



FELLOWSHIP REPORT

Summary of work activities

Lynn Meurs

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;

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 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

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- To develop a European network of public health epidemiologists who use standard methods and share common objectives;
- To contribute to the development of the community network for the surveillance and control of communicable diseases.

Pre-fellowship short biography

Lynn Meurs has a MSc in Biomedical Sciences (Radboud University Medical Centre Nijmegen, The Netherlands), and a joint PhD from the Institute of Tropical Medicine, Antwerp, the University of Antwerp, Belgium and Leiden University Medical Centre, The Netherlands. As a pre- and postdoctoral fellow at the Institute of Tropical Medicine, Antwerp, Belgium, she has studied epidemiological, micro-geographical and immunological patterns in schistosomiasis and the diagnosis and eco-epidemiology of polyparasitism in sub-Saharan Africa, mainly in Senegal.

Fellowship assignment: Intervention Epidemiology path (EPIET)

In September 2017, Lynn Meurs started her EPIET fellowship at the Robert Koch Institute (RKI) in Berlin, Germany, under the supervision of Dr Gerhard Falkenhorst. This report summarizes the work performed during this fellowship.

Methods

This portfolio demonstrates the competencies acquired during the ECDC Fellowship, EPIET path, by working on various projects, activities and theoretical training modules.

Projects included epidemiological contributions to public health event detection and investigation (surveillance and outbreaks); applied epidemiology field research; teaching epidemiology; summarising and communicating scientific evidence and activities with a specific epidemiology focus.

The outcomes include publications, presentations, posters, reports and teaching materials prepared by the fellow. The portfolio presents a summary of all work activities conducted by the fellow, unless prohibited due to confidentiality regulations.

Results

The objectives of these core competency domains were achieved partly through project or activity work and partly through participation in the training modules. Results are presented in accordance with the EPIET core competencies, as set out in the EPIET scientific guide¹.

Fellowship projects

1. Surveillance

Title: Analysis of Hepatitis C surveillance data in Germany, 2016-2018

Hepatitis C (HCV) infection is a notifiable disease in Germany. Most HCV infections lead to chronic disease, and the detection of infection in an early stage of the disease therefore mainly depends on laboratory (rather than clinical) diagnosis. Since 2014, chronic HCV infections can be cured in the large majority of patients due to the introduction of direct-acting antivirals (DAAs). This radically changed the clinical management of infected patients and, as a consequence, has an impact on HCV epidemiology. The HCV case definition was adapted accordingly on 1-1-2015 and further changes were made in the Infectious disease protection Act (IfSG, 25-7-2017) and notification system. The present study aimed to describe the HCV surveillance data in-depth for the years 2016, 2017 and 2018 in order to better understand the effect of these recent changes as well as HCV epidemiology in Germany.

It was found that the number of notifications that were transferred to the RKI had increased in 2017. This was mostly due to the changes in the IfSG, which may have led to more notifications of mostly chronic and asymptomatic HCV or incomplete notifications that could not be de-duplicated. Another reason for this increase might be an increase in testing due to optimised treatment options and case-finding of old infections. Notification of acute HCV remained stable in the reporting period, suggesting that HCV transmission - which appeared largely autochthonous - remained stable over the reporting period. So, in spite of the revolutionary improvements in HCV treatment and in contrast to

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>

previous predictions, there seemed to be no decrease in HCV transmission. More efforts are therefore needed to control HCV in Germany.

Role: Lynn was the principal investigator in this project. She developed the protocol for this study, described the HCV surveillance system, analysed surveillance data, and wrote the report.

Supervisor: Dr Ruth Zimmermann

Title: Feasibility of enhancing hepatitis C surveillance in Germany

The above-mentioned changes that have been applied in HCV surveillance in 2015 and 2017, likely do not suffice to adapt to the DAA-induced changes in HCV epidemiology. In the light of the WHO's aims to eliminate HCV it would be important to get a better insight in HCV dynamics on the national and subnational level, including the occurrence of different geno- and subtypes of the virus, reinfections, and DAA resistance. Although it would be highly desirable to collect this virological information laboratory information is currently limited to the detection method used, based on ribonucleic acids and/or core antigen. It was therefore investigated what in-depth information on HCV (i.e. on re-infection status, geno- and subtype, molecular sequence data, and DAA resistance) routine laboratories may have to possibly enhance HCV surveillance.

