FELLOWSHIP REPORT

Summary of work activities

Laurène Peckeu
Intervention Epidemiology path (EPIET)
Cohort 2018

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.

The objectives of the ECDC Fellowship - EPIET path are:

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

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

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

Stockholm, July 2020

- 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 ECDC Fellowship Programme Manual.

Pre-fellowship short biography

Laurène Peckeu is an epidemiologist with a master degree in Public Health from the Institut de Santé Publique, d'Epidemiologie et de Développement (ISPED), Bordeaux Segalen University. After graduating from her master degree, she started her career at Santé Publique France working in the regional Public Health unit in Lyon. She then coordinated the national French surveillance Network of Creutzfeldt-Jakob diseases at the Brain and Spine Institute, Team Alzheimer's and prion diseases, Paris, France. During these years, she also completed a PhD in Neuroepidemiology, focusing on the susceptibility of developing Creutzfeldt-Jakob disease and the factors influencing its incubation period after human growth hormone treatment.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On the 11th of September 2018, Laurène Peckeu started her EPIET fellowship at the Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands, under the supervision of Susan Hahné. This report summarizes the work performed during the fellowship.

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.

Fellowship projects

1. Surveillance

Routine national surveillance activities for measles, mumps and rubella 2018/2019

Measles, mumps and rubella (MMR) are notifiable diseases in the Netherlands and targeted for elimination; vaccination for MMR is part of the national immunisation program (NIP). Routine MMR surveillance is conducted by the RIVM using two different data sources: case notification from the Osiris registration system, and virological data from several medical laboratories in the Netherlands. Surveillance for notified MMR cases is updated weekly by RIVM and important results are shared with the weekly infectious diseases early warning meeting.

Measles

The number of measles cases has increased in the past two years, from 24 cases reported in 2018 to 45 cases in the first six months of 2019. In 2018, nine cases were imported. Four of these patients led to secondary infection of five individuals in total. Ten patients were infected by an unknown source in the Netherlands. One of these led to a cluster with two secondary infections and one tertiary infection. In 2019, seven clusters were identified including a total of 33 patients. One cluster in May 2019 occurred in a workplace. Another large cluster started in June 2019 in a municipality

with low vaccination coverage. Up to the end of June 2019, eleven patients were reported, mainly unvaccinated children born after 2012 (i.e. just before or after the last epidemic). In 2018, measles virus genotype B3 was detected in 12 cases and measles virus genotype D8 was detected in three cases. In 2019, only measles virus genotype D8 was detected.

Mumps

In 2018, 73 cases of mumps were reported and 5 clusters were identified. The first cluster occurred in an asylum seekers' centre. Another 3 small clusters consisted of 2 or 3 patients who were partners or family members. The last cluster consisted of 14 students. Up to 1 May 2019, 42 mumps cases have been reported. Most cases (n=30, 71%) were sporadic mumps cases, except for 2 clusters. The first cluster of 4 patients was reported in February 2019 and included 2 students. The second cluster included 8 students from 3 different student houses in the same city.

Rubella

In the calendar year 2018 and in the first six months of 2019, no rubella cases were reported. No rubella cases have been reported in the Netherlands since 2016.

Role and outputs:

Between December 2018 and October 2019, the EPIET fellow was responsible for the weekly analysis of data from the national surveillance system for measles, mumps and rubella. For clusters or outbreaks, data was analysed and reported in the early warning meetings. The fellow also updated the chapters on Mumps and Rubella in the RIVM's annual report and wrote the Annual Status update on Measles and Rubella elimination in the Netherlands, 2018 (WHO report).

Principal investigator: Laurène analysed and reported surveillance data weekly, reported clusters/outbreaks to the early warning committee, and updated the chapters in the RIVM annual report on Mumps and Rubella (year 2018), wrote the Annual Status update on Measles and Rubella elimination in the Netherlands, 2018 (WHO report).

Supervisor(s): *Irene Veldhuijzen*

Competencies developed:

During this activity, I learned about 3 new topics which were measles, mumps and rubella. I improved my knowledge on the national surveillance for these diseases and was able to discover how the system is organized in the Netherlands between the regional and national levels on one side and the local and reference laboratories. Engaging in this activity gave me opportunity to write the Annual Status update on Measles and Rubella, which taught me about reporting of disease on the global level.

International assignment at the WHO emergency team, Cox's Bazar, Bangladesh to support the response to Rohingya Refugee crisis, January to February 2020

Since 25 August 2017, an estimated 706 364 Rohingyas have crossed into Cox's Bazar, Bangladesh. In total there are more than 900,000 refugees residing in Cox's Bazar, and together with the host communities in the area, the target population of the health response is 1.3 million. Cox's Bazar is one of Bangladesh's poorest districts and is prone to natural disasters.

Two years on, the health needs of this highly vulnerable population continue to be immense and are likely to increase manifold in the rainy season, increasing the risk of water borne diseases such as diarrhoea and hepatitis and vector borne diseases such as malaria, dengue and chikungunya.

WHO and Ministry of Health and Family Welfare (MoHFW) set up a disease early warning and response system (EWARS) to gather and analyse data on disease trends and investigate and respond to alerts for epidemic-prone diseases.

