FELLOWSHIP REPORT

Summary of work activities

Tom Woudenberg
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;

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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.

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

Pre-fellowship short biography

Prior to his fellowship, Tom worked at the Dutch institute for Public Health and the Environment (RIVM). For four years, he studied a measles outbreak in The Netherlands as part of a PhD programme. The focus of this PhD thesis was the epidemiology and control of measles. In addition, two chapters focused on the serology of measles. His Master'sand Bachelor's degree is in health sciences. For his master's thesis Tom worked at Fiocruz, Rio de Janeiro to study the burden of dengue.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On September 10, 2018, Tom Woudenberg started his EPIET fellowship at the Bavarian Health and Food Safety Authority, Oberschleißheim, Germany, under the supervision of Katharina Katz and Andreas Sing. 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.

[1] European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2013. Available from: http://ecdc.europa.eu/en/epiet/Documents/Scientific%20guides/EPIET%20Scientific%20Guide_C2015.pdf

Fellowship projects

1. Surveillance

Title: Influenza season 2018/2019 completely dominated by Influenza A; findings from a sentinel surveillance in Bavaria, Germany

Seasonal influenza constitutes an important public health burden in Europe. In Bavaria, Germany, sentinel surveillance for acute respiratory infections signals the start and end of the influenza season, describes circulating influenza viruses, and identifies groups at higher risk for severe disease. We describe Bavarian Influenza Sentinel (BIS) results from the 2018/2019 season.

BIS comprises 75 physicians, both paediatricians and GPs, who submit specimens weekly from two randomly-chosen patients presenting with acute respiratory symptoms, from week 40 to week 16, to the state health authority (LGL). Specimens are tested with RT-PCR to identify the influenza virus type. Physicians use a standardized questionnaire to collect information about symptoms and vaccination status.

Of 1761 specimens tested for influenza, 35% were positive. Positivity rate, weighted by age (children, adults) was 36% (95%CI 33-38%). The majority of specimens were influenza A virus-positive (99.7%), (58% Influenza A(H1N1) and 37% A(H3N2)). The season started in week 2 and peaked over weeks 7–10 in 2019, with a positivity rate of more than 60%. The highest average positivity rates (38%) were among children aged 6-18 years. Vaccination coverage among people 60 and older, recommended to receive flu vaccine, was 33% among those with confirmed influenza infection, and 44% among those without.

Results from this sentinel system, illustrated that season 2018-2019 was dominated by influenza type A, and virus circulation exhibited a month-long peak. The dominance of influenza A has been observed elsewhere in Germany and Europe, and is remarkable given the dominance of lineage B in season 2017/2018. Early detection of seasonal influenza provides valuable information for clinical decision-making; and characterization of circulating viruses informs future vaccine formulation.

Role and outputs: *principal investigator*

Tom Woudenberg was involved in the weekly data analysis and reporting of results. These results were published weekly on the LGL web-page and in the bulletin "LGL Monitor", which is distributed to all local health authorities in Bavaria. The fellow led the data analysis, and wrote the first draft of a yearly report that was sent to participating physicians and a Bavarian medical journal (1). Furthermore, the results were presented at ESCAIDE 2019 (2).

Supervisor(s): *Ute Eberle, Andreas Sing*

Title: Development of a system of automated analyses and reporting in times of pandemic COVID-19 in Bavaria, Germany

A timely epidemiological analysis of notification data is important in times of a COVID-19 pandemic. This requires continuous analysis of notification data. A commonly used tool is Microsoft Excel. Microsoft Excel is generally non-reproducible, can be time consuming and is prone to error. RMarkdown is a tool that allows creation of reports that include analytical code. The advantage of Rmarkdown is that a report, comprising written text, figures and tables, can be easily updated when new data is used. Rmarkdown also enhances transparency as the script can be shown alongside the report. The objective of this work was to develop automated analyses and reporting of COVID-19 data. The implementation of Rmarkdown documents that generate automated analysis and reporting substantially reduced the analytical burden, reduced the opportunities for error and increased reproducibility and accountability. The reduction in time and effort has allowed the EPI-unit at LGL to dedicate our time to the interpretation of epidemiological data rather than spending it on creating content.

