FELLOWSHIP REPORT

Summary of work activities

Klamer, Sofieke
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

Sofieke graduated in September 2007 with a Masters in Molecular Biology (Wageningen University and Research Centre, Wageningen, the Netherlands) including a Master's thesis in virology, investigating the hepatitis B virus (INSERM, Paris, France). Subsequently, Sofieke performed laboratory research of haematological precursor and innate immune cells (Sanquin - blood bank, Amsterdam, the Netherlands/ Amsterdam Medical Centre (AMC), Amsterdam, the Netherlands) as part of a doctorate. Sofieke published three first author papers around the cell cultures of human hematologic precursor and innate immune cells, one first author paper around malignant haematological cells and a second-author paper describing micro-RNA treatments against the HIV-virus in human cell cultures.

Next, Sofieke moved to Belgium for medical education and graduated as Bachelor in Medicine (2012-2015; Antwerp University, Antwerp, Belgium), while working in clinical research as laboratory technician and clinical study coordinator (Antwerp University Hospital (UZA) and SGS, Antwerp, Belgium; 2013-2016). In May 2016, Sofieke started at the scientific institute of public health (WIV-ISP, Brussels, Belgium) and worked on the surveillance of foodborne infectious diseases and the support of the coordination and data-management of the sentinel laboratory surveillance network. Sofieke gained experience with the analysis and reporting of surveillance data, and participation in international outbreak investigations (*Salmonella* and hepatitis A) during the first years of her stay at the public health institute in Belgium.

Fellowship assignment: Intervention Epidemiology path (EPIET)

In September 2017, Sofieke Klamer started her EPIET fellowship (MS-track) at the current Sciensano (former WIV-ISP), Brussels, Belgium, under the supervision of Els Duysburgh and co-supervision of Amber Litzroth and Javiera Rebolledo. 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 guide[1].

[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

Fellowship projects

1. Surveillance

1.1: Surveillance report of food and waterborne diseases, Belgium 2015-2016

The epidemiological situation of food- and waterborne diseases (FWD) in Belgium during 2013-2014 was already described. The aim of the this project was to identify trends in the number of reported cases and characteristics of cases during 2015-2016 in Belgium and the individual regions, in order to recommend possible preventive measures to health authorities and directions for further investigations for health institutes and authorities. Our analysis was based on data from sentinel-laboratory-network, mandatory notifications and national reference centres (NRC).

The target audience of the surveillance report are regional and federal health authorities, physicians, microbiologists and other health workers. The regional infectious disease (ID) control teams performed a detailed review of all chapters before publication, which indicates that they are well aware of the content of the report. In addition, the final report was provided to regional ID control teams and the federal health authorities ten days in advance to online publication for the general public. NRCs did review corresponding chapters, ahead of publication and agreed on the final version of their chapter before online publication for the general public. The report was also distributed among all NRCs and sentinel laboratories within the sentinel network, in parallel to online publication for the general public. Key points and trends were discussed in periodic meeting with the regional ID control teams and the regional and federal health authorities.

Within the context of the EPIET program, an English summary report and reflective notes were prepared. It described the outline of the original report and most important conclusions, in particular the chapters for which the fellow was responsible. The reflective report contained a detailed description of the tasks of the fellow and other investigators. Furthermore, reflective notes are included about lessons learned for improvement of the surveillance and the writing of the surveillance report in the future.

What did the fellow learn: Overall, the fellow learned collaboration and coordination with different stakeholders involved in a national surveillance system of FWD in order to develop, draft and finalise the national FWD surveillance report. The fellow learned to have a detailed look at the surveillance data, and establishing contacts with the NRC and data managers to understand the context of the data. The fellow learned that understanding the context of the data is essential in order to draw valid conclusions and interpretations. Furthermore, during the data analysis and report writing the fellow has improved her data analysis skills in SAS. The fellow learned that antimicrobial resistance surveillance is important.

Role: The fellow was principle investigator for five pathogens (*Listeria*, *Salmonella*, *Shigella*, HEV, HAV) for which she conducted data analysis, preparation of figures and tables and wrote the surveillance report text. The fellow was co-investigator for the others pathogens included in this report. This surveillance report is part of the routine workflow of the department and is prepared every two years.

Supervisor(s): Stephanie Jacquinet, Sophie Quoilin

1.2: Surveillance of Hepatitis E in Belgium, 2010-2017

Reported cases of autochthonous hepatitis E viral disease have increased in the last decade in many European countries and concern mainly genotype 3 (HEV-3). Little is known about the distribution of hepatitis E viral subtypes among identified cases and the distribution of cases among age groups and regions in Belgium. We aim to identify epidemiological trends of hepatitis E cases since 2010 and to describe phylotype dynamics.

