FELLOWSHIP REPORT

Summary of work activities

Cecilia Wolff
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;

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

- 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

Cecilia Wolff is a veterinarian from Sweden who after working as a clinician in mixed practice completed a PhD in clinical science with a specialisation in veterinary epidemiology at the Swedish University of Agricultural Sciences. After her doctoral studies she continued to work with different veterinary epidemiology and one health projects in Sweden and East Africa.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On 11 Sep 2017, Cecilia started her EPIET fellowship at the Norwegian Institute of Public Health, Oslo, Norway. Her main supervisor has been Siri Hauge, and frontline coordinator Louise Coole. This report summarises 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 guide[1].

Fellowship projects

1. Surveillance

Title: *Evaluation of the national surveillance of Legionnaire's disease, 2008 to 2017*

Supervisors**:** Heidi Lange and Emily Macdonald

In Norway, Legionnaire's disease is reportable upon clinical suspicion to public health authorities and mandatorily notifiable through the Norwegian surveillance system for communicable diseases (MSIS) for both clinicians and laboratories. In the summer of 2017, several European countries reported high notification rates for Legionnaire's disease, which was not observed in Norway. We evaluated MSIS to assess if it meets its objectives of detecting trends in incidence and outbreaks of Legionnaire's disease.

We retrieved MSIS data from 2008 to 2017 and calculated timeliness as days from sampling to notification, and internal completeness for key variables as the proportion of observations with a value. Where possible, we assessed internal validity on the presence of a plausible value. To estimate external completeness and validity we linked MSIS with hospital reimbursement claims in the Norwegian Patient Registry. To assess acceptability and representativeness, we surveyed doctors in 39 hospitals on their units' diagnostic and notification procedures, and their use of MSIS.

[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

There were 438 notified cases. Internal completeness and internal validity were high for key variables (≥95%). The median delay from sampling to notification was 4 days. There were 73 patients in MSIS only, 70 in the Norwegian Patient Registry only, and 351 in both registers. The external completeness of MSIS was 83% (95% CI 80-86%). For external validity, the positive predictive value of MSIS was 83% (95% CI 79-86%). Forty-seven respondents from 28 hospitals described testing procedures. These were inconsistent: 29 (62%) reported no systematic application of criteria for requesting legionella testing. Eighteen (38%) reported testing all patients with suspected pneumonia and a travel history. Thirty-one (66%) found the notification criteria clear.

Our results suggest that the surveillance in MSIS can detect changes in incidence of Legionnaire's disease over time, by place and person, but likely does not detect every case diagnosed in Norway. We recommend wider investigation of diagnostic procedures in order to improve representativeness and awareness of MSIS notification criteria among clinicians in order to improve acceptability of the surveillance. We also recommend a more comprehensive assessment of whether patients only registered in the Norwegian Patient Registry were true Legionnaire's disease cases.

Role: *Principal investigator*

Cecilia wrote the evaluation protocol, attended meetings with supervisors and other co-authors, designed the survey questions, wrote the data request to the NPR register, analysed the surveillance, NPR, and survey data, wrote a report [2] and submitted an abstract to ESCAIDE 2019 which was accepted for an oral presentation [9]. She authored a manuscript and submitted it [1].

Title: *Patient characteristics in the virological influenza sentinel surveillance, seasons 2010/11 to 2017/18*

Supervisors: Siri Hauge and Olav Hungnes

The main objectiveof the virological influenza surveillance is to monitor which influenza types are circulating in Norway. A subset of samples is antigenically and genetically characterised, and tested for antiviral drug susceptibility and the relatedness between the circulating and vaccine strains is evaluated. Virological surveillance is carried out through hospital laboratory reports of the number of tested and positive results during the influenza surveillance season, and a selection of the influenza positive samples being characterized by the national influenza laboratory (NRL). In addition a virological sentinel surveillance system with a network of 65 to 70 volunteering GP practices is active all year. The epidemiological surveillance of influenza like illness (ILI) indicates the start, peak and end of the seasonal outbreak. For the NIPH it would be useful to know the characteristics of the patients that are sampled in the sentinel surveillance, and if this is consistent with supporting the surveillance system objectives. Patient characteristics, including their clinical symptoms, have not yet been described, nor any associations with influenza test outcome in this surveillance in Norway, and the aim of our study was to explore this.