Role and outputs: *principal investigator*

The fellow wrote an R script to retrieve and analyze surveillance data. The R-script was incorporated in an Rmarkdown document that enabled automated analyses and visualization of surveillance data on a daily basis. In total, three Rmarkdown documents were written by the fellow. These three were used on a daily basis and generated reports that were sent to the Ministry of Health, to the web redaction for publication on the LGL website, and to local

health authorities. The reports consisted of a geographical representation of notification data, a description of the temporal distribution of the notified cases, and in-depth analyses of the age, sex, and hospitalization status of notified cases, as well as deceased cases. Furthermore, standard operating procedures were written.

Supervisor(s): *Katharina Katz*

Competencies developed:

Running this viral sentinel system gave me a better concept of what a laboratory-based surveillance system encompasses. While being engaged in the weekly reporting and analyses, I developed a better grasp of how concepts such as representativeness, timeliness, and usefulness are crucial in monitoring a seasonal influenza epidemic. Especially when one aims to detect early transmission of influenza. I also became more aware of different types of surveillance that can be used to monitor a disease. Before I worked on this project, I was mostly focused on notification data. Further, content-wise, I also learned more about the biology of the virus, for example the genetic drift and shift, the different subtypes of influenza A and linages of Influenza B, etc. Last, I improved my proficiency in the German language, as I wrote a manuscript in German.

The use of the Rmarkdown documents and creation of situation reports made me learn what types of information an epidemiologist finds essential to detect public health threats, being an increase in SARS-CoV-2 transmission. Individuals with different backgrounds and professions, however, do not necessarily agree with what is considered essential. What is considered essential is viewed differently between different experts and is subject to the timing in the pandemic, as well as what is being shown in daily reports from other renowned institutes. Being in this situation taught me to find a balance between what makes sense from my point of view, and what is requested in a dynamic political arena driven by a viral pandemic with huge consequences.

2. Outbreak investigations

Title: Following a cluster of Salmonella enterica serotype Enteritidis identified by whole genome sequencing in southern Germany 2018-2019: more analytical epidemiological investigations needed.

The use of whole genome sequencing has been shown to delineate outbreak clusters with a higher resolution compared with previous methods. Epidemiological and food trace back investigations are often still needed to find the source of infection and essential in interpreting sequence data. We aimed to find the source of infection of a cluster identified with cgMLST by investigating outbreaks and sporadic cases.

We found a total of 61 cases, of which 33 were part of this cluster based on sequencing results and 28 cases were epidemiologically linked to the cluster. Forty-four cases were part of outbreaks, and 17 cases were sporadic. One outbreak, comprising 28 cases, was investigated using a cohort study. The vehicle of infection was spätzle, which is a type of pasta. Further food trace back investigations into the eggs that were used to produce the spätzle only derived *Salmonella* Enteritidis negative samples. Two other outbreaks were not investigated through analytical studies.

Due to a combined effort of epidemiological, microbiological and trace back investigation, we were able to conclude that spätzle, a certain type of pasta, was the vehicle of infection of one outbreak causing 26 infections of *Salmonella* Enteritidis. Finding the vehicle of infection is the first step towards finding the source of infection. To prevent further cases of *S.* Enteritidis, sources of infection need to be identified. These sources can be found by identifying vehicles of infection by conducting more and timelier analytical epidemiological investigations guided by timely next generation sequencing, enabling targeted food trace back investigations. These targeted food trace back investigations could ultimately lead to the discovery of a source of infection and really prevent further infections.

Role and outputs: *principal investigator*

Tom Woudenberg provided analytical support to a local health authority leading the local outbreak investigation. The fellow continued the outbreak investigation, comprising further case finding of cases that could be linked due to identical isolates, conducting analytical analyses, and generating a hypothesis. After writing the first draft of the outbreak investigation report, Tom presented the results at the BundLänder Arbeitsgruppe Surveillance at RKI (3). Tom also wrote an abstract and presented the results at ESCAIDE 2019 (4).

