Summary of work activities
Xanthi Andrianou
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;
- To contribute to the development of the community network for the surveillance and control of communicable diseases·

Pre-fellowship short biography

Before the fellowship Xanthi Andrianou was working at the Water and Health Laboratory of the Cyprus University of Technology where she did her PhD on the definition and application of the urban exposome. Xanthi has a Bachelor in Biology (National Kapodistrian University of Athens, Greece), and a Master in Global Health (Maastricht University, the Netherlands) during which she focused on epidemiology, as during her PhD studies she received additional training in epidemiology and biostatistics. Prior to the fellowship Xanthi had worked in different population health studies and projects from study design to data collection and data analysis.

Fellowship assignment: Intervention Epidemiology path (EPIET)

In September 11, 2017, Xanthi Andrianou started her EPIET fellowship at the Italian National Institute of Health (Istituto Superiore di Sanità), Rome, Italy, under the supervision of Patrizio Pezzotti (main supervisor) and Flavia Riccardo (co-supervisor). Alicia Barrasa was the frontline coordinator. This report summarizes the work performed during this fellowship.

Methods

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

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

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

Results

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

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[1] European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2013. Available from: http://ecdc.europa.eu/en/publications/Publications/.pdf

Fellowship projects

1. Surveillance

Title: Spatiotemporal distribution and determinants of measles incidence during a large outbreak, Italy, September 2016 to July 2018

Background: Measles is still endemic in Italy and outbreaks are frequent. From 2016 to 2018, more than 7,000 measles cases were reported to the national integrated measles and rubella surveillance system, the largest outbreak since implementation of this system.

Aim: We aimed to describe the characteristics and spatiotemporal distribution of measles cases in Italy and explore determinants of incidence at municipality level.

Methods: We performed a retrospective observational study, mapping by municipality, all measles cases reported to the national surveillance system with symptom onset between 1 September 2016 and 31 July 2018. We also analysed measles–mumps-rubella (MMR) vaccination coverage (VC) data (2000–2017) for the first and second dose, collected from the Ministry of Health. We used regression analysis to explore factors associated with measles incidence at municipality level.

Results: We analysed 7,854 cases, 3,927 (50%) female. Median age was 26 years; 475 cases (6%) were younger than 1 year. The outbreak occurred in two epidemic waves. The first started in central/northern regions (end of 2016), the second (mostly within 2018) was concentrated in southern regions. In 2016 and 2017, national VC was below 95% for both MMR doses. In 2017, only one region reported VC above 95% for the first dose. At municipality level, incidence was associated with higher urbanisation, less deprivation and fewer adults.

Conclusion: The spread of measles between September 2016 and July 2018 in Italy indicates the need to improve VC and to explore further how societal and other parameters might be linked to incidence.

Supervisor: *Antonietta Filia*

Role: *Xanthi worked in all stages of this project from proposing the study to the development of the methodology and the design, conducted the data analysis and prepared the first draft of the manuscript.*

Title: Surveillance of invasive bacterial diseases - evaluation

In Italy, surveillance of the invasive bacterial diseases (IBD) caused by *Neisseria meningitidis*, *Streptococcus pneumoniae* and *Haemophilus influenzae* started in 2007 extending the surveillance of meningitis and other related diseases. The surveillance is based exclusively on the laboratory confirmation of the pathogens and the subsequent reporting through the local health units and the regional or national laboratories which conduct the serotyping or molecular typing of the pathogens. The surveillance is coordinated by the Istituto Superiore di Sanità which regularly analyses and reports the results. The surveillance of IBD in Italy had not been previously evaluated. Therefore, with this project we aimed to develop the protocol for evaluation and to perform the evaluation of IBD surveillance in Italy. Along these lines, we evaluated different attributes of the IBD surveillance such as completeness and timeliness, while a capture-recapture study was also conducted to describe the sensitivity and specificity of the surveillance using the hospital discharge records as reference.