HCV-diagnosing laboratories could not be identified a priori, and the true response rate of invited laboratories could therefore not be estimated. Amongst responders, half the HCV-diagnosing laboratories used direct detection methods, and thereby generated data used in national HCV surveillance. The findings of this study suggested that HCV is commonly geno- and subtyped in these laboratories, and that in-depth virological data and information on HCV re-infection were indeed available. It was therefore recommended including these parameters in the forthcoming German electronic system for infectious diseases. This may produce an enhanced and more comprehensive surveillance of HCV in Germany in the future. Over time this will lead to a better insight into HCV epidemiology in Germany and can support targeting prevention and control strategies for HCV.

Role: Lynn was the principal investigator for this project. She discussed the project with diagnostic laboratories for guidance, carried out a literature review on molecular HCV surveillance, developed the protocol and online survey (incl. pretesting), obtained data protection clearance, compiled the sampling frame, invited the laboratories, and cleaned and analysed the data. The writing-up of these analyses is currently ongoing.

Supervisor: Dr Ruth Zimmermann

2. Outbreak investigation

Title: Investigation of a Germany-wide *Salmonella* Havana cluster (January-June 2019)

The National Reference Centre for salmonellosis and other enteric pathogens (NRZ) observed an accumulation of the rare *Salmonella enterica* serovar Havana since the beginning of 2019. A relatively large number of infants were diseased with *S. Havana* and hospitalised. It was therefore decided that it was necessary to investigate whether this could be an outbreak and to identify a potential outbreak vehicle.

Potential *S. Havana* outbreak cases were identified based on notification data at the RKI as well as patient information provided by the NRZ and the Institute for Hygiene and Environment in Hamburg. In addition, potential outbreak cases were searched for outside Germany using the Epidemic Intelligence Information System (EPIS). All human *S. Havana* isolates from 2019 were sequenced. Exploratory interviews were planned with the outbreak cases that occurred in 2019 in order to generate a hypothesis regarding the potential outbreak vehicle.

A total of 17 *S. Havana* cases were identified in the notification system. Confirmed cases were defined as persons with a *Salmonella* infection (including cases with unknown clinical symptoms) that was notified according to the Infection Protection Act (IfSG) between week 1 and 23 in 2019, and 1) who had not travelled abroad in the incubation period, and 2) whose samples tested positive for the Havana serovar (at the NRZ or at the Institute for Hygiene and Environment in Hamburg) or for whom the Havana serovar was reported in the notification system, and 3) whose isolates belonged to the outbreak cluster type according to whole genome sequencing (WGS). Probable cases were defined as confirmed cases but without WGS result. The present study showed that 12 confirmed cases were infected in Germany with very closely related *S. Havana* isolates. For a 13th *S. Havana* outbreak case (probable case) there was no isolate for sequencing available.

No interviews could be conducted, due to language barriers and difficulties in getting access to outbreak cases. As a result, no hypothesis on an outbreak vehicle could be generated and attempts to investigate this outbreak were discontinued on the 12th of June 2019. At that time, the last known disease onset was the 26th of May 2019 (week 23). Since no outbreak vehicle could be identified, this outbreak investigation did not lead to public health recommendations. The health authorities should further motivate the primary laboratories to send isolates to the NRZ for serotyping. Upcoming *S. Havana*-positive isolates will continue to be sequenced at RKI so that possibly newly-emerging outbreak cases will be detected.

Role: Lynn was the principal investigator and contributed to the communication for this investigation within the outbreak team. She carried out the literature review, fine-tuned the trawling questionnaire, assisted with telephone interviews with possible cases, entered the data, and compiled the line list. She made the case definition, described the time, place and person parameters of the outbreak and wrote the outbreak report.

