



FELLOWSHIP REPORT

Summary of work activities

Morana Tomljenovic

Intervention Epidemiology path (EPIET)

Cohort 2017

Background

The ECDC Fellowship Training Programme includes two distinct curricular pathways: Intervention Epidemiology Training (EPIET) and Public Health Microbiology Training (EUPHEM). After the two-year training EPIET and EUPHEM graduates are considered experts in applying epidemiological or microbiological methods to provide evidence to guide public health interventions for communicable disease prevention and control.

Both curriculum paths are part of the ECDC fellowship programme that provides competency based training and practical experience using the 'learning by doing' approach in acknowledged training sites across European Union (EU) and European Economic Area (EEA) Member States.

Intervention Epidemiology path (EPIET)

Field epidemiology aims to apply epidemiologic methods in day to day public health field conditions in order to generate new knowledge and scientific evidence for public health decision making. The context is often complex and difficult to control, which challenges study design and interpretation of study results. However, often in Public Health we lack the opportunity to perform controlled trials and we are faced with the need to design observational studies as best as we can. Field epidemiologists use epidemiology as a tool to design, evaluate or improve interventions to protect the health of a population.

The European Programme for Intervention Epidemiology Training (EPIET) was created in 1995. Its purpose is to create a network of highly trained field epidemiologists in the European Union, thereby strengthening the public health epidemiology workforce at Member State and EU/EEA level. Current EPIET alumni are providing expertise in response activities and strengthening capacity for communicable disease surveillance and control inside and beyond the EU. In 2006 EPIET was integrated into the core activities of ECDC.

The objectives of the ECDC Fellowship - EPIET path are:

- To strengthen the surveillance of infectious diseases and other public health issues in Member States and at EU level;
- To develop response capacity for effective field investigation and control at national and community level to meet public health threats;
- To develop a European network of public health epidemiologists who use standard methods and share common objectives;

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

This portfolio does not represent a diploma. Fellows receive a certificate listing the theoretical modules attended and the 23-month training. Additionally, if all training objectives have been met, they receive a diploma.

Stockholm, September 2018

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- To contribute to the development of the community network for the surveillance and control of communicable diseases.

Pre-fellowship short biography

Morana is a physician, who is completing her 4 year residency in Epidemiology. She is based at the Medical University in Rijeka, as an assistant in Department of Social Medicine and Epidemiology, where she completed her PhD in Biomedicine.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On the 18th September 2017, Morana started her EPIET (MS-track) fellowship at the Croatian Institute of Public Health, Zagreb under the supervision of Nataša Antoljak. Her frontline coordinator was Lisa Hansen. 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.

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>

Fellowship projects

1. Surveillance

Supervisor: Tatjana Nemeth Blazic

Title: *Evaluation of Croatian HIV/AIDS surveillance system*

From 1985 to 2017, there were 1540 HIV cases and 500 AIDS cases reported in Croatia. In 2017, new variables were added to the surveillance database. The aim of this evaluation was assess whether the updated surveillance system has improved data quality to provide adequate information on the “continuum of care” for HIV/AIDS patients, in order to provide recommendations for improvement of the HIV/AIDS surveillance system in Croatia.

For the evaluation, we used HIV/AIDS surveillance data from 2014-2018 to analyse timeliness, completeness, and validity, and conducted an anonymized online survey of 75 surveillance system participants to assess usefulness and acceptability.

The completeness of data varied: age (100%), gender (100%), residency (93%), route of transmission (98%), country of birth (53%), CD4 (42%), outcome (24%), ART therapy (83%), VLL (42%) and partner transmission data (97%). Validity was good, as no misclassification was detected. Timeliness was measured as the number of days between the date of diagnosis of HIV and the date of notification to national level: the median was 222 (IQR: 109-332). Usefulness and acceptability were deemed satisfactory.

The HIV/AIDS surveillance system is adequate to describe the HIV epidemiological situation in Croatia, and the objectives of the surveillance system are mostly achieved. Most of the attributes assessed were acceptable; data fields that have been in longer use have higher data quality. Many primary, secondary and tertiary prevention measures have resulted from the use of this surveillance system, as a result of continuously monitoring HIV data in Croatia. The updated surveillance system should be continued and data quality is expected to improve over time.

