



FELLOWSHIP REPORT

Summary of work activities

Savina Stoitsova

Intervention Epidemiology path (EPIET)

Cohort 2015

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;

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 acknowledging the 2-year training and listing the theoretical modules attended. 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.

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 guide¹.

Pre-fellowship short biography

Before EPIET, Savina Stoitsova was a PhD student at the Communicable Disease Surveillance Unit of the National Center of Infectious and Parasitic Diseases in Sofia, Bulgaria. She specialized in the epidemiology of hepatitis A, carrying out spatial analysis to identify and characterise higher-risk regions, and time-series analysis to develop an alert threshold model for outbreak detection using surveillance data. Savina has a Bachelor's degree in Biochemistry and Cell Biology from Jacobs University, Bremen, Germany and a Master's degree in Molecular and Cell Biology from Heidelberg University, Germany.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On 15th September 2015, Savina started her EPIET fellowship at the National Institute of Public Health – National Institute of Hygiene, Warsaw, Poland (NIPH-NIH), under the supervision of Dr. Małgorzata Sadkowska-Todys. Her EPIET frontline coordinator was Dr. Marion Muehlen between September 2015 and April 2017, and Dr. Kostas Danis after April 2017. This report summarizes the work performed during this 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.

Fellowship projects

1. Surveillance

Title: Sequential administration of inactivated followed by oral poliovirus vaccine in Poland between 2000 and 2014 did not fully prevent vaccine associated paralytic poliomyelitis

Existing serologic and limited epidemiologic evidence suggests that inactivated polio vaccine (IPV) completely prevents vaccine-associated paralytic poliomyelitis (VAPP) upon subsequent administration of oral polio vaccine (OPV). Children born in Poland between 2000-2007 were vaccinated under three different schedules: 1 IPV + 4 OPV (S1), 2 IPV + 3 OPV (S2), and 3 IPV + 1 OPV (S3). We described VAPP cases notified in Poland between 2000 and 2014 by schedule.

To identify VAPP cases, we used the annual reports on polio eradication activities, prepared by the National Polio Eradication Certification Committee, which summarize VAPP cases during the respective year. We classified them as possible VAPP cases (onset of paralysis 4-30 days following receipt of OPV or 4-75 days after contact with OPV

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_C2016.pdf

recipient) and confirmed cases (additionally, isolation of vaccine virus). We assigned cases to vaccination schedules, using birth date and vaccination history from case reports. We excluded cases who could not be unambiguously assigned to a schedule. We pooled 2000-2007 birth cohorts by schedule, estimated total OPV doses to be administered per schedule (2000-2014 "intention-to-treat"), and calculated attack rates (VAPP per pooled birth cohort/million (bcm)) and incidence per million OPV doses.

Out of nine cases summarized in the reports, seven could be assigned to a schedule: one probable and one confirmed under S1, one probable and one confirmed under S2, and three confirmed under S3. This corresponds to 1.85 cases/bcm (S1); 5.83 cases/bcm (S2); 2.07 cases/bcm (S3) and to 0.46, 1.94 and 2.07 cases/million OPV doses for S1, S2, and S3, respectively.

Our results indicate that sequential administration of IPV followed by OPV in Poland between 2000 and 2014 did not completely prevent VAPP. We recommend continuing surveillance of VAPP after introduction of single/multiple doses of IPV prior to OPV administration in immunization schedules, to identify cases in a timely manner, and gain more insight into the association of VAPP with polio vaccination schedules.

Role and outputs:

Savina was the principal investigator of this study. She wrote the protocol, analysed the surveillance data, and presented the findings orally at an international conference (1). A manuscript is under preparation for submission to a peer-reviewed journal (2).

Supervisor:

Dr. Małgorzata Sadkowska-Todys (NIPH-NIH)

Competencies developed:

During this project, I got acquainted with the Polish acute flaccid paralysis surveillance system from its introduction in Poland to date. The diagnosis of vaccine associated paralytic polio is complex, and classifying each suspected case using the study case definitions required interpretation of a combination of medical, epidemiological and microbiological data and communication with experts from different backgrounds. During this process, I had the valuable help of former and current members of the national polio eradication certification committee, and of the department of virology at the National Institute of Public Health.

