



FELLOWSHIP REPORT

Summary of work activities

Astrid Louise Løvlie

Intervention Epidemiology path (EPIET)

Cohort 2016

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;

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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.

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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

Astrid Løvlie completed her Master of Philosophy in International Community Health at University of Oslo in 2013, and started to work at the Norwegian Institute of Public Health (NIPH) - Folkehelseinstituttet (FHI) - as an advisor in the department for Infectious Disease Surveillance the same year. Here she has been responsible for the surveillance of hepatitis C in the Norwegian Surveillance System for Communicable Diseases (MSIS). After a re-organization of NIPH in 2016, Astrid was appointed to be the coordinator for MSIS, with responsibilities to be the contact point for MSIS internally and externally.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On 15 September 2016, Astrid Louise Løvlie started her ECDC fellowship at the Norwegian Institute of Public Health, Oslo, Norway, under the supervision of Katrine Borgen, later Emily MacDonald. Her EPIET frontline coordinator was Christian Winter. This report summarizes the work performed during this 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:

Developing and implementing a system for surveillance of Human Papilloma Virus in the Norwegian Surveillance System for Communicable Diseases (MSIS)

Supervisors: Anja Schou Lindman, Katrine Borgen, Emily MacDonald

In order to reduce the incidence of new cases of cervical cancer and precancerous lesions, the Human Papilloma Virus (HPV) vaccine was included for 12-13 year old girls in the Norwegian Childhood Immunisation Programme in 2009. We identified a need to establish a specific system for surveillance of HPV genotypes in cervical cancer and precancerous cervical lesions, as these biological materials are not routinely tested for HPV. As MSIS did not have

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>

the necessary attributes, we developed a new module to include the surveillance of these conditions caused by HPV into MSIS in 2014. We therefore describe the establishment of a biobank and design of the surveillance of precancerous cervical lesions and cervical cancer caused by HPV in MSIS.

The system was developed and designed as part of a project started in 2014. The project team included experts in HPV vaccination, infectious disease surveillance, and IT development and project management. We also collaborated with the National Reference Laboratory, both regarding handling data and management of the biobank.

We defined a case in MSIS as an individual with cervical cancer and precancerous cervical lesions, where HPV also has been identified. The Cancer Registry of Norway provides MSIS with data on all women registered with cervical cancer and precancerous cervical lesions. Then MSIS extracts information on all individuals with cervical cancer and a selection of individuals with precancerous cervical lesions for further testing. This information is transferred to the National Reference Laboratory for HPV, which collect and analyses the selected samples, and sends the HPV analysis results back to MSIS. The biological material is then stored in the biobank for possible new analysis in the future.

We have designed and set up a new system for surveillance of effect of the HPV-vaccine. The system is complicated and required a complex project with many partners. For the first time, the MSIS regulation also gave a legal basis to establish a biobank to store biological samples for future testing of HPV, with the sole purpose to be used for evaluation of HPV-vaccination. Further on, women have a legal right to opt out on storing biological material in the biobank. This highlighted the need for legal clarifications, and a comprehensive information strategy, to inform the women of their rights. This unique new system will be useful for the surveillance of the effect of HPV vaccine on the HPV genotype distribution and evaluation of the effect of the vaccine.

Role:

Astrid wrote protocol for the implementation of the surveillance system. She has participated in the pre-project from 2015, leading to the project for developing a new IT-solution. Astrid has been the main contact point for external and internal partners. She had a central role in the implementation phase, including extensive collaboration and cooperation with project leader, IT developers, and experts on HPV internal at FHI and external at the reference laboratory for HPV. When the system came into operation, Astrid has done the data handling, including selection of data based on file received from Norwegian Cancer Registry, and transfer of data to the reference laboratory for HPV. The implementation of the new system is described in a report.

Title:

A review of evaluations of the Norwegian Surveillance System for Communicable Diseases: Need for a systematic approach

Supervisor: Emily MacDonald

The Norwegian Surveillance System for Communicable Diseases (MSIS) was established in 1975 and currently includes 68 conditions. Notification criteria are based on clinical findings and/or laboratory confirmation. Data are collected to describe disease incidence, detect outbreaks and evaluate the effects of infection control measures. We performed the first review of studies and evaluations of MSIS including conditions covered, surveillance objectives, study rationale, recommendations and their implementation, to inform future prioritization of evaluations and improve follow-up of recommendations.

We conducted a literature search in PubMed and the NIPH archives and included all MSIS studies that documented one or more surveillance attributes from the "CDC Guidelines for Evaluating Public Health Surveillance Systems". We extracted information on the stated aims and objectives, methods, attributes evaluated, findings and recommendations using a standardized data extraction form. We verified if recommendations were then implemented.