Molecular and epidemiological data were collected by the National Reference Centre (NRC). Suspected patients were patients for whom clinicians requested either hepatitis E serology and/or polymerase chain reaction (PCR) analyses. Confirmed cases were IgM and/or PCR positive individuals. Overall, 417 confirmed cases were identified among 8941 tested samples. Hepatitis E was mainly detected in 40–64 year-old adults (61% of cases) and rarely in children and adolescents. The overall proportion of confirmed cases (confirmed cases/suspected patients) dropped from 8.1% (2010) to values between 3.5% and 4.6% during the years 2012-2017. Successful genotyping was performed on 217/263 PCR-positive samples (83%). Among those, 93% were of genotype HEV-3. Confirmed HEV-3 cases increased from 0.21 per 100,000 (2010) to 0.98 per 100,000 inhabitants (2017). Higher numbers of confirmed HEV-3 cases per population were observed in Wallonia (1.2 per 100,000 inhabitants, 2017) compared to Flanders (0.81 per 100,000 inhabitants, 2017), with equal numbers of samples tested per population. Overall most common subtypes among the HEV-3 strains were 3f, 3c and 3e. Subtype 3c cases increased significantly from one in 2010 (1/5) to 35 cases in 2017

(35/68), whereas other HEV-3 subtypes remained stable or showed milder increase (3f), indicating a phylotype switch among the HEV-3 strains circulating and identified among cases in Belgium.

The continuous increase in the number of hepatitis E confirmed cases between 2010-2017 may be explained by rising awareness among physicians in Belgium. The stable proportions of laboratory confirmed cases between 2012 and 2017 suggest that infection pressure was probably stable between 2012 and 2017 in Belgium. Hepatitis E viral genotypes identified from patients were similar to and interspaced with those identified from Belgian swine, suggesting transmission from pigs to humans. Studies to detect hepatitis E virus in food products will contribute to shape dietary recommendations for high risk groups (e.g. immunocompromised) and may identify possible interventions in food production processes.

Role: The fellow was co-investigator: this project was a collaboration with the NRC of viral hepatitis. The fellow did analyse and interpret the data available from 2010-2017. Fellow did construct one structured database in SAS from multiple datasheets with annual data with different structures. Fellow prepared epidemiological figures and tables for a scientific manuscript and contributed to the text of the manuscript. The fellow presented the reports' main findings in an oral presentation at ECCMID 2019.

Supervisor(s): Vanessa Suin, Steven Van Gucht, Sophie Quoilin

2. Outbreak investigations

2.1: Foodborne outbreak of norovirus in a high school, Flanders March 2018

On Tuesday 13th of March 2018 the school nurse notified the regional infectious disease control team of an unusual number of sick pupils in a high school with four separate sites in Oudenaarde. The students mainly reported vomiting and nausea and other complaints associated with acute gastroenteritis. New cases of vomiting were reported daily up to and including the 20th of March. The sick pupils were spread over all four locations of the school, which has three canteens that were supplied by one central kitchen, in which the meals were prepared. The sick pupils were spread over all grades. There was no sickness reported among the teachers. Two kitchen staff members were fallen ill. Microbiological analysis revealed the presence of norovirus in ten of the eleven available vomit samples, that were collected from pupils and from garbage. The epidemiological analysis showed that students who had eaten in the canteen had a 14x higher risk of being ill, compared to those that had eaten home-made lunch (relative risk=14.0; 95%-confidence interval = 8.4 – 23; p<0.0001). The school informed all parents and students and introduced preventive measures for students and kitchen staff (consistent (hand) hygiene, a request to the affected students to stay home until complete recovery). The school extended stay-at-home advice for sick kitchen staff.

Role: The fellow was principal investigator for the epidemiological investigation. The school collected data on symptoms and food exposure from all absent people. The fellow calculated relative risk for having eaten the school menu with aggregated data and contributed to communication towards the school and parents. The fellow drafted a short communication for the monthly epidemiological flash.

Supervisor(s): *Naïma Hammani, Valeska Laisnez*

2.2: Foodborne outbreak of Salmonella affecting 51 schools, Flanders May-June 2018

On May 22nd 2018, the Flemish infection control team was notified of 15 gastroenteritis cases in two schools. By May 25th, cases were reported in 30 schools, all supplied by caterer A, that distributed about 10,000 meals daily among 83 schools. We investigated the extent and source of this outbreak to limit further spread.