2. Outbreak investigations

Title: Suboptimal measles vaccination coverage among asylum-seeker children arriving in Poland, during a measles outbreak in centers for foreigners, Poland, 2016-2017

During weeks 24/2016–5/2017, a measles outbreak in nine centres for foreigners in Poland resulted in 124 notified cases. In week 39/2017, we investigated in the most affected centre - one with a mobile population, offering short-term first shelter to arriving asylum-seekers, to identify risk groups and estimate child vaccination coverage.

Cases were those meeting the probable/confirmed EU case definition and notified from the centre to the National Institute of Public Health during weeks 27-42/2016. We compared cases with all those registered in the centre during weeks 27-39/2016 who did not become cases (non-cases). Age, sex and nationality were recorded at registration. In week 39/2016, we obtained measles vaccination status of all children, present in the centre, from their parents. We calculated proportions, odds ratios (OR) and 95% confidence intervals (95%CI) allowing for clustering in families.

We identified 42 cases from four nationalities (83% Russian, 57% male, 90% <10 years old, 93% without documented pre-exposure vaccination) and 1,481 non-cases. Compared with ≥10 year olds, <1 year olds (before routine vaccination eligibility: OR=31 (95%CI 10-101)) and 1-9 year olds (OR=14, 95%CI 5.0-39) had higher odds of measles. Based on parental recall, measles vaccination coverage among 1-17 year-olds (n=100) was 75% (95%CI 58-86%) for one dose and 41% (95%CI 26-58%) for two doses. Based on records only, coverage was 32% (95%CI 18-50%) and 32% (95%CI 19-49%), respectively.

Our findings indicate low measles vaccination coverage among asylum-seeker children, arriving in Poland, which could lead to future measles outbreaks in this vulnerable group. Measles vaccination among children <10 years of age should be prioritized in this setting.

Role and outputs:

Savina was the principal investigator of this outbreak investigation. She wrote the protocol, developed an interview guide and a questionnaire, coordinated field data collection, performed data entry, and analysed the data. This work was presented at a national meeting (3), and was accepted as oral presentation at an international conference (4). A manuscript has been submitted to a peer-reviewed journal (5).

Supervisor(s):

Dr. Małgorzata Sadkowska-Todys (NIPH-NIH), Dr. Iwona Paradowska-Stankiewicz (NIPH-NIH)

Competencies developed:

During this investigation, I developed my communication competencies. The investigation involved close collaboration with and ongoing feedback to the Ministry of Interior, the Office for Foreigners, and the administrative staff of one of the centres for foreigners. In addition, we created a leaflet and poster on measles, which was then printed by the Office for Foreigners and distributed among centres for foreigners. During the survey in the camp, we also carried out information sessions for the asylum-seekers and the workers in the centre. I also developed my management competencies through planning the resources and coordinating the field work team, my biostatistics competencies and my written communication competencies through the analysis of the data and preparation of the manuscript.

3. Applied epidemiology research

Title: Healthcare-associated transmission of hepatitis B and C to patients in EU/EEA Countries: A systematic review (2006-2016)

Healthcare-associated transmission was the second most commonly reported hepatitis B (HBV) and hepatitis C (HCV) transmission route according to 2006-2012 European surveillance data, but data quality/completeness issues hinder comprehensive characterisation of healthcare-associated transmission of HBV/HCV. We carried out a systematic review of published literature on healthcare-associated transmission of HBV/HCV in Europe to complement surveillance data and identify higher-risk settings.

We searched the PubMed database (01/2006-12/2016) for publications, reporting transmission events after 2000, related to a healthcare setting/procedure. An event was defined as transmission to patients from a single source. We collected data on number of patients, country and setting type.

28 HBV and 33 HCV events were identified in 44 publications from 16 countries, resulting in 339 newly infected patients. Most were reported from the United Kingdom (7 HBV, 3 HCV events), Italy (5 HBV, 4 HCV), Spain (1 HBV, 7 HCV) and France (3 HBV, 3 HCV). Haemodialysis units accounted for 13 (21%) events (1 HBV, 12 HCV), nursing homes for 8 (13%, only HBV), oncology wards for 5 (8%, 2 HBV, 3 HCV) and CT/MRI scanning units for 5 (8%, only HCV). Active case finding among recipients of blood products from occult hepatitis B donations resulted in the identification of 6 (10%) events.