We carried out a retrospective cross-sectional study using NRL data for all sampled patients in the sentinel surveillance from season 2010/11 to 2017/18. We summarised and calculated the prevalence (%) of influenza test positive results, by patient characteristics including clinical symptoms and days since symptom onset. We estimated univariate relative risks (RR) with 95% confidence intervals between these variables and influenza test outcomes.

Our results suggest that the youngest children who are important for the epidemiology of influenza are poorly represented in the sentinel surveillance. Sampling instructions should highlight the importance of also including children. Moreover, because the proportion of flu positive results decreased the more days since illness onset the samples were taken, the instructions to participating GPs should better emphasize a selection of patients with recent onset of ILI symptoms. Further, among the children aged 0 to 4 years fever was the only ILI symptom more frequent among flu positive than negative. Sampling instructions to GPs should include a statement on this.

Role: *Principal investigator*

Cecilia wrote the study protocol, designed a data entry mask in Microsoft Access, entered referral note data, analysed laboratory and referral note data, submitted an abstract to ESCAIDE 2019 [11], authored a manuscript for scientific publication and will submit this as first author [12].

Title: *Study protocol for an assessment of patient characteristics for Shigellosis notified in Norway from 1990 to 2017 and risk factors for specific Shigella clones and AMR, 2002 to 2017*

Supervisors: Umaer Naseer and Emily Macdonald

Shigella infection is a major contributor to the global diarrhoea burden with 125 million cases annually in Asia alone, most of whom are children. More recent estimates from reanalysis of Global Enteric Multicentre Study samples using molecular techniques suggested the incidence of Shigella diarrhoea is likely to be much higher than previously thought. Shigellosis is a leading cause of diarrhoeal deaths globally, second only to rotavirus, and estimated to cause 164,000 deaths each year. Up to 99% of infections caused by *Shigella* spp. occur in low- and middle income countries (LMIC), and most deaths occur in sub-Sahara Africa and south Asia. One way *Shigella* is imported from LMIC to high-income countries is through travel and 2- 9% of travel-associated diarrhoea cases are estimated to be caused by *Shigella* spp. Antimicrobial resistance is increasingly found among *Shigella* worldwide, and *Shigella* spp are on the WHO list of priority pathogens for research and development of new antibiotics.

In Norway, shigellosis is a mandatorily notifiable disease. The annual incidence of notified cases has decreased slightly over the last three decades with 80 to 290 notified cases per year. In the last five years, approx. 80% of cases were reported as travel-associated.

Given the changing epidemiology of shigellosis globally, with a shift in species in LMIC, and emerging antimicrobial resistance (AMR), it would be useful to know how this has impacted on shigellosis diagnosed in Norway. Further, because of international travel and changes in what travel destinations are commonly visited by Norwegian residents, the incidence of patients with specific individual and combinations of risk factors may have changed over time. We aim to explore the notified cases with regard to demographic characteristics of the patient, country of infection, genotype/clone and AMR. Knowledge of risk groups and destinations for *Shigella* infection, including specific clones and/or AMR phenotypes, and whether this has changed over time, both for infections acquired abroad and in Norway, might allow NIPH to give recommendations on for example prevention of infection.

Role: *Co-investigator*
Cecilia wrote the study protocol, wrote a data protection impact assessment and communicated with the Personombudsman at NIPH. She received training in how to analyse the MLVA-data. Due to GDPR and data availability issues the project could not be finalised during the fellowship. Another fellow will analyse the data and draft a manuscript, which Cecilia will co-author.

2. Outbreak investigations

Title: *Outbreak of a rare type of Methicillin-resistant Staphylococcus aureus (MRSA) among teenagers and their families in a small community in Norway, 2016-2017*

Supervisors: Thale Berg, Oliver Kacelnik, and Petter Elstrøm

MRSA is a notifiable disease in Norway with 2,338 cases notified in 2016. Community outbreaks are occasionally reported, but not routinely investigated. In May 2017, the Norwegian reference laboratory for MRSA detected a cluster of a rare type of MRSA from mainly adolescent patients in one municipality, which were sampled from February to May 2017. There was no known epidemiological link. We investigated the outbreak to identify the transmission route and develop a tool for investigating community outbreaks of resistant bacteria.