Supervisors: *Paola Stefanelli, Flavia Riccardo*

Role: *Xanthi worked on developing the protocol, analysing the surveillance data, method development, prepared presentations for team meetings.*

Title: Monthly measles and rubella bulletin

The Integrated Measles and Rubella Surveillance in Italy is coordinated by the Department of Infectious Diseases of the National Institute of Health (Istituto Superiore di Sanità, ISS). Monthly bulletins were produced using various different software including Excel, Access, and STATA. There was a need to create an automatic workflow for the generation of the bulletin which would require less manual editing. Within this project, we developed the workflow for the generation of the monthly measles and rubella bulletins, and automated the process for the generation of the bulletin using R and Rmarkdown.

Supervisors: *Martina del Manso, Antonino Bella*
Role: Xanthi worked in the preparation of the workflow for the analysis and created the script.

2. Outbreak investigations

Title: Tuberculosis outbreak in a school, Italy, 2019

Italy is a low-incidence country for tuberculosis (TB). In 2019, a TB outbreak occurred in a primary school in north-eastern Italy, involving 10 cases of active pulmonary disease and 42 cases of latent infection. This was one of the largest school outbreaks in Italy the last 10 years. The index case was detected in March 2019, while the primary case, an Italian-born schoolteacher, was likely infectious since January 2018. In total more than 400 contacts of all identified cases were investigated. This outbreak highlighted the need for improved timeliness in TB diagnosis and for timely and efficient TB outbreak investigation to ensure early detection of infections.

Supervisor: *Antonietta Filia*

Role: Xanthi worked in data analysis, and manuscript preparation.

Title: Secondary autochthonous Chikungunya outbreak in a village in Calabria, Italy, 2017

In 2017, for the first time since the 2007 outbreak that had occurred in the North-East, a Chikungunya outbreak was detected in Central Italy (region of Lazio) that later evolved in a large secondary cluster in the South (region of Calabria). For the investigation of the cases that were reported in the area of Guardavalle Marina in Calabria, an outbreak investigation protocol was designed to assess the size of the outbreak in the village, explore epidemiological links with other cases occurring in Italy, and set up effective vector control measures. The outbreak investigation team comprised of clinicians, epidemiologists, medical entomologists and microbiologists from the Calabria Regional health system and from the National Institute of Health (ISS). The team investigated cases prospectively and retrospectively from the 26th of September 2017. The spatio-temporal spread of the outbreak was described on a subset of cases that could be geocoded and mapped. The presence of significant case clusters with the prospective space-time permutation model was sought. A manuscript was prepared describing the outbreak and the response.

Supervisors: *Caterina Rizzo, Flavia Riccardo*
Role: Xanthi developed the methodology and conducted the spatial analysis of the outbreak.

Title: A large foodborne outbreak of Campylobacteriosis linked to schools in Pescara, Italy, May-June 2018

In June 2018, more than 100 students and school personnel presented with gastroenteritis symptoms at hospitals in Pescara, Italy. Microbiological analysis confirmed Campylobacter spp. infection. One catering/provider with two cooking centers had prepared lunches for the involved schools. We present results of the investigation and the measures implemented.

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We performed active case finding in schools and checked hospital admission records using the EU definition for probable and confirmed campylobacteriosis. Cases were compared with controls from the same schools. A detailed questionnaire, with foods served during 28/05/2018-01/06/2018 school lunches, was administered. Additional information on the cooking centers supplying the schools was obtained and food samples tested.

In total, 222 cases (91.4% aged 3-11 years) from 21 schools were identified with symptom onset: 30/05/2018-06/06/2018 (peak on 01/06/2018); 91 were confirmed. The highest attack rates (AR) were for those having lunch at school on 29/05/2018: 7.8% for all schools and 13.1% for schools supplied by one cooking center. Hundred-seventy-six cases and 62 controls were interviewed. Cases were more likely (OR=4.02 [95% CI: 1.11-15.62]) to have consumed lunch from the cooking center with the highest AR. The most likely exposure was a cheese consumed on 29/05/2018 (OR=2.02 [95% CI: 1.01-4.05]) which tested positive for Campylobacter spp.

This was the largest Campylobacter outbreak recorded until now in Italy, where approximately 1000 cases are reported yearly. The analysis indicated that one cooking center was more involved in the distribution of the contaminated food. The timely suspension of the catering service and the closure of the schools for summer the week after the start of the outbreak probably prevented further spread. Authorities are reconsidering the school caterers' selection criteria in the region.