Role: principal investigator

Morana led the evaluation, wrote the protocol, designed and administered the questionnaire, analysed the data, and wrote a report (6).

2. Outbreak investigations

Supervisor: Sanja Prlic

Title: *Norovirus outbreak in nursing home in Zagreb, November-December 2017*

In late November 2017, the head nurse from a nursing home in Zagreb with almost 250 residents, informed the regional epidemiologist of an increased number of people with vomiting and diarrhea.

A case was defined as a resident or employee of the nursing home in Zagreb, with onset of vomiting and/or diarrhea on or after 20th November 2017. Nursing home staff was instructed to report all persons with symptoms to the main nurse. A questionnaire was administered to characterize cases and assess risk factors. Stool samples were collected from 14 cases and tested for *E. coli*, *Salmonella*, *Shigella*, *Campylobacter*, *Yersinia*, *Norovirus*, *Adenovirus* and *Rota*. Environmental investigations were also implemented.

From the total population of 298 people living or working in the nursing home, there were 56 persons reported ill, for an attack rate of 19.1%. Residents were more affected, with an attack rate of 19.8%, while the employees had an attack rate of 16.0 %. The case with earliest reported onset of illness was an employee. The descriptive findings indicated that the most affected patients were those who were less mobile, requiring a higher level of care, wearing diapers, having meals in their rooms, and less involved in social activities. Three of 14 stool samples were positive for *Norovirus* gen 1.

The outbreak of *Norovirus* infection in the nursing home was relatively mild, as no hospitalizations or deaths resulted. The nursing home was advised to implement isolation of ill residents until fully recovered, more extensive and frequent hygiene measures, restrictions on outside visits, restriction of staff movement, and the exclusion of ill staff from work.

Role: principal investigator

Morana led the outbreak investigation, constructed the questionnaire, performed analysis, wrote a report (7) and provided recommendations for control measures to the affected facility.

Supervisors: Mirjana Lana Kosanovic Licina, Branko Kolaric

Title: An outbreak of haemorrhagic fever with renal syndrome linked with mountain recreational activities in Zagreb, Croatia, 2017

In 2017 Zagreb faced the largest outbreak of haemorrhagic fever with renal syndrome (HFRS) to date. We investigated to describe the extent of the outbreak and identify risk factors for infection.

We compared laboratory-confirmed cases of Hantavirus infection in Zagreb residents with the onset of illness after 1 January 2017, with individually matched controls from the same household or neighborhood. We calculated adjusted matched odds ratios (amOR) using conditional logistic regression.

During 2017, 104 cases were reported: cases were 11–81 years old (median 37) and 71% (73) male. Compared with 104 controls, cases were more likely to report visiting Mount Medvednica (amOR 60, 95% CI 6–597), visiting a forest (amOR 46, 95% CI 4.7–450) and observing rodents (amOR 20, 95% CI 2.6–159). Seventy per cent of cases (73/104) had visited Mount Medvednica prior to infection. Among participants who had visited Mount Medvednica, cases were more likely to have drunk water from a spring (amOR 22, 95% CI 1.9–265), observed rodents (amOR 17, 95% CI 2–144), picked flowers (amOR 15, 95% CI 1.2–182) or cycled (amOR 14, 95% CI 1.6–135).

Our study indicated that recreational activity around Mount Medvednica was associated with HFRS. We recommend providing information to visitors about the risk of HFRS and personal protective measures. Outbreak detection should lead to prompt implementation of enhanced surveillance in recreational areas.

Role: co-investigator

Morana was the co-investigator. She was involved in data analysis and co-authored a publication (1) and a poster presented at ESCAIDE 2017 (10).

Supervisor: Bernard Kaic

Title: Measles outbreak in Dubrovnik-Neretva County, Croatia, May-June 2018

Beginning from May 19, 2018, an adult who had recently travelled to Kosovo, sought care from health care facilities in Dubrovnik, before developing a rash on May 24. On May 25, a hospital notified regional public health authorities of a possible case of measles. Epidemiological investigation and control measures were implemented immediately and additional cases were subsequently reported.

