

Summary of work activities

Elke den Boogert

The ECDC Fellowship Programme

Field 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 Elke den Boogert, cohort 2020 of the Intervention Epidemiology path (EPIET) at the National Institute for Public Health and the Environment (RIVM), Bilthoven, the Netherlands.

Pre-fellowship short biography

Elke den Boogert completed her studies in Health Sciences (BSc) in 2015 and Health Education and Promotion (MSc) in 2016 at Maastricht University in the Netherlands. After her studies, she started working as a researcher at the Municipal Health Service (GGD) Hart voor Brabant at the Department of Infectious Diseases. As a researcher, she managed several qualitative and quantitative research projects on the prevention of infectious diseases, and published articles nationally and internationally. From 2018 until the start of her fellowship, Elke worked as a project assistant for the Regional Antimicrobial Resistance (AMR) Network, and had a shared responsibility for project management and administrative matters involving a large budget. On 11 September 2020, Elke started her EPIET fellowship at the RIVM, which she finished on 9 September 2022 under the supervision of her training site supervisor Mirjam Knol and her frontline coordinators Guido Benedetti (first year) and Tanja Charles (second year).

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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. Cluster of STEC O157 in the Netherlands, 2021

Supervisors: Ingrid Friesema

Through Whole Genome Sequencing we discovered a cluster of 12 patients with STEC O157 in the Netherlands, three males and nine females. The date of onset ranged from 21 July 2021 to 3 October 2021 (with one date of onset unknown). Ten of the cases lived in the north-eastern part of the Netherlands, and two cases in the western part. STEC is routinely reported to the National Institute for Public Health and the Environment (RIVM), so information on demographics and risk factors were already available for 11 cases. One case did not fit the case definition for routine reporting, but was considered part of the cluster. Additional trawling questionnaires were sent. For two cases, no information on risk factors was available from trawling questionnaires.

We conducted two case-case studies and calculated odds ratios and p-values. First, we compared the current STEC O157 cluster (n=10) with all other STEC O157 cases (n=17) from 2021 in the Netherlands. Second, we compared the current cluster (n=10) to all other STEC cases (n=205) from 2021 in the Netherlands.

The results of both case-case studies suggested carpaccio and lettuce as a likely source of infection (respectively, OR 17.5 95% CI: 1.79 to 221.6 and OR 27.6 95% CI: 5.45 to 174.8, however, not all cases reported eating this. As most carpaccio sales were linked to larger supermarket chains and restaurants, we contacted the Dutch Food and Consumer Product Safety Authority (NVWA) as we assumed there might be a common supplier. The NVWA received a list of the supermarkets and restaurants where cases bought or ate the carpaccio, but they were unable to identify a link with the cluster.

After 5 October 2021 (last date of onset) no new cases were reported, suggesting that the source of infection is eliminated and we considered the outbreak over.

Elke was a co-investigator. She contacted laboratories and local health authorities to start additional trawling questionnaires and she developed a case register. Elke conducted the case-case analyses, co-authored two signals for the weekly Early Warning Committee meeting [5] and wrote a short internal outbreak investigation report [7].

1.2. Cluster of Salmonella Typhimurium in the Netherlands, 2021

Supervisors: Roan Pijnacker

The National Institute for Public Health and the Environment (RIVM) discovered a cluster of 34 patients with Salmonella Typhimurium from September to December 2021 in the Netherlands, based on routine Whole Genome Sequencing surveillance (WGS). The median age was 42 years (range: 0-83 years), and 17 (50%) were female. Salmonella is not a notifiable disease and food consumption data are not routinely collected. Local health authorities (GGD) interviewed cases using trawling questionnaires.

We conducted two case-case analyses and one case-control analysis to identify the most likely source of infection. We calculated odds ratios and p-values. First, we compared food consumption of the current cluster (n=22) to all four Salmonella clusters investigated in 2021 (n=61). The results suggested a meat-related source, but no specific

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>

meat product was identified with wide confidence intervals (any beef OR 32 95% CI: 4.5 to 1 374; any pork OR 8.1 95% CI: 2.4 to 32; any chicken OR 18 95% CI: 2.5 to 763). Moreover, cases of the current cluster more often bought their meat at the butcher than the (super)market (OR 4.4 95% CI: 1.1 to 18). The second case-case study compared the current cluster to the previous 2021 *S. Typhimurium* cluster (n=16). This analysis showed that cases of the current cluster ate chicken meat significantly more often, with wide confidence intervals (OR 13 95% CI: 1.2 to 606). However, again no specific food products were identified.

