FELLOWSHIP REPORT

Summary of work activities

Patricia Ndumbi
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;

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.

Stockholm, September 2016

- To develop a European network of public health epidemiologists who use standard methods and share common objectives;
- To contribute to the development of the community network for the surveillance and control of communicable diseases.

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

Pre-fellowship short biography

Before starting EPIET Patricia Ndumbi worked with international organizations such as UNAIDS and WHO, where she contributed to health system strengthening strategies and collaborated with host governments and national NGOs. In 2015 she completed her PhD in Experimental Medicine from McGill University.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On September 15th, Patricia started her EPIET fellowship at the National Centre for Epidemiology (NCE) at the Instituto de Salud Carlos III (ISCIII), in Madrid, Spain, under the supervision of Maria Victoria de Aragón. Her EPIET front line coordinator was Dr. Chris Williams. This report summarizes the work performed during the fellowship.

Fellowship portfolio

This portfolio presents a summary of all work activities (unless restricted due to confidentiality regulations) conducted by the fellow during the ECDC Fellowship, EPIET path. These activities include various projects, and theoretical training modules.

Projects included epidemiological contributions to public health event detection and investigation (surveillance and outbreaks); applied epidemiology field research; teaching epidemiology; summarising and communicating scientific evidence and activities with a specific epidemiology focus. The outcomes include publications, presentations, posters, reports and teaching materials prepared by the fellow.

This portfolio also includes a reflection from the fellow on the field epidemiology competencies developed during the 2-year training, a reflection from the supervisor on the added value of engaging in the training of the fellow, as well as a reflection by the programme coordinator on the development of the fellow's competencies.

[1] European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2013. Available from: http://ecdc.europa.eu/en/epiet/Documents/Scientific%20guides/EPIET%20Scientific%20Guide_C2016.pdf

Fellowship projects

1. Surveillance

Title: Morbidity and Vaccination coverage survey in Bokoro, Chad

Background: Chad has one of the highest malnutrition rates in the world. Malnourished children are more likely to acquire severe infections and to die from common illnesses. Therefore, tackling malnutrition requires a comprehensive approach that not only addresses food security, but also access to vaccination. Between April and May 2016, Médecins Sans Frontières (MSF) implemented a morbidity and vaccination coverage survey to collect data on the health and vaccination status of children <5years living in Bokoro, in order to inform preventive strategies in this region.

Method: We conducted surveys using a two-stage cluster sampling strategy according to the WHO standardized method. At the first stage, 50 villages were selected using a probability proportional to the village size. At the second stage, 1200 households were selected by simple random sampling using a household list. We collected coverage data for oral polio, inactivated polio, measles, pentavalent and yellow fever vaccines. The prevalence of illnesses within two weeks preceding the survey was used to assess child morbidity.

Results: We collected data on 2289 children <5 years. Based on responder´s recall, 28% (N=658) of these children were sick within the two weeks preceding the survey. Children between 24-59 months reported the highest rate of morbidity (N=203; 61%). The most common morbidities were diarrhoea, fever/suspected malaria and respiratory illness. The vaccination coverage was highest for oral polio (75%) and lowest for yellow fever (5%). The coverage for injectable polio, measles and pentavalent was 28%, 11% and 30% respectively.

Conclusion: Child morbidity was mainly attributable to preventable and/or treatable infectious diseases. Vaccination rates estimates were well below the recommended standards. This may ultimately lead to an accumulation of children susceptible to infectious diseases and could favour the emergence of outbreaks.

Role and outputs: Patricia was the main field investigator. She contributed to the questionnaire development, developed data entry masks, performed the data analyses and wrote a final report for MSF and the Chadian Ministry of Health (1). She also trained and supervised a team of 25 people, including surveyors and data entry technicians.

Supervisor(s): Annick Lenglet

Title: Monitoring and evaluation of the national surveillance system towards measles elimination in Spain for the year 2016.