Events were reported from settings known to pose higher risk (haemodialysis units), but also from settings perceived to be at lower risk (CT/MRI scanning units, oncology wards), which underlines the importance of following universal precautions in all settings, and possibly the need to carefully review procedures to enhance the implementation of universal precautions in settings like CT/MRI scanning units.

Role and outputs:

Savina was the principal investigator of this project. She wrote the protocol, developed the search strategy and risk of bias analysis tool, coordinated a team of reviewers during the title and abstract screening, performed the full-text screening and data extraction, analysed the data and wrote the report. This work has been presented as an oral presentation at one international meeting (6) and was accepted as poster presentation at an international conference (7). A manuscript for submission to a peer-reviewed journal is under preparation (8).

Supervisor(s):

Dr. Magdalena Rosińska (NIPH-NIH), Dr. Erika Duffell (ECDC)

Title: Effectiveness of one dose of killed whole cell cholera vaccine in response to an outbreak in 2016 in Lusaka, Zambia

The killed whole cell oral cholera vaccine (OCV) Shanchol is typically administered in two doses about two weeks apart, which is logistically complicated. Recent data suggest that a single dose may provide sufficient short-term

protection and limit spread during outbreaks. We aimed to estimate the short-term effectiveness of the single vaccine dose during the cholera outbreak response in Lusaka, Zambia.

A suspected case was a person older than 12 months, presenting with diarrhea (at least three watery stools in 24 hours), admitted to a study health centre between 22/04-15/06/2016; a confirmed case was a suspected case, confirmed by culture and/or PCR; a cholera-negative case was a suspected case for whom all culture and PCR results were negative. First, we compared odds of vaccination between confirmed cases and controls, matched by age group, sex and residence (case-control study). Second we recruited a randomly-selected cohort living in high cholera-risk areas, included cases from the case-control study in that cohort, and compared cholera incidence between vaccinated and un-vaccinated people (case-cohort study). We calculated vaccine effectiveness using both studies. Last, we compared odds of vaccination between cholera-negative cases and controls, matched by age group, sex and residence, to assess health-seeking behaviour bias.

The case-control analysis included 66 confirmed cholera cases and 330 controls. The case-cohort study included 335 vaccinated and 554 unvaccinated people recruited from the high-risk areas, and additionally all confirmed cases from the case-control study (63 unvaccinated, 3 vaccinated). Adjusted vaccine effectiveness was 89% (95%CI: 43-98) in the case-control study and 89%(95%CI: 65-97) in the case-cohort study. The odds of vaccination between cholera-negative cases and controls did not differ (p-value=0.292) suggesting that there was likely no health-seeking behaviour bias.

The results confirm that one dose of Shanchol can be an effective cholera epidemic control tool if administered in a timely manner.

Role and outputs:

Savina was a co-investigator in this international assignment in Zambia, working under the supervision of the principal investigators from Epicentre. Savina participated in the preparation of training material and survey forms for the case-control and case-cohort studies, facilitated the training sessions for the field data collection and laboratory teams, and worked directly with all data collection teams in the field to ensure good data quality. She participated in the writing of the report (9) and of the paper submitted to a peer-reviewed journal (10).

Supervisor(s):

Dr. Francisco Luquero (Epicentre), Eva Ferreras (Epicentre)

Title: Low measles and polio vaccination coverage among children in a long-stay centre for foreigners in Poland primarily driven by fear of vaccine side effects

In 2016, low measles vaccination coverage was detected among asylum-seeker children arriving in Poland. Reports from one centre for long-term stay indicated that some residents refused vaccination. We conducted a mixed methods study to (1) estimate vaccination coverage among asylum-seeker/refugee children residing in a long-term stay centre, and (2) identify determinants of vaccination uptake within the centre's asylum-seeker/refugee population.