We used the Norwegian Surveillance System for Communicable Diseases to find cases with the rare type PVL-positive MRSA CC398, spa-type t034. All such isolates in 2016 and 2017 from this municipality were whole-genome sequenced (WGS). For the case interviews, we developed a questionnaire with semi-open questions covering school, employment, organised and non-organised activities, and social networks.

The outbreak included twelve cases from five families: five male teenagers, three three-to-six-year-old children (two males), and four adults (two males). Cases presented with superficial wounds or skin abscesses. Samples were taken from 16/08/2016 to 17/06/2017 and WGS confirmed close relatedness of the isolates (<=6 single nucleotide polymorphisms). Interviews with parents of four families revealed epidemiological links between all five families via their social network and schools.

Awareness of and testing for MRSA increased, and the outbreak did not extend any further into the community. Local authorities and NIPH agreed that no community-focused actions were needed. This is the first MRSA community outbreak investigated by NIPH through a combination of surveillance information, WGS and case interviews. We recommend this approach for future community outbreaks of multi-drug resistant organisms known to be transmitted via contacts.

Role: *Principal investigator*
Cecilia participated in several meetings with the outbreak management team at NIPH and the MMD, she wrote a protocol, carried out a literature review for questionnaire design for community outbreaks of MRSA, designed the interview questionnaire, carried out case interviews, described WGSs results, wrote a report (in Norwegian) [4], presented a poster at ESCAIDE 2018 [8].

Title: *Outbreak of gastrointestinal illness at an airbase from Nov 2017 to Jan 2018*

Supervisors: Heidi Lange and Emily Macdonald

In December 2017, local Food Safety Authorities (FSA) reported an outbreak of GI illness among conscripts at an airbase. The 13 patients, including seven hospitalised, were from five different units within the airbase. A PCR standard GI panel was negative. The clinical picture was consistent with appendicitis, however, with several ill soldiers an infection was more likely, and *Yersinia pseudotuberculosis* infection was suspected. Typing by the national reference laboratory at NIPH identified that one patients sample was positive for *Y. pseudotuberculosis*, a notifiable disease in Norway. The outbreak management team at NIPH supported the investigation team from the FSA, the airbase, and the municipality medical doctor who lead the outbreak investigation.

Local authorities did hypothesis generating interviews with nine patients, inspections of the mess and cantina kitchens, and drinking water supply system on the airbase, and sampled environment and food items. We carried out a retrospective cohort study with the objectives to describe the outbreak and identify a possible source(s) of infection in order to prevent further cases. We used an online questionnaire for case finding and data collection on exposures including drinking water and food, distributed among all conscripts at the airbase. We described the outbreak by time, place, and person. The case definition we used was "a conscript at the airbase who on the 27 November or later fell ill with abdominal pain for 2 days or longer or fever for 2 days or longer". We calculated crude odds ratios for all food and water exposures, and applied a multivariable logistic regression models to estimate exposures' association with being a case, adjusted for other exposures.

The number of cases was 9/119 (AR 8%). The clinical symptoms and their duration, winter season, and in addition one microbiologically positive sample suggest *Y. pseudotuberculosis* caused the outbreak. The only food item that remained a risk factor from the multivariable model was scrambled eggs (OR 7). Eggs are not a typical risk factor for *Y. pseudotuberculosis*. Known risk factors include vegetables contaminated during storage, meat from wild animals such as deer or hare, and untreated drinking water from nature, and the infectious dose is usually high. We recommended further investigations into how the scrambled eggs were prepared and how they were served. If eggs were served together with e.g. raw vegetables or herbs we recommended these to be sampled for microbiological analysis as well.

Role: *Principal investigator*
Cecilia designed the questionnaire, analysed questionnaire data, drafted a report (in Norwegian) [5] and a summary in English. She also participated in several phone meetings with the full outbreak management team with local and national public health and food safety authorities.

Title: *Outbreak of gastrointestinal illness among school children in Asker municipality, May to June, 2018*

Supervisors: Heidi Lange and Emily Macdonald

In May 2018, the municipality medical doctor (MMD) reported a suspected outbreak of gastrointestinal illness (GI). Fifty children had fallen ill with vomiting, diarrhoea, or nausea. Most had illness onset Sunday evening with a duration of 1-2 days. Several of the sick children had visited a specific public beach on the weekend. Recent routine tests of the water at the beach had been without remark. Results were pending for new water samples. We investigated the outbreak with the objectives to firstly, describe the symptoms and duration of the illness in the children in order to limit the number of possible pathogens, and secondly, to assess any association between visiting this beach and the outbreak.