We identified 19 completed studies: nine evaluations, seven epidemiological studies and three quality assessments. Fifteen studies evaluated the surveillance of one notifiable condition, while four evaluated multiple conditions. Surveillance of 42/68 conditions have never been evaluated until April 2018. The most evaluated attributes were completeness (n=17), timeliness (n=10) and representativeness (n=6). Rationale for the evaluation was stated seven out of nine times. Specific recommendations to improve the systems were followed up partly or completely eight out of 16 times.

We recommend developing a framework for conducting surveillance evaluations of notifiable conditions in MSIS more systematically. This should include clear evaluation rationales and follow up of recommendations.

Role:

Astrid was the principal researcher, and planned the project with supervisor Emily MacDonald. She wrote the protocol and did literature search in different databases, as well as obtained literature from the local server at NIPH and from former EPIET/EUPHEM-fellows. She structured findings in an Excel-database, and wrote an abstract for ESCAIDE, that was accepted as a poster presentation. She has

also presented the project at the Nordic Mini Project Review Module, as well internally in meetings at NIPH for colleagues. The project is described in a report, but is expected to continue as a project after Astrid's EPIET-fellowship has ended.

Title:

Routine surveillance work: Coordinating the Norwegian Surveillance System for Communicable Diseases (MSIS)

Supervisors: Department Director Anja Schou Lindman, and later Anita Kanestrøm

Yearly report on operating of MSIS

As the coordinator for MSIS, Astrid has written a yearly report on the operating of MSIS, to be sent to the Minister of Health and The Norwegian Data Protection Authority. The report includes an overview over work load in the register last year, over all data disclosures from MSIS, and an overview over all published articles based on data from MSIS. The report also includes information on budget and resources used in MSIS.

Monthly Surveillance Report

Astrid has also extracted and sent out monthly reports on the number of cases of notifiable diseases to MSIS for the last 12 months, and the mean number of cases last five years for the respective months. The report is sent internally to experts responsible for surveillance for specific diseases at NIPH. Stata was used for extraction and analysis.

Yearly national and international reporting from MSIS

Astrid has been responsible to extract data from MSIS on vaccine preventable diseases and merge the data-files with data from the national vaccination registry (SYSVAK) for a national and international reporting. She has also merged information from MSIS with data from the reference laboratory on invasive infectious diseases for the yearly report.

Routine surveillance tasks

Astrid has registered new cases of hepatitis C in MSIS, as well as performed quality assurance and follow-up of missing information. She has also actively collected missing information by sending letters to medical doctors and microbiological medical laboratories for various diseases. For genital Chlamydia she has yearly collect data from all the microbiological laboratories in Norway diagnosing genital Chlamydia, as well as participated in cleaning and uploading files.

Participation in various projects

Astrid has been a member of a project group for **concept evaluation and impact assessment of national accessible microbiological data**. Project described the current situation, users and their needs, and future needs. Her role was primarily to describe secondary use of data from medical microbiological data, for surveillance purposes, and use for research and quality assurance.

Further, Astrid has been participating in the project for **modernisation of the technological solution for MSIS**. In this project she is the product owner and represents the users of MSIS. She arranged the kick-off for this project, inviting all relevant experts and users of the system. She has a coordinating role in the project, and is the contact point where all partners communicate their wishes. She conducted weekly meetings with the IT developers, in addition to meetings with surveillance experts from different departments.

As part of being the coordinator, Astrid responded to the preliminary report from the Norwegian Data Protection Authorities in April 2017, after an audit of MSIS in March 2016. She will also respond to the final report from the audit, received at NIPH June 2018.

Role:

Throughout the fellowship, Astrid Løvlie has been the coordinator of MSIS. This role includes being the main contact point for the register for IT, epidemiologists, experts, and employers in the register. Further on, she was responsible for keeping the overview over the work load for each employee in MSIS, advice prioritizing between different tasks when needed, follow up all reported deviations, develop and keep updated internal control routines. This includes holding meetings every other week for colleagues in MSIS. She has data handled new applications for data to MSIS, including proceeded applications with regard to juridical issues. She has extracted data for researcher and reports, as well as quality assured extracted data, and merged different sources of data in line with application. Ensure data is handled and handed out according to data protection regulations. As coordinator, Astrid has participated in the project for modernisation of MSIS as a whole. Her role in this project has been the 'owner of the system'. Training of colleagues in MSIS-group, and in other departments in use of data-system to extract

data and do simple analysis. During the fellowship a critical situation regarding lack of resources in MSIS occurred related to stringent economic situation, and Astrid coordinated and followed up this with notifying and have meetings with leaders, other departments and co-workers in order to plan for register of new cases and how and what to prioritize in the future.

