



FELLOWSHIP REPORT

Summary of work activities

Sebastian Thole

Intervention Epidemiology path (EPIET)

Cohort 2016

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;

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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.

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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

Sebastian Thole is a biologist. While finishing his PhD in the field of microbial genomics in 2011, he started his career at the North Rhine-Westphalian (NRW) Centre for Health in Bochum, Germany. He worked as a research associate in the Dutch-German INTERREG project EurSafety-Health-Net, focussing on cross border prevention of antimicrobial resistance.

In 2014 he moved to the section Infectiology and Hygiene. In the field of immunization and control and prevention of vaccine preventable diseases (VPD), Sebastian's main tasks are consultancy and scientific advice to public health authorities and the Ministry of Health in North Rhine-Westphalia.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On September 15, 2016, Sebastian Thole started his EPIET fellowship at the NRW Centre for Health, Bochum, Germany under the supervision of Dr Annette Jurke. This report summarizes the work performed during the 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

Supervisor(s): Dr Annette Jurke

Title: Surveillance of invasive meningococcal disease (IMD) in North Rhine-Westphalia, 2004-2017

While IMD incidence is low in Germany and NRW, its severity and potential public health impact requires rapid detection of IMD cases. The surveillance system for IMD was established in 2001, and cases are mandatorily notifiable by health-care providers and laboratories. In the near future, the existing paper-based reporting from healthcare providers will transition to a computerized system.

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>

The objective of IMD surveillance is to detect every case of IMD, in order to guide immediate and appropriate interventions for contact persons. Further objectives are to measure the frequency and distribution of IMD cases and *N. meningitidis* serogroups, in order to identify high-risk groups and assess the implementation of national immunization strategies. Data completeness, timeliness and sensitivity are the most important attributes of the system's performance.

The purpose of the evaluation was to assess the performance of the IMD surveillance system in NRW from 2004-2017, in order to identify potential areas for improvement. The results can also serve as a benchmark for future evaluations of the new electronic reporting system. The evaluation revealed high levels of data completeness (89 to 99%) and timeliness (>75 % of all cases reported in less than one day in 2016 and 2017). Sensitivity of IMD surveillance in North Rhine-Westphalia was estimated at 98 % (mandatory infectious disease reporting) and 83 % (national reference laboratory), mainly attributable to manual data curation efforts by local and state health authorities. Improvement is required in the accurate recording of disease related dates and notification dates. Furthermore, more isolates should be sent to the national reference laboratory to determine *N. meningitidis* serogroups.

Role: principal investigator

Sebastian developed the protocol for evaluation and conducted the surveillance system evaluation. He extracted, cleaned and analysed surveillance data and undertook the capture-recapture analysis. He wrote the report (4).

2. Outbreak investigations

Supervisor(s): Dr Annette Jurke

Title: Non-foodborne outbreak of acute gastroenteritis among German guests in a self-catering youth accommodation in Austria, March 2017

In March 2017, a group of 51 students and 16 adults from North Rhine-Westphalia visited Austria and stayed in a self-catering accommodation. During the trip, over half of the participants experienced acute gastroenteritis. A retrospective cohort study collected information on clinical symptoms, food consumption and risk exposures via a self-administered online questionnaire. Stool samples of some hospitalised cases were analysed.

Of the 44 participants who completed the questionnaire, 35 were identified as a case (AR=80%). 27 were students (AR=61%) and 8 were adults (AR=80%). The predominant symptom was vomiting (91% of cases), and norovirus was confirmed in four stool samples. On the second day of the trip, a student vomited in a corridor connected to several rooms; the outbreak peaked two days later. As the questionnaire responses did not identify a significant food exposure or another risk factor, the presumed vehicle of this outbreak was norovirus dissemination after the first case vomited on the premises.

Responsible adults on school trips should contact local health authorities promptly, for advice on implementation of control measures, including immediate separation of participants with symptoms of gastroenteritis. Additionally, training of adult chaperones on appropriate response to illness incidents is required in order to control norovirus outbreaks on school trips.

Role: principal investigator

Sebastian led the cohort study and developed the online questionnaire, in cooperation with colleagues from the outbreak investigation team. He extracted, cleaned and analysed outbreak data. He wrote the outbreak report (3) and communicated findings with the responsible local health authority and the school. The outbreak will be presented as a poster at ESCAIDE conference, 2018 (6).

Supervisor(s): Dr Annette Jurke

Title: Ongoing HUS outbreak caused by sorbitol-fermenting (SF) STEC O157 in Germany, 2017.