Supervisor Patrizio Pezzotti

Role: *Xanthi worked in the preparation of the internal risk assessment, the abstract and poster for ESCAIDE 2018. Additionally, she worked in the manuscript preparation.*

Title: Second epidemic wave of a large measles outbreak in Italy, 2018, amid vaccination policy changes

A large measles outbreak started in Italy in 2017. In the first wave (January-December 2017, described elsewhere), >5000 cases including four deaths were reported, mostly in central and northern regions, prompting the introduction of a mandatory vaccination law (up to 16 years of age). Our objectives were to describe the second, ongoing, epidemic wave, and measles vaccination coverage (VC) in Italy.

We analyzed measles cases reported to the national surveillance system between 1 January and 31 July 2018. Cases were classified using the EU case definition and described by age-group. National and regional incidence per 1,000,000 was calculated. VC data (2016-2017), collected from the Ministry of Health, were analyzed.

Overall, 2162 cases were reported (incidence: 61/1,000,000); 75.5% laboratory confirmed and 87% unvaccinated. Sicily (southern Italy; 51% of cases) reported the highest incidence (373/1,000,000). The second highest incidence was reported in another southern region (Calabria, 143/1,000,000). This wave peaked in April 2018 (n=467); the number of cases decreased to 120 in July. The highest incidence occurred in infants <1 year (507/1,000,000). Median age was 25 years. Overall, 56% reported at least one complication; 61.4% were hospitalized. Four deaths occurred. National VC at 2 years of age (one dose) was 91.7% in 2017 (4.4% higher than 2016).

The second wave of the 2017-2018 measles outbreak in Italy seems less intense than the first and is affecting different geographical areas. As in the first wave and other European outbreaks, high incidence occurred among infants. Control measures included vaccination of susceptible contacts from 6 months of age. The mandatory vaccination law contributed to VC increase in children but additional interventions addressing adult immunity gaps are needed to reach elimination.

Supervisors: Antonietta Filia

Role: *Xanthi worked in all stages of the analysis of the second epidemic wave of measles from proposing the study to the design, data analysis, preparation of the abstract and also presented it in ESCAIDE 2018.*

3. Applied epidemiology research

Title: Chikungunya outbreak in Calabria, Italy, 2017: follow-up study

A Chikungunya outbreak occurred in Italy in September 2017. The first cases were reported in Anzio, in July 2017, and Rome (both in the Lazio region), and they were followed by the identification of cases in the town of Guardavalle Marina, in the Calabria region. This was the second Chikungunya outbreak reported in Italy. The first outbreak occurred in 2007, when approximately 200 cases were identified in the Emilia-Romagna region (Castiglione di Cervia and Castiglione di Ravenna) between July and September. In order to identify factors associated with the Chikungunya infection and to describe possible long term effects among the cases, a study was set up in the region of Calabria. A study protocol was developed detailing the study design, including all tools necessary for the study (e.g. questionnaires), and it was submitted for approval to the bioethics committee.

Supervisor: *Caterina Rizzo*

Role: *Xanthi worked in the preparation of the study protocol that was submitted to the bioethics committee*

Title: Hospital networks, patient flows and the burden of healthcare acquired infections in Italy

Italy is among the European countries with the highest levels of antimicrobial resistance (AMR) at hospitals. A national plan against AMR has been implemented since 2017 and it aims to develop and establish a national plan for healthcare-associated infections (HAI) surveillance since HAI are associated with increasing AMR trends .

Routinely collected hospital data such as discharges, admissions, and referrals can be used to recreate hospital networks and describe patient flows as it has been shown in studies from the UK, the Netherlands and elsewhere. In Italy, the hospital information system was established in 1995, covers admissions in the whole country in the public and private sector. Individual, anonymized data are available to the National Institute of Health (Istituto Superiore di Sanità, ISS) every year for research purposes.

The objectives of this project were to use the Italian hospital discharge records to: (i) map the national health care network, and (ii) describe how patient flows influence the spread of HAI among the hospitals.

