



FELLOWSHIP REPORT

Summary of work activities

Name

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;

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

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

Stockholm, September 2018

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- To 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

A pharmacist by background, Basel Karo has a Master of science in Public Health at Berlin School of Public health, Charité and PhD in Epidemiology at the Hannover Medical School (MHH), Germany. Prior to EPIET, Basel worked at the Robert Koch Institute (RKI), Berlin on activities primarily related to the epidemiology of TB and TB/HIV coinfection at national and European level.

Fellowship assignment: Intervention Epidemiology path (EPIET)

In September 11th, 2017, Basel Karo started his EPIET fellowship at the Public Health England, London, UK, under the supervision of Sooria Balasegaram. This report summarises 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 guide¹.

Fellowship projects

1. Surveillance

Title: *Epidemiological Review of Tuberculosis Surveillance System in Mauritania*

Based on WHO standards and benchmarks, Basel has contributed to the epidemiological review of TB surveillance system in Mauritania. The aim of the review was to evaluate the capacity and operation of the surveillance system at national and sub-national levels and to provide an overview of the Monitoring and Evaluation (M&E) activities that are necessary to strengthen surveillance and measurement of diseases burden. In collaboration with the Mauritania National Tuberculosis Programme (NTP), WHO team carried out field visits and interview with key stakeholders in addition to in-depth epidemiological analyses of surveillance data. As a part of the WHO team, Basel conducted the epidemiological analysis of TB data. Findings and recommendations from the review are used to strength the TB surveillance system in the country and as part of concept notes for funding applications to the Global Fund.

Role: Basel was the co-investigator; he participated in the WHO evaluation mission in Mauretania, conducted analysis of the national TB data, contributed to the evaluation report.

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>

Supervisor(s): Marek Lalli and Laura Anderson

Title: World Health Organization Early Warning, Alert and Response System (EWARS) in the Rohingya Crisis, Bangladesh 2017-2018

Since August 2017, violence in Myanmar's Rakhine State has driven hundreds of thousands of Rohingya persons across the border into refugee settlements in Cox's Bazar, Bangladesh. As a part of a massive response, the World Health Organization (WHO), in partnership with the Bangladesh Ministry of Health and Family Welfare (MoHFW), has implemented an Early Warning, Alert and Response System (EWARS) across the Rohingya settlements. EWARS is a web-based system and mobile application designed to enhance disease surveillance and outbreak detection in emergency settings. In December 2017, WHO sent 2 "EWARS in box" kits to the WHO office in Cox's Bazar. Over 2 weeks, the WHO team organized 2 workshops and a series of field visits, in which the staff of 151 health facilities run by 23 humanitarian organizations were enrolled and trained as reporting sites for EWARS across the refugee settlements, serving >700,000 Rohingya refugees. Information obtained by the weekly bulletins played an important role in driving public health action. For example, mapping alerts related to measles in EWARS and identifying the affected age groups helped in targeting new vaccination campaigns. In addition, alerts triggered by EWARS detected clusters of acute jaundice syndrome cases. EWARS was also used for daily monitoring of a diphtheria outbreak (reporting form, contact tracing form, treatment centers bed counts, and diphtheria antitoxin use).

Role: Basel was a co-investigator; he designed and encoded reporting forms and alert thresholds into EWARS; conducted training for humanitarian partners on using EWARS. Basel drafted a manuscript for publication on implementing EWARS in refugee settlements in Cox's Bazar, Bangladesh.

Supervisor(s): Christopher Haskew, Ali S. Khan

Title: Presentation and health care delays among people with tuberculosis in London, and the impact on treatment outcome.