We first performed semi-structured in-depth interviews with a small sample of parents in the long-stay centre, focusing on attitudes towards vaccination and disease prevention, and identified central issues related to vaccine hesitancy (qualitative study). During a subsequent quantitative survey, we interviewed all families residing in the same centre, using a questionnaire on (1) vaccination status of their children, and (2) attitudes towards vaccination and issues identified through the qualitative study. 6 families of 4 nationalities participated in the qualitative study and 23 families in the quantitative study (17 (74%) of Chechen origin, and the remaining from Ukraine, Azerbaijan, Tajikistan and Kyrgyzstan). The median stay in Poland was 1.4 years (ranging from 3 months to 3.5 years). Based on parental recall, measles vaccination coverage among 1-17 year-olds (n=72) was 69% (95%CI 48-85%) for one dose and 36% (95%CI 18-59%) for two doses. 45% (95%CI 28-63%) of the 0-17 year olds (n=80) had received at least one dose of polio vaccine. 9 of the 10 families who did not intend to vaccinate their children in the future, reported fear of side effects as the main reason.

Child vaccination coverage against measles and polio in this long-term stay centre was suboptimal. Both the qualitative and quantitative studies identified fear of side effects as the main reason for vaccine hesitancy. The results may not be generalizable to all asylum-seekers in Poland, but suggest that communication activities aimed at improving vaccination coverage in this group should underline vaccine safety.

Role and outputs:

Savina was the principal investigator of this study. She prepared the protocol, ethical review documents, in-depth interview guide and survey forms, carried out the training of the field data collection teams, coordinated data collection and the interim data analysis, and is preparing the final data analysis and the report.

Supervisor(s):

Dr. Małgorzata Sadkowska-Todys (NIPH-NIH)

Competencies developed:

The systematic review has allowed me to learn and apply systematic review methodologies using PRISMA guidelines and a concept-based approach to developing search strategies. As most of the studies used phylogenetic analysis to identify/confirm clusters, I got better acquainted with this methodology.

During the vaccine effectiveness study in Lusaka, I was involved in training the staff, provided ongoing support to the teams, field data collection and data-checking. I am grateful for this experience, which made it way easier for me to later plan and carry out two other field projects as principal investigator. The selection of neighbourhood matched controls, as well as the recruitment of cohort members using spatial sampling involved very careful planning and constant monitoring of progress, in order to achieve the objectives and the required sample size within a very short timeframe. Such skills are best learned by doing, and I very much enjoyed the process. In addition, I was directly involved in the logistics of safe sampling strategies in the cholera treatment centre, and got acquainted with the different laboratory methods for cholera diagnosis both in theory and hands on in the laboratory.

Finally, during the qualitative/quantitative study on measles vaccination uptake, I had the chance to apply a mixed methods methodology, and I got acquainted with qualitative methods. This choice of methodology required very careful planning and training of our data collection team.

4. Communication

Manuscripts submitted to peer reviewed journals (in review process)

- Two manuscripts submitted to peer review journals, one as a first author (2, 10)

Conference presentations

- Three oral presentations at an international conference (ESCAIDE (1, 4), Hepatitis B and C Network Meeting 2017 (6))
- One poster presentation at an international conference (ESCAIDE (8))

Other presentations

- One oral presentation at a national meeting (1)

Reports

- One report for Epicentre as a co-author (9)

5. Teaching activities

Title: Facilitation during the EPIET Rapid assessment and sampling methods (RAS) module: Computer practical: Spatial sampling and use of GPS.

The objective of the session was to create a geo-referenced polygon from a satellite image, select and identify random points within the polygon. An instructional handout had been prepared in advance. The target audience was EPIET fellows from cohorts 2014 and 2015. My role as facilitator was to assist participants in carrying out the instructions using Google Earth and QGIS. The session took 1.5 hours, and I was facilitating a group of 6 people.

Supervisor(s):

Lutz Ehlkes, Dr. Kostas Danis

Title: Facilitation during the EPIET RAS module: Case study: Mortality

Survey.

The objective of this case study was for participants to be able to define study objectives, choose an appropriate study design, select the appropriate sampling method, calculate a sample size for estimating disease specific mortality rates, describe sampling concept and procedures, describe the use of GPS in a random sampling strategy, identify main indicators for the plan of analysis, compute mortality rates, discuss design effect and formulate recommendations based on the results. The target audience was EPIET fellows from cohorts 2014 and 2015. My role was to facilitate a group of 7 people going through the steps of the case study, together with Dr. Kostas Danis. The session lasted 3.5 hours.