Title:***Epidemic Intelligence***

Epidemic Intelligence is the process to detect, verify, analyze, assess and investigate public health events that may represent a threat to public health. Epidemic intelligence provides early warning signals as one of the main objective of public health surveillance systems. In Norway epidemic intelligence is based on both event based and indicator based surveillance, and NIPH is the national focal point for International Health Regulations (IHR) for WHO and Early Warning and Response System (EWRS) for the EU.

Role:

During the fellowship, Astrid has participated in the epidemic intelligence operated by NIPH. She has been an active member of the National Epidemic Intelligence Group, and participated in weekly Epidemic Intelligence meetings where national and international epidemic intelligence relevant for Norway are discussed. As part of this group, Astrid has been responsible for monitoring and follow-up of notifications on outbreaks and events received through utbrudd@fhi.no. She has operated and monitored this system a total of 8 times 2 weeks during her fellowship. This is a daily epidemic intelligence system operated by NIPH, where incoming alerts from the outbreak reporting system (VESUV), the international surveillance network communication (EWRS/IHR), media surveillance, distribution of information to relevant employees, are the main tasks. Part of this task is to write weekly reports to be presented at the weekly Epidemic Intelligence meeting. This report is the basis for simplified report to Directorate of Health and Ministry of Health.

Astrid has also been a member and a secretary organizing the regular general surveillance meetings taking place every second week at NIPH. This included writing summaries during the meetings, and arranging topics and presentations for the meetings.

2. Outbreak investigations

Title:***A prolonged outbreak of norovirus in a conference hotel, Norway 2017***

Supervisors: Katrine Borgen, Bernardo Guzman and Heidi Lange

On 17 February, the owner of a conference hotel in Norway notified the municipality doctor and local food safety authorities (FSA) that more than 20 guests were ill with gastroenteritis. Two days earlier, a guest vomited in the reception area of the hotel. The FSA did not identify any irregularities when inspecting the kitchen. To stop the outbreak the hotel implemented the following control measures: wash down of the kitchen and the common areas in the hotel, enhanced focus on hand hygiene among guests and employees and use of chlorine-based disinfectant. However, new cases continued to occur among guests, and the hotel closed for three days on 24 February for rigorous cleaning. First of March the municipality doctor asked the Norwegian Institute of Public Health (NIPH) for assistance. We investigated the outbreak in order to describe the extent, identify the causative microbiological agent and support the implementation of control measures.

We conducted a retrospective cohort study among all the guests and staff who stayed at the hotel between 13 and 24 February 2017. The hotel provided contact information to guests and staff. Through a web-based questionnaire, we collected information on the disease, demographics and selected exposures. NIPH staff went to the hotel, collected information on the control measures implemented, and visually observed the environment. Individuals with gastroenteritis were encouraged to submit stool samples for laboratory testing. Cases were defined as persons staying at the hotel 15 -24 February, and experienced vomiting and/or diarrhoea between 15 and 28 February.

In total, 436 people who stayed at the hotel between 15 and 24 February responded to the questionnaire. Of the respondents, 281 (64.4%) were female and 284 (65.1%) aged between 40 and 64 years. Guests accounted for 417 (95.6%) of the responses, the remaining were staff. 161 met the case definition, giving an estimated attack rate of 36.9%. The epidemic curve indicated a common source outbreak coinciding with the vomiting incident in the reception on 15 February, with subsequent person-to-person transmission.

Eight stool samples were positive for norovirus, and we identified genotype GII.P7 in all.

This outbreak proved difficult to control, leading to a prolonged and extensive outbreak. Besides the epidemic curve, our investigation revealed challenges in documenting person-to-person transmission. We recommend clearer/more comprehensive guidelines for cleaning after incidents like vomiting in similar facilities.

Role:

Astrid Løvlie was principal investigator. She coordinated and participated in several outbreak meetings, including telephone conferences with the municipality doctor and local food authorities. She visited the hotel, developed an online questionnaire (Questback) in cooperation with Lotta Siira (EUPHEM C2016), sent out questionnaires, and conducted the descriptive and analytical analysis. She wrote outbreak report (in Norwegian) and sent it to colleagues at FHI and to the municipality doctor and local food authorities. She wrote a summary of the report, which was sent to the hotel. She gave a poster presentation at the ESCAIDE 2017.

Title:***An outbreak of gastroenteritis after a memorial service, Norway, December 2016***

Supervisors: Katrine Borgen

On 19 December 2016, the Norwegian Food Safety Authority (NFSA) at the department of Romerike reported 32 cases of gastroenteritis to NIPH. These cases were among approximately 70 people that had lunch during a memorial service at Aur Gjestegård on 16 December. NFSA in Romerike in collaboration with the Municipal Medical Officer and NIPH initiated an outbreak investigation to estimate the extent of the outbreak and identify the mode and vehicle of transmission in order to implement control measures and prevent further cases.

