



FELLOWSHIP REPORT

Summary of work activities

Emma Löf

Intervention Epidemiology path (EPIET)

Cohort 2017

Background

The ECDC Fellowship Training Programme includes two distinct curricular pathways: Intervention Epidemiology Training (EPIET) and Public Health Microbiology Training (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 are part of the ECDC fellowship programme that provides competency based 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.

Intervention Epidemiology path (EPIET)

Field epidemiology aims to apply epidemiologic methods in day to day public health field conditions in order to generate new knowledge and scientific evidence for public health decision making. The context is often complex and difficult to control, which challenges study design and interpretation of study results. However, often in Public Health we lack the opportunity to perform controlled trials and we are faced with the need to design observational studies as best as we can. Field epidemiologists use epidemiology as a tool to design, evaluate or improve interventions to protect the health of a population.

The European Programme for Intervention Epidemiology Training (EPIET) was created in 1995. Its purpose is to create a network of highly trained field epidemiologists in the European Union, thereby strengthening the public health epidemiology workforce at Member State and EU/EEA level. Current EPIET alumni are providing expertise in response activities and strengthening capacity for communicable disease surveillance and control inside and beyond the EU. In 2006 EPIET was integrated into the core activities of ECDC.

The objectives of the ECDC Fellowship - EPIET path are:

- To strengthen the surveillance of infectious diseases and other public health issues in Member States and at EU level;
- To develop response capacity for effective field investigation and control at national and community level to meet public health threats;

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

This portfolio does not represent a diploma. Fellows receive a certificate listing the theoretical modules attended and the 23-month training. Additionally, if all training objectives have been met, they receive a diploma.

Stockholm, September 2018

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- To develop a European network of public health epidemiologists who use standard methods and share common objectives;
- To contribute to the development of the community network for the surveillance and control of communicable diseases.

Pre-fellowship short biography

Emma Löf has a PhD in Veterinary Epidemiology and an MSc in Agricultural Sciences and Animal Husbandry. Emma has worked with the Agricultural Board of Sweden, and she has been employed by the Public Health Agency of Sweden (Folkhälsomyndigheten) since 2014, currently at the Unit for Surveillance and Coordination. She has primarily worked with surveillance of zoonotic diseases and outbreak management.

Fellowship assignment: Intervention Epidemiology path (EPIET)

In September 15, 2017, Emma Löf started her EPIET fellowship at the Public Health Agency of Sweden, in Stockholm, under the supervision of Adam Roth and frontline EPIET coordinator, Lisa Hansen. This report summarizes the work performed during the fellowship.

Methods

This portfolio demonstrates the competencies acquired during the ECDC Fellowship, EPIET path, 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 EPIET scientific guide¹.

Fellowship projects

1. Surveillance

Title: *Syndromic surveillance of Winter Vomiting Disease - Can data from a telephone health advice line be used for a geographical syndromic surveillance?*

Supervisor(s): *Pär Bjelkmar and Adam Roth*

Winter vomiting disease (WVD) is seasonal, with an observable peak during winter months. Outbreaks occur every year, and WVD is a substantial burden to healthcare systems and to society. While syndromic surveillance exists in Sweden, it does not capture geographical information, which regional health professionals have suggested would facilitate response. We evaluated whether data on calls regarding vomiting or nausea to a national telephone health could be used to complement the existing syndromic surveillance with geographical information.

We assessed this question by a) cross-correlating weekly calls to the national telephone health service with voluntary laboratory notifications of Caliciviruses during 2014-2018, after standardisation and smoothing; and b) comparing callers' age, sex and residency to the general Swedish population in 2017 using chi-square goodness of fit tests; c)

¹ European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2013. Available from: <http://ecdc.europa.eu/en/publications/Publications/.pdf>

describing the spatial and temporal distribution of calls during 2015-2018, using the space-time permutation model in SatScan to identify clusters.

Of 1,752,248 calls from 2014-2018, 21% referred to vomiting or nausea. 'Vomiting or nausea calls' were strongly correlated with laboratory Calicivirus notifications (correlation coefficient=0.96) with no lag in time between calls and notifications. When comparing characteristics of callers with the general Swedish population, calls were more likely from women (58% vs. 50% $p<0.0001$) and pertaining to children <5 years (19% vs. 12% $p<0.0001$), but less likely to come from the area of Skåne (8% vs. 14% $p<0.0001$). We identified 122 clusters of 'vomiting or nausea calls' during seasons 2015-2018.