Supervisor(s):

Dr. Kostas Danis

Title: Facilitated a session on Outbreak investigation: a case study – measles outbreak in Poland, 2016.

I facilitated a session as part of the Polish Epidemiology Specialization course offered at the National Institute of Public Health, Poland. During this session, we described the ten steps of an outbreak investigation using a real-life example from the outbreak of measles among asylum-seekers/refugees residing in open centres for foreigners in Poland, 2016. I prepared the training material and lead the session and discussions with a group of 6 participants, and prepared the evaluation (participants rated the course and provided suggestions for improvements).

Supervisor(s):

Dr. Małgorzata Sadkowska-Todys

Educational outcome:

I had already carried out trainings in Bulgaria before my EPIET fellowship. During my fellowship, I was happy to participate and facilitate case studies and interactive sessions that require group work and participation. Such a collaborative approach keeps the attention of everyone throughout lengthy sessions, and prompts active solving of problems. As a participant in such sessions during the modules, I appreciated how much more one learns through this active approach. As facilitator, I came to acknowledge that each person in the audience understands questions differently, and that a facilitator should carefully listen to his/her audience, and ensure that everyone is on the same page.

6. Other activities

Title: International assignment with Epicentre during the outbreak of cholera in Lusaka, Zambia in 2016

See research section

Title: Annual status update report on measles and rubella elimination, Poland, 2016

In 2016, 90% of the measles cases reported from Poland were linked to the measles outbreak among asylum-seekers/refugees residing in open centres for foreigners. I presented the data from the outbreak investigation (see outbreak investigation section) during the technical WHO visit to Poland, related to Measles and Rubella Elimination, which took place between 27 February and 1 March 2017. I actively participated in all meetings, which aimed to produce the Annual Status Update report on Measles and Rubella Elimination, and contributed to the writing of the report, which was then submitted to WHO.

Title: Morning epidemiological discussions in the department of Epidemiology at the National Institute of Public Health – National Institute of Hygiene, Poland

In January 2016, I initiated a discussion group within the department of Epidemiology. The five discussions were informal and focused on the following current topics: 1. Polio Eradication Endgame Strategic Plan; 2. Zika Virus; 3: Acceptance of screening for hepatitis C in Poland; 4: Measles outbreak in Poland, preliminary outbreak investigation results; 5. The movie VAXXED (directed by Andrew Wakefield). Information about some of the discussions is available online in a blog I have created for this purpose (<https://cappuccinosessions.wordpress.com>).

7. EPIET/EUPHEM modules attended

1. Introductory course, 28th of September to 16th of October 2015r, Spetses, Greece
2. Outbreak investigation module, 7th to 11th December 2015, Berlin, Germany.
3. Multivariable analysis module, 14th to 18th March, 2016, Vienna, Austria.
4. Rapid assessment and sampling module, 20th to 26th of June 2016, Athens, Greece.
5. Project review module, 22nd to 26th August 2016, Lisbon, Portugal.
6. Time series analysis module, 7th to 11th November 2016, Bucharest, Romania.
7. Vaccinology module, 12th to 16th of June 2017, Stockholm, Sweden.
8. Project review module (PRM), 28th of August to 3rd of September 2017, Lisbon, Portugal.

Supervisor's conclusions

During the two-year fellowship at the National Institute of Public Health-National Institute of Hygiene Savina Stoitsova has been involved in a variety of public health activities, e.g. outbreak investigations, surveillance, and research in epidemiology (including an international mission), as described in the core competencies of the EPIET programme. Savina has achieved all of her EPIET training objectives, being very pro-active and engaged in all her projects. She showed her ability for field and analytical work by participating in a wide range of projects. It is worth to underline her involvement in a measles outbreak investigation among refugees and later in a research project on measles and polio vaccination coverage among children in a long-stay centre for foreigners. These works were to a large extent initialized and conducted by the fellow, showing her multitasking skills, ability to coordinate and negotiate with different stakeholders and external public health partners. The results of these activities will be of high relevance for implementation of appropriate control measure in this population. The fellow has an understanding of epidemiological, statistical and evaluation approaches. Her dedicated attitude and leadership skills make Savina fully independent, highly qualified, and a valuable employee for work in public health.