We carried out a retrospective cohort study with an online questionnaire for case finding and collection of data on exposures, distributed through the school which the majority of ill children attended. Questions included any visits to the beach and activities while at the beach, and visits to other beaches. We summarised the questionnaire data by time, place, and person, and calculated attack rates. To test risk factors for illness we estimated univariable RRs for the different exposures by log-binomial regression, and RRs adjusted for age and sex.

The questionnaire response rate from the school was 174/350 pupils (50%). The final cohort included 156 observations with 40 cases (AR 26%) meeting the clinical case definition "pupil at the school who fell ill 26 May or later with at least two of the symptoms diarrhoea, vomiting, nausea, or abdominal pain, and with a duration of up to

two days". Cases were predominantly boys (78%) and most were of 6-10 years age (78%). We did not find an association with visits to any beach. Eight cases had not visited any beach.

No stool samples were analysed. Water samples from the beach were without remark. Canada geese faeces collected at the beach was negative with regard to Salmonella and Campylobacter. Results from water samples from a creek by the school where pupils play indicated faecal contamination of the water.

The clinical picture with a high person to person transmission suggested the outbreak was caused by a virus such as Norovirus. However, without microbiological findings, we could not be sure which pathogen caused the outbreak. Outbreak detection was through a parent who contacted the MMD. Routine disease surveillance is based on patients seeking medical care. It is therefore useful if schools alert local public health authorities when they experience unusually high sick leave among their pupils. In addition, schools should alert parents about ongoing GI outbreaks, and request that sick children stay home until they have been symptom-free for 48 hours in order to avoid further spread.

Role: *Principal investigator*

Cecilia wrote the protocol, designed a questionnaire, analysed data, wrote a report in Norwegian [6], and an English language summary. She participated in meetings with the outbreak management team at the NIPH.

Title: *National outbreak of Yersinia O:9 in Norway, 2018*

Supervisors: Heidi Lange and Emily Macdonald

On 18 June 2018 the national reference laboratory for enteropathogens (NRL) reported a cluster of 11 *Y. enterocolitica* O:9 isolates. The patients had been sampled in the period from 22 to 30 May, and were from different geographical areas of Norway. The isolates were whole genome sequenced (WGS) at the NRL. Further *Yersinia* isolates had been received.

We investigated the outbreak to describe it with regard to time, place, and person, and to identify a source for the outbreak in order to implement control actions to prevent further cases.

We carried out a matched case-control study. We designed questions based on results from trawling interviews, and interviewed cases. Three controls per case were selected from the population registry for interviews. Controls were matched on municipality, sex, year and month of birth, and had a telephone number listed in the phone directory. The time of exposure was one week before disease onset. We described interview data by time, place, and person and applied univariate conditional logistic regression models to test associations between cases and food risk factors.

We asked cases for receipts from any grocery shopping in the exposure period. Suspected food products were traced by the Food Safety Authorities (FSA). Samples for microbiological analysis were collected at the trawling interviews from any suspected food items.

A confirmed case was defined as a person infected in Norway with laboratory-confirmed *Yersinia enterocolitica* O:9, by WGS confirmed to be part of "Y.enterocolitica_Cluster_2018-03" (up to one allele difference, Yersinia core genome), and symptom onset 1 May 2018 or later. The total number of cases was 20, 19 were interviewed, whereof 7 for the case-control study.

The date of onset for the 18 symptomatic cases ranged from 10 to 21 May. Eleven of 20 cases were female (55%). The median age 31 years old. For the analytical study, the food items we tested were those that at least three of seven cases had eaten. All had an OR with a confidence interval that included 1.

Summary of all data sources pointed towards fresh spinach and rocket salad from one supermarket chain, and delivered by one salad-packing company. Taking into account the incubation period from the date of illness onset, and purchase date from receipts, we concluded that any products associated with the outbreak would have been in the salad-packing facilities during the first week of May. At inspection of the company's facilities, the internal control protocol, and hygiene and microbiological testing routines, were found suboptimal. The fresh produce company was ordered to improve their risk assessment, sampling protocols and cleaning routines. The FSA will also follow-up the quality assurance and test routines for vegetables within the supermarket chain the company delivers to.