We concluded that 'Vomiting and nausea calls' are a reliable proxy for laboratory notifications, and provide timely information on the geographic distribution of WVD. Providing local public health teams with specific information on locations with high WVD activity may allow better identification of populations at risk for targeted control measures.

Role: Principal investigator

Emma designed the study, wrote the protocol (4), performed the statistical analysis, interpreted the results, and wrote an internal report (5) and an abstract for ESCAIDE 2019 (15).

Title: Development and implementation of a tool for surveillance of Campylobacter

Supervisor(s): Marie Jansson Mörk, Sharon Kühlmann-Berenzon and Adam Roth

In 2016-2017 Sweden experienced a large Campylobacter outbreak. Before the outbreak started, changes were observed in the epidemiology of Campylobacter. Prompt response to the increase was challenging, since defining the baseline was difficult due to an increase of domestically-acquired human cases of Campylobacter over several years in Sweden. Unusual winter peaks of cases had also been recognized in recent years. There is a reporting delay for country of infection (i.e. delay in number of days until the case has an updated/confirmed country of infection), which impacts the interpretation of number of domestically-acquired cases.

A former EPIET fellow in Sweden undertook a project to estimate the burden of disease from the 2016-17 outbreak, by developing a model to estimate the number of expected cases, to identify the number of excess cases attributable to the outbreak.

After the large outbreak in 2016-17, the public health response was externally evaluated. One recommendation from this evaluation was: "In the future, a signal in surveillance data should initiate typing and consideration of epidemiologic investigation without delay."

In order to implement this recommendation, we identified the need for a tool for real time surveillance using weekly data, to inform surveillance analysis and trigger investigations or other public health actions. This tool will define a threshold for when surveillance data aberrations occur, which can provide a timely signal for public health measures to limit outbreaks, and for other actors (i.e. animal health or food safety authorities) to identify sources of infection.

Role: Principal investigator

Emma designed the study, wrote the proposal, and wrote the protocol (6). The study is yet to be initiated.

2. Outbreak investigations

Title: Outbreak of enteroinvasive Escherichia coli O96:H19

Supervisor(s): Adam Roth

In mid-November 2017, a local Public Health Authority was notified that more than 20 individuals had developed severe diarrhoea after attending a conference venue in Halland county, Sweden. An outbreak investigation was initiated to identify the causative pathogen and prevent further transmission. Persons attending the venue from November 8-10 were invited to complete an online questionnaire to identify food exposures. Cases were visitors and staff, who had consumed food at the venue and subsequently experienced gastrointestinal illness. Stool samples were collected by local healthcare providers and analysed by PCR for enteric pathogens. Of 554 potential respondents, 398 (72%) replied; 83 reported gastrointestinal symptoms. Women had higher attack rates than men (24.6% versus 15.6%, RR 1.58 p=0.029). Attendees at lunch on November 9th had highest risk for illness (RR 3.02, 95%CI: 1.51-6.04). Leafy greens (rocket, baby spinach and mixed salad) were included in 8/8 of the food items with the highest risk ratios for illness (RR 1.47 to 1.96). Local food authorities conducted trace back of leafy greens, but none of these food items were available for testing. Five stool samples were PCR-positive for the ipaH gene, and whole genome sequencing of three isolates indicated O96:H19 enteroinvasive E. coli (EIEC) with ST99. This is the first time EIEC has been associated with an outbreak in Sweden; epidemiological results suggested leafy greens as the source. The same serotype and sequence type were reported from outbreaks in Italy in 2012 and the United Kingdom in 2014, with vegetables implicated as the vehicle. In Sweden, EIEC has been considered a travellers' disease, but this outbreak shows that EIEC should be considered in domestic outbreaks of gastroenteritis.

Role: Principal investigator

Emma liaised with local and regional authorities, described the cases, refined hypotheses on source of the outbreak, discussed possible control measures, co-wrote the study protocol (7), co-wrote an internal report (8), prepared an abstract for ESCAIDE 2018 (13), presented a poster at ESCAIDE 2018, and co-authored a publication in a scientific journal (2).