We conducted a retrospective cohort study among all individuals who consumed food served at the memorial service. We collected data using a short self-administered online questionnaire. A case was defined as a person who consumed food served at the memorial service in Aur Gjestegård on 16 December and reported diarrhoea or vomiting or any two of the following symptoms: nausea, fever and abdominal pain; with onset of symptoms from 16 until 19 December 2016. Specimens from ingredients used for preparation of the food were collected and patients were encouraged to deliver stool samples. We calculated attack rates (AR) and risk ratios (RR) using univariate analysis for each food item and drinks.

Of all participants, 44 (60%) completed the questionnaire and 33 (75%) cases were identified; symptoms included nausea (97%), vomiting (94%), diarrhoea (76%), stomach pain (76%) and fever (24%). Onset of symptoms was reported from 9 pm on 16 December to 12 am on 18 December. The epidemic curve suggested a point source outbreak. The median duration of illness was two days (min 0-6 hours; max 4 days). Of the food and drink items consumed, those that consumed salmon sandwich had a 44% (95% CI 0.87-2.38) higher risk of illness compared to those who did not; 80% of cases ate salmon sandwich. Specimens from two patients were positive for norovirus. No pathogens were identified in the three tested food specimens.

Our investigation confirmed an outbreak related to the lunch served at the memorial service. Epidemiological data suggested that this was a point source norovirus outbreak without conclusive results regarding the source and mode of transmission. Neither cross-contamination of food nor person-to-person transmission can be ruled out. We emphasise the importance of appropriate hygienic measures when preparing and serving food and the current guidelines to prevent norovirus outbreaks.

Role:

Astrid Løvlie was co-investigator of this outbreak. She participated in outbreak meetings, and collaborated with colleagues at FHI, EUPHEM and EPIET, to develop a questionnaire in Norwegian in Questback to the guests. She performed the descriptive data analysis, and translated the outbreak report from English to an extensive summary in Norwegian for our collaborating partners. Principal investigator was Lamprini Veneti (EPIET C2015).

Title:***An outbreak of gastroenteritis connected to an accordion festival at a hotel, Norway, January 2017***

Supervisors: Katrine Borgen, Heidi Lange

On 17 January 2017, the Norwegian Food Safety Authority reported gastroenteritis cases among approximately 210 people who had attended an accordion festival at a hotel in Oppland during 13-15 January. We investigated to estimate the extent of the outbreak and identify the mode and vehicle of transmission in order to implement control measures.

We conducted a retrospective cohort study among all individuals who consumed food served at the hotel during the festival. A case was defined as a person who consumed food served at the hotel and reported diarrhoea or vomiting with symptom onset during 14-18 January. We conducted telephone interviews using a structured questionnaire. We inspected the premises including kitchen facilities. Patients were encouraged to provide stool samples. We calculated attack rates and adjusted risk ratios (aRR) using binomial regression.

Of all participants, 67 (32%) completed the questionnaire and 23 (31%) cases were identified; symptoms included nausea (68%), vomiting (64%), diarrhoea (75%), stomach pain (57%) and fever (17%). The epidemic curve suggested a point source outbreak. The median duration of illness was two days (range 0-6 hours to 7 days).

Those that consumed cured meats (aRR 2.03; 95%CI 1.25-3.32), crayfish (aRR 2.25; 95%CI 0.138-3.68), and cured cod with saffron (aRR 3.05; 95%CI 2.10-4.43) had higher risk of illness compared with those who did not; 81% of cases had eaten at least one of the above three cold buffet dishes. One patient sample was tested and was positive for Norovirus. No irregularities in kitchen hygiene were identified. No food samples were available.

Epidemiological evidence suggested that the three cold buffet dishes consumed by the majority of cases may have been the vehicles of transmission. However, neither cross-contamination of food nor person-to-person transmission could be ruled out. We recommend adherence to the current guidelines to prevent norovirus outbreaks.

Role:

Astrid Løvlie was co-investigator. She conducted phone interviews using standardized questionnaires, and participated in the outbreak investigation team with frequent meetings. Corporation with external partners (Food Authorities and Municipality Doctor) She also performed descriptive and analytical analysis of the outbreak. Principal investigator was Lamprini Veneti (EPIET C2015).

