FELLOWSHIP REPORT

Summary of work activities

Jozica Skufca
Intervention Epidemiology path (EPIET)
Cohort 2014

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 the 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.

This portfolio does not represent a diploma. Fellows receive a certificate acknowledging the 2-year training and listing the theoretical modules attended. Additionally, if all training objectives have been met, they receive a diploma.

Stockholm, September 2016

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;
- 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.

Fellows develop core competencies in field epidemiology mainly through project or activity work, but also partly through participation in training modules. Outputs are presented in accordance with the EPIET competency domains, as set out in the EPIET scientific guide[1].

Pre-fellowship short biography

Prior to EPIET, Jozica Skufca worked short-term as a lecturer on infectious diseases and on dengue prevention with the Medicine Faculty/El Bosque University in Colombia, and in event-based surveillance in the Western Pacific Region at the World Health Organization/WPRO in the Philippines. She also previously worked for 3 years on human medicines in the pharmaceutical unit of the European Commission in Belgium, and for 6 months at the pharmaceutical company Krka in Slovenia. She holds a Doctor of Veterinary Medicine degree from the University of Ljubljana, Slovenia, and a Master of International Public Health from the University of New South Wales, Australia.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On 14 September 2014, Jozica started her EPIET fellowship at the National Institute for Health and Welfare (THL), Helsinki, Finland, under the supervision of Dr Outi Lyytikäinen. This report summarizes the work performed in that fellowship assignment.

Fellowship portfolio

This portfolio presents a summary of all work activities (unless restricted due to confidentiality regulations) conducted by the fellow during the ECDC Fellowship, EPIET path. These activities include various projects, 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.

This portfolio also includes a reflection from the fellow on the field epidemiology competencies developed during the 2-year training, a reflection from the supervisor on the added value of engaging in the training of the fellow, as well as a reflection by the programme coordinator on the development of the fellow's competencies.

[1] European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2013. Available from: http://ecdc.europa.eu/en/epiet/Documents/Scientific%20guides/EPIET%20Scientific%20Guide_C2016.pdf

Fellowship projects

1. Surveillance

Title: Evaluation of post-discharge surveillance of surgical site infections in Finland, 1999-2013: Can register linkage improve completeness of reporting?

Background
Due to increasingly shorter hospital stays, post-discharge surveillance (PDS) of surgical site infections (SSIs) is vital for estimating the incidence of SSI . Hospitals participating in the Finnish Hospital Infection Programme (SIRO) utilize three methods to detect SSIs after hospital discharge; post-discharge questionnaire, follow-up visits, and readmissions to the hospital. Despite this some cases may be missed. We evaluated whether the National Hospital Discharge Register (HILMO) can be used to validate and increase the completeness of SSI surveillance data and sensitivity to detect SSI on readmission.
Methods
We included all surgical procedures under surveillance in SIRO hospitals during 1999-2013 and identified the overlapping hospitalizations from HILMO by using the national identity number and hospital codes. We assessed the overall percentage of SSIs detected by PDS and percentage detected on readmission. We completed the missing hospital discharge dates from HILMO, which allowed us to ascertain the percentage of SSIs occurring after discharge. We compared the number of SSIs identified on readmission with the number of readmitted patients with the ICD infection code (T81.4) in HILMO.
Results
In total, 185,351 surgical procedures and 4,757 (2.6%) SSIs were identified in 19 hospitals, of which 3,288 (69%) were detected by PDS, including 1,708 (36%) on readmission. 177,108 (96%) surgical procedures matched with hospitalizations in HILMO, allowing to complete 177,069 (96%) hospital discharge dates and to confirm 3,337 (70%) post-discharge SSIs in SIRO. In total, 2,442 readmissions coded as T81.4 were identified in HILMO, including 640 overlapping with SIRO.
Conclusion
HILMO can be used to validate and complete SSI data in SIRO and for additional case finding. Number of post-discharge SSIs on readmissions detected by only one of the systems indicates that their combination will increase sensitivity.

Role and outputs: *Primary investigator.*

Wrote the protocol; conducted semi-structured interviews with the staff members of SIRO, HILMO, National Register of Primary Health Care visist (AvoHILMO) and infectious control doctor and nurse in one Finnish hospital; conducted a web-based questionnaire and analysed data; performed data linkage between databases and analysed surveillance data; poster presentation at ESCAIDE 2015 (1); oral presentation at SIRO 2015 (2); wrote the final report (3).