Background: The WHO has established a strategic plan to reduce measles morbidity-mortality by at least 95% and to achieve the elimination of indigenous measles by 2020. A set of indicators has been proposed to evaluate the quality and performance of the measles surveillance system. These include: timeliness of notification, timeliness of laboratory investigation, rate of discarded cases, genotype identification and determination of the origin of infection. Based on WHO recommendations, Spain has implemented a national action plan for the elimination of measles. The aim of this project was to evaluate the current quality of the surveillance system for measles in Spain in 2016 and assess the country's progress towards measles elimination.

Method: We calculated WHO-recommended indicators for measles surveillance for Spain in 2016 and compared them to the proposed target. We also performed a descriptive analysis of measles cases and outbreaks reported at national level in 2016.

Results: In 2016, Spain reported a total of 35 confirmed cases of measles and 3 outbreaks (affecting 22 cases). The incidence rate was 0.08 cases per 100,000 habitants. 37% of these cases were children <5 years. 71% of cases were unvaccinated and 14% were vaccinated with one dose. All cases were either imported or related to importation. Genotype D8 was the most prevalent genotype. Most targets for the performance indicators were reached except for the timeliness of notification which was achieved in only 51% of cases (target: ≥80%) and the rate of discarded cases which was 0.13 cases per 100,000 habitants (target ≥2 cases per 100,000 habitants).

Conclusion: This was Spain's third consecutive year without endemic transmission, which means that the country achieved the regional target for measles elimination. However, the rate of discarded cases still needs to be improved in order to increase the sensitivity of the surveillance system.

Role and outputs: Patricia was the principal investigator. She described the national surveillance system, analysed national surveillance data on measles, presented the results during the measles surveillance team meetings and contributed to the development of reports for both the European Regional Verification Commission for Measles and Rubella Elimination (RVC) and the Spanish working group of the National Plan for Measles and Rubella Elimination (2, 3).

Supervisor(s): Maria de Viarce Torres and Josefa Masa Calles

Competencies developed:

During the morbidity and vaccination coverage survey I collected, analysed and interpreted surveillance data. This data was essential for monitoring and evaluating the impact of preventive strategies aimed at reducing the morbidity of vaccine-preventable diseases in children <5 years. During this project I also became familiar with vaccination policies and immunization targets according to the Expanded Programme on Immunization (EPI) guidelines. I also collaborated with nurses, medical doctors and logisticians for the planning of a mass vaccination campaign. This provided me with valuable insight on the technical, logistical and communication challenges that can emerge while preparing this type of preventive activities. I also understood the limitations caused by recall bias in the absence of a vaccination card, and appreciated the usefulness of seroprevalence surveys in these contexts.

The measles surveillance project gave me the opportunity to evaluate the key performance indicators of the Spanish national measles surveillance system. I also spent time at the National Reference Laboratory where I became familiar with the laboratory surveillance of measles and was introduced to a new platform that facilitates the linkage of epidemiologic and laboratory data for measles. Through this project I understood the importance of viral detection and sequencing for adequate monitoring of measles transmission patterns.

2. Outbreak investigations

Title: Outbreak of hepatitis A among men who have sex with men in Andalucía, Spain, June 1st –October 31st 2016

Background: In 2016, 560 cases of hepatitis A (a 4.5 fold increase from 2015) were reported in Andalucía. The male-to-female incidence ratio was 6.5, indicating a possible outbreak among men who have sex with men (MSM). As of March 2017 the outbreak is still ongoing. In order to evaluate whether the outbreak is driven by sexual transmission between MSM, we have described its epidemiologic characteristics among adult males.

Method: A case was defined as male, 15-65 years, with symptoms onset between June 1st and October 31st 2016, a positive anti-HAV IgM test and residing in Andalucía. As sexual orientation is not routinely collected, information on MSM-status was obtained through cross-linking of medical records and active search of public health notes. Cases were stratified as reported-MSM or unknown-MSM based on the availability of this information. We compared reported-MSM to unknown-MSM by demographic, clinical and spatio-temporal characteristics. Phylogenetic analysis (VP1/2A) of 14 samples isolated from cases residing in Sevilla was performed at the Spanish Viral Hepatitis Reference Laboratory.