Between December 2016 and May 2017, health authorities in NRW were notified of 16 cases of haemolytic-uremic syndrome (HUS). Of these, 13 occurred in children and adolescents. A strain of Shiga-toxin producing *E. coli* (STEC) O157 was identified as the pathogen. Laboratory analyses characterized 7 cases in NRW belonging to a cluster of 14 confirmed cases in different parts of Germany. A common foodborne source was suspected, and a case control study was conducted in order to identify the vehicle. The outbreak investigation was lead by a team at the Robert Koch Institute. Results indicated packaged minced meat as the most likely outbreak vehicle. However, food safety investigations did not identify and trace back a common food source. No additional confirmed cases were reported after April 2017.

Role: co-investigator

As a co-investigator, Sebastian interviewed five cases (or parents) in NRW, using a standardized questionnaire collecting information on clinical symptoms and potential food and non-food exposures. As member of the federal state level outbreak investigation team, he shared information with the RKI outbreak management team about HUS cases and acted as link between NRW and national health authorities. He co-authored a rapid communication (2).

Title: Contact tracing following measles exposure on three international flights, Germany, 2017

If measles post-exposure prophylaxis (PEP, vaccination or human normal immunoglobulin) is to be effective, European guidelines recommend prompt identification of passenger contacts after a person with contagious measles has travelled by aircraft. In two separate events in April 2017, persons with measles travelled on three international flights to and from NRW. Local health authorities (LHAs) with responsibility for contact tracing were confronted with several problems.

In one event, contact tracing was unnecessarily delayed, due to pending laboratory confirmation of a clinically diagnosed measles case. Accessing passenger contact data was difficult in both events due to data protection issues with the airline. In both events, passengers were not reached in time to provide PEP; one event resulted in at least two secondary measles cases. Eventually, all passengers were informed about the risk of infection by e-mail that was sent by the airline and tertiary cases were presumably prevented.

Despite multiple international conventions and guidelines, contact tracing was hampered by concerns over data protection and ineffective communication between LHAs and the airline. Public health authorities and the transport sector must collaborate to resolve competing legal regulations for infection prevention and data protection, in order to simplify and accelerate identification of air travellers exposed to communicable diseases.

Role: co-investigator and first author

Sebastian was a co-investigator. On behalf of the outbreak management team, he communicated the events. Sebastian wrote the manuscript and coordinated review among co-authors. The manuscript has been finalized and approved for submission to a peer-reviewed international journal (1).

3. Applied epidemiology research

Supervisor(s): Dr Annette Jurke

Title: Small-scale analysis of measles vaccination coverage among children starting school in 2015 in North Rhine-Westphalia, Germany.

Two-dose measles vaccination coverage (VC) among children at school entry has increased from 88.1% in 2007 to 94.3% in 2015 in North Rhine-Westphalia (NRW). However, measles VC varies between NRW's 53 districts: in Münster district, measles VC has been below the NRW average for several years and local areas have susceptible populations where measles outbreaks could occur.

In order to identify local susceptibility, we analysed data from the 2015 school entry examinations (SEE). The vaccination status of 2,356 children starting school was recorded in 45 schools by the local health authorities (LHA). Children who had not received two doses of a measles vaccine were defined as susceptible.

Nine percent (221/2,356) of children had not received two measles vaccinations; 539 (25.3%) of those completely vaccinated received the second dose late. Measles susceptibility ranged from 3.2% to 60.0% (median 8.8%) per school. Five schools had high proportions (20.8-60.0%) of susceptible children. One local physician was identified as healthcare provider for 32% of measles-susceptible children in Münster.

Small-scale analysis of SEE data in NRW successfully identified local areas of higher susceptibility. Based on these findings, LHA can implement direct information programs or catch-up campaigns for schools, families or physicians. LHAs can also target control measures for schools with higher measles susceptibility in the event of an outbreak.

Role: principal investigator

Sebastian wrote the protocol (7), and led the study in cooperation with the Münster LHA, who collected the data. He analysed and interpreted data. The study was presented at the ESCAIDE conference, 2017 (5).

Supervisor(s): Dr. Annette Jurke

Title: *Small-scale analysis of the immunisation status of school-starters in the city of Münster and survey of parents' attitude towards childhood vaccination.*

Surveys on parental knowledge attitudes and beliefs (KAB) and vaccine hesitancy have been performed in several countries and settings. However, no such information is available on a smaller scale, i.e. cities or districts in North Rhine-Westphalia, Germany. In addition to the small scale analysis of measles VC, the research study included a survey of parents to assess local concerns about childhood vaccination.

Parents of children eligible for school entry examinations will be invited to complete an online survey. Respondents will be assigned to one of two groups (complete vs. incomplete), based on the vaccination status of their children. The survey at district level in Münster will provide insight into the reasons why children are not fully immunized, and assess the association of parental attitudes with the vaccination status of their children. The results will enable LHA to develop targeted strategies to address vaccine hesitancy and improve vaccination coverage.

