Summary of work activities
Karin Taus
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;

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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 response capacity for effective field investigation and control at national and community level to meet public health threats;

- 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

Karin graduated as registered nurse and completed a Masters in Anthropology. After several missions with Médecins Sans Frontières (MSF), Karin joint the Austrian Agency for Health and Food Safety (AGES) in 2014 as public health nurse, working on surveillance and research.

Fellowship assignment: Intervention Epidemiology path (EPIET)

In September 2016, Karin started her EPIET fellowship at the Austrian Agency for Health and Food Safety (AGES), Vienna, Austria, under the supervision of Daniela Schmid. This report summarizes the work performed during this fellowship.

Methods

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

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

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

Results

The objectives of these core competency domains were achieved partly through project or activity work and partly through participation in the training modules. Results are presented in accordance with the EPIET core competencies, as set out in the EPIET scientific guide[1].

Fellowship projects

1. Surveillance

Title: *Design and set up of a multiple-site based surveillance system of multi-drug resistant bacteria, (TY-SUM), 2017-06/2018*

Supervisor(s): Peter Kreidl, Daniela Schmid

Multidrug resistant (MDR) pathogens are one of the most important current threats to public health. The spread of MDR pathogens is associated with increased morbidity, mortality, healthcare costs and antibiotic use. Monitoring the antimicrobial susceptibility of pathogens recovered from clinical specimens is needed to gain knowledge on the

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[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

development of resistant pathogens. In Europe AMR is monitored by the European Antimicrobial Resistance Surveillance Network (EARS-Net). In 2017, thirty European countries were reporting routine clinical antimicrobial susceptibility data from invasive isolates (blood and cerebrospinal fluid) to the Network. In Austria, a total of 134 acute care hospitals are reporting data to the EARS-Net. The Diagnostic Section Bacteriology/Mycology/Parasitology and Molecular Biology, based at the Division of Hygiene and Medical Microbiology - the Medical University of Innsbruck (MUI) provides service in clinical microbiology for all inpatient premises and most outpatient clinics in Tyrol. In January 2017, a new laboratory software (MEDAT) was implemented at the Diagnostic Section.

We designed a pathogen-based surveillance system for MDR-pathogens, based on routinely collected laboratory data in MEDAT, with regular analyses of temporal and spatial trends to provide regular feedback to the sending healthcare (HC) premises and an automated analysis for MDR-pathogen-specific cluster detection to facilitate timely identification and response. to clusters in order to limit further spread of multidrug resistant bacteria in Tyrolean hospitals.

We extracted data on bacteria recorded between 01.2017 and 06.2018 from MEDAT. Cases of interest were defined as positive for MRSA, LRS, VRE, LRE, LGRE, 3 and 4MRGN according to the case definition for surveillance. For incidence rate (IR) calculation and threshold generation we only used data from the one tertiary hospital and the eight public hospitals of Tyrol. IR was calculated per 10 000 patient days (pds) of MRSA, LRS, VRE, 3MRGN, 4MRGN positivity for the 8 public Tyrolean hospitals, overall and separately and for the Univ.-Kliniken Innsbruck overall and by unit as defined, for the period 01. 2017- 06.2018. The thresholds were established specifically for each Tyrolean hospitals included in the surveillance system or for each unit in case of the Univ.-Kliniken Innsbruck based on the frequency of occurrence of the MDR-pathogens as found in the descriptive epidemiological analyses: high frequency was defined as >1 MDR-pathogen case/month and a low frequency ≤1 MDR-pathogen case/month. Sensitivity analyses for the "high frequent MDR-pathogen threshold" were performed.

The descriptive analyses of data on MDR-pathogens under surveillance shows, 973 and 914 cases of MDR-pathogens related to the Univ.-Kliniken Innsbruck and related to the 8 public Tyrolean hospitals. Among all recorded cases of MDR-pathogens, 3MRGN *Enterobacteriacea* accounted for the highest proportion 55% and 63%, and the highest IR 13 cases/10 000 pds and 7.8 cases/10 000 pds in Univ.-Kliniken Innsbruck and in the public Tyrolean hospital, respectively.

The newly established surveillance component for MDR-pathogen-specific cluster detection based on threshold was applied for each of the eight Tyrolean hospitals and for each unit (units are specifically created out of wards that have either regular patient transfer among each other, share medical staff or geographical vicinity) of the Univ. Kliniken Innsbruck. In the period 01.2017-06.2018 the early warning component generated several signals, but only one was a known and described outbreak. Therefore the cross-check of our signal findings was difficult, and further generated signals needs to be investigated and verified.
An automated surveillance system with regular analyses of temporal and spatial trends of MDR-pathogens including an early warning cluster detection component with regular feedback to the sending HC-premises is possible and should be implemented as soon as possible.