We carried out a cohort study of children attending five affected schools using online questionnaires completed by parents. Probable cases: students with gastroenteritis symptom(s) of between 18 May and 9 June. Confirmed cases were probable cases with *Salmonella* Typhimurium with the outbreak MLVA type or whole genome sequence profile (last part only applied for cases who were MLVA/WGS typed). We calculated exposure-specific attack rates (AR) and risk ratios (RR) with 95%-confidence intervals (CI). Case finding was performed among 83 schools and the incremental risk difference in school AR per kilometre from the caterer's premises was estimated using linear regression. 207 environmental/food samples were analysed. We received 423 responses (29%) in the cohort study, including 157 cases with a median age of 6.8 years, 50% reporting fever and 33% vomiting. Eating food from caterer A (RR=8.1, 95%CI 3.1-21.2) was associated with illness, more specifically, eating the school menu on 17th May (RR=3.2, 95%CI 1.5-6.7). Specific food-items were not analysed individually, because there were no food-options in menu (salad and turkey stew for everyone on 17th May). The extended case finding investigations

identified 546 cases in 51/83 schools, including 399 confirmed cases, spread over 21 days. The global attack rate among exposed was 5,5%, but for individual schools AR ranged between 0-25%, with a 1.3% increase in AR per 10km from the caterer's premises (p=0.001). All non-human microbiological analyses were negative. Inspections and interviews by the food safety authority did not identify major non-conformities, but found that salad was transported from the caterer to the schools at unrefrigerated conditions.

The meal on May 17th was the likely source of infection. Food distributions of caterer A were halted between 25th May and 9th June. Higher AR among schools further away from the caterer suggest transport of unrefrigerated food may contributed to the outbreak's extent. We recommend strengthening food safety regulations for caterers supplying schools or public services, concerning the storage of retention meals and refrigerated transport of cold food products. To our knowledge, we identified for the first time school-related risk factors for school AR by using a regression analysis with school AR as outcome, which sets an example for future outbreak investigations of extended school-related outbreaks involving high numbers of schools.

Role: The fellow was principal investigator for the epidemiological investigation. The fellow did the analysis of the cohort study in three schools; data was collected by an online questionnaire to the parents, which was designed by the regional infection control team but adapted by the fellow. Relative risks were calculated by the fellow. School-level AR analysis was performed for travel-distance from caterer. Fellow was involved in communication between institutes. The fellow wrote an outbreak report and presented a poster at ECCMID 2019 and ESCAIDE 2019, and presented the outbreak investigation in an oral presentation during Sciensano Scientific Seminar on Infectious diseases (SSID 2019; taking over from the regional health authority due to circumstances).

Supervisor(s): *Naïma Hammani, Valeska Laisnez*

3. Applied epidemiology research

3.1: Prioritisation of infectious diseases in Belgium, 2018

National public health agencies need to prioritise infectious diseases for prevention and control, because resources are limited. We aimed to apply the ECDC recommended prioritization methodology to rank infectious diseases according to their relative importance, in order to inform future surveillance and public health action in Belgium.

We applied the multi-criteria decision analysis (MCDA) approach. A balanced set of 18 criteria, structured in five hierarchical criteria groups, was composed by a working group of epidemiologists and statisticians. Subsequently, the criteria were weighted according to perceived impact, by a panel of key informants (n=80; median weights calculated) through an online survey. In a second survey, 37 experts scored each disease against the 18 criteria, guided by surveillance and background data concerning the period 2010-2016. These values were averaged among all experts. The weighted sum of the 18 criteria's score composed the total score per disease, on which the ranking was based. We found that the highest ranked diseases were: pertussis, human immunodeficiency virus infection, hepatitis C and hepatitis B. Among the five criteria groups, the highest weights were assigned to 'impact on the patient', followed by 'impact on public health'. Differences in perception were identified between clinicians, microbiologists and public health workers, with physicians prioritising impact on the patient higher. Among the 18 individual criteria, the highest weights were assigned to 'case fatality ratio', 'spreading potential' and 'existing multi drugs resistance'.

This project effectively ranked infectious diseases. The diseases ranked highest are included in current public health programs, but additional programs among risk groups might be valuable. Further cross-reference of the obtained ranking with current programs is recommended. We recommend to implement this method in a recurrent evaluation cycle of national public health priorities.