Supervisor: Dr Outi Lyytikäinen

Competencies developed:
From being involved in this surveillance project, I learned about the advantage of the personal identity numbers (IDs) recorded in Finland, which allows the linkage between the databases. I learned that by database linkage the completeness of surveillance data can be greatly improved, and that linkage could be used on a regular basis for surveillance purposes, providing a more standardized and less resource demanding method. This project also provided me the opportunity to gain confidence in delivering presentations.

Title: *Surveillance data of surgical site infections (SSIs) after breast surgeries in Finnish hospitals, 2003-2010*

Introduction
In 1999, a Finnish Hospital Infection Surveillance System (SIRO) was established. It includes the surveillance of surgical site infections (SSIs) in several procedure types, including breast surgery. Feedback of SSI rates to surgeons can lead to reduction in risk of SSIs. The aim of this study was to investigate SSI rates and risk factors for SSIs in order to explore options for a meaningful feedback to the hospitals. We also evaluated whether the National Hospital Discharge Register (HILMO) can be used to increase the completeness of SSI surveillance data to detect SSIs on readmission.
Methods
We analyzed routinely collected SSI surveillance data of breast surgery reported by SIRO hospitals, and conducted a more detailed investigation of severe SSI cases detected in one hospital during focusing. By using the national identity number and hospital code we obtained the number of SSIs identified on readmission with the ICD-10 infection code (T81.4) from HILMO.
Results
Breast surgery was under SSI surveillance in 4 SIRO hospitals during 2003-2010. A total of 7,294 breast surgical procedures, with 287 SSIs (3.9 %) identified, of which 107 (37%) were severe SSIs. A total of 4,976 procedures were identified in one hospital contributing the majority of all breast procedures under SIRO surveillance. Of all procedures, 163 (3.3%) SSIs were identified, of which 79 (48%) were severe and 43 (28%) detected on readmission. The number of procedures (n) and SSIs were highest for the procedure group of partial excision of mammary gland (n=2,479; 53 SSIs) and mastectomy (n=1,369; 66 SSIs). Several factors were associated with development of SSI, such as length of procedure and wound contamination. In total, 38 readmissions coded as T81.4 were identified in HILMO, including 12 overlapping with SIRO.
Conclusions
Almost half of SSIs were severe and additional readmissions were identified from HILMO, suggesting that feedback could be focused only on severe SSIs, and administrative data could be used for additional case finding. These results could be used when developing feedback in collaboration with surgeons of the participating hospitals.

Role and outputs: *Primary investigator.*

Wrote the protocol; analysed data of all Finnish hospitals; analysed focused data of one hospital; participated in discussions with the hospital infection control nurse/surgeons and presented analysed data; manuscript as a co-author is planned.

Supervisor: Dr Outi Lyytikäinen

Competencies developed:
Being involved in this study I learned to analyse extensive datasets and to link databases. By having an ambundance of surveillance data available, I became aware of the importance to select relevantr results, which contribute to meaningful feedback.

Title: *Enhanced EVD surveillance and Establishment of the National database of all Ebola Virus Disease (EVD) cases reported during the Liberia Ebola Outbreak 2014/2015, Liberia*

Background
After Liberia was declared Ebola-free on 9 May 2015, the 90-days enhanced EVD surveillance activities were implemented, including laboratory surveillance. One of the top priorities for the Ministry of Health

and Social Welfare of the Republic of Liberia (MOH) was to establish the national database of all EVD cases reported during the Liberia Ebola Outbreak 2014/2015.

Methods

As part of the enhanced EVD surveillance, daily suspected EVD cases reported by the MOH and by the WHO county field coordinators were followed up. Data on the EVD laboratory samples taken in all counties were collated and analysed on a weekly basis at a national level, and results presented to various partners. Establishment of a national EVD database included extensive data cleaning, reviewing data from the case investigation forms recorded in two databases (VHF and DHIS2), combining case investigation databases, and preparing county spreadsheets flagging incomplete or invalid information for counties verification.

Results

The analyses of the daily enhanced surveillance of EVD suspected cases and laboratory testing have identified significant under-reporting. The datasets of EVD cases were reviewed and records were flagged for incomplete and invalid data.