Supervisor(s): *Katharina Katz*

Title: Investigation of a COVID-19 outbreak in Germany resulting from a single travel-associated primary case: a case series

In December, 2019, the newly identified severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in Wuhan, China, causing COVID-19, a respiratory disease presenting with fever, cough, and often pneumonia. WHO has set the strategic objective to interrupt worldwide spread of SARS-CoV-2. An outbreak in Bavaria, Germany, starting at the end of January, 2020, provided the opportunity to study transmission events, incubation period, and secondary attack rates.

Transmission events were likely to have occurred presymptomatically for at least one case, and at least on the day of symptom onset for 4 other cases. Despite cases having predominately mild, non-specific symptoms, they were infectious before or on the day of symptom onset. The finding that transmission can occur prior to the onset of symptoms or from patients with very mild symptoms makes it much more difficult to contain the spread of disease. To contain the spread, very timely and rigid contact-tracing is required to stop transmission chains.

Role and outputs: *co-investigator*

For the estimation of the secondary attack rates of COVID-19 cases, the denominator needed to be determined. The numerator was the number of cases among contacts and the denominator was the number of contacts of these cases. The fellow collected the number of contacts from all local health authorities involved in the outbreak investigation to estimate the attack rate. Böhmer et al summarized the outcomes of these analyses in Table 3 of the publication (5).

Supervisor(s): *Katharina Katz, Merle Böhmer*

Competencies developed:

My involvement in these outbreaks mostly improved my analytical skills. I also recognised that increased knowledge on a subject leads to increased creativity in generating hypotheses. More specifically, I applied many of the ten steps in an outbreak investigation in practice. I especially learned a lot about the additional value of WGS in foodborne outbreaks. Further, it was insightful to transform the manuscript focusing on one singular Salmonella outbreak into a manuscript analysing the epidemiological and microbiological data of a cluster of genetically identical incidental cases and outbreaks of Salmonella Enteritidis spread in time and place.

3. Applied epidemiology research

Title: Dynamics of Borrelia burgdorferi specific antibodies: Seroconversion and seroreversion between two population-based, cross-sectional surveys among adults in Germany

Lyme borreliosis is the most common vector-borne disease in Europe. The burden of disease is high, with up to 300 reported cases per 100,000 population and it constitutes a major public health impact given the wide arrange of manifestations, including severe ones such as lyme neuroborreliosis and arthritis. Lyme borreliosis is, for various reasons, difficult to combat and a challenge for public health. Disease surveillance from mandatory reporting is hampered by the fact that a clear stand-alone meaningful laboratory diagnostic test is not available. Data on the population distribution of the infection determined by serosurveys can be used as a surrogate for surveillance and provides population-representative estimates, not only for prevalence but also for factors associated with B. burgdorferi s.l. infections.

We assessed the seroprevalence from blood samples taken from participants included in two nation-wide population-based surveys Germany. A subset of the participants was included in both serosurveys and allowed us to estimate seroconversion and seroreversion rates. The manuscript is currently under review.

Role and outputs: *principal investigator*

Tom analysed data, drafted a manuscript and submitted the final manuscript to Microorganisms (6).

Supervisor(s): *Hendrik Wilking, Volker Fingerle*

Title: Epidemiology and transmission characteristics of early COVID-19 cases, January 20 – March 19, 2020, in Bavaria, Germany

As most of Europe experiences declining case numbers, with accompanying relaxation of lockdown measures and increasing travel activity, the risk of new introductions and transmission from returning travellers with SARS-CoV-2 is ever-present. We described the epidemiology and transmission characteristics of COVID-19 cases in Bavaria, Germany during the initial weeks of the outbreak. Our analysis identified that an important proportion of reported cases were attributable to travel outside the region, which led to rapid local transmission and a steep increase in cases in Bavaria. We emphasise the importance of sustaining monitoring and risk assessment of SARS-CoV-2 in travel destinations outside one's own jurisdiction, and continuing to isolate returnees from higher-risk areas.
In addition, we are the first to estimate the incubation period and serial interval based on European case and contact data. Our finding, that 95% of cases developed symptoms by 11 days after exposure, provides concrete evidence to inform control measures and to set the duration of isolation for returnees.