Role: The fellow was principal investigator. The fellow wrote the protocol, coordinated the disease and criteria selection working groups, designed the surveys, collected responses and performed data analysis. The interim report was distributed among stakeholders. The fellow presented a poster at the Sciensano Scientific Seminar on Infectious diseases (SSID 2019) and ESCAIDE 2019 and an oral presentation was presented at ECCMID 2019 by a co-investigator. The fellow drafted a scientific manuscript.

Supervisor(s): *Sophie Quoilin*

3.2: *Chlamydia prevalence study among Belgian population, 2019-2020*

In most Western countries, *Chlamydia* is the most prevalent bacterial sexually transmittable disease (STD) among the general population. In women, untreated infections may lead to pelvic inflammatory disease (PID), chronic pelvic pain, ectopic pregnancies and infertility. *C. trachomatis* infections are highly underdiagnosed, because most infections are asymptomatic. The prevalence among sexually active woman aged 14-24 years was estimated around 5% (United States, 2007-2012). In Europe, 27 countries reported Chlamydia cases to ECDC in 2015, with overall 173 reported cases per 100,000 inhabitants. In countries with comprehensive surveillance systems and active community based or opportunistic testing services, incidences up to 350-600 cases per 100,000 inhabitants were reported (UK, Sweden, Norway, Denmark, Iceland). In Europe, two-thirds of the cases were reported within the age group of 15-24 years. The number of reported cases in Belgium by the laboratory sentinel-network (coverage estimated around 50%) increased from 988 cases in 2002 (9.6/100,000 inhabitants) towards 6788 cases in 2016 (60.1/100,000 inhabitants). Infections are reported more among women than among men, whereas the gender-ratio (female/male) of reported cases gradually decreased from 3.9 in 2002 towards 1.9 in 2016. In Belgium, the number of reported cases is highest in the age groups of 15-29 years. The exact prevalence of *Chlamydia* -infections and the distribution among the population of Belgium, however, is unknown. In Belgium, diagnostic testing for *Chlamydia* is mainly performed in specific targeted groups through opportunistic testing practices, and thus reported incidences by the laboratories do not necessary reflect the actual distribution of *C. trachomatis* in the Belgian population. The aim of this study is to estimate the prevalence of genital *C. trachomatis* infections in the population of Belgium in 2019-2020 within different population segments (according to regions, age groups and gender). The results will help prevention organizations through providing accurate evidence-based information, and help to target prevention programs and possible screening programs to more specific risk groups. In addition, target groups for more detailed follow-up studies may be identified.

We designed a point prevalence study among a random sample of the population in Belgium (n=2000), by analysis of self-collected urine samples (PCR for *C. trachomatis* and *N. gonorrhoea*) combined with a short self-administered questionnaire. The sample procedure was designed to be rolled out in six sequential waves, in order to correct for non-response bias by activating replacement persons in each sequential wave.

Role: The fellow was principal investigator for writing the protocol and gaining ethical approval. The fellow wrote the protocol and study documents, performed sample size calculations and made sure ethical clearance was obtained. The fellow was involved in logistic and practical preparation to launch the first wave of invitations to participate in the study.

Supervisor(s): *Wim Vandenberghe, Sophie Quoilin*

3.3: *Burden of food and waterborne diseases, Belgium 2013-2017*

The total incidence of symptomatic infections among the general population, the related disease burden and uncertainty intervals per pathogen are essential indicators that may guide public health policies. These indicators are not directly evident from health-care-based surveillance networks, because of under-ascertainment (symptomatic infections missed by the health care system) and underreporting (diagnoses not reported to the surveillance network). We aim to estimate the number of symptomatic cases among the general population and related burden of disease for eleven food- and waterborne pathogens in Belgium in 2013-2017.

In order to translate cases captured by surveillance into total numbers of symptomatic infections among the general population, multiplication factors were estimated. These included underreporting of positive diagnoses, test sensitivity, proportion of samples analyzed, proportion of samples prescribed and submitted and finally proportion of medical care seeking. We used surveillance data, health insurance reimbursement data, clinical hospital data, literature and expert opinions. The burden of disease was quantified as 'Disability Adjusted Life Years' (DALYs), expressing the number of healthy life years lost due to morbidity and mortality associated with infection. Disease models were used to describe the various health states (morbidity and outcomes) and adapted from ECDC Burden of Communicable Disease in Europe (BCoDE) studies, the WHO Foodborne Disease Burden Epidemiology Reference Group (FERG) or custom designed. Monte Carlo simulations were used to account for uncertainty around incidence and DALY estimates. We applied source attribution proportions according to results of the WHO expert elicitation. We estimated the average annual multiplication factors (translating surveillance-based numbers into total incidence) ranging from 1.1 (*Clostridium botulinum*) to 171 (*Cryptosporidium*). Incidence estimates were highest for norovirus (24,030 symptomatic cases per 100,000 inhabitants). The average DALY per case was highest for *C. botulinum* (370 DALYs per 100 cases). The annual disease burden was highest for *Campylobacter* and norovirus (5148 and 5136 DALYs, respectively). The annual disease burden attributable to foodborne transmission was highest for *Campylobacter* and *Salmonella* (3905 and 2018 DALYs, respectively).