A quarter of London's pulmonary tuberculosis (TB) patients have over four months of delay. Late diagnosis increases disease severity and the risk of transmission. We aim to classify delays, identify associated risk factors and assess treatment outcome. We conducted a retrospective cohort study using London surveillance data, 2012-2018 on adults aged ≥ 18 years with pulmonary TB. We defined presentation delay (days from symptom onset to first healthcare visit) and healthcare delay (first healthcare visit to treatment commencement) as dichotomous variables; positive delay being days equal or greater than the 3rd quartile. Basel was co-investigator of the project and applied logistic regression models to identify risk factors associated with delays and treatment outcome at 12 months. Of 7216 people, 4539 reported presentation and 5193 healthcare delays. The 3rd quartiles for presentation and healthcare delay were 84 and 61 days, respectively. Presentation delay was associated with female sex (adjusted Odds Ratio (aOR)=1.21; (95%CI) 1.04-1.39), increasing age (aOR=1.004; 1.001-1.008), white compared to Asian ethnicity (aOR=1.35; 1.12-1.62), previous imprisonment (aOR=1.66; 1.22-2.26) and alcohol misuse (aOR=1.44; 1.04-1.89). Healthcare delay was associated with female sex (aOR=1.39; 1.21-1.59), increasing age (aOR=1.014; 1.009-1.018) and white ethnicity (aOR=1.41; 1.19-1.68). 16% of 5678 people with known outcome did not complete treatment. Neither delay was associated with non-completion (p -value<0.05). In conclusions, female, white and older people with TB were more likely to experience both presentation and healthcare delays. Social risk factors were also associated with delay in presentation. Early diagnosis and treatment remain critical to reduce transmission, regardless of whether delay affected completion.

Role: Basel was a co-investigator, participated in the study design and conducted part of the analysis.

Supervisor(s): Sooria Balasegaram, Charlotte Anderson

Title: Epidemiological Review of Tuberculosis Surveillance System in Afghanistan

Basel led the WHO and NTP team in conducting the evaluation of tuberculosis surveillance system in Afghanistan. The evaluation aimed to (1) Describe current national TB surveillance and vital registration systems, using the WHO Standards and Benchmarks Checklist, with attention to their capacity to measure the level of and trends in TB disease burden (2) Assess the levels and trends in TB disease burden (incidence, prevalence and mortality) (3) Determine whether recent trends in TB burden indicators are plausibly related to a changes in TB-specific interventions taking into account external factors including economic or demographic (4) Define the investments needed and define associated targets to strengthen surveillance and directly measuring trends TB disease burden

Role: Basel was the principal investigator; he organized the mission with MoH in in Afghanistan, developed the agenda, led the evaluation of the surveillance system, and co-drafted the final report

Supervisor(s): Charalampos Sismanidis

2. Outbreak investigations

Title: *An outbreak of Norovirus in an event in England*

An outbreak control team was established to investigate reports of gastrointestinal disease among guests who attended an event in 2018. Approximately 115 guests were reported part or all the event.

Stool samples were requested from affected individuals. A cohort epidemiological study was undertaken of daytime guests and all catering and venue staff working at the event. A case was defined as a guest or staff member who attended the event with diarrhoea and/or vomiting in the seven days before or after the event. Cases were described, and univariate and multivariate analysis undertaken to identify risk factors for illness. Environmental Health Officers inspected the venue and caterers respectively.

Four samples taken from attendees (two staff members and two guests) tested positive for norovirus genogroup 2. The cohort study identified 40 cases (minimum attack rate 26%), all with onset after the event. The patterns of illness were suggestive of a point source outbreak with a median onset of illness of 35 hours after the main wedding meal. Only one food item (ketchup – consumed by 34% of cases) was identified on multivariable analysis as being a risk factor for illness. No food that required cooking was identified as a risk factor for illness. On-site vomiting was reported. No concerns were noted in relation to either the venue or the caterers, and no ongoing risks were identified.

There was microbiological and epidemiological evidence that this was an outbreak of norovirus. Ketchup is not considered an important vehicle of infection as consumption could only explain a minority of illness and this finding could have occurred by chance. There is no strong evidence that food served at the event caused the outbreak. Norovirus can be transmitted in several ways, including person to person transmission, and it was not possible to robustly determine which may have contributed to this outbreak.