Supervisors: Dr Anika Schielke & Dr Gerhard Falkenhorst

Title: Contributions to other outbreak investigations

Under the supervision of Dr Ruth Zimmermann and within the framework of her tasks in the routine surveillance of HCV (please see Section 6), Lynn contributed to the line-listing, communication, as well as preparations for phylogenetic and epidemiological investigations (mainly study design) of a nosocomial HCV outbreak in Bavaria, Germany.

Under the supervision of Alexandra Holzer, Lynn investigated cases from a Listeriosis outbreak cluster in Saxony and Saxony-Anhalt (June-August 2018). These cases had been detected through genotyping at the national reference centre for *Listeria*. Six cases were reported in the national surveillance system. Lynn assisted with the telephone trawling questionnaire interview, entered the questionnaire data, and described the notifications that were transferred to the RKI by place.

Under the supervision of Dr Thomas Kratz and Dr Matthias Borchert, and within the framework of her research project on pulmonary plague infection in healthcare workers in Madagascar, Lynn furthermore contributed to the design of the analytical study to investigate the risk factors for infection, and the organisation and data collection in this study together with German FETP fellow Inessa Markus (please see Section 3).

3. Applied epidemiology research

Title: Intestinal colonization with extended-spectrum β -lactamase producing Enterobacterales in German travellers

Intercontinental travel likely contributes to the spread of extended-spectrum β -lactamase producing Enterobacterales (ESBL-PE). The present study assessed risk factors for intestinal ESBL-PE colonisation in people travelling to low and middle income countries in the tropics and subtropics to better understand how travel affects ESBL-PE spread. This prospective cohort study in travellers attending a travel clinic in Leipzig, Germany was conducted in 2016-2017. Information on risk factors related to travel, symptoms, antibiotic use, health care usage, accommodation, destination, diet and hygiene was collected by questionnaire after travel. Stools were phenotypically tested for ESBL-PE before and after travel. Risk factors for ESBL-PE colonisation were identified using logistic regression.

Of the 230 travellers that were ESBL-PE negative before travelling, 23% (n=53) travellers returned positive. Multivariable analyses showed that age, type of accommodation and travelling to Asia were associated with ESBL-PE colonisation. Given that a considerable amount of travellers returned with ESBL-PE, it is recommended to raise awareness in returning high-risk travellers, e.g. those returning from high-risk areas. They should be aware that they may carry antimicrobial-resistant bacteria after travel, and how they can prevent its spread. The role of the type of accommodation as a factor favouring intestinal colonization with ESBL-PE requires further investigation.

Role: This was a joint project between RKI and the Leipzig University Hospital and Lynn was the principal investigator for data analysis. She wrote the protocol for data analysis, cleaned and analysed the data, presented the results at conferences, contributed to a press release on the study, managed inquiries from the media and wrote the manuscript.

Supervisors: Dr Jan Walter & Dr Tim Eckmanns

Title: Risk factors for pulmonary plague infection in healthcare workers in Madagascar 2017 (IPAMU project)

During the pulmonary plague (PP) outbreak in Madagascar in 2017, WHO identified 81 healthcare workers (HCWs) as (possible) PP cases. So far, only anecdotal reports describe possible transmission and burden of PP within HCW. In order to better understand HCW infections with PP, the Malagasy-German IPAMU partnership project "Investigation of pulmonary plague infection in healthcare workers in Madagascar" was founded. The IPAMU project aimed to identify the major routes of transmission of PP in HCWs, in order to improve future education on preventive measures (e.g. personal protective equipment training). Specific objectives were:

- 1) to determine whether (possible) cases - i.e. HCW with symptoms compatible with PP during the epidemic according to the Malagasy surveillance authority, DVSSE - were seropositive for PP (June 2018),
- 2) to assess whether it was indeed plausible that they were infected with PP (at work), and
- 3) to assess knowledge, attitude and practice (KAP) on PP among the cases that had been identified and their current colleagues (September 2018).