Following the monsoon rains in 2019, Cox's Bazar is seeing an increase in cases of acute watery diarrhoea (AWD) with a number of cases confirmed by Rapid Diagnostic Tests (RDT). Along the lines of the AWD multis-sector plan, the Civil Surgeon of Cox's Bazar District has requested WHO for technical assistance to contain this event.

Since no new AWD cases RDT positive were notified at the time of my deployment, starting on the 3rd of January (week 1, 2020), the objectives and tasks during my mission were no longer supporting the response to the cholera outbreak. I was involved in surveillance activities, clusters detection, infection and prevention control training, data analysis, verbal autopsies and preparedness activities regarding the COVID-19 response.

Role and outputs:

From January to February 2020, Laurène was deployed as a field epidemiologist. In addition to activities described above, Laurène wrote reports and gave oral communications to the different partners on the field (UN agencies, Ministry of Health and NGOs). A detailed end of mission report was written and shared with the WHO country office and headquarters.

Supervisor(s): *Jennie Musto (EPI team lead and Incident manager, WHO emergency team, Cox's Bazar, Bangladesh*

Competencies developed:

During this mission, I learned more about many diseases which were acute watery diarrhoea, bloody diarrhoea, measles, diphtheria, hepatitis C and Coronaviruses. Being deployed taught me about the specific tasks and challenges of a field epidemiologist. While being placed in Cox's Bazar, I also discovered how partners involved in a refugee crisis are organized on the ground. I attended and presented in meetings involving different UN agencies and sectors, and NGOs which taught me about the goals of each organisation.

The association between influenza like illness (ILI) and invasive meningococcal diseases (IMD) in the Netherlands, 2006-2019

Invasive meningococcal disease (IMD) displays a seasonal pattern. In the US and western Europe, IMD is most common in the late winter and early spring. However, besides this annual pattern, it was observed that seasonal variations of IMD differed among age groups in Denmark and serogroup distribution changed over time in Europe. In addition, some studies examined the relationship between influenza and IMD and suggested that influenza infections may predispose to IMD and increase the risk of IMD. Based on these findings and the epidemiological observations regarding IMD incidence in the Netherlands, we described IMD seasonality overall, by age and serogroup and quantified the number of IMD cases attributable to influenza. The latter study in the Netherlands, was conducted before the implementation of nationwide vaccination against IMD serogroup C (IMD-C) in 2002. Here, we analysed data from 2006-2019, after the implementation of nationwide IMD-C vaccination in order to inform better vaccination strategies to reduce the burden of IMD.

We included IMD and ILI (influenza like illness) cases notified between January 2006 to September 2019. IMD seasonality was evaluated by fitting a negative binomial regression on monthly counts of IMD cases overall and by age group and serogroup. We analysed the influence of ILI on IMD based on the monthly number of cases for both disease types. We used the multivariate extension model described by Paul and colleagues. Attributable fractions of ILI on IMD seasonality were calculated on the overall IMD cases, by age group and in IMD serogroup B patients.

The seasonality of IMD comprised 3 seasonal terms with an annual periodic parameter and two long-term patterns of 60 and 180 months. Those patterns differed by age and serogroup-B. Overall, the ILI attributable fraction varied along the 13 year-period from 1% per month to a maximum of 40%. On average, among cases <15 years of age, 9% (minimum-maximum: 1-37) of the cases were attributable to ILI. The attributable fraction of ILI was 7% (minimum-maximum: 0-30) in the elderly and, 6% (minimum-maximum: 1-24) in IMD-B cases.
IMD incidence varied seasonally and between age and serogroup. An effect of ILI activity on IMD was found but did not vary between children and the elderly. Influenza vaccination may have an indirect benefit of reducing IMD risk.

Role and outputs:

Principal investigator: Laurène developed a study protocol, prepared and analysed data, communicated results, and wrote a manuscript.

Supervisor(s): *Mirjam Knol and Hester Korthals-Altes*

Competencies developed:

This activity was my first project using the statistical software R. I applied descriptive analysis and was able to go further into data modelling using different models of time series analysis techniques. I also learned about the two diseases and particularly by which biological mechanisms ILI could influence the IMD incidence.

Analysis of COVID-19 contact tracing data of Brussels-Capital region. Collaboration with the Institute of Tropical Medicine (Antwerp, Belgium)

To control the transmission of SARS-CoV-2, Belgium's regional governments scaled up their contact-tracing capacity to over 2000 contact tracers on 11 May 2020. These contact tracing efforts involve the identification of contacts of SARS-CoV-2 PCR-positive cases and the request to self-isolate for a period of 14 days to limit transmission in the event of a high risk contact. Data collection for this Belgian contact tracing system remains suboptimal with COVID-19 cases listing less contacts than expected, and with incomplete data for several. Understanding the current performance of the Belgian contact tracing system, including gaps in the (quality of) data collected, is important to improve it so that transmission chains can be stopped early and a second COVID-19 wave prevented. Moreover, further enhancement and analyses of the data collection at this point in time, can ensure the relevant data will be collected to improve our understanding of SARS-CoV-2 transmission dynamics in various settings.

By descriptive analysis, visualisation, and modelling of COVID-19 contact-tracing data, we aimed to improve data collection, identify factors associated with transmission, and get insight into the underlying transmission structure of SARS-CoV-2 in Brussels, which, altogether, contribute to timely detection of new cases and their contacts.

The output of this project was to produce an automated weekly report using R Markdown. This report was forwarded to the regional Public Health office in Brussels.