Role and outputs: *principal investigator*

Tom Woudenberg conceived the study idea, analysed the data, and wrote the first draft of the manuscript. The manuscript is currently under review at Epidemiology and Infection (7).

Supervisor(s): *Katharina Katz, Lisa Hansen*

Title: Identifying high-risk villages to screen for human African trypanosomiasis in Maniema, Democratic Republic of Congo: findings from an active screening campaign

Human African trypanosomiasis (HAT) is a parasitic disease that can be fatal if left untreated. MSF conducted an active screening campaign for HAT, deploying mobile teams in remote areas of the Democratic Republic of Congo (DRC) between February 2018 and June 2019. We aimed to identify village-level risk factors associated with the presence of HAT cases, to better inform future targeted screening activities.

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In total, 32,343 individuals were screened for HAT out of an estimated population of 41,764 (77.4%). With 46 (Card-Agglutination Trypanosomiasis Test 1:16) positive cases, the incidence of strongly suspected cases was 1.4 per 1000 screened individuals. Strongest risk factor for HAT cases in a village was proximity to a village with cases. The incidence ratio was 2.4 (95%CI: 1.3 – 4.7) for villages close (< 4.5 km) to villages with strong suspect HAT cases compared with villages further away.

Given the low prevalence of disease, active screening campaigns might not be efficient. Apart from the observation that villages with HAT cases tended to cluster, other risk factors did not have sufficient predictive power to guide screening programs. We recommended using a passive screening system (screening for HAT in routine health checks within existing health structures) and only upon finding HAT cases, apply active screening of villages within a radius of 4.5 kilometres.

Role and outputs: *co-investigator*

Tom Woudenberg carried out the data analysis and assisted in the writing of the manuscript. The fellow spent a week at the Manson Unit of MSF in London, UK to familiarize himself with the project and clean the data under supervision of Maria Verdecchia and Raphael Brechard. Further data analyses was conducted at the fellow's host institute LGL. With assistance from Maria Verdecchia and Cono Ariti, the fellow carried out the analyses. The project was accepted as an oral presentation at the MSF scientific days (8). Together with a co-author, the fellow presented the results during an online version of the conference. A manuscript is in preparation. The fellow will be listed as a co-author.

Supervisor(s): MSF: *Maria Verdecchia, Raphael Brechard*

Competencies developed:

These three different research projects have taught me a great deal. Firstly, of course, the acquisition of knowledge about three different diseases. And secondly, applying different methodologies to answer different research questions. Furthermore, I also worked with three different institutes, namely RKI, RIVM and MSF. Last, I found the cooperation with the laboratory particularly exciting.

4. Communication

Publications in peer reviewed journals

One manuscript entitled "Investigation of a COVID-19 outbreak in Germany resulting from a single travel-associated primary case: a case series" was published at Lancet Infectious diseases (5).

Manuscripts submitted to peer reviewed journals (in review process)

Two manuscripts submitted and currently under review (6, 7)

Conference presentations

Two poster presentations at ESCAIDE 2019 (2, 4)

Other presentations

Presented the results of surveillance data of Human African trypanosomiasis at the Scientific Days of MSF (8)
Presented the first results of an investigation into a Salmonella outbreak at the Bund-Länder-Arbeitsgruppe at Robert Koch Institute (3)

Reports

Other

Presented a research proposal about a source-attribution study on campylobacter at Jour Fix, RKI.