Title: Salmonella outbreak among elderly and hospitalized people in Sweden, October 2017-March 2018

Supervisor(s): Linda Trönberg, Lena Sundqvist and Anna Lindqvist Angervall

On 20 October 2017, the Public Health Agency of Sweden was alerted to an outbreak of Salmonella Kentucky, with five cases in Västra Götaland County and one case in Uppsala County. As the outbreak affected several counties, an outbreak investigation was initiated under the coordination of the Public Health Agency of Sweden in order to identify the source of the outbreak and implement control measures.

The outbreak affected 65 people in 6 counties: median age of cases was 85 years; 43 cases (68%) were women. The first specimen was provided on 05 October 2017 and the last on 12 March 2018, and Salmonella Kentucky was isolated from 33 fecal, 25 urine, 3 blood, 1 wound, and 1 sputum samples. Many cases had no gastrointestinal symptoms, or no identifiable gastrointestinal illness onset date. All cases had an epidemiological link with hospitals (hospitalized for long periods for underlying diseases, or employees), nursing homes or elderly homes, whose kitchens were all supplied by the same distributor. Nutrient drinks were initially suspected, but after testing they were ruled out as a cause of illness. In Västra Götaland County, the most affected county, the same menus were offered in all hospitals, and the menu was identical every 6 weeks. The time distribution of cases in Västra Götaland County supported the hypothesis that the source of the outbreak came from the distributor. Over 80 food item samples were tested, but none were positive for Salmonella. The source of the outbreak could not be identified, but control measures were implemented in the kitchens of hospitals to improve food safety.

Role: Principal investigator in initial outbreak investigation

Emma participated in the field investigation in Västra Götaland County, described the cases, refined hypotheses on source of the outbreak, discussed possible control measures, and co-wrote an internal report (9).

Title: *Outbreak of Hepatitis A linked to frozen strawberries imported from Poland***Supervisor(s):** *Lena Sundqvist*

On 14 June 2018, the Public Health Agency of Sweden (PHAS) received a notification from a regional office of a suspected local outbreak of Hepatitis A virus (HAV) in County A with five cases. An epidemiological investigation was initiated by County A, together with PHAS and the National Food Agency (NFA).

Most early cases had purchased smoothies containing strawberries from a juice bar. In Sweden, the Environmental Health Offices in Counties A and B traced back the origins of the frozen strawberries used at the juice bars, the elderly homes, schools and at a hotel breakfast buffet (nine locations in total). Food wholesaler X was identified as a common supplier of frozen strawberries to all locations. From wholesaler X, the strawberries were traced back through a trader in Sweden who had purchased frozen strawberries from producer Y, residing in Poland. Leftover strawberries from wholesaler X were found in the freezer in one of the elderly homes and were sent to the NFA for testing.

Between June–September 2018, 20 hepatitis A cases were notified in six counties in Sweden. Sequence analysis confirmed the outbreak strain IB in the strawberries with 100 % identity and the respective batch was withdrawn. Sharing the sequence information internationally led to the identification of 14 additional cases in Austria, linked to strawberries from the same producer. Combined epidemiological and microbiological investigations identified imported frozen strawberries produced in Poland as the source of the outbreak. On 26 June, wholesaler X initiated the withdrawal from the market of the implicated batch of frozen strawberries. In total, 1,664 packages with 5 kg strawberries each (corresponding to 8,320 kg) were withdrawn from the Swedish market.

Role: *Principal investigator in early outbreak*

Emma held outbreak meetings, liaised with regional, central and international authorities, and contributed to a publication in a scientific journal (1).