Quantification of the disease burden related to food- and waterborne diseases indicated a considerable burden. Preventive measures aiming to increase food safety may focus on *Campylobacter* and *Salmonella* because of the highest associated food-attributable burden.

Role: The fellow was principle investigator for five pathogens (*Listeria*, *Salmonella*, *Shigella*, HEV, HAV), co-investigator for the others. The burden of disease was estimated for eleven pathogens in terms of disability adjusted life years (DALYs), an estimate of the healthy life years lost due to the infectious disease. The fellow focused on estimation of the real incidence for five pathogens and on the quantification of uncertainty. Data analysis was performed in SAS and R. An interim report was published and distributed among stakeholders and publicly available on the Sciensano website. A poster about this study was presented by the fellow on ECMID 2019 and SSID 2019.

Supervisor(s): Stephanie Jacquinet, Sophie Quoilin

4. Communication

Publications

Publications in peer reviewed journals

Suin V, Klamer SE, Hutse V, Wautier M, Jacques M, Abady M, Lamoral S, Verburgh V, Thomas I, Brochier B, Subissi L, Van Gucht S. **Epidemiology and genotype 3 subtype dynamics of hepatitis E virus in Belgium, 2010 to 2017.** Euro Surveill. 2019 Mar;24(10). Available from here.

Manuscripts submitted to peer reviewed journals (in review process)

Sofieke Klamer*, Nina Van Goethem*, Working group diseases and criteria, Working group epidemiologists, Daniel Thomas, Els Duysburgh, Toon Braeye, Sophie Quoilin. **Prioritisation of communicable diseases for future surveillance, prevention and control in Belgium: a 2018 multi-criteria decision analysis study.** Manuscripts TO BE submitted, not yet under review. *equal contribution.

Reports

Research / surveillance reports:

1. Surveillance of foodborne infectious diseases, Belgium 2016-2017. Available from here (NL) or here (FR).
2. Outbreak investigation report – *Salmonella* outbreak in 51 schools, Belgium May 2018
3. Outbreak investigation report – Norovirus in a school, Belgium March 2018

Project protocols:

1. Research protocol for ethical approval: *Chlamydia* prevalence study among the population in Belgium 2019
2. Research protocol: Prioritisation of infectious diseases, Belgium 2018
3. Research/surveillance protocol: Epidemiology of hepatitis E in Belgium, 2010-2017

Reflection reports:

1. Teaching reflection report – October 2018
2. English summary and reflection on: Surveillance of foodborne infectious diseases, Belgium 2016-2017

Conference presentations

Oral presentations at international conference:

1. Oral presentation (O1038), ECCMID 2019, Amsterdam, The Netherlands, 16 April 2019, Session: Viral hepatitis: new trends, old challenges. **Sofieke Klamer**, Vanessa Suin, Veronik Hutse, Magali Wautier, Majorie Jacques, Mona Abady, Sophie Lamoral, Vera Verburgh, Sophie Quoilin, Isabelle Thomas, Bernard Brochier, Lorenzo Subissi, Steven Van Gucht. Epidemiology and phylotype dynamics of hepatitis E viral disease in Belgium, 2010-2017.
2. Oral presentation (O0463), ECCMID 2019, Amsterdam, The Netherlands, 14 April 2019, Session: The diverse aspects of international health. **Nina Van Goethem**, Sofieke Klamer. Evidence-based prioritisation of infectious diseases in Belgium for public health and surveillance.