Thirdly, we conducted a case-control study by comparing the current cluster (n=22) to routinely and randomly collected trawling questionnaires (n=126). Again, several meat products were significantly more consumed by cases than controls, such as steak (OR 5.5 95% CI: 1.5 to 19) and tartar (OR 5.9 95% CI: 1.3 to 26). In addition, cases reported eating at a restaurant more often than controls (OR 4.2 95% CI: 1.5 to 13).

Although we did not identify the source of infection, no new cases were reported in 2022.

Elke was the lead investigator. She contacted laboratories and GGDs to start trawling questionnaires. She conducted the case-case and case-control analysis and co-authored two signals for the weekly Early Warning Committee meeting [6]. In addition, she and Roan met with the NVWA to discuss the relevance of food sampling. Elke constructed an internal outbreak investigation report [8].

Training modules related to assignment/projects

EPIET/EUPHEM Introductory Course – This module introduced the fellow to the 10 steps of an outbreak investigation and the basics on performing an epidemiological investigation. With case studies, the fellow could practice the basics of the ten steps to apply to the outbreak investigations conducted during the fellowship.

Outbreak Investigation Module – This module continued and deepened the knowledge of the ten steps of an outbreak investigation. The module included practicing analytical skills, including data management, performing descriptive statistics, cohort and case-control studies, as well as the interpretation and communication of findings. The module guided the fellow in choosing study designs and interpret findings.

Multivariable Analysis Module – This module taught the fellow more on multivariable statistical analysis using R. The module included linear regression, multivariable and conditional logistic regression, Poisson and negative binomial regressions. Both analytical skills and interpretation of the findings were taught during this module. During both outbreak investigations, Elke used her analytical skills.

Educational outcome:

Elke was able to gain experience in outbreak investigation on national level, in addition to the regional experience she already had from working at the GGD. By conducting an outbreak investigation at the national level, she gained knowledge on national processes for data collection and surveillance. She worked with multiple municipal health services and laboratories and performed case-case and case-control studies. She increased her confidence in her role as an epidemiologist during an outbreak investigation by applying the 10 steps.

2. Surveillance

2.1. Substantial impact of the COVID-19 pandemic on reported chronic hepatitis C virus infections in the Netherlands, 2019-2021

Supervisors: Eline Op de Coul

The COVID-19 pandemic has had irrevocable consequences for health facilities, social contacts, and health-seeking behaviour affecting the occurrence and reporting of other infectious diseases. We examined trends in reported chronic hepatitis C virus (HCV) infections and associated transmission risk groups in the Netherlands to identify the potential impact of COVID-19 on access to healthcare (testing) services. We analysed notification data of patients with chronic HCV reported to the National Notifiable Disease Surveillance System from January 2019 to December 2021 in the Netherlands. Rates per 100 000 population with 95% confidence intervals (CI) were calculated, and we compared proportional changes in all transmission risk groups for chronic HCV between 2019 (pre-pandemic), 2020 and 2021 (pandemic).

In the study period, 1 391 chronic HCV infections were reported. Patients had a median age of 52 years, 71.8% were males and the overall rate per 100 000 population was 8.0 (95% CI: 7.6 to 8.5). We observed an overall decline of 41% in the number of reported chronic HCV in 2020 compared to 2019, with the sharpest decline in men who have sex with men (MSM) (59% in 2020, p=0.008).

The number of reported cases of chronic HCV strongly declined during the COVID-19 pandemic when healthcare services were scaled down. Between February and June 2021, reported chronic HCV cases increased again, indicating a recovering of healthcare services. MSM showed the largest decline compared to other risk groups. Further research is needed to fully understand the impact of access to healthcare, health-seeking behaviour and (sexual) transmission risks of HCV during the COVID-19 pandemic.