Results: 214 cases fulfilled the case definition; of these 47% were from Sevilla, 70% were between 25-44 years and 54% were hospitalized. 93/214 (43%) cases were reported-MSM. There were no significant differences between reported-MSM and unknown-MSM in terms of age (median= 32 years in both, p=0.67) and hospitalization (57% and 52% respectively, p=0.44). 31 of 60 epidemiologically linked cases were reported-MSM. The epidemic curve and the geospatial analysis showed the same temporal and geographical distribution in both reported-MSM and unknown-MSM cases. An identical genotype IA strain was detected in 14 cases, 7 of which were reported-MSM.

Conclusion: The current hepatitis A outbreak affecting young adult men in Andalucía is likely driven by sexual transmission between MSM. Prompt control measures including post-exposure prophylaxis through active immunization of identified contacts have been implemented.

Role and outputs: Patricia was the lead investigator for this outbreak investigation. She wrote the protocol, collected the data, performed the statistical analyses and wrote the final outbreak report for the Andalusia Public Health Agency (4). .

Supervisor(s): Carmen Montaño and Marcelino García

Title: Large and ongoing outbreak of hepatitis A among men who have sex with men in Spain, June 1st– December 31st 2016

Background: In 2016, 1152 cases of hepatitis A (HepA) were reported in Spain (2015: 564 cases). The male-to-female (M:F) incidence ratio was 4.6, suggesting an outbreak among men who have sex with men (MSM). The increase started in June 2016 and has persisted into 2017. We analyzed notifications from 2016 to characterize cases and identify the most affected regions, in order to target public health interventions.

Method: Cases were defined as residents of Spain with laboratory confirmed HepA and onset between June 1st and December 31st 2016. Demographic and clinical data were collected from the Spanish National Surveillance System. MSM-status was obtained from public health/medical records. We calculated annual incidence and M:F ratios by region, and compared them to previous 4 years. Phylogenetic analysis (VP1/2A) of 124 samples was performed at the Spanish Viral Hepatitis Reference Laboratory.

Results: 18 out of 19 Spanish regions reported 919 cases (81% male); 53% were from Andalucía and 19% from Madrid. Of these 919 cases, 45% were hospitalized and the median age was 31[23-40] years. Compared to 2011-2015, the 2016 incidence among adult men increased 7.4-fold, but remained stable in adult women and children <15 years. The M:F ratios were highest in Madrid (9.8) and Andalucía (7.8). In these regions, 32% and 39% of male cases were reported MSM. An identical genotype IA strain was detected in 118 of 124 sequenced samples: 95% of these were from male cases in Andalucía and Madrid.

Conclusion: This HepA outbreak disproportionately affects young adult men in Madrid and Andalucía, and is likely driven by sexual transmission between MSM. Active immunization of identified contacts was implemented. Hepatitis A vaccination was offered to at-risk MSM.

Role and outputs: Patricia was the lead investigator for this outbreak investigation. She wrote the protocol, described the outbreak in terms of time, place and person, performed statistical analyses, prepared a national outbreak questionnaire, made specific public health recommendations, suggested revisions to the national protocol for Hepatitis A surveillance and wrote the final outbreak report for the Spanish Ministry of Health. This work was presented as an oral at ESCAIDE 2017 and a manuscript is being prepared (5, 6, 7).

Supervisor(s): Carmen Varela

Title: Hepatitis A outbreak affecting men who have sex with men (MSM) in the European Union and European Economic Area (EU/EEA), June 1st 2016 – March 31st 2017

Background: Between June 2016 and May 2017, 17 EU/EEA countries reported 4058 cases associated with a multi-country hepatitis A (HA) outbreak mostly affecting men who have sex with men (MSM). Molecular analysis identified three co-circulating hepatitis A virus strains: VRD_521_2016, V16-25801 and RIVM-HAV16-090. We investigated the extent of this outbreak within the EU/EEA and described case characteristics to inform public health interventions across Member States and prevent further transmission.