Supervisors: *Patrizio Pezzotti, Annalisa Pantosti*

Role: *Xanthi worked on the development of the project and the data analysis, prepared the data analysis protocols and presented the preliminary results in meetings.*

Title: West Nile in Italy: defining triggers for emergency response

In June-October 2018, an unprecedented West Nile virus (WNV) outbreak occurred in Italy with >500 cases (>40 deaths) reported. Besides routine response, additional measures, including unplanned vector-control, were implemented in August/September, suggesting the need to plan/trigger emergency actions during high-transmission seasons.

Our objective was to test whether human cases occurring within a restricted spatiotemporal window could function as alerts of increased local WNV circulation to trigger planned emergency response measures. We retrospectively analyzed confirmed neuroinvasive (N) and non-neuroinvasive (nN; fevers/blood donors) human WN cases reported to the surveillance system during 2018 (n=579), and 2017 (average transmission season, n=52). Alerts were detected when two cases occurred within 2km (*Culex pipiens'* expected flight range) and with symptom onset 15 days apart (twice the incubation period in 95% WN cases). Alerts were stratified as: N-N, nN-nN, and N-nN. We described the spatiotemporal distribution of the alerts.

Between July-September 2018, 156 alerts (N-N=31, N-nN=54, nN-nN=71; 184 cases in 64 municipalities) were detected in the four most affected regions (99% of cases). Most alerts were triggered in August (n=102; N-N=22; N-nN=38, nN-nN=42) and July (n=42/156; N-N=3; N-nN=12, nN-nN=27), with the earliest one month after the first case confirmation (15/07/2018). Cross-border alerts occurred at municipal (n=10) and provincial/NUTS3 (n=3) level. In 2017, one alert (N-N) was detected in September. The alert system proposed was specific to the high-transmission season and provided early alerts of increased local circulation. Prospective implementation could signal local higher risk for human infection (municipality/NUTS3) during future high-transmission seasons and support risk assessments. As nN subnational surveillance sensitivity can vary, stratification by clinical presentation could support interpretation of the local impact of WNV circulation and better inform action.

Supervisor(s): Flavia Riccardo, Antonino Bella
Role: Xanthi conducted the data analysis and prepared material that was discussed with stakeholders during the preparation of the new plan for the West Nile surveillance.

4. Communication

Publications

Publications in peer reviewed journals

1. Riccardo F, Venturi G, Di Luca M, Del Manso M, Severini F, Andrianou X, et al. Secondary autochthonous outbreak of chikungunya, southern Italy, 2017. Emerg Infect Dis. 2019 Nov. Available from: https://doi.org/10.3201/eid2511.180949
2. Cinquetti S, Dalmanzio M, Ros E, Gentili D, Ramigni M, Grossi A, et al. High rate of transmission in a pulmonary tuberculosis outbreak in a primary school, north-eastern Italy, 2019. Eurosurveillance. 2019 Jun;24(24). Available from: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2019.24.24.1900332
3. Andrianou XD, Del Manso M, Bella A, Vescio MF, Baggieri M, Rota MC, et al. Spatiotemporal distribution and determinants of measles incidence during a large outbreak, Italy, September 2016 to July 2018. Eurosurveillance. 2019;24(17). Available from: https://eurosurveillance.org/content/10.2807/1560-7917.ES.2019.24.17.1800679

Conference presentations

4. Andrianou XD, Del Manso M, Bella A, Pezzotti P, Rota MC, Filia A. Second epidemic wave of a large measles outbreak in Italy, 2018, amid vaccination policy changes. In: European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE). 2018.

Other presentations

5. Andrianou XD. Hospital networks: the Italian perspective. Workshop presented at: Networks working to improve surveillance (NeWIS) - JPIAMR; Freiburg, Germany.

Other (posters)

6. Graziani C, Robuffo G, Bellino S, D'Amario M, Alfonsi V, Lodi F, et al. A large foodborne outbreak of campylobacteriosis linked to schools of Pescara, Italy, May-June 2018. In: European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE). 2018.