Title: *Outbreak investigation of Legionella non-pneumophila infection, including L. longbeachae and L. bozemanii spp., associated with gardening and use of commercial bagged soil in Sweden, April to August 2018***Supervisor(s):** *Pontus Juréen, Sharon Kühlmann-Berenzon, Adam Roth*

In June 2018, an unusually large number of domestic cases of Legionella non-pneumophila subspecies were reported in Sweden. Four of 22 early cases were identified with *Legionella longbeachae*, known from previous investigations to be found in soil. An outbreak investigation was initiated to identify exposures and find the source of the outbreak. Cases were defined as non-travel-related laboratory-confirmed cases of *Legionella non-pneumophila* spp. with symptom onset after 1 April 2018. In the case-control we matched cases that had symptom onset after 14 May with controls from a national survey panel, by sex, age, county and exposure period. Assuming response from 25 cases, probability of exposure of 0.5 among controls, correlation between cases and controls of 0.2, and a power of 80%, we required at least 7 controls per case; to account for non-response among controls we invited 10 controls per case. We inquired about water exposures, gardening, and soil handling, and computed matched odds ratios (mOR) using conditional logistic regression. Case specimens and soil samples from gardens of cases were analysed for *Legionella* spp. and by whole genome sequencing.

Forty-one domestic cases of *L. non-pneumophila* (median age 70, 49% women) from 6/21 counties were reported during April to August 2018. A total of 30 cases were classified as *L. longbeachae*, six by culture, four by 16s-sequencing, two by paired serology, twelve by PCR and six by serology with a single high titre. In total, two cases were classified as *L. bozemanii*, one by culture and one by serology with a single high titre.

The case-control study had 37 eligible cases (i.e symptom onset after 14 May). Twenty-seven of these cases responded, and 182 matched controls, were included in the study. In univariate analysis, when compared to the controls, cases were more likely to suffer from underlying immunosuppression (mOR 9.2 95% CI:3.1-27.3), respiratory disease (mOR 7.7 95% CI:1.8-31.8), heart conditions (mOR 4.2 95% CI:1.5-11.9), diabetes (mOR 2.9 95% CI:0.7-12.2) and other underlying disease (mOR 2.8 95% CI:1.0-7.5). Cases were more likely to have at least

one of the conditions above (mOR 13.4 95% CI:3.9-46.3) Only one case reported being an active smoker, 13 (48%) cases reported that they had been former smokers, and the remaining 13 cases (48%) were non-smokers. Compared to controls, however, cases were more likely to be current or former smokers (mOR 2.6 p=0.03).

All cases reported having been involved in gardening activities during the two weeks prior to symptom onset, and 132 of the controls. In univariate analysis, 19 of the specific gardening activities had a p-value less than 0.2 To investigate which products of CBS, bagged manure fertiliser, compost from own garden, bagged ground bark, were associated with *L. non-pneumophila* infection, we fitted a multivariable regression model. Bagged ground bark was excluded from the model since only 3 cases reported using it. After backward elimination, only CBS remained statistically significant in the model (mOR=2.6, 95%CI:0.9-7.5). Neither smoking nor any underlying conditions proved to be effect modifiers. We further looked into which characteristics of and activities performed with CBS (n=22 cases, n=70 controls). In the model, including all activities conducted with CBS, cases were more likely to have handled dusty soil (mOR=15 95% CI:1.2-185.9).

Joint analysis of soil and case specimens did not produce any clustering with an epidemiological link between cases or between cases and soil samples. Substantial polyclonality was noted between and within soil samples, with the outcome that we were unable to confirm a single source of infection from soil or soil products.

Our study confirmed that cases were more likely than controls to have underlying conditions such as cardiac illness, immunosuppression and respiratory problems, and were more likely to be current or former smokers. These are known risk factors for *Legionella* infection and public health recommendations regarding handling CBS or soil products should therefore be aimed towards these risk groups. Individuals using soil or compost materials were advised, through media and through the official website of PHAS, to take specific measures to minimise inhalation of aerosols or dust from soil or compost materials, such as moisten the product to avoid dust in a way that do not produce aerosols (water with a water-can), open soil bags in a well-ventilated area, avoid inhaling, and wash hands after being in contact with soil. Efforts should also be made to elevate the awareness among physicians that LD should be considered for cases of community-acquired pneumonia that have gardened before onset of disease, and that other diagnostic methods than the UA-test are required for diagnosis.

Role: *Co-Principal investigator.*

Emma developed the protocol and questionnaire, analysed data, prepared a late-breaker abstract for ESCAIDE 2018 and held the presentation (14), wrote an internal report (10) and drafted a manuscript for publication in a scientific journal (3).