Methods: Seventeen affected countries provided demographic, clinical and phylogenetic information on cases via their national surveillance system. We categorized cases as confirmed, probable or suspected, according to the EU outbreak case definitions. We investigated case characteristics and strain-specific risk factors for transmission.

Results: 1400 (34%) cases were confirmed. VRD_521_2016 accounted for over half (56%) of cases. Among confirmed cases with available epidemiologic data: 84% identified as MSM, 92% were not vaccinated, 36% had sexual contact with ≥3 partners (mostly anonymous) and 35% reported travel to Spain during the incubation period. Case characteristics and exposures were similar between the strains.

Conclusion: These results suggest that this HA outbreak is driven by sexual transmission of multiple HAV strains within a cross-European population of non-immune MSM engaging in high-risk behavior. There is no evidence that the outbreak has reached its peak. The most effective preventive measure in the context of this outbreak is vaccinating MSM against HAV, supplemented by raising awareness through information campaigns targeting the MSM population.

Role and outputs: Patricia was the lead investigator for this outbreak investigation. She wrote the study protocol, prepared a standardized European outbreak questionnaire, liaised with ECDC and public health representatives from 17 EU member states, contributed to the development of an ECDC rapid risk assessment (8), performed data analyses (including case mapping) and made specific public health recommendations at EU level. This work was presented as a poster at ESCAIDE 2017 and a manuscript is currently under review at Eurosurveillance (9, 10). Patricia was invited as a guest speaker to present this study during the ECDC symposium at the International Union against Sexually Transmitted Infections (IUSTI) conference (Helsinki, 2017) (11). Patricia was also invited to present this study at the ECDC "Threats in Depth" seminar (Stockholm, September 2017).

Supervisor(s): Ettore Severi and Carmen Varela.

Competencies developed:

During my EPIET fellowship, I had the opportunity to follow the evolution of this outbreak at local, national and international level.

I started my first outbreak investigation at the local level in Sevilla (Andalusia), where I relocated for two-weeks to conduct the investigation. I formulated the case definition and generated a hypothesis about the main risk factor. I collected the data and reviewed interview transcripts from all cases. I produced scientific evidence that the outbreak was likely driven by sexual transmission between men who have sex men, and summarized these results in my first outbreak report. Through this experience I also became familiar with the Andalusian surveillance system for hepatitis A.

As the outbreak expanded across the country, I became responsible for the national outbreak investigation. This allowed me to collaborate with 19 different autonomous Spanish regions and understand regional differences in terms of data collection, case notification and laboratory capacity. I also reviewed the national protocols for hepatitis A surveillance and highlighted the need to update it in order to better capture data on sexual risk factors. This recommendation was well received by the MoH and measures were put in place to update the protocol. Furthermore, I generated an extended questionnaire to help local epidemiologists identify potential sexual risk factors during the outbreak. After completing the data analysis, I drafted a second outbreak report for the MoH and proposed evidence based recommendations for control measures. Finally I participated in a national TC with the MoH and representatives of all 19 regions, in order to discuss the findings of the outbreak report and the proposed control measures.

As the outbreak reached an international dimension, affecting 16 other European countries, ECDC asked me to lead and coordinate the European outbreak investigation. This allowed me to liaise with epidemiologists and microbiologists from all affected countries. I became familiar with international differences in the hepatitis A surveillance systems, sequencing protocols and national vaccination policies. I also contributed to the development of an ECDC rapid risk assessment. Furthermore, I was granted access to the Epidemic Intelligence Information System for food and waterborne diseases and zoonoses (EPIS-FWD), gave me an insight into how data sharing between countries can facilitate the early detection and assessment of multi-country outbreaks. Finally I learned how to represent the spatio-temporal diffusion patterns of the outbreak using geographic information systems such as QGIS and ArcGis.