3. Applied epidemiology research

Title:

Prevalence of and factors associated with pneumococcal carriage in Norwegian children, four years after introduction of PCV13

Supervisor: Anneke Steens

Pneumococci are often carried asymptotically but can cause invasive pneumococcal disease (IPD). In Norway, >1,000 IPD cases occurred annually pre-vaccine introduction, mainly affecting children and elderly. Pneumococcal carriage is a prerequisite for disease, with children as main reservoir. In 2006, a seven-valent pneumococcal conjugate vaccine (PCV7) was introduced to the Childhood Vaccination Program, which was replaced with PCV13 in 2011. We aimed to estimate PC prevalence and factors associated with carriage in children attending day-care centers (DCC), 4 years after switching to PCV13.

In 2015, we conducted a cross-sectional study in DCC using questionnaires and nasopharyngeal swabs to collect data and identify serotypes. We used chi²-test to compare carriage prevalence in 2015 with similar studies pre-PCV7 introduction, two years afterwards, and two years after switching to PCV13. We used mixed-effect multivariable logistic regression to determine associations between carriage and possible risk factors, correcting for cluster sampling.

In 2015, 896 children from 40 different DCC participated, with a response rate of 45 %. Median age was 44 months (range 8-80), and 52 % was boys. In 2015, 48.1/100 children carried any *S.pneumoniae*, of whom 2.8/100 carried vaccine types (VT) and 45.3/100 none-vaccine types (NVT). In 2006, 2008 and 2013, the overall carriage rate was 77.7/100, 80.3/100 and 62.2/100 respectively, and carriage of VT decreased from 50.0/100 in 2006 to 7.3/100 in 2013. Carriage of NVT increased from 27.7/100 to 54.9/100 between 2006 and 2013, but decreased to 45.3% in 2015. In the multivariable logistic regression analysis, we found that age, antimicrobial use and being vaccinated were negatively associated with *S. pneumoniae* carriage.

Our study showed a decrease in overall *S. pneumoniae* carriage especially in the carriage of vaccine-serotypes of *S. pneumoniae* after the introduction of the vaccine. NVT carriage did not increase from 2013 to 2015. We found that being vaccinated, increasing age and being treated with antimicrobials were protective for carriage.

Role:

Astrid was the primary researcher in the project. Data collection was done in 2015, prior to the start of Astrid's fellowship. Astrid wrote a protocol, analysed the data and wrote a manuscript. Astrid has presented the project at the Nordic Mini Project Review Module in 2018, as well as internally at NIPH. She submitted an abstract to ESCAIDE 2018, where it was accepted as an oral presentation. The manuscript is submitted for review in 'Epidemiology and Infection'.

Title:

Prevalence of hepatitis C among persons who inject drugs (PWID) in treatment centres

Supervisor: Hilde Kløvstad

HCV-infection is mandatory notifiable to MSIS. However, there are several weaknesses to this surveillance. As HCV-infection is mainly an asymptomatic disease, the number of reported cases is closely related to testing activity and there are no tests that can distinguish between new infections and past infection. The surveillance case definition has changed several times since 1990 and since 2016, only HCV-RNA positive cases are reported. Prevalence surveys of HCV infections in PWID are supplements to the national surveillance to obtain valid, reliable and comparable measures of HCV prevalence and trends in prevalence and risk behaviour over time. Since 2002, the NIPH has cooperated with local health authorities in the municipality of Oslo to conduct regular health surveys among PWID. The aim has been to provide tests for blood-borne infections, provide vaccines for hepatitis A and B, to evaluate the effect and quality of the municipality's work on preventing blood-borne virus infections and to do surveillance of the prevalence of blood-borne virus infections among PWID in Oslo. The recruitment of participants has been done through different low-threshold programs targeting PWID in Oslo such as needle exchange-and housing facilities. In Norway, specialized interdisciplinary treatment centres (TSB) provide treatment for substance use disorders. Currently, an ambulant treatment team for HCV for inpatients at the TSB in South-East Norway is under development. The aim of this study was to investigate whether it is feasible to use TSB centres as an arena for repeated HCV-surveys in the future. To investigate this, the prevalence of HCV among PWID in TSB in 2017 is calculated and compared to the prevalence found among PWID in the low-threshold centres in Oslo and Bergen in 2015. In addition, the results of this study will give a baseline prevalence before establishing treatment options for chronic HCV infections through TSB.

This was a cross-sectional study conducted using two different approaches for recruitment: (1) in TSB centres in South East Norway in 2017, and (2) at two different low-threshold centres in Bergen and Oslo in 2015.

In total, 66 people from seven TSB participated in the cross-sectional study, compared to 228 and 114 participants from the Oslo and Bergen low-threshold centres, respectively. We found the prevalence of HCV-RNA positives to be 41 % in TSB, compared to 44% and 55% in Oslo and Bergen, respectively. When running cohort-specific chi-squared analyses, we did not find any significant associations between HCV-infection and sex or age group.