Elke was the lead investigator. Together with her supervisor she determined the study aim, constructed the project protocol and discussed the analysis. Elke performed the data cleaning and analysis, presented the results at ECCMID [10], and wrote a manuscript for publication in an international peer-reviewed journal [2]. In addition, based on the results of the study she suggested changes to the surveillance questionnaire. Elke was also involved in writing the chapters on Hepatitis C and B of the annual report on STI in the Netherlands.

2.2. Investigating opportunities for surveillance of long-term chlamydia complications in the Netherlands: a qualitative study

Supervisors: Janneke Heijne, Fleur van Aar

Chlamydia Trachomatis (chlamydia) can result in complications such as Pelvic Inflammatory Disease (PID), ectopic pregnancy (EP), and Tubal Factor Infertility (TFI). Internationally, asymptomatic chlamydia testing is under debate. Changes in these strategies influence chlamydia infection surveillance, and it is unknown how changing strategies influence the occurrence of complications. We investigated the opportunity of introducing routine surveillance of complications.

A qualitative study including 15 in-depth interviews with a purposive sample of gynaecologists, general practitioners (GP), sexual health and emergency doctors was conducted. The sample size was determined by the principle of saturation. A semi-structured interview guide focused on experiences with diagnosis and registration of PID, EP and TFI and how a change in asymptomatic chlamydia testing strategy might influence the occurrence of chlamydia infections and related complications. Interviews were transcribed and analysed using a thematic approach.

Gynaecologists reported diagnosing PID, EP, and TFI most frequently. Other professions rarely diagnose these complications, with emergency doctors only diagnosing EP. Most respondents reported unique registration codes for PID and EP, but TFI is more ambiguous. They reflected that diagnosis and registration of PID, EP and TFI are handled differently within their profession, despite guidelines. Most respondents acknowledged registration in diagnostic codes as a useful surveillance tool. They expressed concerns in representativeness (e.g. differences in interpretation of diagnosis criteria) and data completeness (e.g. missing diagnosis of asymptomatic complications and unknown causality between chlamydia and complication) for surveillance.

When establishing a chlamydia complication surveillance system, professionals should be engaged in further standardising diagnosis and registration practices. This will improve complication surveillance and facilitate evaluating the impact of changing testing strategies on occurrence of complications.

Elke was the lead investigator of this surveillance project. She wrote the study protocol, conducted the stakeholder analysis, constructed the interview guide, and wrote the recruitment information which she discussed with her supervisors. She recruited and interviewed the participants, and also coded and analysed the interviews, as well as drafting a participants' summary and a manuscript for a peer-reviewed international journal [3]. In addition, she submitted an abstract to ESCAIDE 2022 that was accepted for a poster presentation.

Training modules related to assignment/projects

EPIET/EUPHEM introductory course – The module introduced the fellow to the different types of surveillance, constructing case definitions for surveillance, analysing surveillance data, and setting up new surveillance by providing lectures, exercises, and case studies.

Rapid Assessment and Survey Methods module – During the module, the fellow was trained for outbreak response in emergency situations. Case studies and practical exercises helped her practice setting up a surveillance system and performing spatial sampling. The fellow was introduced to and trained in using Google Earth and QGIS for mapping. Risk communication to different audiences was also practised during this module.

Outbreak Investigation module – During this module, the fellow was introduced to the principles of qualitative and mixed methods in infectious disease control during one lecture. This included information on sampling, data collection, data analysis, and assessing quality and validity of qualitative studies. The fellow was able to apply the information from this lecture to her qualitative surveillance project.

Time Series Analysis module – The module helped the fellow to understand and perform time series analysis as a surveillance tool by giving examples on how to use time series analysis and letting her practice on her own dataset. The fellow applied time series analysis during the Hepatitis C surveillance project.

Educational outcome

Elke was able to perform both quantitative as qualitative research to increase her experience in surveillance. She was responsible for conducting interviews on potentially setting up a new surveillance system, and performed data analysis on routine surveillance data. Elke broadened her previous knowledge on regional surveillance by being involved in national surveillance projects. She better understands why and how the regionally collected surveillance data are used by the national institute. In addition, she gained more experience in carrying out qualitative research by setting up the interview guide, conducting the interviews, and coding and analysing the data.