3. Applied epidemiology research

Title: *Inequality and Parents' socioeconomic characteristics associated with HPV vaccination uptake in school-based vaccination program in Sweden, 2013-2018*

Supervisor(s): *Adam Roth and Pär Sparen (Karolinska Institutet)*

HPV (human papillomavirus virus) vaccination was introduced into the Swedish national program in 2012, as a school-based vaccination for girls aged 10-12 years. Coverage for initiation of vaccination (at least one dose) among girls born in 2002 and 2005 was around 80%. This participation rate is considerably lower than the coverage for other childhood vaccines in Sweden. Low socioeconomic status has been associated with lower HPV vaccination uptake, higher incidence of cervical cancer, and lower survival from cervical cancer in Denmark. In Sweden, HPV-unvaccinated women are less likely to attend cervical cancer screening: there is thus a risk of increasing social inequity in HPV-related cancer burden. The objective of the study was to compare parents' socioeconomic and demographic characteristics, according to their daughter's HPV vaccination status, in order to guide future interventions to enhance vaccine uptake.

Girls born in 2002 and 2005 and their parents were identified from population registries. Socioeconomic characteristics were obtained from population registries, and HPV vaccination status from the National Vaccination Registries.

Among the 212,135 vaccine-eligible girls, 167,661 (79%) initiated HPV vaccination. Factors associated with lower initiation of vaccination included girls born outside of Sweden; low parental education; family income below the median; at least one parent receiving social benefits; and unemployment of one parent.

Although HPV vaccine is available free of charge, these results highlight social inequalities in the initiation of HPV vaccination. Equal access to healthcare among the Swedish population is a priority objective for the Public Health Agency of Sweden. Identifying and describing the parents of girls who do not access HPV vaccination will help to target qualitative studies, and provide evidence to improve vaccination uptake and cervical cancer outcomes.

Role: *Co-investigator*

Emma conducted data analysis and interpreted results; she wrote a proposal for ethical approval (22) and drafted a manuscript for publication in a scientific journal (11).

Title: *Study protocol for Hospitalization and mortality of three gastrointestinal diseases, (domestic Salmonellosis, Enterohemorrhagic Escherichia coli and Shigellosis) in Sweden, 2007 - 2017*

Supervisor(s): *Adam Roth*

Salmonellosis, enterohemorrhagic Escherichia coli (E. coli) and shigellosis are gastrointestinal diseases caused by Salmonella enterica subspecies, shigatoxin producing E. coli (STEC) and Shigella species infection. The most common clinical symptoms of these three infections include diarrhoea (sometimes bloody), abdominal pain, fever, headache, nausea, and/or vomiting. The symptoms typically last 1 to 2 weeks. The onset of disease symptoms usually occurs 6 to 72 hours (salmonellosis), 2 to 10 days (STEC) and 1 to 3 days (shigellosis) after infection with the bacteria.

The number of reported cases with enterohemorrhagic E.coli has steadily increased during the last decade. During the same time period, reported cases of salmonella and shigella have decreased. While it is known that bacterial gastrointestinal infections may lead to severe disease and hospitalization, there is no active follow-up on reported cases of bacterial enteric infection for complications or long-term disease outcomes in Sweden.

The objectives of the study are: to describe the trends in severity of reported cases of salmonellosis, enterohemorrhagic E.coli and shigellosis over time; to estimate the case fatality and hospitalization rates for cases of salmonellosis, enterohemorrhagic E.coli and shigellosis for the years 2007 to 2017; to estimate the short- and long-term complications such as sepsis, HUS (STEC), reactive arthritis (salmonellosis and shigellosis) and IBS for all reported cases of salmonellosis, enterohemorrhagic E.coli and shigellosis for the years 2007 to 2017.

Role: *Principal Investigator*

Emma designed the study and wrote the protocol (12); she wrote a proposal for ethical approval (23).