We see TSB as a possible area for future surveys, with repeated data collections including prevalence of HCV-infection, and risk behavior. Future surveys, either in TSB or low-threshold centers is important for surveillance of prevalence and risk behavior, and evaluation of measures like treatment of HCV-infection or needle exchange.

Role:

Astrid was the primary researcher in this study, writing a protocol in close cooperation with external partners. Astrid had sent letter of information and reminders to institutions collecting data, and collected the data in a local database at NIPH. Astrid also interviewed data collectors at most of the institutions for their experiences with conducting the survey. She has summarised the work in a report, to be published at NIPH's web page. She has also presented the project at a meeting with experts on intoxication and psychiatry among people who inject drugs (PWID).

4. Communication

Publications

- Prevalence of and factors associated with pneumococcal carriage in Norwegian children, four years after introduction of PCV13 (under review in 'Epidemiology and Infection')

Reports

- A prolonged outbreak of norovirus in a conference hotel, Norway 2017 outbreak report (in Norwegian)
- Implementing surveillance of Human Papilloma Virus in the Norwegian Surveillance System for Communicable Diseases, 2017 (report)
- Prevalence of hepatitis C among PWID in treatment centres (report)
- A review of evaluations of the Norwegian Surveillance System for Communicable Diseases: Need for a systematic approach (report)

Conference presentations

- Poster presentation at ESCAIDE 2017: A prolonged outbreak of norovirus in a conference hotel, Norway 2017

- Poster presentation Health Register Conference, Tromsø, Norway March 2018: Implementing surveillance of Human Papilloma Virus in the Norwegian Surveillance System for Communicable Diseases, 2017
- Oral presentation at ESCAIDE 2018: Prevalence of and factors associated with pneumococcal carriage in Norwegian children, four years after introduction of PCV13
- Poster presentation at ESCAIDE 2018: A review of evaluations of the Norwegian Surveillance System for Communicable Diseases: Need for a systematic approach

Other presentations

- Five presentations during her fellowship about the **implementation of a surveillance system for HPV in MSIS**, both internally at NIPH, and in external meetings.
- Presentation of the project: **Prevalence of hepatitis C among PWID in treatment centres** at a meeting with experts on intoxication and psychiatry among people who inject drugs (PWID). Presentation focused on how to perform the study and future possibilities. 20 minutes presentation, including Q&A.

Other

Information

Astrid participated in developing information material on MERS as new mandatory disease to report and notify to MSIS. Formulated and published online public information regarding this. <https://www.fhi.no/hn/helseregistre-og-registre/msis/mers---ny-meldings--og-varslingspliktig-sykdom-i-msis/>. She also participated in deciding on a Norwegian case definition for Zika, when Zika was defined as a new notifiable disease, and took part in disseminating information about the new case definition.

Astrid has developed an information text about MSIS aimed for the public. The text included information about the surveillance system itself, what gets registered there and how a person registered in MSIS can full-fill his/her right to access information. Information is accessible online at NIPH webpage: <https://www.fhi.no/hn/helseregistre-og-registre/msis/>.

5. Teaching and pedagogy

Title:

Surveillance of communicable diseases in Norway

Astrid held three lectures (one in 2016, and two in 2017) at the Oslo University College for students in nursing, physiotherapy, bioengineering, radiograph, occupational therapy and physiotherapists, taking a course in international public health. Approximately 30-80 students attended each 45 minutes-lecture.

Training objective was an introduction to infectious disease surveillance, with emphasis on why we do surveillance, and the situation in Norway. Objectives included a description of the nature and purpose of public health surveillance, illustration of the importance of knowing frequency, severity and cost of a disease, a demonstration of the utility of a surveillance system, and a list of different types of surveillance system

Target audience were students in nursing, physiotherapy, bioengineering, radiograph, occupational therapy and physiotherapists, taking a course in international public health

Reflection:

I learned that I needed to change the lecture after presenting it for the first time (both simplifying and generalizing) to better engage the students, and make the content more relevant for them. I had to engage the students more actively than I initially thought, and asked questions to the audience, made eye contact, and tried to illustrate the theory with examples relevant to their work.

Title:

Lecture and facilitation at outbreak course about outbreak in hospitals for infection prevention personnel

Astrid held one lecture at one outbreak course for infection prevention and control personnel and healthcare personnel from hospitals, and adjusted the case study for the course, and facilitated the case studies during the course.

Training objectives of the lecture was to present and give an overview over important and the most used tools to use in an outbreak investigation. The case study included the steps on an outbreak investigation, the roles and responsibilities of the different actors in a hospital setting in Norway. The case study emphasized the need to systematize and structure the collected information during an outbreak.