Role and outputs:

Principal investigator: Laurène developed a study protocol, prepared and analysed data and communicated results. The contact tracing data were separated into 18 datasets. To be analysed the datasets needed to be first linked between each other. Laurène manged this part of the project. In order to share the contact tracing data, the public health office in Brussels requested to pseudonymise the data and remove identifying variables. Laurène wrote the R scripts to automatize these steps.

Supervisor(s): *Esther van Kleef (Institute of tropical medicine, Belgium)*

Competencies developed:

From this activity, I extended my knowledge of the statistical software R. The first challenge of this project was to link the multiple data sources which gave me the opportunity to improve my skills in data management. This project taught me about assessing data quality and evaluating the feasibility of the planned analyses. I learned how to automatically produce a surveillance report in the context of a pandemic with the following: epidemic curve with moving average, cluster plot with transmission chains and the graphic of the reproductive number per index case. Finally, I learned to use R Markdown to convert the report into a PDF document.

2. Outbreak investigations

An outbreak of scabies in a nursing home: the potential use of PCR on bed linens for diagnosis

In October 2018, the public health service of The Hague was notified of a scabies outbreak by the management of a nursing home. This was the fifth outbreak in this nursing home since March 2015. In this context of repetitive outbreaks, we described the
extent of this outbreak and investigated risk factors for scabies.
For a retrospective cohort study among residents and staff, we obtained data on demographics, symptoms and predisposing factors (contacts with possible sources of scabies inside/outside the nursing home) through medical records for residents and questionnaires for staff. We defined cases as: possible (reported symptoms), probable (scabies-like lesions) and confirmed (PCR or microscopy in skin-flakes). Experimentally for case finding, we included skin-flakes from bed-linens of possible cases.

All residents (41) and 37/44 staff were included. We identified 20 possible, four probable and six confirmed cases. The overall attack rate for probable/confirmed cases was 10/78 (13%); 8/41 (20%) among residents. Three cases were confirmed by PCR and four by microscopy. Of these, two bed-linen specimens were PCR-positive. The attack rate was higher for staff with pre-existing skin conditions (RR 3.0;95%CI:1.9–4.9) and contacts in the family with scabies-like symptoms (RR 3.2;95%CI:1.9–5.3). Staff with physical contact with residents were less likely to develop disease (RR 0.39;95%CI:0.25–0.62). No significant risk factors were found for residents.

We found significant risk- and preventive factors for staff, but not for residents. Due to the repetitive outbreaks staff dealing with patients might have taken more protective measures. In a scabies outbreak, we recommend to include screening staff with pre-existing skin conditions and with household members who have scabies-like symptoms. We recommend evaluating the potential of scabies-PCR on bed-linens to contribute to case finding.

Role and outputs:

Co-investigator: Laurène prepared and analysed outbreak data, visited the GGDs in Den Haag and Rotterdam, performed data entry, presented results, and wrote a communication in a peer-reviewed international journal.

Supervisor(s): *Mariska Petrignani (GGD Haaglanden) and Ewout Fanoy (GGD Rotterdam-Rijnmond)*

Competencies developed:

This outbreak investigation gave me the opportunity to work in collaboration with the local public health authority in den Haag and be aware of the challenges on this field level regarding data collection, data entry and laboratory investigations. In this outbreak, I learned to conceive a research question in the context of an outbreak.

Measles outbreak in a workplace

On the 29th of May 2019, 5 laboratory confirmed measles cases were notified to National Public Health Institute of the Netherlands. All of these cases were employed by the same company accounting 253 workers. Due to the extensive number of people potentially exposed and the setting of this company (workers sharing desks in open spaces), large-scale contact tracing was initiated.

In total, 14 measles cases were reported. The median age was 40 years (Interquartile range (IQR): 40-42) and all cases were males except one. Ten cases (72%) met the clinical definition of measles and among them 4 cases were hospitalized. Four cases were not vaccinated (including the index case), 2 cases received one dose of vaccine, 4 cases were vaccinated with 2 doses and one case was vaccinated three times. For one case (case 12), the vaccination status could not be verified. Laboratory investigations were performed for 11 cases. For the 4 unvaccinated cases, laboratory results were consistent with primary measles-virus infection. Five cases were considered breakthrough infections. One case was considered a case with primary vaccine failure. Measles-virus-specific IgM antibodies were detected in the case who received 3 doses, indicative of a recent infection. However, these results could not be confirmed with another measles virus IgM enzyme immunoassay.

Our results are in accordance with recent publications on measles outbreaks reporting breakthrough infections in high vaccination coverage areas. Since it is not possible to distinguish breakthrough measles from primary measles-virus infection using clinical criteria alone; the use of laboratory criteria could be considered in classifying individuals especially when information on vaccination status is difficult to obtain.

Role and outputs:

Co-investigator: Laurène prepared and analysed outbreak data, communicated results, and wrote a manuscript.

Supervisor(s): *Irene Veldhuijzen*

Competencies developed:

In this outbreak, I learned the concepts of immunity, breakthrough infection, primary and secondary vaccine failure in measles vaccination. I had the opportunity to collaborate with the molecular biologists, who taught me about the

different laboratory' tests, how to interpret the results and drawing conclusions regarding vaccine failure. Here as well, I learned to conceive a research question in the context of an outbreak, based on the collected data.