Role: Basel was the principal investigator, he designed the outbreak questionnaire, conducted the analysis and drafted the protocol and final report

Supervisor(s): Paul Crook

Title: *Outbreak of Diphtheria among Forcibly Displaced Myanmar Nationals (FDMNs) in Bangladesh, 2017-2018: an epidemiological study*

Since August 2017, almost 700,000 Rohingya have fled to Bangladesh to escape violence in Myanmar's Rakhine State. The pre-existing lack of health services for this vulnerable population coupled with poor environmental conditions and extremely high camp-density triggered a humanitarian and public health crisis. We describe the epidemiological features of a diphtheria outbreak among the forcibly displaced Myanmar nationals in Cox's Bazar, Bangladesh from November 8, 2017 through February 10, 2018. We analysed case-reports submitted by Diphtheria Treatment Centers through an open source WHO health information management system. Characteristics of cases including clinical manifestations, treatment, and frequency of complications were assessed coupled with a review of community-based containment measures.

From 8 November 2017, through 10 February 2018, a total of 5,592 case-patients with diphtheria were reported among forcibly displaced Myanmar nationals (N=5,547, 99.2%) in settlements in Cox's Bazar and host nationals who lived in and around these communities (N=45, 0.8%). The median age of case-patients was 10 years [IQR 6-15 years]; 22.9% of the reported case-patients were aged 15 years and older. The majority of the case-patients were female (54.5%) and were unvaccinated (89.8%). Diagnostic testing by a multiplex PCR assay was performed on 354 case-patients. Among them, 119 (33.6%) case-patients were positive for toxigenic *C. diphtheriae* strain. The most common signs and symptoms reported among the case-patients include sore throat (92.0%), fever (83.6%) and pseudo-membrane (34.8%). A total of 618 (11.1%) case-patients received diphtheria anti-toxin (DAT). There were 38 deaths reported, corresponding to a 0.7% case-fatality proportion. A first and second rounds of diphtheria vaccination campaigns were completed for children <15 years of old (N=315,889 and N=397,375 respectively). Preparations are underway for the third round of vaccination.

This ongoing diphtheria outbreak is the largest outbreak to have been reported since the 1990s. As a result of targeted containment efforts, a decline of reported cases was observed since January 2018. However, full protection of this population community will likely require at least one round of diphtheria vaccine for adults. A sustained and comprehensive approach is urgently required to prevent the next epidemic among this vulnerable population

Role: Basel was a co-investigator, he managed alerts, conducted data analysis for the weekly bulletins

Supervisor(s): *Ali S. Khan*

3. Applied epidemiology research

Title: *Isoniazid (INH) mono-resistance and tuberculosis (TB) treatment success: analysis of European surveillance data, 2002 to 2014*

Isoniazid (INH) is an essential drug for tuberculosis (TB) treatment. Resistance to INH may increase the likelihood of negative treatment outcome. We aimed to determine the impact of INH mono-resistance on TB treatment outcome in the European Union/European Economic Area and to identify risk factors for unsuccessful outcome in cases with INH mono-resistant TB. In this observational study, we retrospectively analysed TB cases that were diagnosed in 2002–14 and included in the European Surveillance System (TESSy). Multilevel logistic regression models were applied to identify risk factors and correct for clustering of cases within countries. A total of 187,370 susceptible and 7,578 INH mono-resistant TB cases from 24 countries were included in the outcome analysis. Treatment was successful in 74.0% of INH mono-resistant and 77.4% of susceptible TB cases. In the final model, treatment success was lower among INH mono-resistant cases (Odds ratio (OR): 0.7; 95% confidence interval (CI): 0.6–0.9; adjusted absolute difference in treatment success: 5.3%). Among INH mono-resistant TB cases, unsuccessful treatment outcome was associated with age above median (OR: 1.3; 95% CI: 1.2–1.5), male sex (OR: 1.3; 95% CI: 1.1–1.4), positive smear microscopy (OR: 1.3; 95% CI: 1.1–1.4), positive HIV status (OR: 3.3; 95% CI: 1.6–6.5) and a prior TB history (OR: 1.8; 95% CI: 1.5–2.2). This study provides evidence for an association between INH mono-resistance and a lower likelihood of TB treatment success. Increased attention should be paid to timely detection and management of INH mono-resistant TB.