Coordinator's conclusions

Savina has been a dedicated and very hard working fellow. She encountered emerging public health issues of delicate political nature, and was able to demonstrate perseverance and insight while at the same time being always polite and tactful. She has been eager to learn new skills and apply them to her daily work, thinking out of the box by analysing data in new ways. The results of her projects have provided relevant insights into current issues like vaccine associated paralytic polio linked to oral polio vaccination, health-care associated hepatitis B and C infection, measles vaccination coverage among asylum-seeker children in Poland, and effectiveness of single-dose oral cholera vaccine during an outbreak in Zambia. The supervisors on site have been very supportive of Savina's training and I would like to thank them for their dedication. Savina's enthusiasm has been admirable and she is always eager to learn new things. Even more admirable is her commitment to return to Bulgaria to implement what she has learned in Poland. I wish her all the very best for her future career and sincerely hope we can maintain professional links in order to support her future endeavours.

Personal conclusions of fellow

The EPIET fellowship is a great learning experience in field epidemiology. It involves structured training in modules, using a training approach, linked to projects, where fellows can apply what they have learned, under the support of experienced supervisors and coordinators. The programme is designed to allow fellows to build on their experience in

the best possible way, depending on their previous knowledge and the areas they need to improve most. My experience with the fellowship has been very positive. I am happy to have filled many knowledge gaps, and to have developed skills which will be very useful for my further work.

My previous epidemiological experience in surveillance and research in Bulgaria has been expanded substantially. During my fellowship, I had the chance to work with different diseases, including cholera, measles, poliomyelitis, hepatitis B and C. I got acquainted with another surveillance system from a country with similar traditions in surveillance as my home country. Poland, however, has managed to move forward on a number of levels, while overcoming barriers and limitations similar to the ones in my home country. I hope I will be able to share the lessons learned with my colleagues back home. Also, I had the opportunity to collaborate with various teams at different levels; I worked at the European level during the ECDC project on hepatitis B and C, at the national level during my work at NIPH-NIH in Poland, and at the local level during the MSF project in Zambia and the two projects in refugee centres in Poland. I particularly enjoyed learning and being able to conduct studies based on field data collection. The skill set needed for this type of studies can only be acquired by doing them. I believe that such studies are important in countries with limited surveillance resources, and in the context of displaced populations. I am very grateful for all the things I learned during this fellowship.

Acknowledgements

I am very grateful for the guidance of Dr. Małgorzata Sadkowska-Todys, who shared knowledgeable advice during our extensive discussions, and readily arranged for the provision of resources necessary for my projects. I would also like to thank Dr. Magdalena Rosińska and Dr. Erika Duffell (ECDC) for their patient and expert supervision during the systematic review project. I would additionally like to thank Dr. Magdalena Rosińska for her availability and the statistical advice she provided – she is an excellent teacher, explaining complicated statistical concepts in an easy way. I would also like to thank Dr. Iwona-Paradowska Stankiewicz for her advice on vaccine-preventable diseases. Many thanks to Monika Roberta Korczyńska for her indispensable role in our refugee projects and her careful, devoted work during field data collection. I would also like to thank Janusz Janiec for all our enthusiastic scientific discussions.

I am very grateful for the initiative and support provided by Justyna Rogalska from the State Sanitary Inspection of the Ministry of Interior and Administration, who has been very helpful in facilitating the liaison between our team in NIPH-NIH and various stakeholders. I would also like to thank our external partners State Sanitary Inspection of the Ministry of Interior and Administration, Office for Foreigners, and the administrative and medical staff at the centres for foreigners, for the good collaboration.

I am very thankful for the opportunity to work and learn under the supervision of Dr. Francisco Luquero and Eva Ferreras from Epicentre during the study on effectiveness of one dose of killed whole cell cholera vaccine in response to an outbreak in Zambia. This experience has given me the knowledge and tools to later smoothly start and carry out field projects in Poland.

Last but not least, I would like to thank Dr. Marion Muehlen for her support as the frontline coordinator during most of my fellowship. She was always available to answer urgent questions and provide me with direction and advice when I had dilemmas on how to go further with projects. I would also like to thank Dr. Kostas Danis, who was my frontline coordinator in the last months of my fellowship, for his availability, comprehensive approach and careful reading of my protocols, reports and article drafts – he helped me improve the quality of my work and has pushed me to learn and develop.

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