4. Communication

Publications

Publications in peer reviewed journals

1. Enkirch Theresa, Eriksson Ronnie, Persson Sofia, Schmid Daniela, Aberle Stephan W., Löf Emma, Wittesjö Bengt, Holmgren Birgitta, Johnzon Charlotte, Gustafsson Eva X., Svensson Lena M., Sandelin Lisa Labbé, Richter Lukas, Lindblad Mats, Brytting Mia, Maritschnik Sabine, Tallo Tatjana, Malm Therese, Sundqvist Lena, Ederth Josefine Lundberg. Hepatitis A outbreak linked to imported frozen strawberries by sequencing, Sweden and Austria, June to September 2018. Euro Surveill. 2018;23(41)

Manuscripts submitted to peer reviewed journals

2. Nina Lagerqvist, Emma Löf, Theresa Enkirch, Peter A. Nilsson, Adam Roth, Cecilia Jernberg. An outbreak of gastroenteritis highlighting the diagnostic and epidemiological challenges of enteroinvasive Escherichia coli, Sweden, 2017 (in review)

3. Emma Löf, Fanny Chereau, Pontus Jureen, Sabina Andersson, Kristina Rizzardi, Petra Edqvist, Sharon Kühlmann-Berenzon, Ilias Galanis, Caroline Schönning, Madelene Kais, Anne Tideholm Nylén, Anders Wallensten, Adam Roth on behalf of the Outbreak Investigation Team. Outbreak investigation of Legionella non-pneumophila infection, including *L. longbeachae* and *L. bozemanii* spp., associated with gardening and use of commercial bagged soil in Sweden, April to August 2018 (in review)

Reports

4. Emma Löf and Bjelkmar, P. 2019. Protocol: Syndromic surveillance of Winter Vomiting Disease - Can data from a telephone health advice line be used for a geographical syndromic surveillance?
5. Emma Löf. 2018. Syndromic surveillance of Winter Vomiting Disease - Can data from a telephone health advice line be used for a geographical syndromic surveillance?
6. Emma Löf. Protocol for development and implementation of a tool for surveillance of Campylobacter.
7. Emma Löf, E, Lagerqvist, N and Enkirch, T. Protocol for Outbreak of EIEC gastroenteritis at a hotel and conference venue in Halland, Sweden, 2017
8. Emma Löf, E, Lagerqvist, N and Enkirch, T. Report of Outbreak of EIEC gastroenteritis at a hotel and conference venue in Halland, Sweden, 2017
9. Chereau, F and Löf, E. Outbreak of Salmonella Kentucky among elderly home residents or hospitalized patients in Sweden, October 2017 - April 2018.
10. Emma Löf and F. Chereau. Outbreak of Legionella non-pneumophila subspecies associated with gardening and usage of commercial bagged soil in Sweden, 2018.
11. Emma Löf. Manuscript: Inequality and Parents' socioeconomic characteristics associated with HPV vaccination uptake in school-based vaccination program in Sweden, 2013-2018
12. Emma Löf. Protocol for Hospitalization and mortality of three gastrointestinal diseases (domestic Salmonellosis, Enterohemorrhagic Escherichia coli and Shigellosis) during 2007 to 2017, Sweden

Conference presentations

13. Emma Löf, N. Lagerqvist, T. Enkirch, C. Jernberg, M. Erntell, K. Truedsson, A. Roth. First reported outbreak of enteroinvasive Escherichia coli O96:H19 in Sweden. Poster presentation at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), Malta, 21-23 November 2018.
14. Emma Löf, F. Chereau, P. Jureen, S. Andersson, K. Rizzardi, M. Kais A. Tideholm-Nylen, S. Kuhlmann-Berenzon. Outbreak of Legionella non-pneumophila subspecies associated with gardening and usage of commercial bagged soil in Sweden, 2018. Oral presentation at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), Malta, 21-23 November 2018.
15. Emma Löf, P. Bjelkmar, A. Roth. Syndromic surveillance of winter vomiting disease in Sweden: added value of geographical information from calls to a telephone health service. Submitted to European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), Stockholm 2019.
16. P. Jureen, E. Löf, K. Rizzardi, C. Schönning, S. Kühlmann-Berenzon, I. Galanis, M. Kais, A. Tideholm-Nylén and S. Andersson. 2019. Outbreak of Legionella longbeachae Associated with Exposure to Soil in Sweden, 2018 The 6th Meeting of the ESCMID Study Group for Legionella Infections (ESGLI) September 10-12, Athens, Greece

Other presentations

17. Outbreak of Salmonella Enteritidis phage type 13a infection in Sweden linked to imported dried-vegetable spice mixes, December 2014 to August 2015. Presentation during Outbreak module in Berlin. 2017-12-04.