A confirmed case was defined as a resident of or visitor to Dubrovnik-Neretva County, with laboratory-confirmed measles and symptom onset after May 19. Vaccination status was extracted from medical records. RT-PCR detection of viral RNA and IgM/IgG was used to confirm infection, and genotyping was performed for the index case.

Sixteen confirmed cases were reported, primarily by hospital physicians. Symptom onset ranged from 19 May to 15 June; four cases were health care professionals (HCP). One case with a history of travel to France was not epidemiologically linked to other cases. The median age was 34 years, with one 8 month-old infant. Vaccination status was unknown for 10/16 cases, there were 11 hospitalizations, and one person developed pneumonia. We identified 711 contacts: 116 received post-exposure vaccination including 62 HCP. Three contacts (one immunocompromised health care worker and two infants) received passive postexposure prophylaxis. In a catch-up campaign triggered by the outbreak, 898 children received vaccination. The detected strain was identified as B3 genotype.

This outbreak was limited to 16 cases and no deaths or disabilities were recorded. The outbreak did not spread to neighboring regions, indicating the effectiveness of rapid outbreak control measures. Vaccine coverage among children in the last few years in Croatia was declining with the lowest coverage recorded in Dubrovnik, but after the intervention the coverage improved. With continuing measles transmission in Europe, even small outbreaks create a massive public health burden, and illustrate the importance of maintaining high immunization coverage.

Role: co-investigator

Morana collected and analysed the data, wrote a report (8). She submitted a manuscript to peer-reviewed journal as first author (3), and the data were used for poster presentation (11). The abstract was submitted to ESCAIDE 2018 as late breaker (12).

3. Applied epidemiology research

Supervisor: Goranka Petrovic

Vaccine hesitancy among primary health care workers in Primorje-Gorski Kotar County in Croatia

Primary health care workers (HCWs) in Croatia provide most vaccine services, and have a critical role in vaccine recommendation and implementation. We aimed to assess the level of vaccine hesitancy among primary HCWs, to identify differences between nurses and physicians, and to determine predictors of vaccine hesitancy, in order to address barriers to optimal vaccine coverage in primary health care.

We conducted a cross sectional study among all primary HCWs in Primorje-Gorski Kotar County, a primarily urban region with a population around 300 000. HCWs (n=495) were invited to complete a self-administered questionnaire, with items addressing sociodemographic and occupational characteristics, and scaled responses on attitude, beliefs and behaviours around vaccination. We used self-reported vaccination status and combined scores to establish a vaccine hesitancy threshold under receiver operating characteristic curve with Youden Index J value, and adjusted for age and gender in multiple logistic regression.

We received responses from 64% (143/223) of physicians and 67% (181/272) of nurses. Seventeen percent of HCWs (55/324) were identified as vaccine hesitant: 25% (45/181) of nurses and 7% (10/143) of physicians ($p < 0.001$). HCWs who were nurses (AOR=5.73, 95%CI=2.48-13.24), had longer service (AOR=1.09, 95%CI=1.02-1.17), had never received a flu vaccine (AOR=2.89, 95%CI=1.01-8.26), who expressed doubt or unwillingness to receive measles (AOR=11.91, 95%CI=5.84-24.31) and HPV vaccines (AOR=5.67, 95%CI=2.98-10,81), and who reported having encountered a serious medical condition (AOR=5.80, 95%CI=2.62-12.82) following vaccination were more likely to be vaccine hesitant.

Vaccine hesitancy was reported by an important proportion of healthcare professionals, especially nurses, in this Croatian region. Because provider attitudes impact patient behaviour, we recommend that public health authorities renew efforts to address vaccination-related knowledge and confidence among primary care nurses.

Role: principal investigator

Morana designed the study and the questionnaire, distributed the questionnaire, entered and analysed the data, and wrote a report (9). An abstract was submitted to ESCAIDE 2019 (13). A manuscript has been prepared for submission to a peer-reviewed journal (4). Two oral presentation were given (14,15).

Supervisor: Anna Mrzljak

Hepatitis E virus among patients on haemodialysis in Croatia

Hepatitis E virus (HEV) infection is an emerging infectious disease in many European countries. Previous studies in Europe indicate that HEV seroprevalence among patients on maintenance haemodialysis (HD) ranges from 1% to 37%. Risk factors for HEV infection among HD recipients are not fully understood. The aim of this study was to determine the prevalence and risk factors for HEV infection among HD recipients in Croatia, to propose recommendations for preventive measures.