Role: Principal investigator

Karin wrote the study protocol, analysed data to set up and develop the surveillance with early warning threshold analyses. She produced a surveillance report (5).

Title: *Syndromic surveillance in Austrian reception centres for early detection of clusters of infectious diseases among asylum seekers during 2015–2018*

(1)

Supervisor(s): Daniela Schmid

Austria was among the main European countries hosting incoming asylum seekers since 2015. This generated an urgent need to predict any public health risks associated with the asylum seekers arriving at Austrian borders. The top five countries of origin were Afghanistan, Syria, Iraq, Iran and Pakistan. The Austrian Agency for Health and Food Agency (AGES) established, in collaboration with the Ministry of the Interior and the Ministry of Health and Women's Affairs, a national syndromic surveillance system (SbSS) in seven reception areas.

We have described and analysed the collected data over the period of September 2015 through February 2018. The objective of this project was to summarise the infectious disease epidemiology among the asylum seekers in order to inform public health measures.

We deployed a daily data collection system for 12 syndromes: Rash and fever, skin affection without fever, acute upper respiratory infection (URI), acute lower respiratory infection (LRI), meningitis/encephalitis, fever and bleeding, non-bloody gastroenteritis/watery diarrhoea, bloody diarrhoea, acute jaundice, skin-soft tissue/bone affections, acute flaccid paralysis, high fever without any other signs and unexplained death. Representatives from the reception centres sent their reports using email, fax or an online platform, and all data was gathered in a central database in Vienna. This data was analysed for cluster detection by using an adopted threshold model. A signal was generated when the number of syndrome-specific observed daily cases exceeded this threshold, and an alarm was defined as signals occurring over two consecutive days.

Overall, the median number of bed occupancy of these reception centres was 160 days (IQR 150-190). A total of 2,913 cases were reported, where the majority were in between the age of 15 and 44 years (2,179/2,913; 75%), followed by children aged 5-14 years (n=369/2,913; 13%) and children under 5 years of age (n=311/2,913; 11%). A total of 406 statistical signals were triggered, where 6.4% (26/406) of them were qualified as alerts.

This was the first time syndromic based surveillance was used in Austria, for an increased incoming of refugees seeking asylum in Austria. The SbSS experience was useful and helped in assessing the occurrence and spread of infectious diseases among the asylum seeking population from September 2015 onwards. Our findings support previous experiences that asylum seekers, compared to the host population, mainly acquire infections with agents present among the host population, even though at higher risk due to many infection favouring factors.

Role: *Principal investigator*

Before the fellow ship, 2015, Karin together with her supervisor Daniela Schmid, proposed, designed and implemented syndromic surveillance in refugee reception and distribution centres. Until the program was suspended in march 2018, Karin was responsible for checking incoming surveillance reports, analysis of surveillance data in terms of trend and cluster detection. Karin provided a weekly feedback report for the MoH and a monthly report for the participating centres and responsible public health district, where the centre was based. Karin was a co-author on a manuscript submitted to a peer review journal (1).

2. Outbreak investigations

Supervisor(s): Daniela Schmid

Title: *An outbreak of Salmonella Enteritidis PT 6c in Austria, related to a traditional Austrian cheese, 2015-2016What was already known?*

In October 2016, the National Reference centre (NRC) identified a cluster of cases of *Salmonella* (*S.*) Enteritidis PT 6c from four of the nine Austrian provinces. The isolates were indistinguishable by Multiple Locus Variable-Number Tandem Repeat Analysis (MLVA) and core genome Multi Locus Sequence Typing (cgMLST). We aimed to describe the outbreak and identify the source(s).

Cases were defined as Austrian residents infected with *S.* Enteritidis PT 6c of MLVA pattern 2-10-13-7-1, 2-9-13-7-1 or cgMLSType complex 2, identified since week 50/2015. The NRC analysed all veterinarian and food isolates of *S.* Enteritidis PT 6c, detected during routine examinations or from suspected food since week 50/2015 by using MLVA and cgMLST. We interviewed cases using a structured questionnaire on food exposures.