Overall these outbreak investigations gave me a good understanding of infectious disease surveillance and notification at local, national and international levels. It also allowed me to develop strong communication and coordination skills when working with multiple public health partners.

3. Applied epidemiology research

Title: Barriers to healthcare services for migrants living with HIV in Spain

Background: In Spain, migrants are disproportionately affected by HIV and experience high rates of late diagnosis. We investigated barriers to health care access among migrants living with HIV (MLWH) in Spain.

Methods: Cross sectional electronic survey of 765 adult HIV-positive migrants recruited within 18 health care settings between July 2013 and July 2015. We collected epidemiological, demographic, behavioral and clinical data. We estimated the prevalence and risk factors of self-reported barriers to health care using multivariable logistic regression.

Results: Of those surveyed, 672 (88%) had information on health care access barriers: 23% were women, 63% from Latin America & Caribbean, 14% from Sub-Saharan Africa and 15% had an irregular immigration status. Men were more likely to report barriers than women (24% vs. 14%, p=0.009). The main barriers were: lengthy waiting times for an appointment (9%) or in the clinic (7%) and lack of a health card (7%). Having an irregular immigration status was a risk factor for experiencing barriers for both men (OR: (4.0 [95%CI: 2.2-7.2]) and

women (OR: 10.5 [95%CI: 3.1-34.8]). Men who experienced racial stigma (OR: 3.1 [95%CI: 1.9-5.1]) or food insecurity (OR: 2.1 [95%CI: 1.2-3.4]) were more likely to report barriers. Women who delayed treatment due to medication costs (6.3 [95%CI: 1.3-30.8]) or had a university degree (OR: 5.8 [95%CI: 1.3-25.1]) were more likely to report barriers.

Conclusion: Healthcare barriers were present in 1 in 5 MLWH, were more common in men and were associated to legal entitlement to access care, perceived stigma and financial constraints.

Role and outputs: Patricia was the lead investigator for this study. She wrote the analytical protocol and performed statistical analyses. This work was presented as a poster ESCAIDE 2016, and as an oral at the GESIDA HIV Symposium 2016 (12, 13). A manuscript was submitted and is currently under review at the European Journal of Public Health (14). Patricia is also a co-author on a related project focusing on the "country of probable HIV infection for HIV migrants". This was presented as an oral at the International AIDS society (IAS) conference (Paris, 2017) (15).

Supervisor(s): Debora Alvarez-del Arco and Julia del Amo

Title: Preventive Interventions to Address Severe Acute Malnutrition in Children in Bokoro District, Chad, 2016

Introduction: Bokoro district, Chad, experiences recurring annual food shortages from June to October, causing high rates of severe acute malnutrition (SAM) in children <5 years. From June -September 2016, Médecins Sans Frontières conducted active case finding and treatment for SAM, and mass distributions of Plumpydoz targeting 27,105 children between 6-23 months. We conducted three cross-sectional surveys in April (baseline), August (hunger gap) and November (two months after the last distribution) to measure the impact of these preventive interventions on SAM and the under-5-years mortality rate (U5MR).

Methods: We conducted three two-stage cluster surveys, including 50 clusters in April and 40 in August and November, using sampling proportional to population size. We randomly selected 20 households per cluster using household lists or modified WHO-EPI sampling. In each household, we measured mid-upper-arm-circumference (MUAC) on children 6-59 months and recorded the number of deaths, by age, within three months preceding the survey. We calculated the U5MR, global acute malnutrition (GAM; MUAC<125 mm and/or oedema) and SAM (MUAC<115 mm and/or oedema) prevalence among children 6-59 months.