We implemented a cross-sectional study, inviting 515 individuals on HD from 6 medical facilities in 5 Croatian cities. Three facilities are in the continental region (Zagreb sites 1 and 2, and Osijek) and 3 in the coastal region (Sibenik, Dubrovnik and Pula). A self-administered questionnaire elicited risk factors for HEV infection: age, gender, food and water consumption, travel, household composition, animal contact, transfusion history and hemodialysis duration. Blood samples were tested for IgG HEV antibody using an enzyme immunoassay.

A total of 392 HD recipients (76%) participated; their median age was 70.5 years (range 21-92 years) and 145 (37%) were female. IgG HEV antibodies were detected in 125 (32%) of participants. Multiple logistic regression indicated that age (OR=1.03; 95%CI=1.01-1.05) and living in the continental region (OR=3.55; 95%CI=2.12-5.96) were risk factors for HEV seropositivity.

Almost 1/3 of HD recipients in Croatia had been exposed to HEV, which is among the highest seroprevalence rates reported in Europe. As HEV infection has been documented among pigs in the continental region of Croatia, we hypothesize that traditional pork-based food consumption could be an important risk factor, and should be investigated further. Routine HEV screening among HD recipients is recommended in this part of Croatia.

Role: co-investigator

Morana collected informed consent from participants, administered the questionnaire, entered and analyzed the data. She has written a report and contributed as a co-author on a manuscript submitted for publication (5). She will present a poster at ESCAIDE 2019 (16).

Supervisor: Tatjana Vilibic Cavlek

Title: Parainfluenza virus types 1, 2, and 3 in children with acute respiratory infections in Croatia, 2012-2017

Parainfluenza viruses (PIV 1,2,3) are an important cause of upper (URTI) and lower respiratory tract infection (LRTI), especially in young children and infants. In Croatia, PIV infections are not notifiable. Our objective was to describe the epidemiological and clinical features of PIV infections among Croatian children admitted to hospital with acute respiratory infection (ARI) in Zagreb, in order to improve prescribing of antiviral and antibiotic drugs in this population.

Nasopharyngeal aspirate or swabs were collected from children aged 10 and younger with ARI admitted to all four pediatric hospitals in the Zagreb area from 2012 to 2017. PIV was detected using a direct fluorescence assay (Light Diagnostics, USA).

Specimens were collected from 13,326 children over the period: PIV were detected in 476 (3.6%) samples: 310/476 (65.1%) were PIV3; 108/476 (22.7%) were PIV1 and 58/476 (12.2%) PIV2. The most common clinical diagnosis among children with PIV infection was URTI (33.3%), followed by croup (15.5%), pneumonia (14.1%), bronchiolitis (10.4%) and bronchitis (3.0%). Children 3 years old or younger with PIV were more likely to test positive for PIV3 than older children, [281/405 (69.4%) versus 29/71 (40.9%), $p < 0.001$]. PIV3 was the dominant type in both URTI (135/229; 58.9%) and LRTI [91/128; 71.1% ($p = 0.033$)], especially in pneumonia (48/66; 72.7%).

Although PIV was detected in a small proportion of children with ARI tested in Zagreb, almost half of those had severe illness. The number of affected children with PIV is likely underestimated, and routine testing could improve understanding the epidemiology of PIV. Rapid and accurate diagnosis of PIV is important, especially in children with severe ARI, to reduce unnecessary use of antiviral drugs and antibiotics.

Role: principal investigator

Morana manually extracted older data from paper forms and constructed the electronic data base for analysis. She analyzed the data. The abstract was submitted to ESCAIDE 2018 (17).

Supervisors: Marija Posavec, Branko Kolaric

Title: Attitudes and beliefs related to childhood vaccinations among parents of 6 years old children in Zagreb, Croatia

The Croatian Immunization Programme is a mandatory prevention programme in which vaccines are offered free of charge and little is known about parental vaccine-related beliefs and attitudes. We aimed to describe beliefs and attitudes towards childhood vaccination of parents in Zagreb, estimate the proportion of positive attitudes towards vaccination and identify the possible predictors of positive attitudes.