18. First reported outbreak of enteroinvasive Escherichia coli O96:H19 in Sweden. Presentation during the Nordic Mini project review module in Oslo, 2018-03-05.
19. The EPIET programme and its core competencies. Presentation at the PHAS. 2018-05-03.
20. CASE – Computer Assisted Search for Epidemics. Presentation in EPIET Time series analysis module. 2018-11-05.
21. Equity and HPV-vaccination uptake in Sweden, 2012-2017. Presentation during the Nordic Mini project review module in Copenhagen, 2019-03-11.

Other

22. Emma Löf. Application to the Swedish Ethical Review Authority Report Equity and HPV-vaccination uptake in Sweden, 2012-2017.13.
23. Emma Löf. Application to the Swedish Ethical Review Authority for Protocol for hospitalization and mortality of three gastrointestinal diseases, domestic Salmonellosis, Enterohemorrhagic Escherichia coli and Shigellosis, during 2007 to 2017, Sweden.

5. Teaching and pedagogy

Lectures on surveillance activities and outbreak investigations, Stockholm, Sweden

In December 2017 and in January 2018, I delivered two lectures on (a) surveillance activities and (b) outbreak investigation, and a case study for students in the Master of Communicable Disease Control programme at Södertörn University. I adapted existing lecture material on surveillance and developed new content for outbreaks. The audience consisted of Master students with diverse backgrounds (microbiology, medicine, pharmacy, communication, public health). I adapted content from the EPIET introductory course and previous teaching presentations by former EPIET fellows. I also used examples from EPIET/EUPHEM case-studies and included personal examples and illustrations from real outbreaks.

I facilitated a 2-hour case study: "Outbreak of gastrointestinal illness in 2010 in Sweden", using a case study developed by previous EPIET fellows.

Facilitation of a case study for veterinary students, Uppsala, Sweden 2018 and 2019

In January 2018 and in January 2019, I facilitated a case study, "Outbreak of trichinosis in France in 1985", for 2 groups of 6-8 veterinary students (at each occasion). Participants were in the last year of the veterinary curriculum and had received basic epidemiology courses on study design and measures of association in their second year. I encouraged discussions among the students and provided guidance during the session.

Lecture on the role of the Public Health Agency, Stockholm, Sweden 2019-01-14

I delivered a lecture on the role of the Public Health Agency of Sweden for the students at the Master of Communicable Disease Control at Södertörn University. I adapted existing material to suit the audience.

Preparation of introductory lecture in epidemiology of infectious diseases for students in medicine

In February 2019, I developed a lecture for introduction to epidemiology of infectious diseases for medical students, using existing material but also incorporating a discussion about the Ebola outbreak in DRC to illustrate

issues in reporting, diagnostics and interpretation of case fatality rates. The lecture was, however, rescheduled to a future date.

Reflection

I learned to be better prepared when using existing lectures and to ensure that the lecture I am presenting is adapted to my own style. I have tried to involve the students more during lectures by asking questions, and encouraging interaction through for instance beehives and group discussions, and to make the content more accessible and engaging to the audience by using real life examples.

In the future I will aim to seek evaluations of my teaching from participants, by sending a short evaluation by email or using a paper form. I also realised that I find it very rewarding to facilitate case-studies.

6. Other activities

During the fellowship Emma has been involved in many on-call duties at the unit of Surveillance and Preparedness, giving input on ongoing outbreaks, been involved in the work with developing the new electronic surveillance system, conducted routine surveillance, and helped to produce maps for surveillance purposes.