Results: GAM prevalence was 5.8% (95%CI: 4.7-7.1) in April, 5.1% (95%CI: 3.7-7.0) in August and 11.0% (95%CI: 9.1-13.1) in November. SAM prevalence was 1.3% (95%CI: 0.8-1.9), 0.5% (95%CI: 0.2-1.1) and 0.9% (95%CI: 0.5-1.6) in April, August and November, respectively. The U5MR remained between 0.69-0.78 deaths/10,000 person-days in each survey.

Conclusion: SAM prevalence in Bokoro remained below 2% throughout the intervention. The increased GAM in November indicated deteriorating nutritional status after the distributions ended, due to ongoing food insecurity. Preventive activities only temporarily relieved the malnutrition burden. Longer term solutions to ensure food security are required to avoid recurrent nutritional crises in Bokoro.

Role and outputs: Patricia was the co-investigator for this study. She coordinated and implemented the baseline survey, collected epidemiologic and anthropometric data, prepared entry masks, performed statistical analyses and wrote a final report for MSF and the Chadian Ministry of Health (1). This work was presented as an oral at ESCAIDE 2017 and a manuscript is being prepared (16). Patricia also trained and supervised a team of 25 people (including surveyors and data entry technicians) and participated to preventive activities such as the screening and referral of critically ill SAM children to MSF supported treatment centres.

Supervisor(s): Annick Lenglet

Title: The health impact of the 2014–15 Ebola outbreak

Introduction: The 2014–15 outbreak in West Africa was the largest and deadliest Ebola outbreak recorded; however, there remains uncertainty over its wider health consequences. Our objective was to provide a comprehensive overview of the impact of the Ebola outbreak on population health in the three most affected countries: Sierra Leone, Liberia and Guinea.

Methods: A narrative overview of the peer-reviewed and grey literature related to the impact and consequences of the Ebola outbreak was conducted, synthesizing the findings of literature retrieved from a structured search of biomedical databases, the Web and references of reviewed articles.

Results: The impact of the Ebola outbreak was profound and multifaceted. The health system was severely compromised due to overwhelming demand, healthcare workers deaths, resource diversion and closure of health facilities. Fear of Ebola and healthcare workers led to a breakdown in trust in health systems. Access to healthcare was compromised. Substantial reductions in healthcare utilization were reported including over 80% reductions in maternal delivery care in Ebola-affected areas, 40% national reductions in malaria admissions among children <5 years and substantial reductions in vaccination coverage. Socio-economic impacts included reduced community cohesion, education loss, reduced child protection, widespread job losses and food insecurity. Increased morbidity and mortality and reduced expected life expectancy were reported.

Conclusions: This review highlights the scope and scale of the consequences of the Ebola outbreak on population health. Sustained commitment of the international community is required to support health system re-building and to urgently address unmet population health needs.

Role and outputs: Patricia was the co-investigator for this study. She reviewed and synthesized the French literature on the health impact of the Ebola outbreak. This manuscript was published in *Public Health* (17).

Supervisor(s): Chris Williams

Competencies developed:

The HIV project gave me the opportunity to gain experience in applied epidemiological research. I received an excellent training in multivariable analysis and statistical modelling. I also learned how to prepare an analytical protocol and strengthened my scientific writing skills. Furthermore, this project was presented at two scientific meetings; this allowed me to improve my scientific communication skills.

Through the malnutrition project in Chad, I became familiar with the WHO-epi cluster sampling method. I learned to analyse nutrition and mortality data using the Emergency Nutrition Assessment (ENA) for SMART software, to create Epidata entry masks and to analyse survey data (including mortality rates calculations) using STATA. I also gained substantial experience in dealing with logistical issues and operational planning during the survey implementation. As the study coordinator, I had to train and manage a team of 25 people which has enhanced my communication and people management skills. Finally, I used the results from the survey to guide MSF preventive activities and formulate public health recommendations for the MoH.

The Ebola review project has allowed me gain a better understanding of the socio-economic and health systems impacts of the 2014-15 Ebola outbreak in West-Africa. I also gained experience in screening and synthesizing scientific findings in French using a structured search of biomedical databases.