Presented an overview of measles outbreaks in The Netherlands at Landeszentrum Gesundheit Nordrhein-Westfalen

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5. Teaching activities

Title: Outbreak investigations of infectious diseases (Technical University Munich)

It involved two lectures and one case-study presented to master students from the Technical University of Munich, who are enrolled in a master of Health sciences. The lectures and case-study are embedded in a course titled "Global health epidemiology". The lectures were 45 minutes and the case-study 1.5 hour. The target audience was master students.

The learning materials were 2 PowerPoint presentations and one paper document. The first lecture addressed the epidemiology and control of a measles outbreak in the Netherlands. The second lecture concerned a talk about the ten steps in an outbreak investigation. I discussed the ten steps along a practical example (Giardiasis outbreak in Norway). I adapted both presentations to the needs of the students. I used the case study of an outbreak of Trichinosis in France. I ensured the active participation of the students by using mentimeter.com during the first lecture. After several slides I asked the students to use their phone to answer a question about the content of my presentation to assess their understanding of my talk. During the second lecture I paused several times to ask how they would proceed in the practical example of giardiasis in Norway. I also distributed a survey after the course to assess the understanding of the students about the study material.

Using mentimeter.com created a livelier presentation and it also enabled me to correct possible misunderstandings when I observed answers that were wrong. This worked very well. In addition, I received feedback by mail from the teacher of the course, saying that the presentations were very interesting and that the students had enjoyed it. Last, the results from the survey suggested that the students had grasped the lectures as the averages of the 8 questions ranged from 3.6 to 4.625 on a scale of 1-5.

Supervisor(s): *Durdica Marosevic*

Educational outcome:

The activity contributed to a better understanding of my knowledge about the ten steps in an outbreak investigation, as well as using either a cohort or case-control study.

For me, it was the first time using an online tool to measure the understanding of the students in real-time; this is definitely something that I will use in future talks. Unfortunately the free version of mentimeter comes with limited functionality, and I am not aware of a free alternative.

I used surveymonkey to distribute the survey among the students. This tool is also limited without upgrade. Next time I will either use the tool developed by PHE or EUsurvey.

Title: Europe's defences against infectious diseases – disease detectives (VU University)

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. 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 'flat' 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.

Supervisor(s): *Maiza Campos Ponce (VU University)*

Educational outcome:

Considering the aim of the session, the participating fellows did not consider that a subsequent formal evaluation of students' knowledge was appropriate. However, a lecturer at the VU gave the following feedback:

"The presentations were very well structured, with a good mix of presentations on research and surveillance and their own careers. Very inspiring for both the students and also myself. Slides were clear, highlighting the main points. Also all presenters had a clear voice and looked relaxed and presented well. It truly was a treat for our MSc and AUC students."

The VU lecturers invited us to return to VU to teach in the future, if we were interested.

My personal reflection: Within the limited possibilities of a lecture of one hour and 15 minutes, it went very well. It was a versatile, lively session with different topics and ditto personalities. Something for everyone, and a perfect appetizer for a career in field epidemiology and advertisement of the EPIET-programme. For my part, I tried to briefly discuss two completely different outbreaks. This succeeded, however, I could have made it a bit livelier by including online real-time questions.

Title: Interdisciplinary Workshop on Epidemiological Investigation of food-borne outbreaks

This is a 3-day workshop for staff working at the local food safety and health authorities. The workshop aims to improve the expertise on outbreak investigations and to make medical officers and food safety employees reflect on their roles during outbreak investigations, to increase understanding and improve collaboration between the two. The workshop trains about 20 participants. Since the aim of the course is to improve collaboration, it is mandatory to have two participants from one district working for the two different disciplines (food safety and health) taking part in the workshop.

Duration, location, date: 3 days, Bad Alexandersbad (Bavaria), 17.09.19.-19.09.2019

Four lectures were distributed over the course of the workshop to improve the expertise on outbreak investigations. The content of the lectures was repeated and applied by participants when working on case studies. The four lectures were divided between Stefanie Böhm (SB) and Tom Woudenberg (TW). Lecturers SB and TW facilitated groups of 6-8 participants working out different steps of an outbreak investigation using a case-study.