Poster presentations at international conference:

1. Poster presentation, ESCAIDE 2018, Malta. **Lorenzo Subissi**, Sofieke Klamer, Veronik Hutse, Magali Wautier, Majorie Jacques, Mona Abady, Sophie Lamoral, Vera Verburgh, Isabelle Thomas, Bernard Brochier, Vanessa Suin, Steven Van Gucht. Emergence of Hepatitis E virus in Belgium, 2010-2016.
2. Poster presentation (P1593), ECCMID 2019, Amsterdam, The Netherlands, 15 April 2019, Session: One Health: the role of food and environment. **Sofieke Klamer**, Stephanie Jacquinet, Mathias Leroy, Dieter Van Cauteren, Sophie Quoilin, Brecht Devleesschauwer. Incidence-based disease burden of food- and waterborne infections in Belgium, 2013-2016.
3. Poster presentation (P1091), ECCMID 2019, Amsterdam, The Netherlands, 14 April 2019, Session: So many respiratory pathogens. **Sofieke Klamer**, Stephanie Jacquinet. Weather dynamics explain part of the increase in reported domestic legionellosis cases, Belgium, 2010-2017.
4. Poster presentation (P0846), ECCMID 2019, Amsterdam, The Netherlands, 14 April 2019, Session: *Salmonella*, *Shigella* and *Campylobacter* on the run. **Sofieke Klamer**, Naima Hammami, Wesley Mattheus, Lorenzo Subissi, Sarah Denayer, Nadina Botteldoorn, Valeska Laisnez. Large and prolonged outbreak of *Salmonella* typhimurium affecting 55 schools, Belgium 2018.
5. Poster presentation, ESCAIDE 2019, Stockholm. **Sofieke Klamer**, Nina Van Goethem, Toon Braeye, Sophie Quoilin. Evidence-based prioritisation of infectious diseases in Belgium for public health and surveillance.
6. Poster presentation, ESCAIDE 2019, Stockholm. **Sofieke Klamer**, Naima Hammami, Wesley Mattheus, Lorenzo Subissi, Sarah Denayer, Nadina Botteldoorn, Valeska Laisnez. Large and prolonged outbreak of *Salmonella* Typhimurium affecting 51 schools, Belgium 2018.

Other presentations

Oral presentations:

1. SSID (Sciensano Scientific Seminar on Infectious diseases) 2019 oral presentation (replacement of Naima): *Salmonella* outbreak in Flanders – May 2019
2. Health authorities: DALYs of food- and waterborne diseases – October 2018
3. Sciensano department epidemiology: *Salmonella* outbreak in Flanders – February 2019
4. Sciensano Epidemiology Journal Club presentation – September 2019

Poster presentations:

1. SSID 2019 poster: Epidemiology and phylotype dynamics of hepatitis E viral disease in Belgium, 2010-2017. Available from here.
2. SSID 2019 poster: Incidence-based disease burden of food- and waterborne infections in Belgium, 2013-2016 Available from here.
3. SSID 2019 poster: Weather dynamics explain part of the increase in reported domestic legionellosis cases, Belgium, 2010-2017. Available from here.
4. SSID 2019 poster: Evidence-based prioritisation of infectious diseases in Belgium for public health and surveillance. Available from here.

Other communications

1. Provided input to journalist who wrote article about hepatitis E – January 2018
2. Flash infectious diseases: short message about the Norovirus outbreak – April 2018
3. Flash infectious diseases: short message about the *Salmonella* outbreak – June 2018
4. Responses on Epidemic Intelligence Information System (EPIS-FWD) as part of the routine work

5. Teaching and pedagogy

5.1 Introduction in epidemiology - Sciensano course March 2018

Sofieke was involved in the annual introductory course for epidemiologist working at Sciensano. The introductory course in epidemiology at Sciensano is organised for newly arrived employees or PhD students within the department of epidemiology (not limited to infectious diseases). The target audience is public health professionals. In this edition of the course there were ten participants. During the five course days 15 lectures were provided, five homework exercises were provided and later on discussed and two case studies were delivered spread over three afternoons. Four facilitators conducted this course.

I was responsible for the facilitation of two case studies ('gastroenteritis' and 'toxic shock syndrome'). I attended the associated lectures delivered by the other facilitators in order to connect with the lectures during the case studies. Training objectives of the 'gastroenteritis' case study were: participants should be able to interpret an epidemic curve, calculate attack rates, calculate and interpret relative risks, perform stratified analysis, identify effect modification and

confounding and list relevant environmental and laboratory investigations. Training objectives of the 'toxic shock syndrome' case study were: participants should be able to apply matching in case-studies and know the limitations, analyse matched case-control data, discuss how to appropriately select controls in case-control studies.

Reflection

I gained experience in facilitating case studies as the main facilitator. I learned to create an interactive environment in which all participants of the course were motivated to contribute to the discussion. I learned to identify when concepts were not clear and to provide questions or explanations that lead participants to the understanding of the concepts. Next time, I would start with asking the participants first a short summary of what they have seen in the lectures. The participants enjoyed the case study and said it helped to grab better the concepts of the lectures.