Between weeks 51/2015 and 44/2016, 33 cases were reported in Styria (n=28; 85%) and three other Austrian provinces (n=5; 15%). Of those, 22 (67%) resided in one of the 13 Styrian districts (district X); 29 (88%) occurred during weeks 27-44. The median age of cases was 54 years (range 0-79); 58% were male; 14 (42%) reported consumption of artisanal cheese ("Steirerkas"), produced in district X. *S.* Enteritidis isolated from this "Steirerkas" and from an asymptomatic excreting cheese producer were indistinguishable from the outbreak strain. After the ban of this cheese production in week 44, no further cases occurred.

Our findings suggest that the artisanal "Steirerkas" was the likely source of the outbreak. The outbreak strain could have entered the cheese production chain through the excreting producer. We recommended reinforcement of adherence to the Austrian standard operating procedures on food safety practices for artisanal food producers.

Role: Principal investigator

Karin was a member of the outbreak control team, she developed the questionnaire and interviewed cases, developed a data entry mask and undertook descriptive epidemiological analysis. The fellow wrote an outbreak report for public health authorities (3) and gave a poster presentation on this outbreak at ESCAIDE 2017 (7)

Title: *Norovirus outbreak at a boarding school in Lower Austria, November 2017*

Supervisor(s): Daniela Schmid

On November 14, 2017 a cluster of acute gastroenteritis was reported from a vocational boarding school for agriculture, followed by a report of cases in two nearby schools (one junior high school and one high school) a day later. All three schools take lunch at the same refectory. A foodborne outbreak with Norovirus as causative agent was suspected.

A probable case was defined as any student or staff member of the three schools with vomiting or diarrhoea after November 9th and food consumption in the refectory on Nov. 9th. Those meeting this case definition with Norovirus NV positive stool sample were confirmed cases. A retrospective cohort study was performed. Information on case demographics and food consumption were collected to calculate risk ratios (RR) with 95% confidence interval (95% CI).

Among 276 respondents, 263 students and 13 staff members, we found 65 probable and 6 confirmed cases (attack rate 26%), among those there were four probable non-food-related cases. Cases occurred between Nov. 9th and 17th, peaking on Nov. 9th, indicating a point source outbreak. Overall, respondents who ate "Kaspressknödel" (RR 2.5, 95%CI 1.7; 3.8), cheese sauce (RR 1.7, 95%CI 1.1; 2.7), lettuce (RR 2, 95%CI 1.3; 3.1) or Custard (RR 1.6, 95%CI 1.0; 2.4) were more likely to become a case compared to unexposed. After stratification, students who ate before 14:00h on Nov. 9th had a higher risk (RR 2, 95%CI 1.2; 3.5) to become a case compared to those who ate at 14:00h. For the cohort that ate lunch before 14:00h, compared with those who did not consume "Kaspressknödel", those who consumed were more likely (RR 2.7, 95%CI 1.8; 4.2) to become a case. For the 14:00h cohort, those who ate beetroot salad (RR 6.4, 95%CI 4.02; 10.19) or lettuce (RR 3.3, 95%CI 1.11; 9.90) had a higher risk to develop the disease compared to the unexposed. Leftover food and environmental specimens for laboratory testing was not available. Stool samples from food handlers and kitchen workers tested negative for NV.

The investigation of this outbreak confirmed norovirus GII as the causative agent and "Kaspressknödel", beetroot salad and lettuce as the likely sources, but the reservoir remains unclear. All areas potentially contaminated with NV were disinfected with NV effective disinfectant. The importance of hand hygiene from food handlers was reinforced and a NV effective hand disinfectant is now used permanently in this kitchen.

Role: Principal investigator

Karin was a member of the outbreak control team, she developed the questionnaire and interviewed cases, developed a data entry mask, analysed the outbreak data (descriptive and analytical) and wrote an outbreak report for public health authorities (4)

3. Applied epidemiology research

Title: *Investigating occupational swine exposure associated with HEV-, Leptospira-, Ascaris-seropositivity and MRSA-colonization in veterinarians in Austria, 2017/2018*

Supervisor(s): Daniela Schmid

Zoonotic pathogens represent the most likely cause of emerging and re-emerging infectious disease. Veterinarians are more exposed to infected animals and therefore at higher risk of infection with zoonotic hepatitis E virus (HEV), methicillin-resistant *Staphylococcus aureus* (MRSA)*, Leptospira and Ascaris suum.* This study investigated the association between occupational swine exposure and HEV-, *Leptospira*- and *A. suum*-seropositivity and nasal MRSA colonization in Austrian veterinarians.

