



Summary of work activities

Athinna NISAVANH

The ECDC Fellowship Programme

Intervention Epidemiology path (EPIET), 2020 cohort

Background

The ECDC Fellowship Programme is a two-year competency-based training with two paths: the field epidemiology path (EPIET) and the public health microbiology path (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 provide 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.

According to Articles 5 and 9 of ECDC's founding regulation (EC No 851/2004) 'the Centre shall, encourage cooperation between expert and reference laboratories, foster the development of sufficient capacity within the community for the diagnosis, detection, identification and characterisation of infectious agents which may threaten public health' and 'as appropriate, support and coordinate training programmes in order to assist Member States and the Commission to have sufficient numbers of trained specialists, in particular in epidemiological surveillance and field investigations, and to have a capability to define health measures to control disease outbreaks'.

Moreover, Article 47 of the Lisbon Treaty states that 'Member States shall, within the framework of a joint programme, encourage the exchange of young workers. Therefore, ECDC initiated the two-year EUPHEM training programme in 2008. EUPHEM is closely linked to the European Programme for Intervention Epidemiology Training (EPIET). Both EUPHEM and EPIET are considered 'specialist pathways' of the two-year ECDC fellowship programme for applied disease prevention and control.

This report summarises the work activities undertaken by Athinna Nisvanh, cohort 2020 of the Intervention Epidemiology path (EPIET) at Santé publique France (SpF).

Pre-fellowship short biography

After his master's degree in Microbiology, Athinna undertook a two year speciality in Public Health at the Pasteur-CNAM School of Public Health in Paris.

Before joining the EPIET Cohort 2020, he had been working as a junior epidemiologist at the Foodborne, Vectorborne and Zoonotic Diseases Unit in the Infectious Diseases Division of Santé publique France (SpF) since 2017.

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Methods

This report accompanies a portfolio that demonstrates the competencies acquired during the EPIET fellowship 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 ECDC Fellowship Manual¹.

1. Epidemiological investigations

Outbreak investigations

1.1 Outbreak of Salmonella serotype 4,5,12:i:- (monophasic variant of S. Typhimurium) in Ile de France region in 2020, France

Supervisor: Nathalie Jourdan-Da Silva

In June 2020, the National Reference Centre for *Salmonella* (NRC) reported a new genomic cluster of *Salmonella* serotype 4,5,12:i:- (S.4,5,12:i:-) to SpF that had been identified through whole genome sequencing (WGS) since January 2020. We investigated to assess the extent of the outbreak and the vehicle of transmission and to implement control measures.

We defined a case as a person with S.4,5,12:i:- isolated in stool samples since January 2020, belonging to genomic cluster HC5_143285 (cgMLST). Data on risk exposures were collected via telephone interviews using a standard trawling questionnaire. Implicated premises were inspected. Trace-back/trace-forward investigations were conducted. Food and environmental samples were cultured for *Salmonella*. WGS was performed on all isolates.

Forty-nine cases were identified, 46 (94%) living in the Ile-de-France region. Among cases interviewed (n=24), symptom onset ranged from 15 January to 18 October 2020, with a peak in week 25-2020. Most cases reported consumption of meat (23/24 consumed chicken, 11/24 beef, 9/24 lamb). No other common exposures were identified. Eight cases (33%) reported buying meat directly from slaughterhouse X in Ile-de-France.

Inspections at slaughterhouse X identified several hygiene deficiencies in equipment maintenance and staff practices. On 24 July 2020, the outbreak strain was isolated in chicken and environmental samples from slaughterhouse X. Trace-back investigations of the place of purchase for other cases was hampered by inadequate documentation on distribution channels.

Our findings identified chicken meat from slaughterhouse X as the most likely vehicle for transmission. To prevent further cases, slaughterhouse X was closed from 29 July to 25 September 2020 and hygiene practices were corrected. No further cases were identified after October 2020. This outbreak highlights the importance of adherence to hygiene procedures in slaughterhouses. Without WGS, this persistent low-level outbreak could have gone undetected. We therefore highly recommended the strengthening surveillance by systematically sequencing all *Salmonella* isolates for human, food and food environment samples.

Role: Athinna was the co-investigator. He interviewed the cases. He participated in meetings with the Ministry of Agriculture regarding the product and environmental investigations. He maintained the line-listing of cases and conducted regular descriptive analyses during the outbreak. He presented the outbreak results at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE) in 2021, and wrote the outbreak investigation report (see Section 5).