Role: *Principal investigator*

Cecilia participated in several meetings with the outbreak investigation team at NPIH as well as phone meetings with the local and national FSA and all municipality medical doctors where the patients lived. She wrote the protocol, designed the interview questionnaire, designed the data entry mask in Microsoft Access, entered and analysed interview data, drafted the report (in Norwegian) [7] and an English language summary.

3. Applied epidemiology research

Title: *Effect of a sms reminder on influenza vaccination uptake among elderly in Norway 2017*

Supervisor: Siri Hauge

Seasonal influenza causes significant disease burden globally in annual epidemics. Although most people do not require medical care, some develop severe illness that might require hospitalization, leads to complications that persist for a longer time, and with increased mortality. One risk group for severe influenza illness are individuals 65 years or older. The most efficient available preventive measure is vaccination. The WHO and the Council of the European Union have set a target of a vaccination coverage of 75% among elderly. In Norway, the vaccination coverage among elderly was 38% the season 2016-17. The evidence for any effect of reminders (phone calls, postcards, and letters) as intervention to increase the vaccination coverage has ranged from none to moderate. We found no examples in the scientific literature where a national agency distributed sms reminders on vaccination to full birth cohorts.

In Nov 2017, the birth cohorts 1945 and 1950 received an sms reminder to have the flu vaccination. By mistake, only 32% and 40% of individuals in each cohort received the sms. Therefore, we abandoned the initial analysis plan for individual level data. Instead, we carried out an ecological study with the objective to test the hypothesis that the reminder increased the vaccination coverage among elderly.

We retrieved data from the Norwegian vaccination registry on the two intervention cohorts and birth cohorts 1951, 1949, 1946, and 1944 for the season 2017/18 and the two previous seasons. We calculated the number and percent vaccinated for each season in total and by birth cohort, sex, and counties.

The proportion of vaccinated increased for each season but the vaccination coverage was not higher in the two intervention cohorts, neither in total nor when assessing only vaccinations administered after the date the sms was distributed. However, in general the vaccinated coverage increased with older age. For all seasons, females had a higher vaccination coverage than males, and there were regional differences (Health Trusts).

Sms reminders are a relatively new tool in healthcare and public health. It has potential to reach a large number of people at a low cost and low input of labour. Even if the outcome is a moderate increase in vaccination coverage, the low input needed might still make this intervention worthwhile.

The results from the study are limited in terms of supporting specific recommendations regarding the use it of an sms reminder as less than half of the intervention group received the sms. We recommend assessing the vaccination coverage for the 15 birth cohorts that received an sms reminder in November 2018. The financial cost for this type of intervention is low, and the low number of negative responses from the targeted group suggests it was overall well received.

Role: *Principal investigator*

Cecilia wrote a study protocol, a data request for the vaccination register, analysed data, and wrote a report [3]. She also wrote a data protection impact assessment for the request for vaccination data on the 15 cohorts to be used for further analysis.

4. Communication

Publications

Publications in peer reviewed journals

None yet

Manuscripts submitted to peer reviewed journals (in review process)

1. Wolff C, Lange H, Feruglio S, Vold L, Macdonald E. Evaluation of the national surveillance of Legionnaire's disease, Norway, 2008 to 2017.

Reports

2. Wolff C. Evaluation of the national surveillance of legionnaire's disease in Norway, 2008-2017.
3. Wolff C. Effect of an sms reminder on influenza vaccination uptake among the elderly in Norway, 2017.
4. Folkehelseinstituttet. Rapport fra MRSA-utbrudd i Nesodden kommune 2016 til 2017.
5. Mattilsynet. Rapport etter sykdomsutbrudd blant soldater på en flystasjon nov. – des. 2017.
6. Folkehelseinstituttet. Rapport etter utbrudd med magetarm symptomer på skole i Asker kommune, 2018.

7. Folkehelseinstituttet. Nasjonalt utbrudd av *Yersinia enterocolitica* O:9, Norge 2018.

Conference presentations

8. Wolff C et al. "Outbreak of a rare type of Methicillin-resistant Staphylococcus aureus (MRSA) among teenagers and their families in a small community in Norway, 2016-2017". ESCAIDE 2018, St Julien's, Malta.
9. Wolff C et al. "Evaluation of national legionellosis surveillance in Norway, 2008 to 2017". ESCAIDE 2019, Sweden.