Role: Basel was the principal investigator, he drafted the study protocol, conducted the analysis and co-drafted the manuscript for publication

Supervisor(s): *Marieke J. van der Werf*

Title: *Seroprevalence and risk factors of hepatitis B and C infection using opt-out testing in a London emergency department*

UK policy promotes innovative strategies to diagnose viral hepatitis. Previous studies showed that uptake of hepatitis testing is 23% in London. Emergency department (ED) is considered as a potential setting for reaching under-served populations. We describe seroprevalence and risk factors from opt-out hepatitis B (HBV) and hepatitis C (HCV) testing of patients attending a London ED. The study was done in two funding phases 12 Oct 2016 – 15 Feb 2017 and 12 Dec 2017 – 31 May 2018. ED attendees aged +16 years having blood tests were tested for HBV surface antigen (HBsAg) and HCV Antibody (Ab) using an electronic preselected blood test order set; followed by reflex HCV-Ag testing if positive for HCV-Ab. Duplicate ED attendances were removed from the dataset. We applied Poisson regression to identify risk factors and estimate the prevalence ratio (PR). Hepatitis testing uptake for HBV and/or HCV was 76% (27,933 / 36,865). The overall seroprevalence of HBsAg and HCV-Ag were (0.8%, 95% confidence interval [CI] 0.7%–0.9%) and (0.9%, 95%CI 0.8–1.0%) respectively. In the adjusted model, independent risk factors for HBsAg positivity were being male (PR: 1.6, 95%CI 1.2–2.1), non-White British ethnicity (PR>4; particularly Black (PR: 14.4, 95%CI 8.3–24.8) or Asian (PR 13.4, 95% CI 7.1–25.0), being homeless (PR: 1.9, 95% CI 1.0–3.5) and being HIV positive (PR: 4.1, 95%CI 1.9–8.9). For HCV-Ag positivity, risk factors were identified as male (PR:2.5, 95% CI 1.7–3.5), age 30–49 years (PR:3.6, 95% CI 2.2–6.0), homeless (PR:17, 95% CI 13–22), and HIV positive (PR:2.8, 95% CI 1.5–5.1). In conclusion, opt-out testing using preselected ordering at ED enables high uptake of hepatitis testing in under-served groups. Our findings encourage consideration of strategies for hepatitis diagnosis and linkage to care in ED..

Role: Base was the principal investigator, he conducted the data analysis and co-drafted the manuscript for publication

Supervisor(s): *Sooria Balasegaram*

Title: *Describe the trend and drug resistant pattern of the drug resistant pattern of S. Typhi and S. Paratyphi and investigate the associated risk factors in England and Wales using the enhanced surveillance database*

[Study Protocol]

Background: The global burden of disease caused by S. Typhi is estimated to be around 27 million cases per year and the infection is common in low and medium income countries with an unsafe water supply and poor sanitation facilities [4, 5]. In the UK, most cases of typhoid and paratyphoid are acquired abroad in countries and regions of the

world where hygiene or sanitation is poor. In 2017, 303 laboratory-confirmed symptomatic cases of *S. Typhi* and *S. Paratyphi* were reported by the PHE SRS in England and Wales. In the same year, 93% of confirmed symptomatic cases with travel history information were presumed acquired abroad. The majority travelled to countries of their ethnic origin, mostly to countries in the Indian subcontinent [3]. There is no national guidance for the treatment of enteric fever in UK and limited information is available on the drug resistance among cases of *S. Typhi* and *S. Paratyphi*. Study aim: In this study we will aim to describe the drug resistant pattern of *S. Typhi* and *S. Paratyphi* and investigate the associated risk factors in England and Wales between 2014 and 2017.

Methods: This study will be based on two datasets:

1. Reference laboratory database including information on drug resistant test of confirmed symptomatic cases of *S. Typhi* and *Paratyphi* in England, Wales
2. Enhanced surveillance database including information on demographics, symptoms, risk groups, travel and vaccination history, and contact and food history for non-travel-related cases.