We recruited Austrian veterinarians during three scientific conferences in 2017. Participants completed a self-administered questionnaire on exposures associated with HEV-, *Leptospira*- and *A. suum*-seropositivity and nasal MRSA colonization. At the same time, blood samples and a nasal swab were collected. The samples were for HEV-IgG antibodies by ELISA, for *Leptospira* antibodies by microscopic agglutination test and for *A. suum*-specific IgG antibodies using an in-house Western blot. The nasal swabs were tested using routine methods. We compared participants with significant occupational swine exposure (> three swine livestock visit per week) to other participants in univariate and stratified analyses. We calculated (strata-specific) prevalence ratios (PR) with 95%CI using R version 3.4.2.

We found HEV- and *Leptospira* -seropositivity of 21% (95%CI: 16.4; 26.7) and of 1% (95%CI: 0.3; 3.7), respectively, among 256 participating veterinarians, *A. suum*-seropositivity of 44% (95%CI: 37.7; 50.4) among 248 participating veterinarians and a nasal MRSA colonization of 13% (95%CI: 9.3; 17.9) among 260 participants. Participants with significant occupational swine exposure (n=16) were 1.8 (95%CI: 1.2; 3.1) times more likely to be seropositive for HEV, 1.5 (95%CI: 1.1; 2.0) times more likely to be seropositive for *A. suum* and 4.2 (95%CI: 2.0; 8.7) times more likely to have nasal colonisation with MRSA than other veterinarians. Seropositivity increased with frequency of swine exposure (across four exposure categories: 2–≥6 visits/week: p-value: <0.01) for *A. suum* seropositivity and nasal MRSA colonization. Participants >55 years were 2.4 (95%CI: 1.5; 3.8) and 1.5 (95%CI: 1.1; 2.0) more likely to be HEV- and *A. suum* seropositive, respectively. In participants younger than 55 years, the relevant occupational swine livestock exposure remained significantly associated with HEV- and *A. suum* seropositivity (R: 1.9, 95%CI 1.0; 3.4 and PR: 1.5, 95%CI 1.0; 2.1), whereas those older, no association between relevant occupational swine livestock exposure and HEV-seropositivity (PR: 1.8; 95%CI 0.9; 3.5) and *A. suum* seropositivity (PR: 1.4; 95%CI 0.9; 2.2). Veterinarians not using gloves during physical animal contact were 1.4 (95%CI: 1.03; 1.80) times more likely to be *A. suum* seropositive. Among those using gloves swine exposure was no longer associated, whereas among those without glove-use the occupational swine exposure remained significantly associated with *A. suum* seropositive (PR: 2.13; 95%CI:1.41; 3.21).

We detected a low prevalence of Leptospira seropositivity among Austrian veterinarians, compared to previous findings among veterinarians. Our findings indicate that Austrian veterinarians with frequent occupational swine livestock contact have an increased risk of HEV-, A. suum seropositivity, and nasal MRSA colonization, and that usage of gloves plays a preventive role in acquiring HEV- and A. suum. Less than half of the swine veterinarians consistently use personal protective equipment. The application of hygiene practices such as wearing gloves when handling animals and a respirator mask (P2 type) when carrying out activities that generate lots of dust should be reinforced among the Austrian swine veterinarians.

Role: Principal investigator

Karin wrote the protocol, designed the questionnaire and data entry mask, recruited the study participant at scientific conferences and collected the samples there. She analysed the data (descriptive and analytical epidemiology). One part has been accepted as an oral presentation at ESCAIDE 2018 (7), a manuscript for submission to a peer-reviewed journal is in preparation (2).

4. Communication

Publications

One manuscript submitted to a peer-review journal (1)

One manuscript in preparation (2)

Reports

Two outbreak reports (3, 4), one surveillance report (5)

Conference presentations

One poster at ESCAIDE 2017 (6) and one oral presentation at ESCAIDE 2018 (7)

Other presentations

Presentation on measles standard operational procedures (SOP) and measles-outbreak investigation, at a training for future hospital hygiene professionals

5. Teaching and pedagogy

Facilitating case study, "Gastroenteritis following a barbecue in Northern Ireland", for medical students at the University of Innsbruck

Karin facilitated a case study for3rd-4th year medical students at the University of Innsbruck as part of a module on Social Medicine and Prevention. This was split over two days and lasted a total of 3 hours. The learning objectives of the training were to enable the participants to understand the operational and epidemiological steps of an outbreak investigation; draw and interpret an epidemic curve, calculate and interpret food specific attack rates, relative risks and understand environmental investigations and control measures

This case study and facilitation was evaluated formally and informally. Informal evaluation was done through discussion with the students at the end of the session; students were very thankful for the facilitation and appreciated the additional real-world examples provided. The formal evaluation indicated that 8/10 (80%) students found the cases study helpful for applying theory to a practical problem.