Other presentations

10. Wolff C. "Influenza surveillance in Norway" presentation at seminar for new employees at the Division for Infection Control and Environmental Health, Sep 2018.

Other

11. Wolff C, Hungnes O, Hauge S. Young children are poorly represented in the Norwegian virological sentinel surveillance for influenza. Abstract submitted to ESCAIDE 2019.
12. Wolff C, Hungnes O, Hauge S. Clinical characteristics of patients sampled in the virological sentinel surveillance for influenza and associations with a positive influenza test, Norway, seasons 2010/11 to 2017/18. Manuscript in preparation.
13. Johansen Bjordal T and Wolff C. Case study for workshop in outbreak investigation 24 April 2019.

5. Teaching and pedagogy

Lecture on outbreak investigation

The title of my lecture was "Outbreak investigation" and the objectives were to introduce high school students from the first year of the programme "Technology and Research" to investigation of disease outbreaks and how we use molecular technologies for this task. The objective of the students' visit to the institute and the lecture I gave was to give context for topics in their curriculum. I developed a new lecture on the ten steps of an outbreak investigation. I used an example of a real outbreak through the lecture with a pathogen that the institute analyses by WGS. To keep students' attention at a high level, the lecture was interrupted by interactive exercises i.e. a change of learning activity.

Reflection

This was the first time I taught such a young audience. Together with the restricted time for my lecture and that it was to be delivered in Norwegian forced me to really think through every word I wanted to say which was a useful experience. With more time available, I would have liked to include more discussion and interactivity.
The session ended with an evaluation of the training. Students were asked to write down words that described how they experienced the training session and what they had learned. The response rate was 15 of 17 (88%) and the overall feedback was very positive with the topics covered considered interesting and relevant.

Case study and workshop in disease outbreak management

Together with Tone Johansen from EUPHEM cohort 2018, I developed a case study on disease outbreak management for a full-day workshop on disease outbreak management [13]. The workshop was to be focussed on One Health and the collaboration between different One Health actors from local to national level. We also participated in the planning of the lectures between the three parts of the case-study and the overall structure of the day.

The target audience was One Health professionals from the Food Safety Authority, Veterinary Institute, Municipality Medical Doctors, our own institute, and others working with outbreaks of zoonotic, food- or waterborne diseases. The learning objective was that upon completion of the training, participants should know and be able to exercise their role and responsibilities in an outbreak of a zoonotic, food- or waterborne disease from a One Health perspective. The workshop was approved by the Norwegian Medical Association for inclusion as a course in the training for Public Health specialists.

Tone and I developed the case study about an outbreak of EHEC in children with focus on the cross-sectorial and collaborative aspects that our workshop aimed to train the participants in. With some editing, this could be used for future training activity. During the workshop I was a facilitator for the case study. It was clear that the discussions worked best when the facilitators did not sit with the group but were available for questions, and led a discussion after each case study part.

Reflection

I found this teaching assignment highly rewarding. It was very useful to have colleagues in the project group with more experience from working with MMDs and local FSA staff, and who could give feedback to Tone and I on what might be a bit difficult or too easy. I learned to schedule a lot of time for any case studies I will develop in the future. It was time consuming to get the right difficulty level, pace of injects and questions, and to prepare data sets, figures, and calculations. We had time for direct feedback at the end of the day and distributed a short evaluation form. The direct feedback was very positive with accounts on how the day was interesting and useful, in particular the group work with the case scenario. We received 26 completed evaluation forms (response rate at least 60%). There were 11 questions with statements with an answer scale from 1 fully disagree to 5 fully agree. When summarized, the average score ranged from 4.5 to 4.9. Free text comments indicated that participants were particularly pleased with the group work with the case scenario, the mix of professions in the groups, the alternation between lectures and groups work, and very good and knowledgeable lecturers.

6. Other activities

Epidemic Intelligence activities

As part of a 2-weekly rotation, Cecilia has been responsible for daily monitoring of emails, the outbreak reporting system (VESUV), the international surveillance network communication (EWRS/IHR), and checking media for outbreaks/alerts. She wrote 10 weekly reports regarding the current alerts and events, presented in weekly outbreak meetings.