Descriptive analysis will be carried out and a Univariable and multivariable logistic regression model will be conducted to identify independent factors associated with resistance. Separate analysis will be performed for *S. Typhi*. and *S. Paratyphi* A, B, C. All tests were two sided with 95% confidence interval (CI); the level of significance was $P < 0.05$. All analyses were performed using STATA (version13, StataCorp, LP, TX, USA) software.

Role: *Basel was the co-investigator, he drafted the protocol and conducted the initial analysis of the data*

Supervisor(s): *Sooria Balasegaram*

Title: *Scarlet fever among children in London*

[Primary results]

Scarlet fever is a highly contagious paediatric infectious disease characterised by high fever, sore throat, and a red rash; it is a statutorily notifiable infection. Despite a sustained decline in scarlet fever notifications in the post-war period, since the spring of 2014 England & Wales have experienced an unprecedented annual marked upsurge in seasonal scarlet fever activity with over 15,000 cases in 2014, affecting predominantly children aged 4-6 years of age.

In this study, we aimed to provide a more detailed description of scarlet fever in the modern era. A questionnaire was used to gather details of symptom onset and duration from each child with suspected scarlet fever. This was administered to each child with confirmed scarlet fever that is part of an ongoing observational clinical study.

A total of 1,703 parents/guardians of children with scarlet fever aged 2-8 years were contacted to participate in online questionnaire. Of them, there were 333 parents/guardians fulfilled the questionnaire between 5 April 2018 and 19 June 2018 (response rate 20%).

Most children were male (51%, N=167) with White British ethnicity (54%, N=179). The median age of children was 4 years [interquartile range (IQR) 3 - 6]. Girls tend to be older than boys (median age: 5 [3-7] vs. 4 [3-6] years, respectively; $P < 0.001$ obtained by Wilcoxon–Mann–Whitney test).

The main symptoms reported were rash (N=301, 91%); sore throat / difficulty swallowing (N=248, 81%), white spots on the tonsils (N=89, 39%) and enlarged tonsils (N=154, 65%). On average the rash went away after 3 [IQR 2-5] days after starting the antibiotic. While sore throat last 4 days [IQR 3-5]. Fever was reported among 279 children (87%), the median of highest temperature was 39 [IQR 38.5-39.5] and last 3 days [IQR2-5] and N=270 (85%) children received OTC (e.g. Calpol or Nurofen) for fever. The very first symptom reported was fever (44%), sore throat (38%) and rash (35%). Antibiotics were prescribed for 316 (95%) children for 10 days (Fig 4&5). Also, 258 (77%) and 242 (73%) children were known to received ibuprofen or paracetamol retrospectively (on average 4 [range: 1-10]).

Role: Basel was the co-investigator, he conducted the data analysis and summarized the main findings

Supervisor(s): *Sooria Balasegaram*

1. Communication

Publications

Publications in peer reviewed journals

1. Karo B, Kohlenberg A, Hollo V, Duarte R, Fiebig L, Jackson S, Kearns C, Ködmön C, Korzeniewska-Kosela M, Papaventsis D, Solovic I, van Soolingen D, van der Werf M. Isoniazid (INH) mono-resistance and tuberculosis (TB) treatment success: analysis of European surveillance data, 2002 to 2014. *Euro Surveill.* 2019;24(12)
2. Karo B, Haskew C, Khan AS, Polonsky JA, Mazhar MKA, Buddha N. World Health Organization Early Warning, Alert and Response System in the Rohingya Crisis, Bangladesh, 2017-2018. *Emerg Infect Dis.* 2018; 24(11):2074-2076.
3. Evenden P, Roche A, Karo B, Balasegaram S, Charlotte A. Presentation and health care delays among people with tuberculosis in London, and the impact on treatment outcome. *BMJ Open Respiratory Research* [In press]

Manuscripts submitted to peer reviewed journals (in review process)

1. WHO Epidemiology Team. Outbreak of Diphtheria among Forcibly Displaced Myanmar Nationals (FDMNs) in Bangladesh, 2017-2018: an epidemiological study
2. T. Charles , M. Eckardt , B. Karo , W. Haas , S. Kröger. Seasonality in extra-pulmonary tuberculosis notifications in Germany 2004-2014- a time series analysis