The present study focussed on the last objective. Structured interviews using questionnaires were conducted in cases and non-cases in two major cities that were affected in 2017: Antananarivo (four hospitals) and Toamasina (two hospitals and a mobile clinic). All available cases that underwent serology were included. Out of the 81 HCW who had symptoms compatible with plague according to WHO, 36 (possible) cases could be identified in the two cities and were recruited for serology. One of these was (still) anti-*Yersinia pestis*-IgG positive. Sixteen cases and 53 non-cases were included in the KAP survey. Preliminary results suggest that the lack of laboratory capacity was a major obstacle in the management of PP cases in general, and that it would be particularly important to better prepare and support nurses and medical students for such crises.

Role: This was a joint project between the RKI in Germany, the DVSSE, Laboratoire d'Accueil et de Recherche en Santé Publique et en Technologies de l'Informatique Médicale, Unité de Peste de l'Institut Pasteur and Centre d'Infectiologie Charles Mérieux in Antananarivo, Madagascar, and the Faculté des Sciences et Techniques en Santé, Université Gamal Abdel Nasser de Conakry in Guinea. Lynn and Inessa Markus, EPIET-associated German programme fellow C2017, jointly lead the KAP survey (objective 3). Within objective 3, they both contributed to the development of the study design, writing the study protocol, development of the questionnaire and data entry masks, organization of the study in the field (2 weeks in Antananarivo and 1 week in Toamasina), data collection, data cleaning and analysis, and to the preparation of abstracts and presentations. Furthermore, the research ideas were used for the research proposal assignment in the Introductory Course (Cohort 2018), and Inessa and Lynn proposed follow-up projects based on their work in Madagascar. Data analysis is currently ongoing.

Supervisors: Dr Thomas Kratz & Dr Matthias Borchert

4. Communication

Publications

Manuscript submitted to peer-reviewed journals (in review process)

Meurs L*, Lempp FS*, Lippmann N, Trawinski H, Rodloff AC, Eckardt M, Klingeberg A, Eckmanns T, Walter J, Lübbert C & RAI Study group. Intestinal colonization with extended-spectrum β -lactamase producing Enterobacterales (ESBL-PE) is still common upon long distance travel: A cohort study in a German travel clinic (2016-2017). *Under Editor Evaluation by Travel Medicine and Infectious Disease*; * these authors contributed equally.

Reports

1. Meurs L, Dudareva S, Diercke M, Altmann D, Bremer V, Zimmermann R. Hepatitis-C-Meldedaten nach IfSG, 2016 – 2018: Auswirkungen der Änderungen von Falldefinition und Meldepflicht. *Epid Bull* 2019(30):275–85.
2. Meurs L, Albrecht S, Bock CT, Dudareva S, Bremer V, Zimmermann R. Can we include virological data and information on re-infection to improve hepatitis C surveillance in Germany? *Internal report in progress. This report will be translated and consequently published in the German Epidemiological bulletin.*
3. Zimmermann R, Meurs L, Schmidt D, Kollan C, Dudareva S, Bremer V. Zur Situation bei wichtigen Infektionskrankheiten in Deutschland. Hepatitis C im Jahr 2017. *Epid Bull.* 2018(29):271–81.

Conference presentations

1. Meurs L*, Lempp FS*, Lippmann N, Rodloff AC, Eckmanns T, Walter J, Lübbert C. Besiedelung mit extended-spectrum β -lactamase produzierenden Enterobacteriaceae unter Reiserückkehrern: eine Folgestudie am Universitätsklinikum Leipzig (2016/2017). *Poster presentation by Lynn at the Kongress für Infektionskrankheiten und Tropenmedizin, Cologne, Germany, June 2018*; * these authors contributed equally.
2. Meurs L*, Lempp FS*, Lippmann N, Trawinski H, Rodloff AC, Eckmanns T, Walter J, Lübbert C. Does staying in a hotel increase the risk of colonisation with ESBL-producing Enterobacteriaceae during intercontinental travel? A cohort study among German travellers (2016-2017). *Poster presentation by Lynn at the 29th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), Amsterdam, The Netherlands April 2019*; Lynn Meurs was presenting; * these authors contributed equally.
3. Kratz T, Radonirina Lazaso A, Razafimbiana V, Markus I, Meurs L, Kolié D, Borchert M, Rajerison M, Rakotoarisoa A, Rakoto Andrianarivelo M, Dupke S, Grunow R, Malvy F, Delamou A, Rapelerano RF. IPAMU – a Madagascar-Germany partnership project aiming to investigate Health Care Worker Infections during the 2017 Pneumonic Plague Outbreak. *Oral presentation by first author at the Conference on Tropical Medicine and Global Health, Munich, Germany, April 2019.*
4. Kratz T, Radonirina Lazaso A, Meurs L, Markus I, Kolié D, Rajerison M, Rakoto Andrianarivelo M, Malvy D, Grunow R, Razafimbiana V. IPAMU - a Madagascar-Germany partnership project aiming to investigate health care worker infections during the 2017 pneumonic plague outbreak. *Oral presentation by first author at the 11th European Congress on Tropical Medicine and International Health, Liverpool, UK, September 2019.*

