemiological methods to provide evidence to guide public health interventions for communicable disease prevention and control. This report summarises all activities and projects conducted by Marie during her two-year EPIET fellowship (cohort 2019) as an MS-track fellow at PHAS, in Stockholm, Sweden.

I had the pleasure to work with Marie during the final months of her Fellowship and this gave me the opportunity to appreciate how extensive and rich her work has been. Marie, who was already employed at PHAS upon starting her Fellowship, sought and found opportunities to expand her professional skills, while continuing to be a team-player in her working group.

Marie extensively contributed to the operational response against the COVID-19 pandemic in Sweden, both with her projects in applied research and surveillance. She routinely responded to the evolving needs of her office, while ensuring that the knowledge gained in the process was documented in robust, evidence-based projects. Also, her interest towards zoonoses facilitated her contribution to the investigation and control of several outbreak. This strengthened her analytical skills that she also transferred into successful teaching experiences.

Marie was always highly committed to achieving the Fellowship objectives, which she successfully and fully obtained. I would like to thank Marie for the opportunity she gave me to learn from her manifold experiences and wish her all the best in her future endeavours.

Supervisor's conclusions

Marie started the fellowship with a wide foundation of both technical skills and work experience from field epidemiology. During the fellowship, she further developed her comprehensive knowledge in statistical methodology, and with her wide understanding of the Swedish infectious disease surveillance system, she has become a competent field epidemiologist. A large part of her fellowship was dedicated to the response of the COVID-19 pandemic and she made an effort to embark on projects and tasks in a way to always gain a new experience and skill. Being involved in numerous COVID-19 surveillance activities including routine analysis and specific research questions, her work has been a large contribution to the agencie's response to the COVID-19 pandemic.

The EPIET learning objectives were all completed through several projects covering a wide range of methods and approaches with varying level of complexity. And with several outputs that directly contributed to the assessment of the pandemic and formulation of public health measures, as well as to actions preventing further cases in foodborne outbreaks.

Marie has many personal qualities making her a great team player and a much-appreciated co-worker. She has a positive and flexible attitude. She has been a mentor to other co-workers, always sharing her knowledge and taking time to ensure they understand the task, making her an invaluable part of our team.

Marie's fellowship has been a great success in meeting the objectives of the programme, including her professional development and the contributions she made to the agency and the field of public health.

Personal conclusions of fellow

EPIET has truly been an enriching experience. I was given the chance to enrol in the Programme's Member State track. As such, my goal was to become a more useful public health professional for PHAS, by improving my epidemiological skills in a public health setting and gaining better understanding of how to conduct outbreak investigations. The plan to work with a variety of communicable diseases was somewhat thwarted by COVID-19. Epidemiological skills are however not disease-specific and I feel confident in that what I have learned has broadened my knowledge as a public health professional, thereby fulfilling my goal. On a personal level, this programme represents a significant step in my development as an epidemiologist. It has also pushed me outside of my comfort zone, for example by the need of communication with the public regarding sensitive topics. Last but not least, the programme have given me a large network of highly skilled public health epidemiologists and microbiologists.

Acknowledgements of fellow

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Finally, to the *Crude and Unadjusted*, for making it such a fun and memorable experience, wish to see you soon.

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