Reports

1. WHO report on the epidemiological review of the tuberculosis surveillance system in Mauritania 2017
2. Outbreak investigation report: An outbreak of Norovirus among wedding guests London
3. WHO report on the epidemiological review of the tuberculosis surveillance system in Afghanistan 2019

Conference presentations

1. Karo B. " Seroprevalence and risk factors of hepatitis B and C infection using opt-out testing in a London emergency department ". ESCAIDE: European Scientific Conference on Applied Infectious Disease Epidemiology, Stockholm, November 2019
2. Karo B. "The impact of Isoniazid mono-resistance on treatment success of tuberculosis in European Union, 2002-2014". ESCAIDE: European Scientific Conference on Applied Infectious Disease Epidemiology, Malta, November 2018.
3. Karo B. " Implementing WHO's Early Warning, Alert and Response System (EWARS): Rohingya Crisis, Bangladesh 2017-2018". ESCAIDE: European Scientific Conference on Applied Infectious Disease Epidemiology, Malta, November 2018

Other presentations

1. Karo B. [Invited speaker]. „Achievements, gaps and challenges on sharing data and information between TB and HIV services: country perspective, Germany". The Wolfheze Workshops and WHO National TB Programme Managers Meeting, The Hague, May 2019.
2. Karo B. [Invited speaker]. "Tuberculosis in people living with HIV/AIDS in the German ClinSurv-HIV Cohort: Incidence, risk factors and immunological biomarkers". The 11th ClinSurv Meeting, Hannover, November 2017.

4. Teaching and pedagogy

Title

1. Conduct training on using WHO's EWARS during the emergency response of Rohingya crisis in Cox's Bazar, Bangladesh
 - Training objective: train the humanitarian partners operating in the Rohingya settlements on recording and reporting in EWARS
 - Target audience: humanitarian partners operating in the Rohingya settlements including MSF, Red Cross, Save Children.

2. Multilevel (Mixed Effects) modelling - Multivariable Analysis (MVA) module, Madrid
 - Training objectives: understand the basic principles of and apply the multilevel modelling for analysing cluster-correlated data
 - Target audience: EPIET/EUPHEM fellows - cohort 2018
3. Workshop on Surveillance and data tools for outbreak response and monitoring in emergency settings, London
 - Training objectives: Understand methods for data collection and data provider perspectives in surveillance systems in emergency settings – WHO's EWARS and LSHTM's EDK as examples
 - Target audience: UK public health rapid support team (UK-PHRST)

Reflection

- After the training, an email was circulated among the attendees asking whether the learning objectives have been achieved, and for their feedback and suggestions for improvements.
- The training was evaluated as very interesting and clear despite the fact that some attendees have no previous knowledge on the topic. However, including other practical examples based on real cases will be beneficial

5. Other activities

on-call duty at Field Epidemiology South East & London, PHE: participate in OCT Meetings and investigate the exceedance of reported infections

6. International assignments:

- WHO – Global TB Programme Mauritania: Evaluation of TB surveillance system
- GOARN – Bangladesh: Emergency response to Rohingya Crisis and diphtheria outbreak
- WHO – Global TB Programme Afghanistan: Evaluation of TB surveillance system

7. EPIET/EUPHEM modules attended

- Introductory Course, 25 Sep -13 Oct 2017, Spetses, Greece
- Outbreak Investigation, 04-08 Dec 2017, Berlin, Germany
- Multivariable Analysis, 16-20 Apr 2018, Nicosia, Cyprus
- Rapid Assessment and Survey Methods, 14-19 May, Athens, Greece
- Project Review 2018, 27-31 Aug, Lisbon, Portugal
- Time Series Analysis, 05-09 Nov 2019, Brussels, Belgium
- Vaccinology, 24-28 June 2019, Rome, Italy
- Project Review 2019, 26-29 Aug 2019, Prague, Czech Republic