Conclusions

The EVD surveillance activities in Liberia should continue and a closer assessment of the reasons behind under-repporting should be undertaken to address the issue. Counties should amend missing and check invalid data in the flagged EVD cases datasets. Cleaned datasets should be further collated with the ETUs, laboratories and burial datasets.

Role and outputs: *Epi-Surveillance WHO Consultant.*

Contributed to finalization of MOH Liberia EVD surveillance database; analysed and disseminated laboratory surveillance data to all partners on a weekly basis; adjusted analysis corresponding to the evolving lab activities post-Ebola; attended weekly MOH laboratory meetings with partners (CDC, laboratories etc.), and provided results of the analysis; analysed data for comparison of the number of lab samples tested, number of oral swabs and suspect cases reported by counties; maintained up-to-date WCO Liberia EVD database; wrote a proposal for consideration to change the daily WCO county reporting. (4)

Supervisors: Dr Esther Hamblion, Dr Nuha Mahmoud

Competencies developed:

Being involved in establishment of the national database of all EVD cases I learned to work with hugely incomplete or inaccurate data collected in times of a public health emergency. By being involved in 90-post Ebola surveillance activities, I learned the importance of heightened surveillance for preventing future outbreaks. By understanding the shortcomings of the daily data collection on EVD suspected cases, I learned about the possibilities for improving data flow and adjusting data needs post-Ebola. By working on laboratory surveillance, I learned about the importance of strong collaboration and communication with all partners involved, and the importance of delivering most relevant analysed data in order to make appropriate conclusions for further actions. I have become very aware of how surveillance data is used for action.

2. Outbreak investigations

Title: *Raw milk as a cause of Campylobacter jejuni outbreak among participants of a school visit on a dairy farm in Finland, April 2015*

Background
A municipal authority from Southern Finland reported to the National Institute for Health and Welfare (THL) an outbreak of gastrointestinal illness among school group visiting a dairy farm on 2 April 2015. We investigated the outbreak to identify the source of infection in order to apply appropriate preventive measures and prevent future outbreaks.
Methods
We conducted a retrospective cohort study. We defined a case as a person from the school with gastrointestinal symptoms after visiting a dairy farm on 2 April 2015. We sent a web-based questionnaire to 27 school visitors on a dairy farm. We calculated the Relative Risks (RRs) with 95% Confidence Intervals (CIs) to determine exposures associated with illness. Reference laboratories typed isolates from patients, milk filter and cows from the farm by a pulsed field gel electrophoresis (PFGE).
Results
A total of 24 participants responded to the questionnaire, of which 20 were school children (median age 10 years). Overall, 16 (67%) cases were reported. Of all cases, 14 (88%) occurred during 4-7 April and the last case was reported on 10 April 2015. Diarrhea, abdominal pain and nausea were the most common symptoms. Drinking raw milk at the farm was not statistically significant associated with illness (RR: 1.36; 95% CI: 0.33-5.61; p=0.60), however, of all cases, 15 (94%) reported drinking raw milk, of which 7 (44%) drank more than one glass. Identical Campylobacter jejuni strains were identified from 11 cases` stool samples, the filter of the milking machine at the farm and from some cows` stool samples.
Conclusion
Contaminated raw milk originating at the farm was the likely source of this outbreak based on the laboratory analysis, with unpasteurized milk as one of the most common sources of infection with Campylobacter jejuni. Public awareness of health risks linked to consumption of raw milk should be increased.

Role and outputs: *Investigation team member.*

Wrote a questionnaire; analysed preliminary outbreak data; co-author of the final report. (5)

Supervisor: Dr Jussi Sane

Competencies developed:
Being involved in this outbreak I learned of the importance of conducting a web-based questionnaire that is appropriate and effective for the analysis of responses. Conducting a cohort study allowed me to apply the analytical knowledge gained through the ECDC training modules, especially univariate analysis. I also learned about the importance of the descriptive analysis, which in combination with the laboratory analysis may contribute to drawing different conclusions than if basing solely on statistical analysis.