Gastroenteritis outbreak during the Rapid Assessment & Survey methods module in Zagreb, Croatia, May 2019

The Rapid Assessment & Surveys methods (RAS) module for Cohort 2018 fellows took place in Zagreb, Croatia, 13-18 May 2019. On 14 May, some fellows reported gastro-intestinal complaints and could not attend the module. Based on symptoms, we hypothesized a food-borne infection as a potential cause of the outbreak; the topic was discussed via informal chats during coffee breaks among fellows. We described the extent of the outbreak and investigated to identify the potential source.

We designed a cohort study, including the RAS module participants. Via online questionnaire, we started case finding and asked about social events and food exposures to assess associations between exposures and illness. We defined cases as fellows who attended the module and who had any of the following symptoms on 14-16 May: diarrhoea, vomiting, abdominal cramps.

Thirty-seven fellows attended the module; among them we identified eight cases (attack rate 22%). The only social event visited by all cases was the dinner on 13 May. Eating goulash during the implicated dinner was significantly associated with being a case (RR=5.63; 95%CI: 1.37-23.10) and explained 63% cases. Stool sample from one case was negative for norovirus, adenovirus, rotavirus, Salmonella spp., Shigella spp., Campylobacter spp. and Escherichia coli. Sanitary inspection in the restaurant on 17 May did not find leftover food for testing.

Our investigation suggested that goulash was the vehicle of infection. No microbiological results were available to support this hypothesis. Information bias could be the limitation of the study due to fact that fellows exchanged their thoughts on the potential vehicle, even before the study was conducted. We recommended proper hand hygiene for fellows during lectures and social activities.

Role and outputs:

Co-investigator: Maja Ilic led the outbreak investigation. Sonia Boender and Laurène Peckeu were co-investigator. The outbreak investigation included defining case definitions, designing the study and questionnaire, preparing and analysing outbreak data, and interpreting the findings. An abstract has been prepared for submission to ESCAIDE2020.

Supervisor(s): *Ioannis Karagiannis*

Competencies developed:

This activity taught me how to define a case in the context of an outbreak investigation as well as designing the study and questionnaire with basics tools. I also learned on the organization of Public Health services in Croatia.

3. Applied epidemiology research

Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands.

In 2011, the 7-valent pneumococcal conjugate vaccine (PCV7) was replaced by the 10-valent vaccine (PCV10) in the Netherlands. We report on impact and effectiveness against invasive pneumococcal disease (IPD) in children aged under 5 years by switching from PCV7 to PCV10.

We included IPD cases between 2004-2018 in children aged<5 years reported via the national surveillance system. To assess the impact of the PCV10 vaccination program we compared IPD incidence 5-7 years after PCV10 introduction (2016-2018) to the two years just before the switch to PCV10 (2009-2011). We estimated vaccine effectiveness (VE) using the indirect cohort method, comparing vaccination status (at least two vaccine doses) in IPD-cases caused by PCV10 serotypes (cases) to non-PCV10 IPD cases (controls), in children eligible for PCV10.

The overall incidence decreased from 8.7 (n=162) in 2009-2011 to 7.3 per 100.000 (n=127) in 2017-2019 (incidence rate ratio (IRR) 0.83, 95%CI: 0.66;1.05). IPD caused by the additional serotypes included in PCV10 reduced by 93%

(IRR 0.07, 95%CI: 0.02;0.23). Incidence of non-PCV10 IPD remained stable (IRR 1.20, 95%CI: 0.93;1.56). Among 233 IPD-cases eligible for PCV10, the overall VE was 91% (95%CI: 68;97) and did not differ by sex or age at diagnosis. Effectiveness against serotype 19A IPD was non-significant with an estimate of 29% (95%CI:176; 81).

PCV10 is highly effective in protecting against IPD in Dutch children under 5 years with limited serotype replacement after switching from PCV7 to PCV10. We found no evidence for a cross-protective effect of PCV10 against 19A serotype IPD.

Role and outputs:

Principal investigator: Laurène developed a study protocol, prepared and analysed data, communicated results, and wrote a manuscript in a peer-reviewed international journal.

Supervisor(s): Mirjam Knol

Competencies developed:

In this project, I discovered the concepts of vaccine effectiveness and impact of a vaccination program. I was able to asses these concepts by applying Poisson and logistic regressions to long term surveillance data. This project taught me a lot on invasive pneumococcal disease and the challenges of implementing, monitoring and assessing a vaccination program.

Retrospective study of epidemiology and risk factors of keratitis by Fusarium and Acanthamoeba in the Netherlands (FUSACA study)

Since 2015, laboratories notifications of severe keratitis caused by *Fusarium* or *Acanthamoeba* increased in the Netherlands. This rare but serious infection is most common among individuals who wear contact lenses (CL). It is however not clear which factors put CL users at a higher risk for infections. We investigated here risk factors for *Fusarium* and *Acanthamoeba* keratitis among contact-lens users.

Since *Fusarium* and *Acanthamoeba* keratitis are not under systematic surveillance, we designed a retrospective case-control study approaching *Acanthamoeba* and *Fusarium* cases diagnosed between 2009-2020 by 16 cornea reference centers across the Netherlands. Controls were recruited in spring 2020 online via social media. Both cases and controls completed a questionnaire containing data on demographics, comorbidities, CL habits and hygiene practices. Risk factors were assessed using logistic regression.