3. Applied public health research

Incidence and severity of SARS-CoV-2 infection in former Q fever patients as compared to the Dutch population, 2020-2021

Supervisors: Rianne van Gageldonk-Lafeber, Lieke Wielders, Marit de Lange.

Surveillance data show a geographical overlap between the early stages of the COVID-19 pandemic and the Q fever epidemic between 2007 and 2010 in the Netherlands. We investigated the relationship between past Q fever and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in 2020/2021, using a retrospective matched cohort study. In January 2021, former Q fever patients received a questionnaire on demographics, SARS-CoV-2 test results and related hospital/intensive care unit (ICU) admissions. SARS-CoV-2 incidence with 95% confidence intervals (CI) in former Q fever patients and standardised incidence ratios (SIR) to compare to the age-standardised SARS-CoV-2 incidence in the general regional population were calculated. Among 890 former Q fever patients (response rate: 68%), 66 had a PCR-confirmed SARS-CoV-2 infection. Of these, nine (14%) were hospitalised and two (3%) were admitted to ICU. From February to June 2020, the SARS-CoV-2 incidence was 1 573/100 000 (95% CI: 749 to 2 397) in former Q fever patients and 695/100 000 in the general population (SIR 2.26; 95% CI: 1.24 to 3.80). The incidence was not significantly higher from September 2020 to February 2021. We found no sufficient evidence for a difference in SARS-CoV-2 incidence or an increased severity in former Q fever patients versus the general population during the period with widespread SARS-CoV-2 testing availability (September 2020–February 2021). This indicates that former Q fever patients do not have a higher risk of SARS-CoV-2 infection.

Elke was the lead investigator of this research project. She helped construct and send the questionnaire via regular mail, performed data entry and data cleaning, conducted analysis, helped write a governmental report [4] and a summary for participants, and prepared and submitted a manuscript to a peer-reviewed journal as first author [1]. In addition, she submitted an abstract for ESCAIDE 2021 and ECCMID 2022 (both rejected). She also contributed to data protection requests.

Training modules related to assignment/projects

EPIET/EUPHEM Introductory Course – The introductory course, including the operational research inject days, provided the fellow with an overview of study designs, selecting samples, epidemiological analysis, and communication of applied research. Practical sessions and case studies helped her apply the principles of research.

Multivariable Analysis Module – During this module, the fellow was introduced to the principles of linear, logistic, and Poisson regression. The fellow was taught how to apply different types of analysis by using R. Elke used these skills in her Q fever and COVID-19 research project.

Rapid Assessment and Survey methods (RAS) module – During this module the fellow was invited to practise setting up questionnaires to investigate possible risk factors and communication findings.

Educational outcome

Elke further developed her epidemiological and analytical skills by developing the study design and analysis plan. She asked for feedback from different sources to select the best method, which helped her to better understand the epidemiological implications of different analyses. By conducting the analysis as the main researcher, she strengthened her analytical and R skills. She prepared several abstracts, a manuscript, and a research report for different types of audiences, which helped develop her research communication skills.

4. Teaching and pedagogy

Facilitation of a case study on Giardia in Bergen, Norway at the Radboud UMC, online, 17 November 2020

As part of the Research Minor Control of Infectious Diseases for third year (bio)medical students, Elke facilitated an EPIET case study on Giardiasis in Bergen, Norway to 13 students, online. Additional supplementary material was developed to assist with the online aspect of teaching. Prior to the case study, a 10-minute presentation was given on Elke's background and career path. The training was evaluated with an overall 4.4 out of 5 by six students.

Facilitation of a case study on Salmonella in the Caribbean at the Radboud UMC, Nijmegen, 20 November 2020

As part of the Research Minor Control of Infectious Diseases for third year (bio)medical students at the Radboud UMC, Elke facilitated an EPIET case study on Salmonella in the Caribbean to a group of 10 students. After the case study, Elke provided a 10-minute presentation on her career path. Feedback was obtained from participants and the supervisor following the case study. Students were pleased with the facilitation, rating an overall 4.5 out of 5.