¹ European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2020. Available from: <https://www.ecdc.europa.eu/en/publications-data/ecdc-fellowship-programme-manual-cohort-2021>

1.2 Investigation of a microsporidiosis cluster in Brittany region, France 2021

Supervisor: Fanny Chereau

On 20 April 2021, the NRC reported an unusually high number of microsporidial infections in the region of Brittany. SpF investigated to confirm the outbreak, assess its extent, identify common exposures and a potential vehicle of transmission, and implement control measures.

We defined a case as a person living in the region of Brittany with Microsporidia detected in a stool sample by PCR since 1 January 2021. Telephone interviews were conducted to collect data on risk exposures the month before symptom onset, using a trawling questionnaire.

In total, 13 cases were identified by the only laboratory in the region certified for Microsporidia testing (*Enterocytozoon* and *Encephalitozoon* genera). This number was in excess of the number of cases recorded for the same period in the previous two years (0-1 case).

Median age of cases was 31 years [range: 1-80 years], sex ratio (F/M) was 0.6. Seven cases resided in Finistère department, six in Côtes-d'Armor department. 10/13 samples were sent to the Parasitology-Mycology laboratory in Clermont-Ferrand for genotyping. *Enterocytozoon bienewisi* was identified in 8/10 samples, *Encephalitozoon hellem* in one sample and another sample was negative. Different genotypes of *E. bienewisi* (C, D, IV/K, WR5-like, WR5-like02) were detected in one stool sample each, Wildboar-3 in two samples and one sample could not be genotyped.

Among cases interviewed (n=8), the median delay between symptom onset and date of sampling was 72 days [range: 9-366 days]. In all, 6/8 cases were immunocompetent. No common exposures were identified.

The investigations did not confirm a common point source outbreak: different species and genotypes, no common exposures. All cases, although diagnosed in the first trimester of 2021, had illness onset over a period of one year. These findings may suggest the occurrence of sporadic cases. Hence, we recommended a prospective analytical study in this region to better understand Microsporidia sources and potential risk factors.

Role: Principal investigator. Athinna undertook an initial assessment to confirm the event and prepared the outbreak investigation protocol. He carried out a review of the literature and elaborated the questionnaire on EpiData. He interviewed the cases and analysed the data. He liaised with the NRC and the laboratory at the hospital in Clermont-Ferrand regarding confirmation of cases and WGS. He maintained the line-listing of cases and undertook regular descriptive epidemiology during the investigation. He wrote the report of the investigation (see Section 5). With his colleagues, he collaborated with Daniela Michlmayr (EUPHEM fellow from cohort 2020) and her colleagues at Statens Serum Institut in Denmark to discuss their results as they were also involved in a microsporidiosis outbreak investigation in Denmark at that time.

1.3 Other contributions to outbreak investigations

Athinna contributed to several other outbreak investigations as a member of the outbreak investigation team, mainly outbreaks of salmonellosis and paediatric Haemolytic and Uremic Syndrome (HUS). He contributed to the surveillance of these infections, outbreak detection, case validation, case interviews, and as a liaison with the laboratories.

Training modules related to assignment/projects

EPIET/EUPHEM Introductory Course - This module introduced Athinna to the main concepts of outbreak investigations, study designs and epidemiological analysis. He became familiar with identifying and performing the 10 steps of an outbreak investigation and how to conduct outbreak investigations, including data analysis.

Outbreak Investigation Module - This module provided in depth understanding of outbreak investigation by providing additional tools to carry out outbreak investigations (data collection using EpiData, validation, cleaning, managing datasets, descriptive analysis, statistical tests and their interpretation, analysis of cohort and case-control studies including analysis using R, and risk communication in outbreak investigation).

Educational outcome

The training modules of the fellowship and the active role in investigating as principal/co-investigator in two outbreaks provided Athinna with excellent learning experiences that allowed him to work independently through all stages of an outbreak investigation. He also developed his skills in the use of several tools (R, Stata, EpiData) for analysis of outbreak data and the writing of outbreak reports. He gained first-hand experience with the challenges and considerations related to inter-institutional communication and management of an outbreak. Athinna also transferred this newly acquired knowledge and experience to a field epidemiology training session (see Section 4. Teaching and Pedagogy).

2. Surveillance

2.1 Hepatitis A surveillance in France in 2020

Supervisor: Julie Fioni

The aims of the surveillance of hepatitis A in France are to obtain data to follow trends in incidence, and to detect and control outbreaks by implementing targeted measures.