In total, 227 cases (184 *Acanthamoeba,* 42 *Fusarium* and 1 unknown) and 1020 controls using CL were included in the analysis. The risk of acquiring keratitis was higher for persons having a history of prior eye trauma (OR 4.4, 95%CI: 1.9-9.8). Traveling abroad (OR 4.3, 95%CI: 1.9-9.4), CL contact with water (OR 3.3, 95%CI: 1.2-8.8) and swimming with CL (OR 2.7, 95%CI: 1.3-5.5) also put CL users more at risk of acquiring keratitis. Washing hands with antibacterial soap before manipulating contact-lenses as well as being advised by a contact lens specialist were protective factors (OR 0.2, 95CI%: 0.03-0.7; OR 0.4, 95CI%: 0.2-0.9, respectively).

With the exception of prior eye trauma, all identified risk factors are related to non-compliant practices when handling CL. Hence, we recommend reinforced communication on appropriate CL habits and hygiene practices among CL users since those could prevent infections.

Role and outputs:

Principal investigator: Laurène developed a study protocol and online questionnaires, prepared and analysed data, communicated results, and wrote a manuscript. An abstract has been prepared for submission to ESCAIDE2020.

Supervisor(s): Barbara Schimmer

Competencies developed:

In this project, the disease that was studied was not a notifiable disease under surveillance. I learned how challenging it is to retrieve reliable data on the cases, when you don't have a surveillance system with ongoing data collection. I learned to conceptualize questionnaires for recruiting cases and controls and the challenges of asking the right questions

having in mind how the responses will be analysed. I used for the first time the online software Questback to build the two study questionnaires, one for case recruitment, the second for control recruitment. I learned also how to recruit controls using social media. On the analysis part, I learned how important it is to set up a systematic data collection in order to have a clean dataset. This project taught me also about the limits of interpreting observational data.

How to support decision-making about childhood vaccination among soon-to-be parents

Childhood vaccination is a very effective intervention to protect against vaccine-preventable diseases (VPDs). It is estimated to prevent up to three million deaths each year. Nevertheless, vaccination coverage has recently declined in various countries. This decline – due to the delay or refusal of (some) vaccines – was linked to an increased level of vaccine hesitancy, which led the World Health Organization (WHO) to argue that vaccine hesitancy is one of the top ten threats to global health. Research showed that the way information is framed about childhood vaccination is often perceived as controlling or directive. This perception of directive information and message framing may lead to anger or counterarguing towards childhood vaccination, and even a lack of willingness or motivation to follow the national immunization program (NIP). However, individual's may be motivated to perform a behavior if they perceive that they can choose autonomously for the behavior. Based on this hypothesis, we tested the provision of autonomy-supportive language with choice options versus providing the current communication strategy used at RIVM. Via online questionnaires, we assessed the effect of the message on intention to vaccinate in parents who are either soon-to-be parents or parents of children younger than 9 weeks old (before the first vaccination).

Due to the COVID-19 situation in the Netherlands, this experiment has been postponed. Data collection is planned to start in September 2020 and end in February 2021.

Role and outputs:

Principal investigator: Laurène developed a study protocol and online questionnaires and messages, designed the behavioural experiment.

Supervisor(s): *Liesbeth Mollema and Kim Romijnders*

Competencies developed:

In this project, I improved my knowledge of behavioural science and particularly in vaccine hesitancy. I learned new terminology and concepts of social science. This project taught me how to design a behavioural experiment working with less concrete indicators such as human sentiments in contrast to classical epidemiological indicators (cases, deaths …). Here as well, I learned to conceptualize questionnaires and to frame messages for recruitment of participants and the challenges of asking the right questions having in mind how the responses will be analysed. I explored how to communicate public health messages with the help of applying concepts from social science.

4. Communication

Publications in peer reviewed journals

Manuscripts submitted to peer reviewed journals (in review process)

1. Peckeu L, Van der Ende A, De Melker H.E, Sanders E.A.M, Knol M.J. Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands. Submitted to Vaccine.

2. Tjon-Kon-Fat R.I, Peckeu L, Hahné S.J, De Coster E, Tas W, Wintermans B , et al. The potential of PCR on skin scrapings from bed linens for diagnosis of scabies in an outbreak. Submitted to Plos Neglected Tropical Diseases.

Manuscripts in preparation for submission

1. Peckeu L, De Jong S, van Rijckevorsel G, Voordouw B, Bodewes R, Loenenbach A, et al. Measles outbreak among employees of a company [manuscript in preparation].

2. Peckeu L, Korthals-Altes H, De Melker H.E, De Lange M, Hooiveld M, Knol M.J. The association between influenza-like illness and invasive meningococcal disease in the Netherlands, 2006-2019 [manuscript in preparation].

3. Peckeu L, Randag A, De Rooij J, Schimmer B, Hahné S.J. Retrospective study of epidemiology and risk factors of keratitis by Fusarium and Acanthamoeba in the Netherlands (FUSACA study) [manuscript in preparation].

Conference presentations

1. Poster presentation at ESCAIDE 2019. Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands. Journal of infectious disease. Stockholm, Sweden, 2019.

2. Poster presentation at ESCAIDE 2019. An outbreak of scabies in a nursing home: the potential use of PCR on bed linens for diagnosis Stockholm, Sweden, 2019.