4. Communication

Publications in peer reviewed journals

One manuscript published as co-author (17)

Manuscripts submitted to peer reviewed journals (in review process)

Two manuscripts submitted and under review (first author) (10, 14)

Conference presentations

One oral presentation at the GESIDA HIV Symposium (12)

Two oral presentations at ESCAIDE (7,16)

One oral presentation at IUSTI-ECDC symposium (11)

Two poster presentations at ESCAIDE (9, 13)

Reports

Three outbreak reports (4, 5, 6)

Two surveillance reports (1, 2)

Other

One European rapid risk assessment (8)

5. Teaching activities

1. Case study: Retrospective survey on cholera related mortality during the epidemic period, Gonaïves, Haïti 2011.

Patricia co-facilitated the case study listed above. The session was 3h30 minutes long and took place during the Rapid Risk Assessment (RAS) module in Athens, in June 2016. The target audience were fellow EPIET trainees from cohort 2014 and cohort 2015. Around 10 fellows attended the session.

Instructional design – Students were provided background information about the context of the case study. They were then presented with a series of 18 questions which they addressed and discussed as a group. The two facilitators moderated the discussion and provided further insight on each topic.

Learning objectives – The main learning objectives for this course were to learn how to:

- Choose an appropriate study design
- Select the appropriate sampling method
- Calculate a sample size for estimating Disease Specific Mortality Rates
- Understand sampling concept and procedure
- Understand the use of GPS in a random sampling strategy
- Identify main indicators for the plan of analysis
- Compute Mortality rates
- Discuss a design effect
- Formulate recommendations based on the results

Evaluation – The case study was evaluated as part of the overall course evaluation. Fellows found the content of the case study useful and appropriate.

2. Course: Applied epidemiology for microbiologists

Patricia co-developed and delivered a course on applied epidemiology. The course was 15 hours long (3 hours per day) and took place at the National Centre for Microbiology (CNM) in Madrid, from April 3rd to 7th 2017. The target audience were microbiologist of the CNM. Around 10 microbiologists registered for the course.

Instructional design – The course consisted of a series of lectures focusing on key epidemiological concepts. Interactive power point presentations were used. Questions were asked during the lectures to stimulate discussion and encourage active participation. Various practical exercises with a focus on relevant microbiology topics were given. For some of these exercises students were encouraged to work in groups.

Learning objectives – The main learning objectives for this course were to learn about:

- The 10 steps of an outbreak investigation
- Different designs of epidemiologic studies
- Sampling methods and calculation of sample size
- Concepts of hypothesis testing
- Effective ways of presenting results

Evaluation – All students completed and returned an evaluation form, using scores from 1 to 5 (1= Very poor, 2= Poor, 3= Average, 4= Good, 5= Very good). The course received a mean score of 4.5.

Educational outcome:

The teaching activities were instrumental in improving my knowledge translation skills. I learned how develop and deliver course materials and exercises that facilitate knowledge assimilation and stimulate class participation. I also learned to adapt my teaching method to my audience. Finally, teaching health professionals and fellow epidemiologists motivated me to consolidate my own knowledge of the key epidemiological concepts and methods. This was a very rewarding experience, which I look forward to repeating.

6. Other activities

Title: Field Epidemiologist for Médecins Sans Frontières (MSF), April-May 2016, Chad.

Bokoro district is affected each year by the hunger gap in the Sahel region, thus leading to very high rates of severe acute malnutrition in this district in children under 5 years of age. In 2016, MSF planned to implement a comprehensive package for the prevention of malnutrition in Bokoro.

The mission's objective was to implement a cross-sectional population surveys to monitor the impact of these preventative activities (vaccination, seasonal malaria prophylaxis, healthcare, water and sanitation activities, therapeutic feeding etc.).

By working in this mission, I learned about survey implementation, people management, malnutrition screening, mass vaccination campaign planning and survey data analysis (see surveillance and research section for more details).