7. EPIET/EUPHEM modules attended

1. Introductory Course, 2017-09-25 - 2017-10-13, Spetses, Greece
2. Outbreak Investigation, 2017-12-04 – 2017-12-08, Berlin, Germany
3. Biorisk & Quality management, 2018-02-05- - 2018-02-09, Stockholm, Sweden
4. Management, Leadership and Communication in Public Health, 2018-02-12 – 2018-02-16, Stockholm, Sweden
5. Multivariable Analysis, 2018-04-16 – 2018-04-20, Nicosia, Cyprus
6. Rapid Assessment and Survey Methods, 2018-05-14 – 2018-05-19, Athens, Greece
7. Project Review 2018, 2018-08-27 – 2018-08-31, Lisbon, Portugal
8. Time Series Analysis, 2018-11-05 – 2018-11-09, Brussels, Belgium
9. Vaccinology, 2019-06-24 – 2019-06-28, Rome, Italy
10. Project Review 2019, 2019-08-26 – 2019-08-29, Prague, Czech Republic

8. Other training

1. One day course in "Security when travelling as a representative of the PHAS", 2017-10-26, Stockholm, Sweden
2. Visited the Epidemic intelligence unit at ECDC and trained doing Epidemic intelligence during one week., 2018-04-23 – 2018-04-27.
3. Nordic Mini project review module in Oslo, 2018-03-04 – 2018-03-06, Oslo, Norway
4. UN Basic course, 2018-05-03, Online
5. UN Advanced course, 2018-05-07, Online
6. GOARN Online course, 2018-05-08
7. "5th Edition of writing and reviewing scientific abstracts: a field epidemiology focus", 2019-03-04 – 2019-03-27, Online
8. Nordic Mini project review module in Copenhagen, 2019-03-11 – 2019-03-12, Copenhagen, Denmark

Discussion

Supervisor's conclusions

Being trained in veterinarian epidemiology and having worked at the surveillance unit of PHAS, often responsible for zoonotic and outbreak investigations, Emma was already at the initiation of the EPIET program more knowledgeable than most at the PHAS on outbreak investigations, surveillance, one health and zoonotic disease. So from the outset of the EPIET program Emma aimed to both enhance her knowledge and quality of her work within these fields, while also venturing into new areas and gaining new competences. Emma has fulfilled the first of these objectives through very generously supervising and supporting other less experienced co-workers and fellows in several outbreak investigations and surveillance work, and naturally through her teaching and training activities. She has also fulfilled the second objective in different ways, and especially impressive I find her achievements in designing useful surveillance tools and conducting advanced data analysis in her research projects. Emma has thereby also achieved the EPIET learning objectives and several of the initiatives and projects she has driven have already contributed to an improved quality for the surveillance work of PHAS. Some of the projects she has been involved in, such as the HPV-study for instance, will also most likely contribute to policy change or improved practice in the future. It has been a real pleasure working with Emma. She is a lively, enthusiastic and generous co-worker with a cool leadership style very much appreciated by her co-fellows and others at PHAS. She has grabbed the chance the EPIET program has offered to advance her skillset and network, and I'm sure she will continue to contribute to improving and forming future public health work in Sweden and Europe.

Coordinator's conclusions

Emma entered the fellowship programme with considerable experience in several core competency areas, and has demonstrated initiative in meeting her own learning needs, and in sharing her expertise with her peers. Emma approached the fellowship as an opportunity to expand her skills, and the Public Health Agency of Sweden is to be commended for enabling her to step away from her prior responsibilities to focus on training. Working with a fellow of Emma's maturity and positive attitude has been my pleasure: she is willing to listen to constructive criticism, takes on any challenge that is offered, and greets in-person training and other fellowship activities with enthusiasm. While Emma has been a valued colleague to her Swedish peers, she has now become a key member of a larger European public health network, and is poised to take on a leadership position in continuing to build public health capacity in Sweden and beyond.

Personal conclusions of fellow

EPIET has truly been an enriching experience for me, both professionally and personally. The fellowship has given me the opportunity to broaden my knowledge as a public health professional and I have acquired key technical skills in outbreak investigations, vaccinology, surveillance and applied epidemiological research. One of my projects also forced me to start (again) to learn R. Returning to my former post I will be able to apply what I have learned, both in routine work and in new areas. I also acquired experience in teaching public health to professionals and public health workers and I am keen to share my knowledge and experience with others. Overall, this programme represents a significant step in my development as an epidemiologist.

During the course of the fellowship, interacting with and becoming a part of this large network of highly skilled public health epidemiologist and microbiologists has been highly rewarding.

Acknowledgements of fellow

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