Using a self-administered questionnaire, we performed a cluster sampling survey from 1 May to 1 June 2017 among parents of 6-years-old children in Zagreb. In total 542 questionnaires were collected, 80% (n=430/542) of respondents were mothers. Overall, 93.5% (n=501/536; 95%CI:91.1-95.3%) respondents reported their child received all age-appropriate mandatory vaccines. Even though 72.6% (n=385/531; 95%CI:69-76 %) respondents feel that childhood vaccination should remain mandatory, 36.3% (n=192/528; 95%CI: 32.7-40) considered that simultaneous administration of vaccines can have negative effect to their child's health. In addition, 38% (n=202/532; 95%CI:33.2-43.1%) feared that vaccines may harm their child. Of total, parents mostly reported having a positive attitude towards vaccination (61.8%; 95% CI: 34.7-42). Parents with the positive attitude were more likely to state their child experienced mild or no adverse reaction after vaccination (OR=5.58; 95%CI: 1.57-21.86 and OR=8.99; 95%CI: 2.45-32.95), report not delaying vaccination (OR=16.7; 95%CI: 4.12-68.01) and provide additional non-mandatory vaccines to their child (OR=1.88; 95%CI: 1.12-3.15). However, gender, age, education and marital status of parent were not significantly associated with the positive attitude towards vaccination.

Our results suggest the need for educational interventions and communication strategies that could foster better knowledge on immunization with a focus on parental misconceptions, perceived constraints and safety issues about vaccine.

Role: co-investigator

Morana developed the questionnaire, analyzed data, and contributed to a peer-reviewed publication (2).

4. Communication

Publications

1. Lovric Z, Kolaric B, Kosanovic Licina ML, Tomljenovic M, Dakovic Rode O, Danis K et al. An outbreak of haemorrhagic fever with renal syndrome linked with mountain recreational activities in Zagreb, Croatia, 2017. *Epidemiology and Infection*; 1–4. 3.
2. Lovric Makaric Z, Kolaric B, Tomljenovic M, Posavec M. Attitudes and beliefs related to childhood vaccinations among parents of 6 years old children in Zagreb, Croatia. *Vaccine* (2018).
3. Tomljenovic M, Lakic M, Vilibic-Cavlek T, Kurecic Filipovic S, Visekruna Vucina V, Babic-Erceg A, Ljubic M, Pem Novosel I, Ilic M, Tabain I, Ivancic-Jelecki J, Hansen L, Kaic B. Measles outbreak in Dubrovnik-Neretva County, May-June 2018. **Submitted** to Eurosurveillance.
4. Tomljenovic M, Petrovic G, Antoljak N, Hansen L. Vaccination attitudes, beliefs and behaviours among primary health care providers in northern Croatia. **Submitted** to *Vaccine*.
5. Mrzljak A, Dinjar Kujundzic P, Knotek M, Kudumija B, Ilic M, Gulin M, Zibar L, Hrstic I, Jurekovic Z, Kolaric B, Jemersic L, Prpic J, Tomljenovic M, Vilibic-Cavlek T. Seroepidemiology of hepatitis E in patients on hemodialysis in Croatia. **Submitted** to *International Urology and Nephrology*.

Reports

6. Tomljenovic M, Nemeth Blazic. Report of evaluation of Croatian HIV/AIDS surveillance system.
7. Tomljenovic M, Prlic S. Report of norovirus outbreak in nursing home in Zagreb, November-December 2017.
8. Tomljenovic M. Report of measles outbreak in Dubrovnik-Neretva County, May-June 2018.
9. Tomljenovic M, Goranka P. Report of vaccination attitudes, beliefs and behaviours among primary health care providers in Primorsko-goranska County.