7. EPIET/EUPHEM modules attended

- Introductory course, 24 Sep to 15 Oct 2017, Spetses, Greece.
- Outbreak investigation, 4 to 8 Dec 2017, Berlin Germany.
- Multivariable analysis, 15 to 21 Apr 2018,Nicosia, Cyprus.
- Rapid assessment and survey methods, 14 to 19 May 2018, Athens, Greece.
- Project review, 27 to 31 Aug 2018 Lisbon, Portugal.
- Time series analysis, 5 to 9 Nov 2018, Brussels, Belgium.
- Vaccinology, 24 to 28 June 2019 Rome, Italy.
- Project review, 26 to 30 Aug 2019, Prague, Czech republic.

8. Other training

- Organised and participated in the Nordic Mini Module Project Review, 5-6 Mar 2018, Oslo, Norway.
- Participated in the Nordic Mini Module Project Review, 11-12 March 2019, Copenhagen, Denmark.
- Participated in the EAN workshop in R for outbreak investigations, 19-20 Nov 2018, Malta.

Discussion

Supervisor's conclusions

Cecilia Wolff has been at the Norwegian Institute of Public Health for two years, and we have been very happy to have her as part of our team. Cecilia has a background in veterinary science and academia, and was highly motivated to understand and learn about the public health sector.

The EPIET learning objectives were all completed in a professional and effective way. During her period at the institute, she was involved in a wide variety of different topics, from influenza, legionella, shigella, vaccination - among others. All of the subjects requires different approaches and knowledge, which never was a problem for Cecilia. She quickly developed an insight and has an ability to ask the right questions, which helps her to solve the problem. As a result of her work we have gained more insight into the quality of our surveillance systems in both legionella and influenza and will use the results for adjusting the systems in the time ahead.

Cecilia has gained a very good insight to and an understanding of field epidemiology and public health. During Cecilia Wolff's time at the Norwegian Institute of Public Health, she quickly showed her abilities to adapt and integrate to the working environment at the institute.

The first qualities I would like to mention are her abilities to quickly understand and get on top of the problem she is solving. Another quality is Cecilia's ability to work independently using her strong statistical skills. This has made her a valuable team member and she has produced results at a high speed and of high, reliable quality. She was

able to move forward many projects with a high working capacity and has always been positive to take on more tasks. This is highly appreciated in a busy work situation where situations change quickly and with a high workload. Cecilia has a very positive attitude and is a good colleague, which are important skills in small departments.

I can strongly recommend Cecilia to other employers in both local, national and international settings.

Coordinator's conclusions

Cecilia has had a very successful fellowship and it is clear that the host organisation (Norwegian Institute of Public Health) appreciated her contribution to their work. Cecilia has made valuable contributions to surveillance for Legionella and Influenza in Norway and has undertaken many outbreak investigations. Her work related to capacity building is notable with the development of a new "one health" focused case study which is aimed at a wide multidisciplinary audience intended to improve the quality of collaboration in outbreak investigation and communicable disease control. I would also commend her for taking on the challenge of introducing the concepts of infectious disease control to high school children which will most certainly have challenged and enhanced her teaching skills and who are such an important group to work with if we really want to improve public health in the future; so well done on that.

Cecilia works hard and shows a determination to resolve challenges. She has developed her competence and confidence greatly during the fellowship adding to an already successful career in veterinary epidemiology and academia. She has always fully engaged with the programme and her colleagues and has been a great pleasure to work with. I am delighted that her future role will provide her with an opportunity to bring together what she has learned through the fellowship and her original discipline.

Personal conclusions of fellow

My motivation for applying to the EPIET programme was to deepen my knowledge on infectious disease surveillance and outbreak management, and to gain experience from intervention epidemiology in a public health context. Coming from a background in academia, I have really appreciated the hands-on practical work at a national public health institute that the fellowship has given me. The excellent modules within the programme have provided me with new methodological skills. Within my projects I have had the opportunity to work with different diseases, whereof many were new to me, and different surveillance systems, which I have thoroughly enjoyed. The structured approach to projects, including teaching and communication, and the focus on what the public health implications are and why we should undertake a project has made me a better researcher. During the fellowship I have developed a network of public health experts throughout Europe which I am convinced will be highly valuable in my future career. In conclusion, the EPIET has been a very rewarding and insightful experience for me and my personal learning objectives were more than met. I would highly recommend the programme.

Acknowledgements of fellow

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