Reflection

I facilitated this case study and was successful in engaging everyone in the group, despite them having varying levels of background epidemiological knowledge. I learned that my enthusiasm for a topic does not necessarily mean that others will be as enthusiastic about it. This reinforced to me the need to fully understand my audience, and the importance of tailoring study material to the audience to improve their engagement. This experience of teaching/facilitating among medical students helped to strengthen my confidence as a teacher but also to understand the importance of the preparation of subject knowledge and teaching methods.

6. EPIET/EUPHEM modules attended

- Introductory Course, Spetses, Greece 26th September 14th October 2016
- Joint EPIET/EUPHEM outbreak module, Berlin 5th -9th December 2016
- Joint EPIET/EUPHEM module on Multivariable Analyses, Zagreb 13th-17th March 2017
- Joint EPIET/EUPHEM RAS module, Athens 6th-12th May 2017
- Joint EPIET/EUPHEM Project Review Module, Lisbon, 28th August-1st September 2017
- EPIET module on Time Series Analyses, Bristol, 20th-24th November 2017
- EPIET module on Vaccinology, Cardiff, 11th-15th June 2018
- Joint EPIET/EUPHEM Project Review Module, Lisbon, 27th-31st August 2018

7. Other training

Karin participated in the the UN Security in the field E-learning training as preparation for field work.

Discussion

Supervisor's conclusions

Karin has had a productive two-year EPIET fellowship. In my opinion she has certainly achieved the EPIET training objectives, being engaged in a variety of projects of importance to public health in Austria in the future, namely setting up a surveillance system of multidrug resistant (MDR) pathogens in hospital setting, a syndromic surveillance in Austrian reception centres for asylum seekers, conducting research in swine-veterinarians, which will have implications for further infectious disease control activities, and investigating several foodborne outbreak investigations.

While already bringing a high level of enthusiasm and professionalism to the program, Karin has achieved an independent level of competence in the required domains. Thanks to Karin's work, AGES was able to establish an Austrian-wide syndrome-based surveillance system at reception centres during the refugee crisis. Her findings on occupational swine exposure will have implications for further infectious disease control activities.

I appreciate her sincere interest and enthusiasm for public health and her eagerness to learn new methods and skills. It has been a pleasure to work with Karin during her fellowship.

Coordinator's conclusions

Karin`s abundant enthusiasm and commitment to public health especially in the field of infectious disease epidemiology has been evident from the start and she has drawn on this throughout her fellowship. She successfully managed to work through some operational challenges in order to deliver some important and impactful outputs for her site. She has been able to develop her technical skills bringing greater rigour to the competency areas that she already had some experience and skills in and strengthened not just her analytical skills but her appreciation of the conceptual frameworks she can apply in future work. I have no doubt that Karin will be a strong advocate for improving the health experience of populations and she has also been able to develop skills that will help her achieve this such as training, communication and negotiation. It has been very rewarding to work with Karin and I hope she will be able to continue to make a difference in a future role strengthened by the strong network of colleagues which she has made during the fellowship.

Personal conclusions of fellow

I am very thankful for the variety of personal and professional experience during the EPIET fellowship. EPIET was a great way to gain exposure to the wider public health community and network within Europe. The training modules and the supervision (site and frontline) helped to expand my knowledge in infectious disease epidemiology. These diverse experiences have allowed further developing my competencies, building new skills and fostering relations with a wide range of public health professionals.

Acknowledgements of fellow

I am grateful to my site supervisor Daniela Schmid for making my fellowship as an MS-track at AGES possible. Thank you for supporting my work with valuable guidance, for your patience, motivation, and immense knowledge throughout these two tough years.

I would also like to give a big thank-you to Peter Kreidl, who started my journey into EPIET and who gave me the opportunity and support for my surveillance project and teaching assignment in Innsbruck.

I would like to thank the team of the department I am working (Infectious Disease Epidemiology department at AGES), for their patience and support. Especially to mention is Lukas Richter for his guidance and patience, not only for R coding, but also for general statistical and mental support. A big thank-you goes to the previous EPIET fellows Sabine, Elisabeth, Alex, Patrick and Ying-Shih Su (Murphy), for sharing their experiences with me.

A great big thank you for my frontline coordinator Louise Coole, for her patience, support, open ear and guidance during this two years. And of course, a big big thank-you to all the fellows of C2016, for the fantastic time together.

References

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