Role: *principal investigator*

Sebastian wrote the study protocol (7). He developed the online questionnaire in cooperation with Münster LHA, developed an informed consent form, and obtained approval from the data protection officer, city of Münster.

4. Communication

Publications

- (1) Thole S, Kalhoefer D, an der Heiden M, Nordmann D, Daniels-Haardt I, Jurke A. Contact tracing following measles exposure on three international flights, Germany, 2017. 2018.
Status: approved by all authors and submitted to Eurosurveillance in September 2018.
- (2) Vygen-Bonnet S, Rosner B, Wilking H, Fruth A, Prager R, Kossow A, et al. Ongoing haemolytic uraemic syndrome (HUS) outbreak caused by sorbitol-fermenting (SF) Shiga toxin-producing Escherichia coli (STEC) O157, Germany, December 2016 to May 2017. Euro Surveill. 2017;22(21).

Reports

- (3) Outbreak investigation report: Norovirus outbreak among children and adults from Kreis Warendorf NRW, during a school ski trip in Austria, March 2017.
- (4) Surveillance system evaluation report: Surveillance of invasive meningococcal disease in North Rhine Westphalia, 2004-2017.

Conference presentations

- (5) Thole S, Iseke A, Daniels-Haardt I, Jurke A. Small-scale analysis of measles vaccination coverage among children starting school in 2015 in North Rhine-Westphalia, Germany. Oral presentation at: European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE); 2017 Nov 6-8; Stockholm, Sweden.
- (6) Thole S, Daniels-Haardt I, Ganser C, Kalhoefer D, Nordmann D, Jurke A. Non-foodborne outbreak of acute gastroenteritis among German guests in a self-catering youth accommodation in Austria, March 2017. Poster presented at: European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE); 2018 Nov 21-23; St. Julian's, Malta.

Other presentations

Oral presentation of the foodborne botulism outbreak during the annual meeting of the LZG.NRW department Infectiology and Hygiene with colleagues from the NRW Food and Veterinary Authority (LANUV - Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen).

Oral presentation: 'measles surveillance data, North Rhine-Westphalia 2001 – 2017'. Talk given during an expert meeting of the local health authorities and the ministry of health in NRW, due to the ongoing measles outbreak, 2017.

Other

- (7) Research study protocol: Small-scale analysis of the immunisation status of school-starters in the city of Münster and survey of parents' attitude towards childhood vaccination.

Guideline for the management of measles cases and outbreaks for public health professionals in NRW (not publicly available).

Preparation of three written statements on planned changes in the national recommendations of the German standing committee on vaccination. (2017 and 2018, upon request of the NRW ministry of health, not publicly available).

5. Teaching and pedagogy

Title: Outbreak investigations and management of human infectious diseases

The objective of the four-day course is to equip staff of local health authorities (LHAs) with theoretical, analytical, and practical competencies to investigate and manage infectious disease outbreaks, including principles of communication during an outbreak. A goal of the training activity was to reduce barriers to conducting epidemiological studies. Target audience included physicians, veterinarians, health engineers and non-medical staff of LHAs in North Rhine-Westphalia.

The overall structure and content of the course met the training needs of the audience and met the expectations of the organizers. Participants remarked on the practical relevance of the course. Some participants criticised the tight time schedule and requested more time for discussion: future courses should allocate more discussion time. Participants were interested in the practical aspects of managing nosocomial outbreaks, and asked for a second case study on that topic.

Role: Sebastian developed a new course syllabus in close cooperation with colleagues. He developed a group exercise, a lecture and the evaluation tools. Sebastian moderated one course-day, gave two lectures and facilitated two case studies. He administered the evaluation and wrote the report.

Reflection

As I was involved in all aspects of planning the training, I learned how to establish the intended learning outcomes to guide development of the activity. Furthermore, I gained knowledge on how to prepare and conduct training evaluation, and to use the results to improve future trainings. I was able to improve my skills in moderation, group management, time keeping and troubleshooting.