The objective of the 2020 annual surveillance report was to provide feedback to the physicians and microbiologists giving notification of cases and to inform stakeholders and the general population about hepatitis A incidence and risk exposure through the publication of the report on SpF's website.

In 2020, the reporting incidence rate was estimated at 0.6 cases for 100 000 inhabitants (vs 2.1/100 000 inhabitants in 2019). The sex ratio (M/F) was 1.0 (mean ratio of 1.3 between 2006 and 2016). Similar to previous years, the reporting incidence rate was the highest among children between 6 and 15 years. Jaundice was reported in most cases (61%), 48% were hospitalised for their illness. The reporting incidence rate was the highest in the French overseas department of Mayotte (30.5/100 000 inhabitants), followed by Tarn-et-Garonne department, with 1.5/100 000 inhabitants. Thirty-two departments reported no cases, while only six reported no cases in 2019. The main risk exposures came from sea food consumption (28% of cases) and travelling abroad (21%). In comparison, the main risk exposures in 2019 were travelling abroad (47%) and the presence of a hepatitis A case in the household, or among other contacts (33%).

In 2020, the reporting incidence was exceptionally low. Such a low level had never been observed in the 14 years of surveillance. During the COVID-19 pandemic, the closure of borders probably had an impact on the incidence of hepatitis A as most cases reported in France are travel-related. Barrier measures such as handwashing, closure of bars and restaurants, lockdowns and curfews, may also have contributed to decreased hepatitis A virus transmission.

Role: Athinna was in charge of routine real-time hepatitis A surveillance (2020–2022), including case validation, weekly and monthly screening of databases in order to detect unusual events, advising Regional Health Agencies (ARS) on investigation of case clusters, and liaising with the reference laboratory. Athinna wrote the annual surveillance report for 2020 (see Section 5).

2.2 Surveillance of acute gastroenteritis during the 2019-2020 and 2020-2021 winter seasons

Supervisor: Henriette de Valk

In France, during the winter season, the surveillance of acute gastroenteritis (AGE) is monitored through a syndromic surveillance system based on data from the hospital emergency departments network (ED), the emergency general practitioners association (SOS Médecins) and the sentinel network of general practitioners (Réseau Sentinelles). Data from the NRC for Enteric Viruses are also analysed.

The system enables the monitoring of weekly trends at national and regional level in order to detect unusual events and to implement targeted control measures. During the 2019–2020 winter season (from W47-2019 to W16-2020) we described the trends in gastroenteritis surveillance data and informed the general population through a seasonal surveillance report published on the SpF website.

The syndromic surveillance system registered unusually high levels of ED attendance in week W1-2020 (3.1% of the total visits due to AGE), and of GP consultations in W2-2020 for SOS Médecins and Réseau Sentinelles (17% and 349 cases/100 000 inhabitants of the total consultations respectively). These significant peaks were linked to the consumption of contaminated oysters during Christmas and New Year's celebrations. Such high levels have not been observed since the 2012–2013 winter season. In W1-2020, the number of samples received at the NRC reached a peak, with 26 samples. Norovirus was detected in 23/26 samples (88%).

After W3-2020, a sharp decrease was observed which stabilised at very low levels after W13-2020 for all data sources compared to the same period for the previous 10 years. This was most likely linked to the mitigation measures implemented during the COVID-19 pandemic in 2020.

During the entire winter season, the virus most frequently detected was norovirus in 118/123 samples (96%). Norovirus genotypes GII.4 2012[P16] and GII.17 [P17] were predominant (respectively 19% (22/118 and 14% (21/118)). Rotavirus was detected in 3/123 samples (2%).

Role: Athinna monitored weekly trends in AGE surveillance data and facilitated weekly meetings with partners. He wrote the 2019–2020 seasonal surveillance report that was published on the SpF website (see Section 5). He also wrote a manuscript on the impact of COVID-19 (restrictions) on AGE incidence. He communicated these results to a working group meeting at the Ministry of Health, and a symposium of emergency department physicians and professional societies (see Section 5).

Training modules related to assignment/projects

Introductory Course - This module introduced Athinna to the main concepts of epidemiological surveillance, identifying and describing components of a surveillance system, analysing and interpreting surveillance data and understanding the use of whole genome sequencing in surveillance.

Time Series Analysis module This module introduced the different types of time series analysis and statistical models used in public health surveillance and research, and provided Athinna with the skills needed to perform time-series analysis on AGE surveillance data.