3. Poster presentation at International symposium on Pneumococci and Pneumococcal diseases (ISPPD) congress 2019. Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease in the Netherlands Toronto/Canada. [presented by M. Knol]; 2019.

Other presentations

1. Oral presentation at the Internal EPIET/EUPHEM Seminars of EPI – RIVM. Project presentation: An outbreak of scabies in a nursing home: the potential use of PCR on bed linens for diagnosis. Bilthoven/Netherlands. 2018.

2. Oral presentation at the Internal Vaccine preventable diseases meeting– RIVM. Project presentation: Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands. Bilthoven/Netherlands. 2019.

3. Oral presentation at the Internal EPIET/EUPHEM Seminars of EPI – RIVM. Project presentation: Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands. Bilthoven/Netherlands. 2019.

4. Oral presentation at the Multivariable analysis Module-Cohort 2018. Project presentation: Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands. Madrid/Spain. 2019.

5. Oral presentation at the Vrije University of Amsterdam. Project presentation: Example of applied research project during the EPIET fellowship: Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands. Amsterdam/Netherlands. 2019.

6. Oral presentation at the Vrije University of Amsterdam. Project presentation: Career path. Amsterdam/Netherlands. 2019.

7. Webinar Cohort-2018. Project presentation: A brief introduction to behavioural science. Online webinar.2019.

8. Oral presentation at the EPIET training site visit. Project presentation: EPIET projects presentation. Bilthoven/Netherlands. 2019.
9. Oral presentation at the Ministry of Health Coordination Center. Project presentation: What do we know about COVID-19 disease? Cox Bazar/Bangladesh. 2020.

10. Oral presentation at the sector coordinator meeting. Project presentation: Coronavirus situation. Cox Bazar/Bangladesh. 2020.

11. Oral presentation at the hygiene promotion working group meeting. Project presentation: Coronavirus situation. Cox Bazar/Bangladesh. 2020.

12. Oral presentation at the Head of Sub-office meeting. Project presentation: Coronavirus situation. Cox Bazar/Bangladesh. 2020.

13. Oral presentation at the Shelter and Non Food Item sector. Project presentation: Coronavirus situation. Cox Bazar/Bangladesh. 2020.

14. Oral presentation at the Sexual and Reproductive Health sector. Project presentation: Measles outbreak in the camps.

Reports

1. Peckeu L, Kaaijk P, Bodewes R, Rots N, Van Els C.A.C.M, Ruijs W.L.M, Van Binnendijk R, Veldhuijzen I.K. Chapter 7.7 Mumps. In: The National Immunisation Programme in the Netherlands. Surveillance and developments in 2018-2019. Bilthoven/Netherlands; 2019.

2. Peckeu L, Bodewes R, Ruijs W.L.M, Rots N, Van Binnendijk R, Veldhuijzen I.K. Chapter 7.11 Rubella. In: RIVM Report 2019-0193. The National Immunisation Programme in the Netherlands. Surveillance and developments in 2018-2019. Bilthoven/Netherlands; 2019.

3. Annual Status update on Measles and Rubella elimination in the Netherlands. WHO Report. 2018.

Other output

1. Peckeu L. Verbal autopsy investigation report of Acute Watery Diarrhea cases in the Kutupalong RC, Ukhia, Cox's Bazar, Bangladesh. January 7, 2020.
2. Peckeu L. Investigation report of Bloody Diarrhea cases in the Kutupalong RC, Ukhia, Cox's Bazar, Bangladesh. January 19, 2020.
3. Peckeu L. Investigation report of Bloody Diarrhea cases in the Kutupalong RC, Ukhia, Cox's Bazar, Bangladesh. January 28, 2020.
4. Public Health situation analysis Rohingya Refugee Crisis in Bangladesh, 2017-2019.
5. Peckeu L. Global Outbreak and response Alert Network. End of mission report. Cox's Bazar, Bangladesh.
6. Peckeu L & Tjon-Kon-Fat R.I, Outbreak investigation report: An outbreak of scabies in a nursing home. 2018.
7. Project team of the FUSACA study. Study protocol. Retrospective study of epidemiology and risk factors of keratitis by Fusarium and Acanthamoeba in the Netherlands (FUSACA study). 2018.
8. Peckeu L. Study protocol. Impact and effectiveness of the 10-valent pneumococcal conjugate vaccine on invasive pneumococcal disease among children under 5 years of age in the Netherlands. 2019.
9. Peckeu L. Study protocol. How to support decision-making about childhood vaccination among soon-to-be parents. 2019.
10. Van Kleef Esther and Peckeu L. Study protocol. Analysis of COVID-19 contact tracing data of Brussels capital region. Study of the transmission dynamics of SARS-CoV-2 to support the early detection of new cases. 2020.

5. Teaching activities

Lecture on Epidemic curves & Facilitation of case study on an outbreak of Giardiasis in Bergen, Norway

This teaching activity was part of an all day training on outbreak investigation. Prior to the lecture on epidemic curves, a presentation of the 10 steps in an outbreak investigation was given to the students. This lecture was followed by facilitating the first part of the case study "Giadiasis in Bergen, Norway". After lunch, I presented my lecture on epidemic curves. The plenary session was an interactive lecture, with several exercises (1 to 3 question(s) each) about the concept that was just presented, where learners had to actively respond. After this lecture, the second part of the case study took place.
The sessions took place on the 7th of May 2019. I had a set timeframe of one hour for the plenary presentation, in addition to 2 sessions of about 1.30 hours (morning and afternoon) for the case study in small groups (7 students each). The group was composed of 14 medical doctors on the first year of their specialization in public health. The module "outbreak investigation" is part of their 2-year training at the Netherlands School of Public and Occupational Health (NSPOH) (Utrecht).
I developed a Powerpoint presentation for the lecture on "epidemic curves". I used the case study "Giadiasis in Bergen , Norway", based on the experience of Barbara Schimmer (EPIET Fellow alumni). This case study is also part of the EPIET fellowship teaching material.