Title: *Measles outbreak in Liberia, May 2015*

Background
As Liberia emerged from the Ebola epidemic 2014/2015, it has been battling a measles outbreak with over 850 cases reported in a period of six months. In response to the outbreak, the Liberian government moved swiftly to organize a countrywide vaccination campaign with the help of WHO, CDC, UNICEF and other partners.
Methods
From 8–15 May 2015, vaccination teams fanned out across the country immunizing hundreds of thousands of children under 5 years against measles and polio (OPV), and giving them mebendazole tablet for deworming. Monitoring of the integrated measles/polio/mebendazole campaign (IMC) was carried out on the field in all districts of Liberia. Data on IMC progress and its challenges was daily

collected from all counties at the National IMC Operational Centre, compiled in a form of IMC reports and disseminated to all partners.
Preliminary Results
In total, 689,754 (101%) children were vaccinated for OPV, 598,251 (98%) against measles and 515,419 (99%) received a mebendazole tablet. Monitoring at the IMC sites revealed many challenges in its implementation, such as community resistance, poor cold-chain, difficulty in accessing teams in remote areas, incomplete tally sheets by a recorder etc.
Preliminary Conclusions
In order to correctly calculate vaccine uptake, the problem with the denominator should be addressed. Monitoring of the standards and effectiveness at the vaccination sites, effective counties reporting on the IMC progress and its challenges, and daily feedback of the compiled information to various partners contributed to rapid improvements of the vaccine's uptake.

Role and outputs: *Consultant in WHO Vaccination Unit.*

Daily collated, analysed and summarized IMC data from all counties; in collaboration with MOH wrote the daily National IMC reports (6) and distributed them to all partners involved; training of the MOH staff on Excel functions for graphical presentation of analysed data; carried out IMC monitoring on the field in Montserrado district and advised accordingly.

Supervisor(s): Dr Wambai Zakari

Competencies developed:
By participating in the IMC, I learned about the importance of effective monitoring, good reporting and data-flow in order to address the challenges quickly and consequently increase vaccine uptake.

Title: *Hepatitis A (HAV) outbreak in Finland: long-term case-control study*

Background
Finland has faced a prolonged food-borne Hepatitis A (HAV) outbreak since 2013. Trawling interviews indicated frozen berries as infection source. A long-term case-control study is planned to investigate HAV exposures.
Methods
We analysed and summarized data of a 2015 otbreak, and newly emerged HAV cases in 2015 were interviewed via a phone call. For the case-control study we defined a case as any person laboratory confirmed and notified for HAV infection to the National Infectious Disease Registry (NIDR). Every case will be matched for sex, age and residence with 2 controls randomly selected from the National Population Register. We prepared a questionnaire based on a review of questionnaires used in 2013-2015 outbreak investigations, and on possible exposures leading to HAV infection described in the literature. We discussed a secure transfer of the web-based questionnaires for cases and controls with the IT security department and about current practices and further collaboration with the laboratory.
Preliminary Results
From the start of 2015, to September 17,, 32 HAV cases (0.6/100,000) were reported, exceeding the number of cases reported in 2014 (27 cases; 0.5/100,000) and in 2013 (41 cases; 0.8/100,000). Of all cases in 2015, 44% (14) were detected in men with the median age of 31 (range 1-66). Of all cases, 8 had identical virus type IB, 2 had identical virus type IA, 3 had identical virus type IIIA and for 18 cases typing was not successful. Of all HAV infections, 18 (56%) were acquired in Finland, 10 (31%) abroad, and location of infection was not reported for 4 cases. Since the case-control study was planned, no newly emerged HAV cases have been reported.
Preliminary Conclusions
Every newly emerged HAV case in Finland will be included in the case-control study.

Role and outputs: *Investigation team member.*

Analysed and summarized 2015 outbreak data; performed literature review and reviewed trawling questionnaires used in previous outbreaks to identify possible exposures leading to HAV infection; interviewed one newly emerged HAV case; involved in study planning, including laboratory and IT security issues.

Supervisor: *Dr Ruska Rimhanen-Finne*

Competencies developed:
Being involved in the planning of this study, I learned about the concepts of a case-control study, the importance of conducting an effective questionnaire with all possible exposures included, about challenges of exposure recall when incubation period is long, and of IT security issues linked to electronic use of questionnaires. By conducting a telephone interview I also realized importantance of concise and length appropriate questionnaires.