5.2 Introduction in epidemiology - Sciensano course October 2018

Sofieke was a second time involved in the annual introductory course for epidemiologist working at Sciensano (exceptionally, two editions this year). The target audience is public health professionals, starting to work at the institute (not restricted to infectious diseases). There were ten participants at this five days course which covered 15 lectures, five homework exercises and two case studies. Sofieke was responsible to deliver three lectures: frequency measures, causality and validity. In addition, she was responsible to facilitate two cases studies, spread over three afternoons: 'gastroenteritis in Sweden' and the 'toxic shock syndrome' case study. Sofieke also performed the post-course evaluation.

The training objectives of the three lectures were for the 'frequency measure' lecture: participants should be able to explain the difference between ratios, rates and proportions; know that prevalence is a proportion; know that incidence can be expressed as proportion (cumulative incidence or attack rate), but in long-term cohort studies is usually expressed as rate (incidence rate or incidence density) with person-time as denominator; describe and recognize factors that influence prevalence and incidence. Training objectives for the 'causality' lecture: participants should be able to: understand basic principles and difficulties in defining and collecting evidence for causality or causal inference; describe the concept of a sufficient cause and a component cause; describe the nine viewpoints of Hill for contributing evidence to a cause-effect relationship. Training objectives for the 'validity' lecture: participants should be able to: explain and calculate sensitivity, specificity, positive predictive value and negative predictive value; explain which of these four depend on the sampled population and which are test-specific; identify and classify possible bias in screening programs.

Teaching material and didactic methods: I have used teaching materials that were available from previous courses, and were partly based on EPIET materials. I have reviewed the material, changed the format to the new institute style, and have added some recent examples to the lecture material. Didactic methods were used to stimulate active learning. The number of participants is kept limited, in order to stimulate interaction with the teachers and between participants. An additional edition of the course was organised, because the number of interested participants was higher than the aimed maximum number of participants. The setup of the room was an open circle, to stimulate interaction. An open ambiance is created by short introduction of each participant and facilitator at the start of the course. The lectures contain short reflective exercises, and participants are stimulated to solve them on the spot and to explain the answer. Participants are stimulated to explain in full sentences the meaning of the outcome measures. Participants are stimulated to listen to each other and complete each other's responses.

Reflection

The lectures were performed in a good atmosphere, there was interaction with the participants during the lecture concerning the short reflective exercises and questions were raised and answered during the lectures. The cases studies occurred in a good atmosphere and most participants judged them useful, in order to practice concepts from the lectures. I observed that participants did improve during the case studies their skills to explain the meaning of outcome measures in plain words. Based on the evaluations, I observe that my lectures were perceived as relatively easy. This might indicate that the lectures we provided very clear, or this might be intrinsically related to topic of the lectures. I have learned that it can be fun to be involved in teaching. I have learned that preparation of lectures is always important and interesting: I have learned myself additional knowledge about the topic.

I gained experience in organising such training and cooperate with the other trainers and developed skills concerning lecturing a professional audience in basic epidemiological principles, facilitating case studies about basic epidemiological principles, stimulating active participation during lectures and case studies and performing an post-lecture evaluation including to summarize feedback of participants and to formulate recommendations for future courses.

What I could do different next time: I would connect with the paper provided about the same topic. When facilitating cases studies, I would be present during the lectures before, even when not teaching myself, in order to connect better. I did attend some lectures of the other teachers, but not all, and at some point during the case study this was a bit confusing, because I assumed that things had been covered by the lectures which was not yet the case.

6. Other activities

Conferences attended

1. ESCAIDE, Stockholm, Sweden, 2017.
2. ESCAIDE, Malta, 2018.
3. ECMID, Amsterdam, the Netherlands, 2019.
4. ESCAIDE, Stockholm, Sweden, 2019.

Workshops, seminars, courses attended

1. Belgian Seminar of Food Microbiology (BSFM) 2018.
2. Food Safety Authority (FAVV/AFSCA) scientific seminar 2018.
3. Sciensano scientific seminar of infectious diseases (SSID) 2019.

Scientific meetings attended

1. ECDC food and waterborne and joined EFSA network meeting – October 2017.
2. Foodborne outbreak platform; meeting between FWD epidemiologists, NRCs of foodborne pathogens, representatives of FAVV/AFSCA, regional infection control teams and health authority – every 4 months.
3. Participated in the EPIET site visit meeting, Brussels, Belgium, 2018.
4. Participated in the EUPHEM site visit meeting, Brussels, Belgium, 2018.
5. Sciensano Epidemiology Journal Club – June, July 2019.