Title: WHO-GOARN Outbreak response training course, July 9th -15th July 2017, Portugal.

I participated in an outbreak response training course organized by the Global Outbreak Alert and Response Network (GOARN) in collaboration with the World Health Organization (WHO).

The course provided a highly realistic field setting and scenario-based simulation exercise. It also provided a unique training experience which allowed me to explore the technical, operational and logistical challenges of a coordinated outbreak response.

Through this course I had the opportunity to work in a team of 8 people throughout the training and be tasked with realistic and actionable deliverables, in highly challenging and time-pressured environments. This allowed to develop valuable soft skills and core competencies in line with the GOARN competency model.

7. EPIET/EUPHEM modules attended

1. Introductory Course, Spetses, Greece, 28th September-16th October 2015
2. EPIET Outbreak Investigation module, Berlin, 7th-11th December 2015
3. EPIET Multivariable Analyses module, Vienna, 14th-18th March 2016
4. EPIET Rapid Assessment module, Athens, 20-25th June 2016
5. EPIET Project Review module, Lisbon, 21st-27th August 2016
6. EPIET Time Series Analyses module, Bucharest, 6th-11th November 2016
7. EPIET Vaccinology module, Stockholm, 12th-16th June 2017
8. EPIET Project Review Module, Lisbon, 28th August-1st September 2017

8. Other training activities

1. ISCIII course on statistical regression (Linear, Logistic, Poisson and Survival analysis), Madrid, Spain, 7th–22nd January 2016.
2. ECDC online course on abstract writing and reviewing, 7th January-29th February 2016.
3. MSF Preparation for Primary Departure course, Bonn, Germany, 10th-16th February 2016.
4. UNDSS online courses on Basic and Advance Security in the field, June 2016.
5. Institute Pasteur's online course on Vaccinology, January 2017.
6. ISCIII course on geospatial analysis, Madrid, Spain, 16th-21st April 2017.
7. GOARN outbreak response training, Lisbon and Evora, 9th-15th July 2017.

Supervisor's conclusions

Patricia has been an incredible asset to the teams she has worked with during her two-year EPIET fellowship. She has achieved all the EPIET training objectives, being very pro-active and engaged in all the projects. Patricia not only has extraordinary intelectual capacity but has a humble and keen attitude to all new challenges and endevours. She also has extraordinary personal quailities, which will surely help her in her future career. As a consequence of this, she has produced a number of presentations, communications and manuscrips in press which will be very relevant to public health. In particular, the work she has done in migrants' health is the first national publication addressing barriers to HIV testing and health care in migrants communities and will likely create the awareness needed in the current context of the HIV epidemic.

Coordinator's conclusions

Patricia has succeeded in identifying and persistently prosecuting relevant projects through her training site and work with MSF, despite some challenges in access to field assignments. She has personally developed through necessity, both in her technical skills and ability to lead, collaborated and co-ordinate projects in difficult conditions. Examples include the tenacity needed to promote initial and wider investigation of the Spanish and EU-wide hepatitis A outbreaks, and managing employee relations in extreme heat during her mission. I am very impressed overall with Patricia both in her technical abilities and personal qualities, and wish her the best in her future work. Consolidating these skills in a substantive post in surveillance or outbreak investigation would be a good next step.

Personal conclusions of fellow

EPIET has been an enriching experience for me, both on a professional and personal level. Through the programme, I acquired key technical skills that gave me the capacity to support various public health projects within and beyond the EU. I also developed valuable soft skills such as people management, multi-country project coordination and effective risk communication during acute public health events. Furthermore, working in different languages enabled me to master technical epidemiologic terms in Spanish, French and English. This will certainly facilitate collaboration and communication when working with multiple countries (EU and non-EU). Finally, through EPIET, I was able to integrate a large network of highly skilled public health epidemiologist and microbiologists. Overall, this programme represents a significant leap in my career as an epidemiologist.

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