Title: *Outbreak of gastroenteritis after a sport camp event, Finland, January 2016*

Background
On 15 January 2016, a cluster of gastrointestinal disease involving 30 participants attending a training camp in a sport facility in Western Finland was notified from the local outbreak investigation team, to the National Institute for Health and Welfare (THL) through the National Registry for Food- and Waterborne Disease (RYMY). We investigated the outbreak in order to identify the source and the aetiology of the infection, the mode of transmission, and undertook control measures to prevent similar outbreaks in the future.
Methods
Web-based questionnaires in Finnish and Swedish languages were sent to the participants of the training camps, and to staff members of the sport facility. Laboratory investigations of cases and environmental samples were conducted. A case was defined as a person who attended a training camp during 2-10 January 2016 or was a staff member at the sport facility who developed symptoms of diarrhoea or vomiting or abdominal pain during 5-13 January 2016.
Results
A total of 148 (45%) of 331 persons interviewed completed the questionnaire and 28 (19%) of the responders met the case definition. Nine food items served during the camp were significantly associated with the illness. Norovirus (NoV) GI was detected in a stool specimen provided by a kitchen staff member. No other timely collected stool specimen was available for NoV testing.
Conclusions
The NoV is likely the cause of this outbreak since the incubation period, the description and duration of symptoms of the reported first people with gastroenteritis were consistent with NoV infection and case‘ sample was laboratory confirmed. The outbreak was effectively controlled due to the implementation of THL guidelines for cleaning and disinfection, and no further cases were reported.

Role and outputs: *Investigation team member.*

Wrote the outbreak protocol; formulated a list of the participants and information on location and food menu; prepared and presented information at the weekly outbreak meetings of the THL‘ Department of Infectious Diseases; jointly with the EUPHEM fellow designed the questionnaire, analysed the data, and wrote the final report (7).

Supervisor: *Dr Ruska Rimhanen-Finne*

Competencies developed:

By participating in this outbreak I learned about all steps of the outbreak investigation, including communication of the findings and methods for the virus characterisation. I learned about the challenges linked to the microbiological investigation, such as lack of samples. Conducting this cohort study allowed me to apply the knowledge gained through the ECDC training modules, especially outbreak investigation and multivariate analysis.

3. Applied epidemiology research

***Title**: Adverse events after immunisation of adolescent girls with human papilloma virus (HPV) vaccine*

Background
The bivalent HPV vaccine has been included in the Finnish National Immunization Programme (NIP) since November 2013. It is routinely offered in three doses schedule free of charge via school-based programs for girls 11–12 years of age, with catch-up among girls 13–15 years of age. The available data demonstrated acceptable safety of HPV vaccines, however, concerns continue to surface around the world about possible adverse events following immunization (AEFI). This study will assess the potential AEFIs following HPV immunization for the first time after it was introduced in the Finnish NIP.
Methods
Retrospective register based cohort study will include all adolescent girls of age 11 to 15 years who are Finnish residents with a personal identification number (ID). The assigned ICD-10 codes for the selected diseases of interest will be obtained from the National Hospital Discharge Register (HILMO) and the National Register of Primary Health Care Visits (AvoHILMO). By using personal ID, we will link information from HILMO and AvoHILMO to the vaccination status of girls recorded in Finnish Vaccination Register. As a pilot, we examined cases of Guillain Barré syndrome (GBS) among girls aged 11-15 years recorded in HILMO in 2014 and linked these to the vaccination register.
Preliminary Results
According to the national vaccination register data, until 13 June 2016, 339,803 HPV vaccines were administered within the NIP, with a mean of 66% coverage for the first dose with considerable regional variation. In total, 4 GBS cases were identified in 2014, of which all have been vaccinated with the HPV vaccine.
Preliminary Conclusions
The protocol was finalized and is now utilized in an overarching register based HPV safety study protocol, which will be used for the final analytic work on HPV safety, including for repeating the analysis on GBS with 2015 data.

Role and outputs: *Primary investigator.*

Conducted literature review; completed applications for permission to access data in confidential registers and records; wrote protocol for HPV safety study (8); analysed data and wrote report on GBS (9).

Supervisor: Dr Hanna Nohynek

Competencies developed:
Being involved in writing a protocol I learned about different study designs that can be used in vaccine safety studies, especially the difference between using the retrospective register based cohort study vs. self-controlled case series (SCSC) method. I also learned about various permission procedures, which need be obtained before such a study can be conducted.