Other presentations

1. Intestinale Besiedelung mit Extended-Spektrum β -Laktamasen (ESBL) produzierenden Enterobacteriaceae unter Reiserückkehrern. *PAE weekly meeting, Berlin, January 2017.*
2. Does staying in a hotel increase the risk of colonisation with ESBL-producing Enterobacteriaceae during intercontinental travel? A cohort study among German travellers. *PAE weekly meeting, Berlin, April 2019. PowerPoint was intended for a press conference which was later cancelled at the 29th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), Amsterdam, The Netherlands, April 2019.*
3. Towards a more comprehensive hepatitis C surveillance in Germany: Understanding routine hepatitis C testing in diagnostic laboratories. *PAE weekly meeting, Berlin, January 2019.*

Other

1. Contributions to the HCV chapters of the RKI epidemiological year book:
 - Robert Koch-Institut (2018). Chapter: „6.23 Hepatitis C“ in „Infektionsepidemiologisches Jahrbuch meldepflichtiger Krankheiten für 2017“, 116-121, Robert Koch-Institut.
 - Robert Koch-Institut (2019). Chapter: „6.23 Hepatitis C“ in „Infektionsepidemiologisches Jahrbuch meldepflichtiger Krankheiten für 2018“, 117-122, Robert Koch-Institut.
2. Contributions to press release entitled "Staying in a hotel during travel to tropical regions is associated with contracting drug-resistant bacteria, with younger travellers aged 20-30 years at highest risk". 29th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), Amsterdam, the Netherlands, April 2019.
3. Description of the national hepatitis C surveillance system in Germany. *In English, May 2019*

5. Teaching and pedagogy

Epikurs@RKI - Applied infectious disease epidemiology course, Module "Data for action"

This three-day training is organized by the RKI for public health personnel working in the field of infection control in Germany. In this interactive workshop at the RKI, interested public health personnel learn to analyse and interpret surveillance data, to present their findings, to design questionnaires, and to plan and evaluate public health interventions. Lynn lectured on questionnaire design and assisted in group exercises.

Reflection: Being involved in this module of the Epikurs helped Lynn to boost her German language skills. It was also her first introduction to professionals working in the German public health services outside of RKI, and the senior facilitators were a great inspiration for her. Lynn realized that she first of all needed to improve her German skills to improve her teaching, but that such barriers should not prevent her from teaching. If her language skills would have been better, she could have been more actively involved in the group exercises.

Evaluation: At the end of each day as well as at the end of the course, participants filled out course evaluation forms developed by Martyna Gassowski, EPIET-associated German programme fellow C2017, to assess the relevance for their own work, and the comprehensibility and usefulness of the course content. The facilitators met to discuss the results of the evaluation after the course which had been put together and analysed by Martyna and Lynn.