As MS-track fellow, Sofieke was also involved in other routine tasks and projects in the Institute (Sciensano).

7. EPIET/EUPHEM modules attended

1. Introductory Course, Spetses, Greece, September 2017
2. Outbreak investigation module, Berlin, Germany, December 2017
3. Multivariable Analysis module, Cyprus, March 2018
4. RAS module, Athens, Greece, May 2018
5. Project review module, Lisbon, Portugal, August 2018
6. Time series analysis module, Brussels, Belgium, November 2018
7. Vaccinology module, Rome, Italy, June 2019
8. Project review module, Prague, Czech Republic, August 2019

8. Other training

1. ECDC online training: Abstract writing and reviewing – April 2019
2. WHO online training: GOARN introduction – April 2018
3. WHO online training: vaccination coverage surveys – June 2018

Discussion

Supervisor's conclusions

During her two-year EPIET-Member State (MS) track fellowship at Sciensano Sofieke was based at the unit of 'Epidemiology of infectious diseases' which is part of the 'Epidemiology and public health' directorate. Sofieke was already a member of this unit before starting the EPIET-fellowship and will remain at this unit after finalising the fellowship. As part of the fellowship Sofieke conducted research on the prioritisation of infectious diseases in Belgium and prevalence of Chlamydia in Belgium. Sofieke was also involved in the Belgian surveillance of food and waterborne diseases and hepatitis A and E. Her outbreak investigation assignment was conducted in cooperation with and under supervision of the Flemish Health Authority. Sofieke was involved in the management of a norovirus and *Salmonella* outbreak in Flanders. Through this work with the Flemish Health Authority Sofieke gained experience in working with another team and in another working environment.

Although Sofieke entered the fellowship with good epidemiological knowledge and skills already (e.g. knowledge of data analysis software), she still benefitted from the training modules and was eager to put the newly gained knowledge immediately into practice (e.g. Sofieke applied learned time series analysis methods on Belgian legionella data and could present this work as a poster at the ECCMID conference). Sofieke also benefitted through the

fellowship to strengthen her presentation and communication skills. Sofieke showed to be an independent worker. As MS track fellow, the combination of the routine work at Sciensano with the EPIET requirements was not always easy and it required good time management which proved to be sometimes challenging. However, Sofieke proved to be able to work on different assignments at the same time and managed to achieve the EPIET fellowship requirements. I wish Sofieke all the best in her future carrier.

Coordinator's conclusions

During her two years at Sciensano, Brussels, Sofieke has gained considerable skills in field epidemiology, and has met all the required competencies. Sofieke has proved herself to be a diligent and efficient worker and has produced an impressive range of outputs during the Fellowship. She has developed good project management skills and has succeeding in managing collaborative projects to completion in a wide range of topics. As a MS track Fellow, Sofieke has been required to balance local service requirements with the requirements of the Fellowship. This has been achieved with support from an excellent supervisory team. As well as gaining good technical skills, Sofieke undertook a very interesting health economics project which required her to develop a degree of strategic thinking. Sofieke has also gained considerable experience of scientific communication and has presented her work at international conferences, and has drafted articles for submission to peer-review journals. On a personal level, I have enjoyed working with Sofieke and her supervisory team at Sciensano. I wish Sofieke every success in the next stage of her career in public health.

Personal conclusions of fellow

This two year fellowship program immersed myself into a broad range of epidemiological activities, projects and research topics. I had the opportunity to develop my competencies on project and time management and team working. I especially have appreciated the collaboration with the regional infection control team during the *Salmonella* outbreak investigation and the broader multi-disciplinary interactions during this outbreak investigation. The EPIET program has been a great learning school for me revealing the broad scope of epidemiology, regarding the fact of my previous professional and academic experience mainly based on academic research in the laboratory. Especially the prioritisation project have broaden my understanding of a wider range of infectious diseases and urged me to think about the understanding of the existential character of public health response. I appreciate the multi-disciplinary aspects of epidemiology and the alternation between team work and individual work, with the objective of relevance for the individual patients, the population and the health care system.

Furthermore, I have appreciated to further develop my network of public health professionals by attending the EPIET training modules, conferences and meetings, which have brought me valuable friendships. I would certainly recommend the two year EPIET fellowship to those public health epidemiologists willing to build and develop competencies in communicable disease surveillance and response.

Acknowledgements of fellow

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