Lecture 1: Outbreak investigation – first steps (17.09.2019; 30 min) (SB)

Lecture 2: Outbreak investigation – descriptive analysis + Line list tool (17.09.2019; 45 min) (TW)

Lecture 3: Outbreak investigation – analytical analysis + Line list tool + bias and confounding (18.09.2019; 45 min) (SB, TW)

Lecture 4: Outbreak investigation – Summary and conclusion (18.09.2019; 30 min) (SB)

Case study 1: Outbreak investigation (18.09.2019; 3hrs)

Supervisor(s): *Durdica Marosevic*

Educational outcome:

I developed my knowledge regarding outbreak investigations and I also believe I increased my teaching skills. As the participants had little experience with outbreak investigations, let alone estimating risks, I started the lectures with examples from the field, instead of starting with theoretical concepts. These examples were recurring between the different lectures. In addition, I tried to clarify certain concepts with figures instead of text.

Preparing a German presentation required a lot of time. Since my fluency of the German language is suboptimal, I needed to spend a lot of time memorizing the presentations. My level of German was insufficient to lead the case-study. Luckily I was not alone in presiding the case-study and a colleague could take over when my German hampered the process. Nonetheless, I was able to explain certain concepts. But I definitely need to improve my German to be able to lead a group of public health professionals in a professional way by myself.

Title: Introductory course into R

At the Bavarian Institute for Food Safety and Health, there was a need for an introductory course to the statistical programme R. Given my experience with R, I decided to set up a course. This course consisted of 4 parts: A general introduction, data processing, data visualization and a repetition session. Each part was addressed in a session of 1.5 hours. Every session consisted of a short PowerPoint presentation (10 minutes), a case study (70 minutes), and a recap moment (10 minutes).

The PowerPoint presentation showed the objectives of the sessions. Often I would also code in real-life to show what the participants were about to do. The case studies were developed so that participants would be able to go through

them independently. I was around for trouble shooting. At the end of the session, I would give a short wrap-up of which functions were used and I would address common mistakes or asked questions.

The sessions were given in a room with 25 computers.

Supervisor(s): *Durdica Marosevic, Katharina Katz, Andreas Sing*

Educational outcome:

Foremost, developing a course requires a firm reassessment of the basics of programming in R. This hugely increased my understanding of the statistical programme R. On top of that, participants asked all kinds of questions. These questions came from people with a different perspective on programming and using command-based statistical software. This gave me some insight into their way of thinking.

6. Other activities

- Designed an interactive dashboard to be used during the seasonal influenza epidemic on the website of LGL
- Wrote a first draft of 6 chapters (Salmonella, Campylobacter, EHEC, HUS, Typhus, and Influenza) of the annual report on notifiable infectious diseases in Bavaria, Germany. The report is named "Jahresbericht meldepflichtiger Infektionskrankheiten in Bayern 2018".
- Held a webinar of 40 minutes for peer-fellows and others about the measles outbreak of 2013-2014 in The Netherlands. (09.11.2018)
- During the RAS module, I prepared a session about data visualization in R. It consisted of a short introduction before a training session where we gave instructions to produce different kinds of graphs. A reference document is being made for the EPIET-fellows.
- Prior to ESCAIDE, I taught health professionals how to use R, together with a team from RECON, who are largely affiliated with Imperial College London. I facilitated the course (2 day-course) and gave a brief lecture on data visualization with the package ggplot2.

7. EPIET/EUPHEM modules attended

1. Introductory course, 24 September 2018 – 12 October 2018, Spetses, Greece
2. Outbreak investigation, 3 – 7 December 2018, Berlin, Germany
3. Multivariable analysis, 25 – 29 March 2019, Madrid, Spain
4. Rapid Assessment and Survey Methods, 13 – 18 May 2019, Zagreb, Croatia
5. Project Review2019, 26 – 30 August 2019, Prague, Czech Republic
6. Time Series Analysis, 4 – 8 November 2019, Utrecht, Netherlands
7. Vaccinology, May – June 2020, online course and webinars

Supervisor's conclusions

During his EPIET training, Tom has further strengthened his skills as an expert public health epidemiologist. Tom has gained comprehensive practical and theoretical knowledge in various fields of infectious diseases epidemiology with a very good flavour of public health microbiology.