Case study: Mapping of disease outbreaks with QGIS software - Outbreak investigation module 2018

The outbreak investigation modules for C2017 and C2018 were organized by ECDC and took place at the RKI in December 2017 and 2018, respectively. Lynn reviewed and co-facilitated a mapping case study in the 2017 module. Subsequently, she drafted the first and second version of a novel, more realistic mapping case study for epidemiologists familiar with theoretical understanding of outbreak investigation (i.e. EPIET fellows of cohort 2018) for the 2018 module. In order to do this, she took the feedback into account of the C2017 fellows and discussed the possibilities for this case study with the local facilitators of the module and EPIET coordinators. In a later stage, also Benjamin Tittmann, EPIET-associated programme fellow C2017, contributed to this case study, and the case study was reviewed and finalised by the facilitators and coordinators. The training objectives of this 1.5 hours' activity were: At the end of the case study, the participant will be able to:

- Explain how mapping can help in an outbreak investigation
- Reflect limitations and applicability of the QGIS software in outbreak scenarios
- Geocode a dataset
- Import and modify spatial data to QGIS
- Apply basic QGIS functions in outbreak situations

- Produce an adequate geographical map in QGIS

6. Other activities

Routine surveillance of Hepatitis C October 2017-July 2019

Weekly control of completeness and coherence of data reported in HCV notifications as well as trend and cluster monitoring of national surveillance data. Lynn participated and prepared biweekly internal meetings with the Hepatitis B, C & D surveillance unit to discuss ongoing surveillance and improvement of data quality of reported HCV cases. She contributed to improvements in plausibility checks, to the annual HCV surveillance reports published in the German Epidemiological Bulletin, and to the HCV chapter of the epidemiological year books. Furthermore, Lynn contributed to the line-listing, communication, as well as preparations for phylogenetic and epidemiological investigations of a HCV outbreak (mainly study design).

Monitoring of the Rapid Alert System for Food and Feed (RASFF)

Monitoring of the RASFF alerts from the European Commission for during 2 months and providing information to local health authorities in case of relevant infectious disease-related risks from food in Germany.

Infectious Disease Surveillance Conference Call at RKI (EpiLag)

The EpiLag conference call is a structured platform for weekly exchange of information about current events related to infectious disease epidemiology between national level and federal states. Exchanges include information relevant to both national and international events in Germany and Europe. Input by RKI is derived from an established, weekly search protocol of different national and international sources for relevant information to present at EpiLag. Lynn was the editor during 2 weeks; i.e. she prepared reports on international events signalled by the "Informationsstelle für Internationale Gesundheit" and other information to be transferred to the federal states, and wrote and sent out the notes of the meetings.

Internship at a local health authority

Lynn interned during one week at the "Gesundheitsamt" Charlottenburg-Wilmersdorf in Berlin in order to experience what the day-to-day work activities are like in a German local health authority. She for example learned about the permit that food handlers need to obtain there (so-called "rote Karten"), how incoming infectious disease notifications are handled and researched, and how infection prevention measures are taken if necessary, how ambulatory medical practices are audited, how drinking and swimming water quality is tested, what the local health authority does when a human dead body is found (e.g. homeless people), and how they do STI testing for people without health insurance.

7. EPIET/EUPHEM modules attended

1. Introductory Course, 25/9 - 13/10/2017, Spetses, Greece
2. Outbreak Investigation Module, 4-8/12/2017, Berlin, Germany
3. Multivariable Analysis Module, 16-20/4/2018, Nicosia, Cyprus
4. Rapid Assessment & Survey Methods Module, 14-19/5/2018, Athens, Greece
5. Project Review Module, 5-9/11/2018, Lisbon, Portugal
6. Time Series Analysis, 5-9/11/2018, Brussels, Belgium
7. Vaccinology Module, 24-28/6/2019, Lisbon, Portugal
8. Project Review Module, 26-30/8/2019, Prague, Czech Republic

8. Other training

Introductory week at the RKI, organized by the German FETP programme, Berlin 15-22/9/2017

Laboratory Methods for Epidemiologists, organized by the German FETP programme at RKI 8/2/2018 & 20-23/2/2018

UNDSS online courses on Basic and Advanced Security in the field 27/4/2018

Course on literature management in Endnote, Berlin, 3/5/2018

eModules on the Global Outbreak Alert and Response Network (GOARN), working with GOARN in the Field, and the WHO Incident Management System 3-4/5/2018

Institut Pasteur Massive Open Online Course (MOOC) on Resistance to antibacterial agents, 14/5-24/6/2018

MSc in Applied Epidemiology, Charité Universitätsmedizin Berlin. Master thesis: "Bridging the gap between hepatitis C routine diagnosis in local labs and national surveillance in Germany" *expected date of graduation 11/2019.*

Discussion

Supervisor's conclusions

Lynn has taken on more projects than needed to fulfil the EPIET competency requirements. Some of the projects posed great challenges, e. g. communication and administrative issues before and during her field research in Madagascar or prolonged discussions about the applicability of different statistical models for data analysis of risk factors for ESBL-PE in long-distance travellers. While acknowledging that external circumstances were not always favourable, she has completed all her training objectives with good results.