5. Teaching and pedagogy

Title: R guide for the "Multilevel (mixed effects) modeling" case study

A new case study on multilevel (mixed effects) modeling was developed to introduce multilevel modeling for the analysis of cluster-correlated data withing the Multivariable Analysis modules. The Rmarkdown script was prepared using as a guide the case study tasks and the STATA script. Additional notes were added to explain the differences between the data analysis as conducted in R and STATA, in different points of the script. The output of the script (in html format) was also generated and provided along with the other case study materials.

Reflection

Overall, based on the evaluation, the case study was perceived very well by the fellows. Preparing the R guide based on the STATA script allowed for the comparison and contrast of different statistical programmes to gain a better understanding of their differences and similarities in teaching.

Title: Data analysis in Public Health – Introduction to data analysis and the use of R for MPH students

The MSc of Public Health (MPH) of the Cyprus University of Technology is a multidisciplinary programme offered to students of diverse backgrounds. It offers two specializations, one on Environmental Health and one on Epidemiology and Biostatistics. The course of Environment and Population Health of the Environmental Health specialization includes a module on data analysis in Public Health that was designed to introduce students to R for data analysis. The objectives of the teaching activity were to design a 10-hour module on data analysis in Public Health, prepare the material and deliver the module in Cyprus within the Environment and Population Health course of the MPH programme of the Cyprus University of Technology. The module included the following parts: (i) Introduction to data analysis and data collection tools, (ii) Exploratory data analysis (descriptives and visualization), (iii) Case study on the analysis of urban exposome data, (iii) Data analysis best practices, challenges and recap. All sessions included practical examples of data analysis using R (scripts and datasets were provided). The material terial prepared for the module included: lectures, case studies (including data analysis scripts, input data, instructions.

Reflection

This activity was an opportunity to develop a new module for data analysis to be used within the course of an MPH. The research for the possible teaching methods included exploring how teaching is conducted in the specific program and to implement new ideas such as the hands-on case study. Developing and delivering the module, allowed for futher development of teaching skills.

6. Other activities

Exchange visit in October 2018 to Oxford University for the research project on hospital networks

The exchange visit took place in October 2018 within the project "Hospital networks, patient flows and the burden of healthcare acquired infections in Italy". The objective of the visit was to develop the study design and start the data analysis. The main activities conducted during the two-week visit were to address the theoretical aspects of hospital networks development and the data analysis. Methodological aspects were extensively discussed including the length of the study period, assumptions for recreating each patient's movements between the hospitals, the type of facilities that will be included in the

networks. The data on the hospital discharges were explored. Additional information necessary to create the networks such as linking the hospital codes from the hospital discharges with information on hospital locations (e.g. address) were checked. By the end of the two-week period, a script that included the data analysis steps was created along with a list combining all the healthcare facilities in Italy that are used in the analysis. During the visits frequent communication via email and one teleconference with Dr Pezzotti took place for updates on the project and to clarify different issues on the Italian data.

Exchange visit in December 2018 to the Italian National Health Insitute (Istituto Superiore di Sanità) by Annalisa Quattrocchi (EPIET fellow Cohort 2017, based at the Health Protection Surveillance Center in Ireland)

Given that both in Italy and Ireland the EPIET fellows were working on the evaluation of national surveillance systems, i.e. the Irish Invasive Meningococcal Disease surveillance system (Annalisa Quattrocchi) and the Italian Invasive Bacterial Diseases surveillance system (Xanthi Andrianou) the exchange visit aimed at: describing both surveillance systems, comparing the methodological strategies for the evaluation of both surveillance system, sharing tools and methods adopted for the evaluations, and at discussing preliminary results and recommendations, in light of the different epidemiological scenarios of the invasive bacterial diseases in the two countries. During the visit, meetings with the IBD surveillance team of the ISS took place in which the preliminary evaluation results were presented both from Ireland (by Annalisa Quattrocchi) and from Italy.

Besides the comparison of the evaluation strategies in Italy and Ireland, during the exchange visit several meetings were organized and attended both at the ISS and the Italian Ministry of Health.