Facilitation of a case study on Giardia in Bergen, Norway at the Netherlands' School of Public Health and Occupational Health, online, 12 January 2021

Elke facilitated a case study on Giardiasis in Bergen, Norway at the Netherlands' School of Public Health, which is part of the curriculum for all infectious disease residents, online to a group of four students. Additionally, Elke reviewed and presented a one-hour existing lecture on epidemic curves. All four students filled in the feedback questionnaire rating the facilitation and lecture with an overall 4.6 out of 5.

Facilitation of a case study on Trichinosis in Paris at the Radboud UMC, Nijmegen, 14 December 2021

Elke facilitated a case study on Trichinosis in Paris to Epidemiology and Immunology Master students at the Radboud UMC in Nijmegen. Additionally, she and another fellow presented their career paths and possible work opportunities for students. The training activity was evaluated with written feedback by the host teacher and oral feedback from students. Students and host were very enthusiastic about the activity.

Facilitation of a case study on Legionella in Norway for the Regional Epidemiology Consultants, Bilthoven, 3 March 2022

As part of an in depth training for Regional Epidemiology Consultants (REC) on Infectious Diseases, Elke facilitated an outbreak related case study on Legionella in Norway and provided a lecture on outbreak investigation, including interesting practical examples from the GGD. The REC were very happy with the practical examples. Their coordinator provided feedback stating: 'I frankly don't see where Elke could improve her teaching skills.'

Facilitation of a case study on Haemophilus influenzae type b in the Netherlands, 2016 at the pre-conference meeting on Applied Infectious Disease Epidemiology prior to WEON, Nijmegen, 8 June 2022

Elke was invited to provide a presentation on the regional perspective in applied infectious disease epidemiology at the GGD and to facilitate a case study on Hib in the Netherlands. A diverse group of individuals interested or working in infectious disease epidemiology attended the pre-conference meeting.

Facilitation of a case study on gastroenteritis outbreak, Sweden at the Netherlands School of Public Health and Occupational Health, Utrecht, 9 June 2022

Elke facilitated a case study on a gastroenteritis outbreak in Sweden at the Netherlands School of Public Health in Utrecht. Students worked on the case study in pairs. Elke was there to provide help and additional information proactively. The host provided written feedback on the enthusiastic and proactive teaching style. She wrote that Elke was capable of answering all questions from the students.

Supervision of a Biomedical Science Master Student on a research project on Hepatitis A vaccination policy, GGD, May-November 2021

As part of her job at the Municipal Health Service (GGD), Elke supervised a Master Student on her thesis project at the GGD for seven months. Elke had weekly meetings with the student, reviewed her study protocol, interview guide and final presentation and manuscript, helped with qualitative analysis, and provided an insight into working at the regional health level.

Training modules related to assignment/projects

EPIET/EUPHEM Introductory Course – The fellow was introduced to the basic concepts of teaching, and different learning styles and sensory preferences of people. She used this information to tailor her teaching activities.

Management Leadership and Communication in Public Health Module – This module build on the principles taught during the EPIET/EUPHEM Introductory Course. Elke was invited to actively participate in exercises that trained her in different communication, learning, and sensory styles.

Educational outcome

Elke further developed her teaching skills and applied the information from the modules in her teaching styles. She gained confidence in speaking to a larger group of participants and she used the feedback to improve the following teaching activities. By preparing for the different teaching activities, she gained more confidence in her expert knowledge and was able to forward this knowledge to others.

5. Communication

Publications related to the EPIET fellowship

1. **Den Boogert EM**, de Lange MMA, Wielders CCH, Rietveld A, Knol MJ, van Gageldonk-Lafeber AB, RIVM COVID-19 Surveillance and Epidemiology Team. Incidence and severity of SARS-CoV-2 infection in former Q fever patients as compared to the Dutch population, 2020-2021. *Epidemiology and Infection*. Cambridge University Press; 2022;150:e116.
2. **Den Boogert EM**, Op de Coul ELM. Substantial impact of the COVID-19 pandemic on reported chronic hepatitis C virus infections in the Netherlands, 2019-2021. [In preparation].
3. **Den Boogert EM**, van Aar F, Heijne JCM. Investigating opportunities for surveillance of long-term chlamydia complications in the Netherlands: a qualitative study. [In preparation].