Lynn has laudable attention to detail, technical skills and aimed for high standards in every project. She learnt to modify her research skills to working in applied epidemiology where one has to work with imperfect data and under imperfect circumstances and still try to make the best of it. I trust that Lynn will benefit from her EPIET fellowship not only in terms of her excellent scientific achievements but also from "surviving" it, i.e. learning from the unforeseen challenges and adapting to public health reality.

Looking at Lynn's output, I imagine that her projects on hepatitis C surveillance may have an impact on the future content of hepatitis C notifications in Germany, which is a tangible public health impact.

Coordinator's conclusions

Lynn was integrated into the HIV/AIDS, STI and Blood-borne Infections unit and was involved in ongoing Hepatitis C surveillance but also in two in-depth surveillance projects that will impact on the need to adapt Hepatitis C surveillance with the changes in treatment. Coming from a research background, Lynn has acquired many public health skills and has participated in a wide variety of tasks and projects fundamental to public health epidemiology, as evidenced by her core competencies – such as dealing with routine surveillance, alerts, answering press queries, outbreak detection. She has also gained useful experience with her international mission. Lynn produced work of high quality with much thought into all aspects of her work. During her time in EPIET, she has improved her epidemiological skills and has achieved a high level of competence. She has also improved her multi-tasking skills and gained more confidence in her own abilities. Lynn is committed to field epidemiology and has excellent professional skills for any epidemiological and public health related work, at regional, national and international level. She has been a pleasure to work with and I wish her all great success in the future.

Personal conclusions of fellow

For me the EPIET fellowship was my first experience in the public health sector and therefore an exceptionally insightful experience. EPIET allowed me to quickly grow from an interdisciplinary scientist into a public health professional, to learn how to apply my epidemiological and academic skills in public health and in the European context, and to boost my epidemiological, communication and managerial skills. Over the two years of the programme, I have been exposed to a wide variety of topics, some of which were completely new to me. I now feel that I have a firm grasp on intervention epidemiology and a clear understanding of disease surveillance. The exchange with other fellows, supervisors, coordinators and RKI staff was also very enriching, and allowed me to build a strong professional network. I am looking forward to putting my newly gained EPIET skills into practice, to continue working with the EPIET spirit, and hope to contribute to the improvement of public health in Europe and beyond.

Acknowledgements of fellow

I would like to thank all my colleagues at the Infectious Disease Epidemiology Dept. at the RKI for creating a supportive and stimulating professional environment during my fellowship. I particularly would like to thank each of the above-mentioned supervisors for giving me the opportunity to work on all these great projects. Special thanks to my mentor Dr Gerhard Falkenhorst and buddy Tanja Charles for always being there with good advice, to Dr Viviane Bremer for hosting me in unit 34 (HIV/AIDS, STI and Blood-borne Infections), to Dr Uwe Koppe for being a such

wonderful office mate, and to the PAE fellows of my cohort for their friendship and support: Inessa Markus, Benjamin Tittmann, Amrei Krings, Martyna Gassowski, Dr Adine Marquis, and Dr Regina Selb.

I furthermore owe a big thank you to my frontline coordinator Dr Sooria Balasegaram, for being such an inspirational role-model, for always being available, and for all your great ideas and fantastic support. I would also like to thank Dr Marion Muehlen, Dr Aftab Jasir, and all the coordinators and facilitators that contributed to the excellent modules, as well as the Faculty Office. It really has been a privilege to be an EPIET fellow.

Last but not least, I would like to thank my husband, P  p  . Without his constant support I would not have been able to start nor complete EPIET.