6. Other training

- Preparation for Primary Departure (PPD) – July 2018: Doctors without Borders – MSF, Bonn, Germany
- Health in Humanitarian Crisis Course – May 2018: Health in Humanitarian Crises Centre at the London School of Hygiene and Tropical Medicine, London (online course)
- Basic & Advanced Security in the Field II and BSAFE: United Nations Department of Safety and Security (online course)

Discussion

Supervisor's conclusions

Basel was already a very skilled fellow and a specialist in TB epidemiology at the start of the fellowship. The beauty of the EPIET fellowship is that it is tailored for the individual learning. Thus, for Basel, it was important to angle his training, so he could enhance his experience in other infectious disease, outbreak investigation, increasing his exposure to international missions; and enhancing his TB expertise. He has also used his skills to teach other fellows; participating as a facilitator in the Multivariable analysis module and developing a lecture and new case study that was received well and will continue to be used in the module. Likewise, he helped with EWARS training. He also helped a junior investigator in the TB delay project.

His work with Enteric fever will be the outline for the new working group advising on treatment guidelines for Enteric fever in the U.K. Likewise, the ED study will be used to analyse cost-effectiveness of Hepatitis C screening. His international missions will contribute to the improvement of TB surveillance in Afghanistan and Mauritania. He gained experience of outbreak missions both overseas and locally and participated in the on-call rota.

Basel was a pleasure to supervise and contributed much to the EPIET fellowship whilst being here. As well as his technical excellence, he has shown teamwork but can also lead investigations. I believe the EPIET fellowship allowed him to modify his career path in a way that has given him many opportunities. I wish him all the best in the future and have no doubt he will contribute immensely to field epidemiology in his career.

Coordinator's conclusions

Basel started his fellowship as an experienced TB epidemiology expert. He was involved in eight field assignments in the surveillance and research area, along with two outbreak investigations. The fellowship was tailored to his experience and excellent technical skills, enhancing his TB expertise internationally and adding experience in other infectious diseases. He has completed all assignments, achieving all EPIET objectives and producing high quality outputs. Particular highlights are teaching in MVA module, projects on drug resistance of Enteric fever, screening of Hepatitis B and C, and on evaluating TB surveillance systems in Afghanistan and Mauritania.

He is highly skilled, able to work independently and effectively. Supported by excellent supervision and project availability, his fellowship has been very successful. He improved his competencies working with several new public health topics and using novel methods.

I believe that Basel has considerable professional and technical skills needed for epidemiological and public health related work and I wish him all the success in his career.

Personal conclusions of fellow

I am glad to have been given the opportunity to do the EPIET fellowship. It was a great experience that allowed me to expand my knowledge and exposed to a variety of public health topics. During the fellowship, I have conducted research projects on infectious disease that I was not familiar with. Moreover, I gained the first experience in field epidemiology and outbreak investigation.

Furthermore, international assignments gave me a great opportunity to develop new skill in field epidemiology and to gain valuable experience at personal and professional level. I have learned how to do my best to maintain and achieve the required works despite the high workload, the intensive situation and different backgrounds of the team members.

EPIET has been a big professional and career leap for me. It has enabled me to build a valuable professional network at the EU and international levels and therefore has opened many possibilities for my future career.

Within the fellowship I could be a part of a community of like-minded people who share similar values and aspirations. The people I have met during the fellowship among fellows and supervisors/coordinators are among the most wonderful friends and colleagues.

Acknowledgements of fellow

First, I would like to thank Sooria Balasegaram, my EPIET supervisor, for giving me the opportunity to be hosted at the Public Health England (PHE) and for all her support and efforts that enabled me to gain the maximum benefit from the fellowship.

Also, I would like to thank Frantiska Hruha, my frontline coordinator, for her smooth and constant support, availability and mentorship.

Many thanks to the colleagues from Field Epidemiology South East & London at PHE, for welcoming me, for their patience to answer my questions, and their inviting me to social activities.

I would like also to express my gratitude to all EPIET/EUPHEM coordinators and organization teams for ensuring the quality of this program and for providing highly valuable training modules.

Finally, I would like to thank all the fellows for the wonderful professional and personal moments we have shared together.