His most impressive and extremely diverse planned project matrix addressing influenza, borreliosis, salmonellosis, food-borne infections and African trypanosomiasis either as epidemiological outbreak investigations or surveillance activities clearly testify to his motivation, scientific expertise and thorough analytical capacities. Of course, his time at the LGL was topped by hisunplanned" activities in the COVID-19 pandemic in which Tom was involved in many different aspects of both practical and scientific work as a key member of the Bavarian COVID-19 Response Task Force which was started in late January with the very first outbreak in Europe and continues to work since then. The different fields of Tom´s pandemic- and policy-driven engagement are too numerous to mention, among others the daily production of different epidemiological markers and reports on the on-going pandemic in Bavaria. Unfortunately, a joint GOARN-WHO Africa field epidemiology study on Ebola for which Tom was nearly on his way to the Republic of Congo had to be cancelled at very short notice due to the COVID-19 pandemic.

Due to his broad knowledge in epidemiology, statistics & novel surveillance tools, his both mindful and enthusiastic character, his refreshing team spirit as well as his interest in teaching he instantly became a very valuable team member and was named "Doctor R" – due to his patient and inspiring teaching in the statistical tool R. Tom and R

helped us also a lot as bridge-builders between lab and epi people making lab statistics a lot easier and more visible during the COVID-19 pandemic.

Nearly incredible: despite his heavy EPIET and LGL work load Tom managed to finish his PhD on measles epidemiology and control in the Netherlands – defending his highly recommended thesis at the University of Utrecht just days before the first COVID-19 cases were diagnosed in Bavaria.

Due to his powerful and dedicated initiative, his broad interest in all aspects of infectious diseases epidemiology, surveillance and outbreak management it was very easy and rewarding to supervise Tom during his fellowship; he independently planned and implemented epidemiological studies, engaged himself in teaching public health experts and MPH students. Very importantly, Tom was able to adapt very fast to the German public health system and learned the language quite quickly ending up speaking German much better than Arjen Robben, the other great Dutch in Bavaria in recent years ; due to his dedicated and thoughtful attitude, his fine sense of humour and his social skills he was a great communicator both within our team as well as outside the LGL on a regional, national and international level. In conclusion, we have to thank both the EPIET program and Tom as an extraordinary fellow for their sustainable impact on our public health epidemiology & microbiology capacities.

Coordinator's conclusions

Tom demonstrated classic field epidemiologist flexibility and adaptability in choosing his training site, and made the most of diverse opportunities available to him. He has been able to further develop his analytical skills, while expanding his knowledge of new disease areas and programmes. Tom successfully defended his PhD during his fellowship, which reflected his comprehensive grasp of a specific topic and context, while advancing projects as diverse as analysing screening data on human African trypanosomiasis, evaluating influenza surveillance in Bavaria, investigating a complex cluster of salmonellosis cases, and contributing to the German response to early COVID19 introduction and transmission. Tom has shown his enthusiasm for continued learning, and for sharing his expertise with others, as well as his capacity for working across disciplines in a collaborative way, to address shared public health goals. His calm demeanour and focused insight will make him a valuable member of any team.

Personal conclusions of fellow

The EPIET programme has made me a better epidemiologist. Firstly because of the experience of working in a foreign environment with a different public health structure and secondly because of the opportunity to work on a variety of infectious diseases through outbreak investigations, (routine) surveillance and research projects. I have also improved my computational skills in R enormously, as I have taught others to apply R in infectious diseases epidemiology. I also improved as a teacher due to the various lectures and working groups that I gave and supervised, but above all because I was given the opportunity to set up an introductory course in R at my host institute. Finally, going through the EPIET programme is an entry ticket to a large network of professionals working in public health in Europe.

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