Educational outcome:

Giving the lecture on epidemic curves helped me formalize the information that we can extract from these graphic representations. Epidemic curves are typically used by epidemiologists in an automatic way without questioning the utility of it, meaning that the utility is obvious for us. While here, you have to present epidemic curves and their use to raise the interest of young public health officers about the rationale behind them. This demanded and promoted a deeper understanding of the subject.

Regarding the case study, I realised that I had to keep in mind what is the important information that should be given, while at the same time following the discussion in the group.

From this activity, I learned that it is better to slower my pace while presenting concepts that have never been seen before by the audience. People need time to process what you are presenting, especially if it is the first time that they hear about it.

Lecture on applied research project during the EPIET fellowship

EPIET fellows Sonia Boender, Laurène Peckeu, Raissa Tjon-Kon-Fat, Tom Woudenberg and Rob Whittaker held a lecture for MSc students in Health Sciences from Vrije University (VU), specialising in PH & Infectious Diseases, and 2nd/3rd year BSc students from Amsterdam University College (AUC), participating in the courses 'Introduction to Public Health' & 'Epidemiology'. The lecture consisted of five separate PowerPoint presentations covering:

1. The topics of the different levels of public health action (Raïssa)
2. Infectious disease surveillance (Sonia)
3. Examples of two outbreak investigations (Tom)
4. Applied public health research using an example of the impact and effectiveness of a vaccination programme (Laurène)
5. An example of how a global elimination goal influences work at a national public health institute (Robert).

The presentations were given in this order. Each EPIET fellow was responsible for one presentation. Each fellow prepared a power point presentation on the topic covered, and prepared a career-path slide for the group discussion on careers.

After the lecture, a Q&A session was held on careers in the field of infectious disease epidemiology & public health, during which each fellow presented their background.

This teaching exercise was conducted in a room and took around two and a half hours, excluding breaks. Around 30 students attended the lecture, and around 15 attended the session on careers.

Educational outcome:

The participating fellows personally felt that the lecture flowed well from one presentation to the next, with smooth interchange between presenters. This was helped by having all presentations open and ready to go before the session started. While one fellow joined the activity at a late stage of planning with an additional topic, the feedback suggests this did not hamper the flow of the lecture. The students appeared engaged in the material, with several questions being raised. Switching from one presenter to another may have helped the students to distinguish clearly between the different topics being presented. The length of time for each presentation (about 15 minutes) was felt to be appropriate, as the aim was not to go in depth into each topic, rather to give the students a taste of different aspects of work within the field of infectious disease epidemiology.

While some fellows were familiar with the programme that the students in the audience were undertaking, having taken the programme themselves and taught at the university previously, other fellows were not. For future similar exercises, it may be of value for presenters less familiar with the audience to better understand knowledge levels of the audience in advance, either through discussion with staff at the university, reviewing the course material, or a survey, to better tailor the level of the presentations to the audience. It may have been beneficial to present the objectives of the session before starting on the presentations themselves, so that it is clear to participants what will be covered. In the same vein, it may have also been useful to present key messages at the end of the whole lecture, summarising all presentations in the context of the aim of the session. The Q&A session on careers was an engaging discussion, which seemed to be of value to the participating students. Students were particularly interested in the EPIET fellowship and internships in different organisations following their studies.

Overall, the facilities were appropriate for the number of students attending.

I enjoyed this teaching activity with my EPIET colleagues, which was an opportunity to learn from their presentations as well. I had already presented this research project a few months previously in front of expert epidemiologists. Although I was confident in explaining the content of the slides, I felt less comfortable in presenting them in front of students with varying levels (MSc and bachelor), mainly because I couldn't assess their knowledge regarding the subject (invasive pneumococcal diseases) and the methodologies used (estimation of the vaccine effectiveness using logistic regression and estimation of the impact of the vaccine using Poisson regression). In the future, I would get more detailed information about the curriculum that the students follow and adjust my communication accordingly.

6. Other activities

After the RAS module in Zagreb, Laurène attended to the EAN workshop: "Social media for Public Health Professionals", SoMe4epis. This two-days workshop included plenary sessions, debates and case studies on the use of Social Media in Public Health and Crisis communication.

Laurène attended online the first WHO global infodemiology conference. The first part was held on the 29th of June 2020 followed by a post-conference webinar on the 21th of July 2020. The different talks presented how infodemic (over-abundance of information) affects the world and reflections on how it can be managed.