***Title**: Incidence rates of Guillain Barré (GBS), Chronic Fatigue/Systemic Exertion Intolerance Disease (CFS/SEID) and Postural Orthostatic Tachycardia Syndrome (POTS) prior to introduction of Human Papilloma Virus (HPV) vaccination among adolescent girls in Finland, 2002-2012*

Background
In Finland, a vaccination program against human papillomavirus (HPV) was introduced in November 2013 for girls aged 11-12 years with a catchup for girls 13-15 years. Allegations that HPV vaccine is causing Guillain Barré syndrome (GBS) and non-specific diagnostic entities, such as chronic fatigue syndrome/systemic exertion intolerance disease (CFS/SEID) and postural orthostatic tachycardia syndrome (POTS), continue to surface. We examined population register-based incidence rates of CFS/SEID, GBS and POTS to provide baseline data for future HPV vaccine safety evaluations.
Methods
First diagnosis of CFS/SEID, GBS and POTS in girls aged 11-15 years were obtained from the National Hospital Discharge Register during 2002-2012. We considered the following ICD-10 codes: G93.3 for CFS; G61.0 for GBS and G90.9, G90.8, G93.3, I49.8 for POTS. We calculated incidence rates per 100,000 person-years with 95% confidence intervals (CI).
Results
In total, 9 CFS/SEID, 19 GBS and 72 POTS cases were identified. The overall incidence rate was 0.53/100,000 (95% CI; 0.27-1.01) for CFS/SEID, 1.11 (95% CI; 0.71-1.74) for GBS and 4.21 (95%CI; 3.34-5.30) for POTS. Significant relative increase in incidence rate per year with a peak in 2012 was observed in CFS/SEID (33% (95% CI; 3.0-70.3: p=0.029) and POTS (16.5% (95% CI; 7.8-25.9: p<0.05), but not in GBS (5.4% (95% CI; -8.4-21.3: p=0.460).
Conclusions
Our findings provide baseline estimates of CFS/SEID, GBS and POTS incidences in Finland. However, rates based on register data should be interpreted with caution, especially for non-specific diagnostic entities for which internationally and even nationally agreed criteria are still being discussed. To assess the associations with HPV vaccine, methods using register linkage for cohort and self-controlled case series should be explored as well as factors contributing to patients seeking care, treating physicians setting the diagnoses and their preference of using of codes for these clinical entities.

Role and outputs: *Primary investigator.*

Analysed data; wrote and submitted manuscript to Vaccine (10); oral presentation at ESPID 2016 (11); oral presentation at Vaccinology Seminar, Finland (12); presented by H. Nohynek at 3rd HPV Brainstorm meeting, Denmark (13) and First HPV Prevention and Control Board meeting, The Netherlands (14).

Supervisors: Dr Hanna Nohynek, Dr Outi Lyytikäinen

Competencies developed:
Being involved in this study, I learned about the importance of looking at the results of the analysis with a critical eye as to cautiously interpret the results. This project also provided me the opportunity to gain confidence in professional writing and delivering presentations.

***Title:** Inter-hospital comparison of surgical site infection rates in orthopaedic surgery*

Introduction
Providing feedback to hospitals on their surgical site infection (SSI) rates can provide information to support the reduction of SSIs. Overall crude rates, including both superficial and deep SSIs, are widely

used when ranking hospitals. We investigated whether comparison by overall, deep or adjusted deep SSI rates are a better basis for a feedback to Finnish hospitals.
Methods
We analyzed surveillance data on 73,227 hip and 56,860 knee arthroplasties from 18 hospitals participating in Finnish Hospital Infection Program, from 1999 to 2014. For each hospital, by dividing number of SSIs and procedures, the rates of overall, deep and adjusted deep SSIs with 95% confidence intervals (CIs) were calculated, and the hospital ranking positions simulated in the Bayesian framework. We adjusted deep SSI rates by relevant patient and hospital characteristics. The correlation between the median theoretical hospital ranks in overall vs. deep and in deep vs. adjusted deep rate was assessed by Spearman's correlation coefficient (ρ).
Results
The overall, deep and adjusted deep hospital-specific SSI rates varied between 0.96-7.10, 0.57-1.82 and 0.37-1.85 for hip surgeries, and from 0.65-4.80, 0.45-1.59 and 0.56-1.55 for knee surgeries. In both procedures, the 95%CIs of the rates between hospitals largely overlapped; only single outliers were detected. Ranking order of hospitals did not correlate between overall and deep SSI rates (hip: ρ=0.03; knee: ρ=0.46), but a correlation was observed for hospital rank of deep and adjusted deep SSI rates (hip: ρ=0.89, knee: ρ=0.95).
Conclusion
Deep SSI rates may be a better tool for inter-hospital comparison instead of the overall rates. The current analysis also suggests that although the adjustment could lead to fairer hospital ranking, it is not necessary for useful feedback.