Target audience was infection prevention and control personnel and healthcare personnel in hospitals

Reflection:

The process in adjusting the case study was a very useful table top exercise in outbreak investigation and management in a hospital setting, something I during my fellowship has not been able to do. To facilitate was also very useful in terms of learning from the infection prevention and control personnel and healthcare personnel from hospitals on how they theoretically manage outbreaks in a hospital setting.

Title:

Introduction to MSIS – the system, privacy and security

Astrid held four training sessions for new colleagues in the departments on surveillance and advice about privacy and security issues in MSIS-system. One hour with background, theory and some practical exercises. The objectives included a short history and background of MSIS, the objectives of MSIS, the IT system and development, privacy and security in the system, and practical examples of the use of the system.

Target audience were new colleagues in departments for surveillance and advice that needed access to MSIS in order to do their future job. The aim has been for the new colleagues to access MSIS and extract information and do simple analysis by themselves.

Evaluation and results: have received good feedback during the sessions. However, the lectures has had limited effect with regard to the new colleagues using the database in MSIS in their daily job. Many of them still ask colleagues in MSIS to extract and prepare the data for them.

Reflection:

These introductions have taught me how to present the register and the use in a simple, but still thorough way. How to emphasize importance of privacy and security, at the same time facilitating for an easy access and analysing of the data. In the future I would to a greater extent make sure that the persons I present for really are going to use the database.

Internal mini-seminar for MSIS

In cooperation with Astrid arranged a 4 hour mini-seminar, presenting the Norwegian Surveillance System for Communicable Diseases for new and old colleagues. Themes were; what is surveillance, the history of MSIS, future challenges and how the data from MSIS are used by the different departments for surveillance and advice (evaluating effect, as basis for advice, for outbreak investigation and detection. Arranged in cooperation with former coordinator for MSIS, Tone Bruun. Invited persons to present different topics, and presented how MSIS works in the new organisation at FHI, as well as what and where reports from MSIS is delivered (TESSy and WHO). About 50-60 participants.

6. EPIET/EUPHEM modules attended

- EPIET/EUPHEM Introductory course, 25/9-14/10-2016, Spetses, Greece
- EPIET/EUPHEM Outbreak investigation module, 5-9/12-2016, Berlin, Germany
- EPIET/EUPHEM Multivariable analysis module, 13-17/3-2017, Zagreb, Croatia
- EPIET/EUPHEM Rapid Assessment and Survey Methods, 8-13/5-2017, Athens, Greece
- EPIET/EUPHEM Project Review Module, Lisbon, 28/8-1/9-2017
- EPIET Time series analysis, 20-24/11-2017, Bristol, England
- EPIET Vaccinology, 11-15/6-2018, Cardiff, Wales
- EPIET/EUPHEM Project Review Module, Lisbon, 27-31/8-2018

7. Other training

17-18/09/2017

Internal course in statistics; "Which statistical method should I use?", "Sample Size", "Introduction to linear regression analysis" and "Introduction to logistic regression", Norwegian Institute of Public Health

Discussion

Supervisor's conclusions

Astrid has taken being an EPIET fellow very seriously and has been exceptionally dedicated, despite many competing obligations, both within and outside the Norwegian Institute of Public Health. Astrid is hardworking and has broadened her expertise in field epidemiology through a wide range of topics during her fellowship period, including but not limited to hepatitis C prevalence, pneumococcal carriage, foodborne outbreak investigation and surveillance of Human Papilloma Virus. She has not been afraid of taking on projects outside her comfort zone and has been persistent in finishing them to high level of quality. Astrid is genuinely interesting in improving public health systems, including the Norwegian Surveillance System for Communicable Diseases. Astrid is an immensely valuable asset for the Norwegian Institute of Public Health, particularly in the field of surveillance. We hope that she will be able to continue using and developing the skills learned through the EPIET at NIPH in the future.

Coordinator's conclusions

Astrid has improved her epidemiological skills very much throughout her fellowship, especially in regards to outbreak investigation and conducting research. She is very dedicated and efficient in her work.

Astrid, who is a nurse by training and has a Master in International Community Health, has been working for the Norwegian Institute of Public Health (NIPH) since 2013. Here, she has been the main coordinator responsible for the Norwegian Surveillance System for Communicable Diseases (MSIS). Despite her great responsibilities and heavy involvement in routine surveillance activities, she was able to fulfil all the additional tasks and activities that came with the fellowship due to her hard work and her organizational skills.