Event-based surveillance in Italy pilot (2018-2019)

The Italian National Istitute of Health (Istituto Superiore di Sanità) in collaboration with the Italian Ministry of Health and with the participation of the regions and the local health authorities is running a pilot project on event based surveillance. This projects included training on using the online platform NewsDesk for the generation of news bulletins as well as training on the evaluation/selection and dissemination of events of public health importance based on news items. Following workshops on event-based surveillance and the methodologies, the participants were divided in "analysis teams" which were responsible for the selection news and the generation of daily bulletins with news of public health importance that were disseminated to the network of analysts and stakeholders. The first round of the pilot was conducted in Novemeber-December 2018 and the second started in June 2019. As part of one of the "analysis teams", Xanthi participated in the pilot (news evaluation/selection and daily bulletins) in December 2018 and in July and August 2019.

7. EPIET/EUPHEM modules attended

1. Introductory course, 25 September-13 October 2017, Spetses, Greece
2. Outbreak investigation, 4-8 December 2017, Berlin, Germany
3. Multivariable analysis, 16-20 April 2018, Nicosia, Cyprus
4. Risk assessment and survey methods, 14-19 May 2018, Athens, Greece
5. Project review module, 27-31 August 2018, Lisbon, Portugal
6. Time series analysis, 5-9 November 2018, Brussels, Belgium
7. Vaccinology, 24-28 June 2019, Rome, Italy
8. Project review module, 24-29 August, Prague, Czech Republic

8. Other training

- *Participation in the training on event-based surveillance conducted at the ISS with the participation of the Italian Ministry of Health and the regions (October 2018)*

Discussion

Supervisors conclusions

Xanthi is a versatile and curious researcher with initiative and a very positive overall attitude. Her communicative and flexible personality has allowed her to interact and engage very well within the site with different project supervisors and overall with the staff.

As a fellow, she achieved all of the EPIET training objectives showing a professional approach to all tasks assigned with a high degree of independence in completing them. She has been very dedicated and hard worker and has grown in her infectious disease field epidemiology competencies. She was also able to provide innovative solutions to research problems by exploring and expanding on previous experiences in different fields and on her knowledge in the advanced uses of "R". She proved autonomous in conducting and leading studies, trainings and in disseminating results with good coordination and engagement with the project supervisors. She showed initiative in engaging both with the EUPHEM counter-part within ISS and with another EPIET-fellow, the latter enabling the conduction of a very constructive bilateral exchange between the Italian and Irish training sites. All the activities she has been involved have been finalized and disseminated through presentations and peer-reviewed articles. She has introduced innovations in the use of R and in analytical mapping methodologies. Her contribution has enabled investment of the site in new research areas such as hospital network analysis.

Coordinator's conclusions

Xanthi started her fellowship as an epidemiologist with strong research and analytical background, and during these two years she wanted to gather experience in infectious diseases surveillance and particularly in its uses in Public Health. With her strong skills in spatial analyses and mapping she contributed to the surveillance and outbreak investigation of vector borne diseases and measles. Based on her excellent skills and high commitment, during the fellowship, she helped her colleagues to improve routine surveillance by establishing automated data analysis processes, and she also worked in project development and data analysis of hospital networks based on patient flows to determine the burden of healthcare acquired infections in Italy. Xanthi is an extremely competent professional working independently but at the same time seeking assistance when necessary. She has a very positive attitude and she is always willing to help her peers. Based on my experience as her frontline coordinator, and knowing her personal and professional skills, I can highly recommend Xanthi for any kind of public health work.

Personal conclusions of fellow

I came to the fellowship from an academic environment and with research experience in epidemiology that was mostly focused on environmental health and data analysis. Therefore, the EPIET training allowed me to expand my skills in two ways: by working at a national health institute that is more focused on operational research, and by working in the field of infectious diseases. During the fellowship, I was able to continue my training and expand my skills in biostatistics and data analysis, and I was given also the opportunity to conduct operational research on issues of public health importance in Italy such as vector-borne diseases (Chikungunya and West Nile), vaccine-preventable diseases (measles), and antimicrobial resistance. Working at the national level allowed me to better understand the complexities of field epidemiology from another perspective that includes considering policy and wider communication implications. The programme, combined with the fact that I was based in an Institute with broad scope of activities, allowed me to build upon my previous epidemiology research experience and further develop my skills and competencies while conducting more inter- and multi-disciplinary research.

Acknowledgements of fellow

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