Educational outcome

For Athinna, the two above-mentioned surveillance projects (hepatitis A and AGE) represented a great opportunity to directly put into practice what he had learned in the EPIET modules, thereby reinforcing his understanding of infectious disease surveillance: how to collect data, how it is generated, how to analyse this data in order to detect unusual events and how to communicate these findings.

3. Applied public health research

3.1 Practices of the French population towards food-borne illnesses and their prevention - Health Barometer survey

Supervisors: Nathalie Jourdan Da-Silva

In France, several outbreaks of Shiga toxin-producing *Escherichia coli* (STEC) related to HUS have occurred over the last decade, seven of which were attributed to the consumption of raw milk cheese, and three to the consumption of (undercooked) ground beef patties. In spite of several efforts to inform the general population about such risks and preventive measures to avoid them, these products are still responsible for HUS outbreaks, mostly among young children.

We therefore decided to upscale and strengthen the information campaigns. In order to design the most effective campaign, to define the target groups and to create a relevant communication content, we decided to carry out a study to document practices of the French population in relation to foodborne illnesses and their prevention. The study focused particularly on children and the elderly, since they are at higher risk of severe illness and represent the most populations most affected in previous outbreaks.

This study was included in the Health Barometer Survey, a national cross-sectional telephone survey on health behaviour and perceptions that is regularly carried out in France. A questionnaire on practices related to foodborne infections was included in the 2021 survey and the specific objectives were to:

- Estimate the proportions of different practices related to household hygiene and food handling in the general population among those who cook, and to identify and assess the sociodemographic characteristics associated with these practices.
- Estimate the proportions of children and the elderly regularly consuming raw milk cheeses, and/or undercooked minced meat and to identify and assess the sociodemographic characteristics associated with these consumptions.

Data analyses are still ongoing using R.

Role: Athinna was involved in the formulation of the public health problem and research questions, determining if and how the Barometer survey could be used to investigate this problem and to assess current behaviour towards foodborne infection. He carried out a literature review to better understand practices relating to foodborne infections in France. He cleaned the dataset and conducted a multivariable analysis to identify the sociodemographic determinants of food handling practices and undercooked minced meat and raw milk cheese consumption. At present, he is preparing a manuscript for publication in the French Epidemiological Bulletin (see Section 5).

Training modules related to assignment/projects

Introductory Course – This module introduced Athinna to the main concepts of applied research in public health, study designs and epidemiological analysis.

Multivariable Analysis Module – This module provided provide the skills needed to perform and interpret multivariable analysis and to communicate the results. This module helped Athinna to acquire competencies in the areas of statistical data analysis, inferential statistics and written communication.

Rapid Assessment and Survey methods (RAS) module – This module provided an additional opportunity for Athinna to explore more advanced concepts in survey methods.

Educational outcome

This research project allowed Athinna to work on survey methods, a field he had not previously been exposed to. It also provided Athinna with the experience of writing a research project protocol, cleaning and managing a large dataset from survey data, conducting descriptive and multivariable analysis, identifying key recommendations based on the main findings, and writing a research report and a manuscript.

4. Teaching and pedagogy

4.1 IDEA Field Epidemiology Training, Rennes, France

IDEA (Cours International d'Epidémiologie Appliquée) is an annual three-week training in Rennes (France) on infectious disease field epidemiology. Athinna facilitated four case studies during the first week (March 2022).

Athinna guided fellows (Public Health Master's fellows, public health professionals, medical doctors from hospitals and general practitioners) through the case studies, reformulating questions where necessary in order to clarify, providing examples based on his own experience and approaching fellows individually as required.

Training modules related to assignment/projects

EPIET/EUPHEM Introductory Course The various case studies Athinna was involved in as a fellow in this module as well as several other modules from EPIET (Outbreak Investigation, Multivariable Analysis, and Vaccinology Module) provided him with examples on how to facilitate a case study.

Educational outcome

The experience with case study facilitation allowed Athinna to view case studies from a different angle. This deepened his understanding of outbreak investigations, surveillance, public health research and the importance of discussing results with professionals from different backgrounds.

5. Communication

Publications related to the EPIET fellowship

5.1 Nisavanh A, Horigue I, Debin M, Turbelin C, Kengne-Kuetche C, Nassany O, et al. Epidemiology of acute gastroenteritis in France from November 2019- August 2021, in light of reported adherence to COVID-19 barrier measures. *Sci Rep.* 2022 Oct 19;12(1):17504. doi: 10.1038/s41598-022-22317-7. PMID: 36261604; PMCID: PMC9581450.