Conference presentations

10. Lovric Z, Kosanovic Licina ML, Tomljenovic M, Kolaric B. Late breaker: A large outbreak of haemorrhagic fever with renal syndrome in Zagreb, 2017. Poster presentation at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), 6-8 November 2017, Stockholm, Sweden. **Poster presentation, co-author.**
11. Ivancic-Jelecki J, Kaic B, Pem Novosel I, Tomljenovic M, Visekruna Vucina V, Kurecic Filipovic S, Babic-Erceg A, Vojnovic G, Tabain I, Bauk N, Artl S, Milasincic Lj, Vilibic-Cavlek T. Measles and rubella in Croatia "WHO European Regional Measles/Rubella LabNet meeting", 13-15. Nov 2018. Denmark. **Poster presentation, co-author.**
12. Tomljenovic M, Lakic M, Vilibic-Cavlek T, Kurecic Filipovic S, Visekruna Vucina V, Babic-Erceg A, Ljubic M, Pem Novosel I, Ilic M, Tabain I, Ivancic-Jelecki J, Hansen L, Kaic B. Measles outbreak in Dubrovnik-Neretva County, May-June 2018. **Submitted** to ESCAIDE.
13. Tomljenovic M, Petrovic G. Vaccine hesitancy among primary health care workers in Primorje-Gorski Kotar County in Croatia. **Submitted** to ESCAIDE.
14. Tomljenovic M, Petrovic G. Vaccine hesitancy among general practitioner workers in Primorsko-Goranska county. 4. Croatian Epidemiological Congress "23.-25. May 2019. Opatija, Croatia. **Oral presentation** [Croatian].

15. Tomljenovic M, Petrovic G. Vaccine hesitancy among health care providers in Primorsko-Goranska county. Vaccination symposium 27. April 2019. Zagreb, Croatia. **Oral presentation** [Croatian].
16. Tomljenovic M, Dinjar Kujundzic P, Vilibic-Cavlek T, Zibar L, Kudumija B, Ilic M, Gulin M, Hrstic I, Jurekovic Z, Knotek M, Kolaric B, Mrzljak A. Hepatitis E virus among patients on haemodialysis in Croatia. Poster presentation at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE), 27-29 November 2019, Stockholm, Sweden. **Poster presentation**.
17. Tomljenovic M, Tabain I, Kolaric B, Antoljak N, Mlinaric-Galinovic G, Vilibic-Cavlek T. Parainfluenza virus types 1, 2, and 3 in children with acute respiratory infections in Croatia, 2012-2017. **Submitted** to ESCAIDE.

Other

18. Tomljenovic M, Lakoseljic D, Dominik S, Tomac A, Lovric MZ. Anti-rabies protection in human in Department of Epidemiology in Rijeka from 1986. to 2017. Emerging and neglected zoonoses in the context of One health; 2018, Zagreb, Croatia. **Poster and oral presentation** [Croatian].
19. Petrovic G, Lovric MZ, Tomljenovic M, Kolaric B. Epidemiology of Tick-borne encephalitis in Croatia 2003. – 2017. Emerging and neglected zoonoses in the context of One health; 2018, Zagreb, Croatia. **Poster presentation, co-author** [Croatian].
20. Lovric Makaric Z, Kolaric B, Tomljenovic M, Posavec M. Attitudes and beliefs related to childhood vaccinations among parents. 27. April 2019. Zagreb, Croatia. **Oral presentation, co-author** [Croatian].

5. Teaching and pedagogy

Epidemiology course at Medical University, Rijeka

Epidemiology is a compulsory course for the sixth year of Medical Studies at the Medical University in Rijeka, Croatia. The course included 104 students and was held for two weeks (60 hours/5 ECTS). I contributed one hour of lecture, 3 hours of seminar support and 6 hours of exercises. I have prepared my own teaching material on several topics including mosquito-borne diseases, descriptive and analytical epidemiology, and travel medicine.

For exercises, students perform a measure of association, standardisation, frequency measures and other calculations. Some seminars are in the form of a debate, and lectures are delivered via powerpoint presentations. Multiple evaluations of the training were conducted, and I developed and administered semi-structured questionnaires to assess: 1) the analytical study exercise 2) overall course evaluation. The University also administrated an evaluation of individual teachers and the overall course. On a 5-point scale, the average assessment of my teaching was 4.72, while for the whole course it was 3.85. The internal evaluations were mostly positive.

Descriptive epidemiology lecture

The exercise is a part of the program in the course of Epidemiology for Sanitary engineering students, established by the Medical University as a three year programme. My 90-minute lecture on Descriptive epidemiology was held at Medical University Rijeka for 30 students.