During her fellowship, Astrid developed and implemented a system for surveillance of Human Papilloma Virus within MSIS, where she needed to get stakeholders from different fields, institutes and laboratories involved. She made this important project a great success with her knowledge and insights into MSIS and her interdisciplinary skills. Additionally, she systematically reviewed previously conducted evaluations of MSIS to explore how such evaluations and their recommendations could be better used to improve the surveillance system and Public Health accordingly.

After having supported a few gastroenteritis investigations in the beginning of her fellowship, Astrid was the principal investigator of a prolonged norovirus outbreak in a conference hotel. Here, they conducted a retrospective cohort study and performed environmental and microbiological investigations. She was able to apply her newly gained epidemiological skills under field conditions.

Astrid conducted a cross-sectional study to estimate the prevalence of pneumococcal carriage in Norwegian children four years after the introduction of PCV12 vaccinations into the National vaccination programme. She also explored factors associated with carriage and compared all the results with previously conducted prevalence surveys. Through this project she was able to further develop her ability to conduct more complex data analysis such as multivariable logistic regression analysis.

Astrid taught University students in surveillance of communicable disease in Norway, and infection prevention and control personnel, and healthcare personal from hospitals on outbreak investigations in hospitals.

These different investigations and projects gave Astrid the opportunity to develop her skills in applied research including project proposal and study protocol writing, designing a questionnaire, conducting data analysis and writing reports. She was able to communicate the findings of her projects and investigations at national and international scientific conferences and through a scientific peer-reviewed publication.

Astrid plans to continue working for NIPH and applying her newly gained skills in her work as MSIS coordinator. I wish her great success in the future.

Personal conclusions of fellow

These two years of my EPIET-fellowship has been a fun, challenging, super-fast, forming and social journey. I got the unexpected opportunity to join the EPIET fellowship as a member state-fellow, and have never regretted. All the modules has well exceeded my expectations, and I still digest the learning outcome from the modules. The fellowship has made it possible to build an international and interdisciplinary network from all over Europe, and I really hope for future cross-country collaborations. Last, the fellowship has given me new friends, and I hope to stay in touch and keep their friendship in the future.

I am very grateful for completing the fellowship, and feel I have gained valuable and important knowledge on applied epidemiology, and now have a more complete framework for what I did before, and will continue to do as a coordinator for MSIS.

Acknowledgements of fellow

My completion of this fellowship had not been possible without the great support and help from so many wise and good people.

I want to thank Katrine Borgen, my first site supervisor for the first half year. She made me keep my fellowship on track in a busy everyday life. Thanks also to Bernardo Herrador Guzman, my second site supervisors, who supervised me safely and wisely through the process of abstract writing and submission for ESCAIDE 2017. The last year Emily MacDonald has been my site supervisor, always available and offering great supervision both in projects, completing projects, and in managing time. Thank you for always being friendly, and for all the coffee breaks we have shared. This had not been possible without you!

I am also grateful to Anja Lindman, my former department director, who despite stringent resources and heavy work load, always encouraged and facilitated for me to pursue the fellowship. I also thank the Norwegian Institute of Public Health for giving me this opportunity.

I owe my project supervisors Anneke Steens and Hilde Kløvstad a lot. Through the two projects I have learned so many aspects of applied epidemiological research, both with regard to data collection and other obstacles possible to meet during a study, and most important, to do analytical analysis. Analytical analysis was completed by the invaluable assistance and teaching from statistician Richard White. Without all of your patience and understanding, the projects would never have come to a completion, and I would never have learned so much.

This fellowship had not been the same without my fellow fellows Laura Espenhain and Lotta Siira from C2016, Lamprini Veneti from C2015 the year before and Cecilia Wolff from the C2017. I feel that our EPIET/EUPHEM-community has been great as a safe and encouraging environment throughout the fellowship, and you have all offered me friendship, help and good times together. Thank you! A special thanks to Laura for being my stata-support in routine work as well as in projects.

I would like to thank my frontline EPIET coordinator Christian Winter for his support and constructive feedback, and for being patient and understanding in all my different projects.

My dear fellow colleagues in MSIS; Kirsten, Åse, Kari Åse and Annette, I am for ever grateful for all the efforts you have put down in order for me to focus on completing the fellowship. I know I said in the start of the fellowship that you would not notice that I was an EPIET-fellow, and how wrong I was. I am looking forward to be more present in our common daily life in MSIS.

Finally, I am nothing without my husband Odd Erling, and my children Oda and Brage. Oda and Brage; you have endured long periods without me, and I am so sorry to have missed important events in your lives when being away. I hope to make it up to you! My dearest Odd Erling; you are the most loving, patient and encouraging husband, and my best friend. Your support have been invaluable, and you have been the important counterbalance, when I needed to be reminded of what is most important in life. I love you!