Reports

5.2 Nisavanh A, Pardos de la Gandara M, Laurent E, Bonifait L, Mission des Urgences Sanitaires, Jourdan-Da Silva N. Outbreak investigation report of *Salmonella* serotype 4,5,12:i:- (monophasic variant of *S. Typhimurium*) in Ile de France region in 2020, France. Infectious Diseases Department, Santé publique France. 2020

5.3 Nisavanh A, Chereau F, Favennec L, De Valk H, Poirier P. Investigation report of a microsporidiosis cluster cases in Brittany region, 2020. Infectious Diseases Department, Santé publique France. Internal investigation report. 2021

5.4 Practices of the French population towards foodborne illnesses and their prevention - Health Barometer survey, 2021. [Manuscript in preparation for the French Weekly Epidemiological Bulletin (BEH)]

5.5 Surveillance of acute gastroenteritis during the 2019-2020 winter season (available on SpF website): <https://www.santepubliquefrance.fr/maladies-et-traumatismes/maladies-infectieuses-d-origine-alimentaire/gastro-enterites-aigues/documents/bulletin-national/bulletin-epidemiologique-gastro-enterite-aigue.-bilan-de-la-surveillance-hivernale-2019-2020>

5.6. Annual report of hepatitis A surveillance in France in 2020 (available on SpF website): <https://www.santepubliquefrance.fr/les-actualites/2022/hepatite-a-chiffres-2020>

Conference presentation

5.7. Nisavanh A, Pardos de la Gandara M, Laurent E, Bonifait L, Mission des Urgences Sanitaires, Jourdan-Da Silva N. Using WGS for the detection of a persistent low-level outbreak of *Salmonella* serotype 4,5,12:i:- (monophasic variant of *S. Typhimurium*) in Ile de France region in 2020, France. Poster presentation. ESCAIDE 2021. Virtual. 16-19 November 2021.

Other presentations

5.8. Outbreak investigation of *Salmonella* serotype *S.4,5,12,i*- (monophasic variant of *S. Typhimurium*) outbreak in the Ile de France region.

- Outbreak Investigation Module. Virtual. 7-11 December 2020.
- Project Review Module. Virtual. 23–26 August 2021.

5.9. Acute gastro enteritis and the impacts of control measures against Sars-Cov2. Working group at the Ministry of Health on the application of handwashing as an alternative to prevent antibiotic use and resistance. Virtual. 20 April 2021.

5.10. Acute gastro-enteritis surveillance data during the COVID-19 pandemic. Symposium of Emergency department physicians and professional societies. Virtual. 31 March 2022.

6. EPIET/EUPHEM modules attended

1. Introductory course part 1 (28 September –16 October 2020), virtual
2. Introductory course part 2 (Operational Research) – Inject days, 9-10 November 2020, virtual
3. Outbreak investigation, 7-11 December 2020, virtual
4. Multivariable analysis, 15-19 February 2021, virtual
5. Introductory course part 3, 26 April – 7 May 2021, virtual
6. Rapid assessment and survey methods, 27 April 2021 and 5-6 May 2021, virtual
7. Project review, 23-26 August 2021, virtual
8. Vaccinology, 14-18 February 2022, virtual
9. Time series analysis, 4-8 April 2022, Rome, Italy
10. Management Leadership and Communication in Public Health, 13-17 June 2022, Stockholm, Sweden.

7. Other training

1. Scientific article: From writing to publishing training, SpF, France, 14-16 March 2022
2. Introduction to survey methods, Ensaie-Ensaie Formation Continue (Cepe), 12-13 May and 19-20 May
3. World Health Organization (WHO) The Global Alert and Response, 3 May 2021, virtual training module.
4. World Health Organization (WHO) Working with GOARN in the Field, 3 May 2021, virtual training module.
5. World Health Organization (WHO) The Public Health Emergency & Humanitarian Architecture & Landscape, 3 May 2021, virtual training module.
6. World Health Organization (WHO) Working in an International Multidisciplinary Outbreak Response Team, 3 May 2021, virtual training module.
7. World Health Organization (WHO) Personal Well-being for Deployment, 3 May 2021, virtual training module.
8. World Health Organization (WHO), United Nations Department of Safety and Security, BSAFE, 3 May 2021, virtual training module.
9. World Health Organization (WHO) Working in WHO's Incident Management System, 4 May 2021, virtual training module.
10. World Health Organization (WHO) Incident Management System Functional Areas, 4 May 2021, virtual training module.
11. World Health Organization (WHO) Ethics and Values, 4 May 2021, virtual training module.
12. World Health Organization (WHO) Team Dynamics, 4 May 2021, virtual training module.
13. World Health Organization (WHO) Me and the Mission, 4 May 2021, virtual training module.