This lecture was a combination of presentation and exercise tasks for students, followed by discussion. The students have the opportunity to apply the theoretical concepts to a concrete activity. This progressed from basic calculations to more complicated tasks. After the presentation there is a discussion about the topics. I prepared my own teaching material.

Zoonoses presentation

This 3-hour session included a presentation for for third-year Sanitary engineering students, at Medical University in Rijeka, in a class of 30 students I prepared my own teaching material which included an extensive literature search. The objective of the session was that, after the lectures, students will understand and be able to describe the path of disease transmitted by different vectors. They will be able to list different diseases caused by zoonotic vectors, and to define basic control measures for vectorborne diseases.

Reflection:

Through these courses, I renewed and updated my knowledge about epidemiology. It was a bit challenging to work with sixth year medical students. They have many questions and I had to be fully prepared at all times. However, I learned a lot through interactive work with students. Since I have planned and organized my lectures, I would make some revisions based on students' comments. The detailed evaluation was very helpful for me to understand the students' perception of my presentations and me as a lector.

6. Other activities

1. Representative of junior epidemiologist at Round table at 4. Croatian Epidemiological Congress, 23-25th May 2019, Opatija, Croatia.
2. The acquisition and improvement of competences for teaching in medical field, 20-25th May 2019.
3. Submitted an article about experience of an fellow who attend EPIET programme for Croatian Medical Newspapers.

7. EPIET/EUPHEM modules attended

1. Introductory course, 25th September -13th October 2017, Spetses, Greece
2. Outbreak Investigation Module, 04th-08th December 2017, Berlin, Germany
3. Multivariable Analysis, 16th-20th April 2018, Nicosia, Cyprus
4. The Rapid Assessment & Survey Methods, 14th-19th May 2018, Athena, Greece
5. Project Review Module, 27th- 31th August 2018, Lisbon, Portugal

6. Time-Series Analysis, 5th-9th November 2018, Brussels, Belgium
7. Vaccinology Module, 24th-28th June 2018, Rome, Italy
8. Project Review Module, 26th- 33th August 2019, Prague, Czech Republic

Discussion

Supervisor's conclusions

Achievement of EPIET learning objectives. Morana upgraded her basic knowledge in epidemiology including statistical evaluation. Practical public health implications of the activities in which Morana was engaged can be documented in prevention and surveillance of communicable diseases, making decisions about needed interventions during outbreaks, outbreak investigations, writing scientific papers, communication, teaching and pedagogy during education of health-care workers and applied epidemiology research

Coordinator's conclusions

It has been a pleasure working with Morana over the past two years: her diverse portfolio is a testament to her efforts to expand her own knowledge about a diverse range of infectious diseases and public health issues. She has been diligent in seeking out projects and supervisors that allow her to address important and emerging public health needs in Croatia, and is enthusiastic about teaching others. Morana has shown a willingness to teach herself about new methods, and displayed an exemplary grasp of the concepts of surveillance system evaluation in developing her evaluation protocol. During this fellowship, Morana has made tremendous gains in her ability to express herself in English, in both written and oral communications. Her increased confidence in both technical and communication skills will equip her for a leadership role in public health in Croatia, and in Europe.

Personal conclusions of fellow

Over a period of two years of EPIET fellowship I gain many skills and knowledge in epidemiology through modules and different projects. Some things I have done for the first time, like outbreak research and surveillance analysis. I understand now better how the epidemiology and public health operate in Europe. I have more competencies in solving diverse tasks in epidemiology field. The concept of problem based learning as we have in this programme is really helpful for my professional career.

I also meet very nice and enthusiastic fellows, with whom through many debates over time I have learned a lot with support of many qualified supervisors, coordinators and other colleagues. I am very grateful to have the opportunity to be a part of this whole program.

Acknowledgements of fellow

I want to thank to everyone with whom I have worked overtime, to my mentors, colleagues and fellows. Special thanks to Bernard Kaic for support and Branko Kolaric. Also I want to thank my supervisor Natasa Antoljak for support me during these two years.

The person who I really want to thank, who took an effort to help me with my fellowship, is a very enthusiastic and positive person, always available, to my coordinator, Lisa Hansen. Thank you.