Reports

4. Van Gageldonk-Lafeber AB, Bom B, **den Boogert EM**, Hogerwerf L, Yzermans CJ, de Lange MMA, Rietveld A, Triemstra M, Weehuizen JM, Wever PC, Wielders CCH. Study on Q fever and COVID-19 [in Dutch]. National Institute for Public Health and the Environment (RIVM), Bilthoven, the Netherlands, 2021.
5. Contribution to Early Warning Meeting Signals 3692: 'Cluster of patients with STEC O157 in the Northern part of the Netherlands'. National Institute for Public health and the Environment (RIVM), Bilthoven, the Netherlands; 16/09/2021, 02/12/2021.
6. Contribution to Early Warning Meeting Signals 3697: 'National cluster of Salmonella Typhimurium'. National Institute for Public health and the Environment (RIVM), Bilthoven, the Netherlands; 23/09/2021, 25/11/2021.
7. **Den Boogert EM**, Friesema IHM. Cluster of STEC O157 in the Netherlands, 2021. Internal outbreak investigation report. RIVM, Bilthoven, the Netherlands.
8. **Den Boogert EM**, Pijnacker R. Cluster of Salmonella Typhimurium in the Netherlands, 2021. Internal outbreak investigation report. RIVM, Bilthoven, the Netherlands.
9. Contribution as a co-author to chapters 9. hepatitis B and 10. Hepatitis C of the annual report Sexually Transmitted Infections in the Netherlands in 2021.

Conference presentations

10. **Den Boogert EM**, Zantkuijl P, Veldhuijzen IK, Op de Coul ELM. Impact of the COVID-19 epidemic on reported chronic hepatitis C in the Netherlands, 2019-2021. European Congress of Clinical Microbiology and Infectious Diseases (ECCMID); 23-26 April 2022; Lisbon; oral presentation.
11. **Den Boogert EM**. Field epidemiology in the regional public health. Pre-conference meeting 'The art of applied infectious diseases epidemiology' WEON; 9 June 2022; Nijmegen; oral presentation.
12. **Den Boogert EM**, van Aar F, Heijne JCM. Investigating opportunities for surveillance of long-term chlamydia complications in the Netherlands: a qualitative study. European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE); 23-25 November 2022; Stockholm; poster presentation.

Other presentations

13. Presentation on career path; November 2020; online.
14. Presentation on career path; November 2020; Radboud UMC, Nijmegen.
15. Lecture 'Epicurves'; January 2021; online.
16. **Den Boogert EM**. [Vaccinatiebereidheid onder zorgmedewerkers in de langdurige zorg]. Oral presentation to the members of the Regional Committee non acute care (RONAZ). January 2021, Tilburg, The Netherlands.
17. **Den Boogert EM**. [Interventies voor het vaccineren van risicogroepen tegen Hepatitis A virus]. Oral presentation for Regional Epidemiology Consultants (REC) at their weekly meeting. January 2021, online.
18. **Den Boogert EM**. Hepatitis C surveillance analysis. Internal meeting 'Discussion on Tuesday' at the RIVM. March 2021, online.
19. **Den Boogert EM**. [Legionella in Schijndel]. Oral presentation for Medical Microbiologists on a legionella outbreak. March 2021, Jeroen Bosch Hospital, 's-Hertogenbosch.
20. **Den Boogert EM**. Oral presentation at the Internal Seminars of EPI – RIVM referee meetings. 'Are former Q fever patients (2007-2010) more at risk for SARS-CoV-2 and/or a more severe course of COVID-19 in the Netherlands?' September 2021, online.

21. **Den Boogert EM.** Opportunities for surveillance on long-term chlamydia complications in the Netherlands, 2021. Oral presentation for EPIET fellows from cohort 2020. November 2021, online.
22. Presentation on career path; December 2021; Radboud UMC, Nijmegen.
23. **Den Boogert EM.** [Hoe schrijf je een onderzoeksvoorstel? Praktijkvoorbeeld van GGD Hart voor Brabant]. Oral presentation on writing a project protocol from a practical GGD perspective. January 2022; online meeting for GGDs working with the academic workplace infectious diseases (AMPHI).