Role and outputs: *Primary investigator.*

Wrote the protocol; analysed data; manuscript submitted to ICHE (15); poster presentation at ESCAIDE 2016 (16); oral presentation at SIRO 2016 (17).

Supervisor(s): Dr Outi Lyytikäinen

Competencies developed:
Being involved in this study and working closely with the THL' statistician, I learned about new statistical methods, such as Bayesian analysis and using WinBUGS software package, creation of funnel plots in STATA, calculating and presenting correlations and adjustement analysis by using hierarchical logistic regression model. I became aware of the difficulties and challenges when choosing the most useful surveillance data feedback. This project also provided me the opportunity to gain confidence in professional writing and delivering presentations.

4. Communication

Manuscripts submitted to peer reviewed journals (in review process)

- 2 manuscripts submitted to a peer-reviewed journal (10, 15)

Conference presentations

- 1 oral presentation at international conference (11)
- 2 poster presentations at international conferences (1, 16)
- 2 oral presentations at national conferences (2, 17)

Other presentations

- 2 oral presentations at the Nordic mini project review (18,19)

- 1 oral presentations at the seminar (12)
- 2 oral presentations at international meetings (13,14)
- 1 oral presentation on the EPIET Programme for the students of Doctoral Program in Food Chain and Health, University of Helsinki. Helsinki, Finland, 23 May 2016
- 3 oral presentations on Ebola mission experience: 1) THL Department of Infectious Diseases, Helsinki, Finland, 23 Jun 2015; 2) THL Virology Unit, Helsinki, Finland, 21 Aug 2015; 3) ECDC Time-series analysis module, Bilthoven, The Netherlands, 24 Nov 2015.
- 3 presentations on the outbreak of gastroenteritis after a sport camp event, THL Department of Infectious Diseases, Helsinki, Finland, Feb 2016.
- 1 presentation on the analysis on breast surgeries in one hospital, THL Department of Infectious Diseases & hospital, Helsinki, Finland, 21 Jul 2015.

Reports

- 3 outbreak reports (5, 6, 7)
- 2 surveillance reports (3, 4)
- 1 research report (9)

Other

- 1 research protocol for vaccine safety study (8)

5. Teaching activities

Title: Facilitation of the "Essentials of Infectious Disease Epidemiology" training module (1 week)

Jointly with the principle coordinator and EUPHEM fellow, facilitated a one-week training module at Tampere University (7-11 December 2015) for the international doctoral programme students in epidemiology.

Lectures given and case studies were facilitated independently:

- Case studies: Salmonella in the Caribbean (1998-1999); An epidemic of Trichinosis in France (1985); Outbreak of haemorrhagic fever in Africa (1976).
- Lecture on the uses of surveillance data and giving a summary of case-control vs. cohort study and case-control vs. case-case study

Supervisor(s): Prof. Dr. Ralf Reintjes

Educational outcome:

Being involved in this one-week teaching, I learned how to prepare and deliver the material for the courses. I gained confidence in conducting case studies independently and learned about initiating discusions following lectures among the group.

Title: Facilitation of the "Outbreak" training module (4 h)

Facilitated a 4-hours training module at the Laurea University of Applied Sciences (17 March 2016) for students of the Masters in global development and management of health care programme.

Lecture given and case study facilitated independently:

- Case study: Gastroenteritis in Sweden (2007)
- Lecture with discussion on the outbreak investigation

Supervisor: Dr Outi Lyytikäinen

Educational outcome:

Being involved in this teaching, I learned how to prepare the material for the course, and ofthe importance of adjusting prepared presentations to the level of knowledge in a group during the course of giving lectures/conducting case-study.