Discussion

Coordinator's conclusions

One of the main goals of the EPIET programme is for fellows to develop core competencies in field epidemiology mainly through project or activity work, but also partly through participation in training modules and apply epidemiological methods to provide evidence to guide public health interventions for communicable disease prevention and control. This report summarises all activities and projects conducted by Athinna during his two-year EPIET fellowship (cohort 2020) as an MS-track fellow at Santé publique France in Saint-Maurice, France.

It was a great pleasure to work with Athinna, whom I got to know as a very hardworking, thankful and modest epidemiologist. Because of his modest nature, this portfolio probably does not display how much he has contributed and how much he has learnt. It is nonetheless clear to all who have worked with Athinna, that despite the difficult circumstances due to COVID-19, the extremely high workload and the lack of face-to-face EPIET modules, he has grown incredibly during his fellowship. Through his many contributions to outbreak investigations in the Foodborne, Vectorborne and Zoonotic Diseases Unit where he is based, he has been an essential force within the team and has developed into an outbreak investigation expert over the course of his fellowship. During his time at SpF, the methods used in outbreak investigations have changed considerably, with more and more WGS and potential outbreak clusters detected. With the *Salmonella* serotype 4,5,12:i:- outbreak investigation, Athinna has been working on the forefront of these developments. In addition, he has gained confidence in infectious disease surveillance through his work on hepatitis A and AGE, and on conducting epidemiological studies from planning to data analysis and dissemination of results, as well as in communicating to different audiences and training others.

Supervisor's conclusions

During the fellowship, Athinna was involved in a large number of different projects which enabled him to further develop his competencies in surveillance, outbreak investigation and the conduct of research. He conducted surveillance of hepatitis A and acute gastroenteritis, during a period which was heavily affected by the COVID-19 mitigation measures and in both cases he prepared the surveillance reports. He also published a paper on the impact of these mitigation measures on the incidence of acute gastro-enteritis. These projects gave him the opportunity to be fully in charge of all aspects of the surveillance of these diseases, from data validation, screening for clusters and outbreaks, to communicating the findings to stakeholders, reporting physicians and the general public. The modules provided by the EPIET programme were well adapted and provided him with the necessary tools and skills to carry out these projects successfully. He also developed a protocol for a KAP survey related to foodborne illnesses and carried out the analysis using what he had learned during the modules. The results of this study will be used to adapt and strengthen the communication campaign for the prevention of foodborne illnesses in children and the elderly in France.

Athinna played a major role (principal investigator) in two outbreaks but was also involved in several other outbreak investigations as a member of the investigation team. He made a valuable contribution to the epidemiological training course for public health professionals, using his recent experience with surveillance and outbreak investigations when he facilitated case studies.

Athinna is a highly motivated epidemiologist with a high work capacity, which enabled him to meet all the training objectives and get the best out of all the learning opportunities that the EPIET programme offers, in spite of the difficult circumstances due to the ongoing COVID-19 crisis, and the difficulties inherent to the MS-track (having tasks in addition to the EPIET projects). During his fellowship he has gained confidence in his epidemiological skills, and he learned to take on responsibility for sometimes complex projects and activities. The training will be a great help for his further career as a field epidemiologist.

Personal conclusions of fellow

These two years of the fellowship have been an outstanding experience that has allowed me to reinforce my competencies in epidemiology, especially in outbreak investigation, statistics and applied research. This was particularly due to the 'learning-by-doing' approach that enabled me to put directly into practice what I had learned during the EPIET modules. The EPIET programme provided me an exceptional training experience that has broadened my understanding of public health methodologies and their potential roles.

Acknowledgements of fellow

I would like to thank my colleagues from the Foodborne, Vectorborne and Zoonotic Diseases Unit at Santé publique France who encouraged and supported me continuously during the two years of my fellowship.

I would especially like to thank my supervisors Henriette de Valk, for her mentorship and support and for making herself available during the very busy period with COVID-19 and Monkeypox and Harold Noel, for his incisive and constructive advice and guidance.

I also would like to thank my frontline coordinators Alastair Donachie, Lynn Meurs and Barbara Schimmer for their remarkable support and constructive feedback throughout my fellowship.