7. EPIET/EUPHEM modules attended

1. Introductory course, 24th September to 12th October 2018, Spetses, Greece
2. Outbreak investigation module, 03rd to 07th December 2018, Berlin, Germany
3. Multivariable analysis module, 25th to 29th March 2019, Madrid, Spain
4. Rapid risk assessment and Surveys method module, 13rd to 18th May 2019, Zagreb, Croatia
5. Project review module (2019), 26th to 30th August 2019, Prague, Czech Republic
6. Time Series Analysis module, 4th to 8th November, Bilthoven, Netherlands
7. Vaccinology module, 4th to 11th may 2020 and 22nd to 24th May 2020, online module

Supervisor's conclusions

Laurène has completed an excellent fellowship at the RIVM, broadening her experience in terms of the number of infections having worked with, software (particularly R), different public health functions, and dealing with different stakeholders both at national and regional level. I believe she has learned a lot in all of these areas, having been exposed to less diversity prior to starting EPIET.

The scientific output of Laurène's work is of a high standard, and the amount of output is very good. This work contributes to public health in general; the PCR on bed-linnen for scabies is I think the most innovative output of her fellowship.

Laurène displayed much interest in a wide range of topics and field epi activities. Of particular note is her mission to Cox's Bazar, working in the Rohingya refugee crisis. She managed to deal very well with the uncertainties of when and how to start the mission, and managed to make it into a good learning experience. To add a mission like this to the fellowship is brave in a number of aspects, also from the point of increasing the workload during the time at RIVM as the fellowship time is shortened.

The COVID-19 pandemic interfered with her fellowship in that modules were organised online and she was working from home most of the time. She seemed to adapt to this well. Having already a number of projects to complete, Laurène did not contribute to the public health response in the Netherlands. However, she did get involved in a COVID-19 project in Belgium, and managed to obtain a position there after EPIET.

In terms of personal development, Laurène progressed in expressing herself as a knowledgeable epidemiologist, particularly observed by me when at the end of a fellowship she presented very clearly arguments for the approach of a data analysis, which was very convincing. She could develop more by trusting her own expertise and experience and assert these when communicating with others.

Coordinator's conclusions

I have only been Laurène's frontline co-ordinator for the final few months of her fellowship, by which time she had already achieved all that was required for graduation and had participated in an international mission. She has taken full advantage of the range of opportunities that the RIVM has to offer. She has been organised and enthusiastic and has worked on a diverse range of projects within the fellowship, expanding her knowledge on various disease groups, looking into behavioural science for the first time and improving her analytical skills. I wish her well in her future career.

Personal conclusions of fellow

Before starting EPIET, my main work experience was coordinating a national surveillance network and doing academic research on one specific infectious disease. By doing the EPIET fellowship, I expected learning more about applied epidemiology and epidemiology taking into account public health relevance. I also wanted to be exposed to a larger scope of topics in infectious diseases and learn divers statistical methods These expectations were fully met (and even beyond) after 2 years as an EPIET fellow at the National Institute for Public Health and the Environment (RIVM). Working at RIVM was a great pleasure for several reasons: all onsite supervisors were highly qualified epidemiologists, enthusiastic in proposing new projects and following-up on our progress. The Epi department at RIVM offered a variety of topics to work on, which is a substantial added value for the fellowship.

Regarding the training modules, I found all them very interesting with dedicated coordinators during lectures and exercises. I enjoyed the clear and interactive presentations. The EPIET fellowship gave me the opportunity to create a bond with more than 40 fellows across Europe, and to be part of the great community of field epidemiologists. I enjoyed to meet them each time and I am sure that the connections created during the past 2 years will continue into the future.

Looking back at this portfolio, these 2 years brought such a professional and personal enrichment that I doubt would have been achievable elsewhere.

Acknowledgements

I would like to acknowledge the European Centre for Disease prevention and Control (ECDC, Stockholm, Sweden) for accepting my application as an EU-track fellow. This would not have been possible without my onsite supervisor, Susan Hahné, to whom I am very grateful for these past 2 years in her team. Thank you for giving me the opportunity to work at RIVM, for the constant support in the different projects, and the ability to pay attention to my needs regarding the fellowship objectives as well as my personal goals and interest.

I would like to thank all the supervisors with whom I collaborated at RIVM, for sharing their expertise, giving advice and criticizing my work in a constructive way. Your remarks were always relevant and I highly value that. I would like to especially thank Mirjam Knol, who allowed me to discover the fascinating field of vaccine preventable diseases and vaccinology. Thank you for the scientific discussions on our different projects.

I would like to thank my current and past frontline coordinators: Mari and Alicia. Thank you Mari, for supervising me during the last part of the fellowship, this must not have been easy. Thank you for your availability and constructive feedback. Alicia, your amazing ability to teach about field epidemiology as well as to explain complex statistical results in a funny and understandable way, were an invaluable to me.

Thank you to all past and current RIVM EPIET/EUPHEM fellows, Anna, Jossy, Raïssa, Anita, Lola and Kamelia for your help and the happy moments we shared around coffee, lunch and meetings that became quite rare these last months, unfortunately.

I would like to thank as well all my co-EPIET/EUPHEM fellows from cohort 2018. What an amazing and eventful fellowship we had! I can't wait to meet you all again.

My last but not least thank you goes to my roomies from de kamer 3.51: Maartje, Inger, Daphne and Wouter. The best office mates I could have expected. Maybe first a thank you to Ilse that placed me in this office. To my roomies, I enjoyed coming to work each morning, you made me feel welcome in the small bubble of this office. Thank you for sharing your Dutch culture and giving me useful tips. I will not forget our countless discussions and laughs, trying most of the time to understand the world we are living in.