6. Other activities

Global Outbreak and Alert Response Network (GOARN), World Health Organisation (WHO), Liberia

Deployment as part of the Liberian Ebola response from 29 April 2015 to 7 June 2015. On WHO's request, mission was further extended until 17 June 2015. The objective of the mission was to provide support to the WHO County Office within the Epi-Surveillance team and to the Ministry of Health and Social Welfare of the Republic of Liberia (MOH) in EVD surveillance and measles outbreak response activities.

7. EPIET/EUPHEM modules attended

1. EPIET/EUPHEM Introductory Course, 29 Sep - 17 Oct 2014, Spetses, Greece;
2. Outbreak Investigation, 8 -12 Dec 2014, Berlin, Germany;
3. Multivariate Analysis, 23 - 27 Mar 2015, Vienna, Austria;
4. Project Review, 24 - 28 Aug 2015, Lisbon, Portugal;
5. Time-series Analysis, 23 - 27 Nov 2015, Bilthoven, The Netherlands;
6. Vaccinology, 16 - 20 May 2016, Paris, France;
7. Rapid Assessment, 20 - 25 Jun 2016, Athens, Greece;
8. Project Review, 22- 26 Aug 2016, Lisbon, Portugal

Other training than EPIET/EUPHEM modules:

1. UNDSS Basic Security in the Field course, 25 Feb 2015, online;
2. UNDSS Advanced Security in the Field course, 25 Feb 2015, online;
3. Biosafety and biosecurity course, 11 & 13 Mar 2015, THL, Helsinki, Finland;

4. Nordic Mini Project Review, 13–14 Apr 2015, Copenhagen, Denmark;
5. ePROTECT course, 23 Apr 2015, online;
6. Pre-deployment Ebola Training Course, 28 – 29 Apr 2015, PHE/WHO/GOARN, London, United Kingdom;
7. Nordic Mini Project Review, 18–19 Apr 2016, Stockholm, Sweden.

Supervisor's conclusions

During the two-year fellowship at THL Dr Jozica Skufka has been involved in a variety of public health activities, including outbreak investigations in Finland and in other countries, surveillance, descriptive and analytical epidemiology and research, as described in the core competencies of the EPIET programme.

The outcome of her work has been excellent, benefitting the departments of infectious diseases and health protection at THL as well as the international community. She has contributed to the evaluation of surveillance systems for surgical site infections in Finland and adverse events related to human papilloma virus vaccine.

The two-year experience at THL has increased her confidence in the field of infectious diseases, which was not her background. Her participation in the daily work of the department has made it possible for the supervisors to carry out projects that would otherwise have been impossible to accomplish.

The fellow developed both personally and professionally during the fellowship and solved the given tasks in a highly competent way with a high and increasing degree of independence, but at the same time seeking assistance when necessary.

A positive attitude towards challenges in the field of infectious diseases, for example the international assignment in West Africa and an open mind towards colleagues makes the fellow a very good team player.

Based on her personal and professional skills, we can highly recommend Jozica Skufca for any kind of public health work.

Coordinator's conclusions

During her fellowship, Jozica faced with great sucsess the challenge to be involeld in projects that were not close to her previous background, like those related to the surveillance of surgical site infections. Throught those projects she has shown her capaticity to adapt and to gather the deep knowledge needed to developed them.

Her involvement on international missions has shown that Jozica is a very good team player able to work in multicultural settings. Her mission in Liberia gave her a deep understanding of how important it is the information provided by surveillance systems to guide acctions.

Jozica has been also involved in a number of outbreaks from the data collection to the communitation of findings, having the opportunity to apply differnet methodologies according to the scenario.Wiht these experiences she improved her analytical and communication skills.

All this makes Jozica a very good candidate for any Public Health related possiton.

Personal conclusions of fellow

My motivation for applying for the EPIET was to increase my skill base in epidemiology, as an interest in this area developed during previous work and whilst undertaking a Master degree. Over the last two years, the programme has provided me with the opportunity to work on a national level for the first time. It also allowed me to further develop statistical and analytical skills that I only could have developed by working with experts in the THL, and applying the knowledge gained through the ECDC training modules. The programme also provided me the opportunity to gain confidence in professional writing and presentation, which will benefit me in throughout my further professional career.

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