6. EPIET/EUPHEM modules attended

1. *Introductory Course, 26/09 – 15/10/2016, Spetses, Greece*
2. *Outbreak Investigation Module, 05 – 09/12/2016, Berlin, Germany*
3. *Multivariable Analysis Module, 13 – 17/03/2017, Zagreb, Croatia*
4. *Rapid Assessment and Survey Methods Module, 08 – 13/05/2017, Athens, Greece*
5. *Project Review Module, 28/08 – 01/09/2017, Lisbon, Portugal*
6. *Time Series Analysis Module, 20 – 24/11/2017, Bristol, England*
7. *Vaccinology Module, 11 – 15/06/2018, Cardiff, Wales*
8. *Project Review Module, 27 – 31/08/2018, Lisbon, Portugal*

7. Other training

Laboratory Module, 20–24/02/2017, Berlin & Wernigerode, Germany (Element of the German FETP)

Participation in weekly telephone conferences with German FETP (PAE teleconference)

Project review mini-modules 'Jour Fixe' at the Robert Koch Institute, Berlin (Element of the German FETP). 09–10/02/2017 and 15–16/03/2018. Oral presentation of the fellowship projects.

At regular intervals: 24/7 infectious disease emergencies on-call roster North Rhine-Westphalia

Discussion

Supervisor's conclusions

Sebastian's fellowship at the NRW Centre for Health developed his expertise in infection prevention and control, and vaccine preventable diseases. He is a team player, always delivering high quality work. He deepened his broad methodological knowledge in all required domains, and applied his newly acquired skills in practice with great commitment, enthusiasm and professionalism. His involvement in ad hoc reporting and ministerial briefing for the measles outbreak among a Roma population supported monitoring the success of control measures state-wide. His study protocol on "Small-scale analysis of the immunisation status of school-starters in the city of Münster and survey of parents' attitude towards childhood vaccination" is a new tool for a targeted approach to measles elimination in NRW. Thanks to Sebastian's work in cooperation with the local health authority, a parents' survey was piloted during school entry health examinations. Results arising from these tools will be used in the near future to support a state-wide vaccination campaign.

As part of his contribution to the on-call roster, Sebastian was involved in contact tracing following measles cases on international flights, from which he has led authorship on a manuscript, and extended his expertise in international health. He was able to apply new learning within the fellowship to foodborne outbreak investigations, resulting in a peer reviewed publication, and recommendations for preventing and managing infectious disease outbreaks during group travel.

The evaluation of surveillance of invasive meningococcal disease in NRW revealed good system performance, but potential for improvement in recording of dates, vaccination history and serotyping. These findings may help to achieve full reporting of IMD cases and comprehensive contact management by public health authorities.

Sebastian's contribution to building capacity among public health staff on outbreak investigation and management of infectious diseases will be continued after the fellowship. Sebastian has achieved an independent level of competence in applied infectious disease epidemiology through a very productive two years of training. I'm certain he will continue to pursue his goals with energy, flair and determination.

Coordinator's conclusions

Sebastian entered the fellowship with considerable professional experience and a solid background in both laboratory sciences and epidemiology, which he has translated to public health practice in surveillance, operational research, and communication with the public, policy-makers, and scientific colleagues. He has balanced a diverse range of projects including foodborne outbreaks, vaccine-preventable disease contact tracing, surveillance evaluation and teaching with his ongoing responsibilities at the federal state level in North Rhine-Westphalia. Sebastian has demonstrated his enthusiasm for learning, and has been receptive to feedback from his training site supervisors and fellowship colleagues. He is a mature and reflective public health professional who has benefitted from a supportive training site, and he is poised to assume more responsibility within his institution and will undoubtedly continue to contribute to the professional development of others and the continued strengthening of public health capacity in NRW and in Europe.

Personal conclusions of fellow

As a Member state track fellow, the training allowed me to think out of the box for two years, to work on interesting projects and to apply the things learned in the classroom on site. Most enjoyable for me was the chance to get in touch with a network of public health and epidemiology experts and to receive excellent training in the various

methods and standards of applied infectious disease epidemiology. The training modules and the projects allowed me to expand my knowledge and to develop new skills and competencies. I am convinced that the fellowship provides a sound basis to build my future work upon and from which infectious disease surveillance and control in North Rhine-Westphalia may profit.

Acknowledgements of fellow

I am very grateful that I was given the opportunity to attend the EPIET programme.

First I would like to thank my site supervisor Annette Jurke. Thank you for the support, useful critiques and enthusiastic encouragement throughout the fellowship. Many thanks also to Inka Daniels-Haardt for her support in managing routine work and the fellowship requirements. I would like to thank Lisa Hansen for being a fantastic frontline coordinator. I greatly appreciate your constant support, constructive feedback and guidance through the fellowship. A big thank you for your support and patience goes to all colleagues at the departments Infectiology & Hygiene and Infectious disease epidemiology at the NRW Centre for Health. Special thanks to Daniela for the invaluable support throughout the last two years. Finally, thanks to all the people that I've met and who made the fellowship a great experience: EPIET/EUPHEM coordinators, facilitators, the fellowship programme office and of course all fellows from cohort 2016. It was a pleasure being part of the 'green cohort' and I hope our paths will keep crossing in the future.