Other activities

24. Interview on being an EPIET fellow and an infectious disease epidemiologist at the GGD, Brabants Dagblad; 25-12-2020.
25. **Den Boogert EM,** de Lange MMA, Wielders CCH, Rietveld A, Knol MJ, van Gageldonk-Lafeber AB. Relationship between former Q fever infection and COVID-19 in the Netherlands, 2020-2021. Submitted to European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE); 16-19 November 2021; online; rejected.
26. **Den Boogert EM,** de Lange MMA, Wielders CCH, Rietveld A, Knol MJ, van Gageldonk-Lafeber AB. The incidence and severity of SARS-CoV-2 infection in former Q fever patients as compared to the general Dutch population, 2020-2021. Submitted to European Congress of Clinical Microbiology and Infectious Diseases (ECCMID); 23-26 April 2022; Lisbon; rejected.
27. **Den Boogert EM,** van Heemskerken PG, van Dam ASG. [Verbeteren hepatitis A vaccinatiegraad onder risicogroepen]. Short research report. Infectieziekten bulletin. [In preparation].

6. Other activities

Elke routinely attended the weekly scientific seminars organised by the epidemiology and surveillance department of the RIVM. She followed the weekly RIVM early warning meetings and had a tour of the laboratory at the RIVM in October 2021. As well as her work as a fellow at the RIVM, Elke also worked at the Municipal Health Service GGD Hart voor Brabant in 's-Hertogenbosch as an infectious disease epidemiologist. During the two years of her fellowship, Elke was involved in many tasks at the GGD level. She conducted a COVID-19 vaccine hesitancy study, participated in daily and weekly COVID-19 surveillance and research, advised on the zoonotic aspect of expansion of livestock farms, participated in provincial surveillance and research meetings, and supported the doctors and nurses in her team with routine surveillance. Within her role as an infectious disease epidemiologist at the GGD, she was involved in a large Legionella outbreak. She constructed and updated the case register, visualised and explored data to find potential sources, and presented results to colleagues. In addition, from December 2021 to February 2022 Elke temporarily acted as one of the seven Regional Epidemiology Consultants (REC). She contributed to the weekly meetings and was the representative for four GGDs for infectious disease epidemiology.

7. EPIET/EUPHEM modules attended

1. Introductory Course, 28 September 2020 to 16 October 2020, virtual
2. Introductory Course part 2; Operational Research, 9-10 October 2020, virtual
3. Outbreak Investigation Module, 7 December 2020 to 11 December 2020, virtual
4. Multivariable Analysis Module, 15 February 2021 to 19 February 2021, virtual
5. Introductory Course part 3, 26 April 2021 to 7 May 2021, virtual
6. Rapid Assessment & Survey Methods Module, 27 April 2021, 5 May 2021 and 6 May 2021, virtual
7. Project Review Module, 23-27 August 2021, virtual
8. Vaccinology Module, 14-18 February 2022 virtual
9. Time Series Analysis Module, 4-8 April 2022, Rome, Italy
10. Management, Leadership and Communication Module, 13-17 June 2022, Stockholm, Sweden
11. Project Review Module, 29 August 2022 to 2 September 2022, Lisbon, Portugal

8. Other training

1. ESCAIDE 2020, 26-27 November 2020, online.
2. COVID-19 outbreak training at the Municipal Health Service, November 2020, online.
3. RIVM course on Tidy-R, May 2021, online.
4. RIVM course on visualisation in R, May 2021, online.
5. ESCAIDE 2021, 16-19 November 2021, online.
6. RIVM course on statistical analysis in R, December 2021, online.
7. Outbreak training at the Municipal Health Service, April 2022, Vught, the Netherlands.

8. ECCMID 2022, 23-26 April 2022, Lisbon, Portugal.
9. ESCAIDE 2022, 23-25 November 2022, Stockholm, Sweden.

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 Elke den Boogert during her two-year EPIET fellowship (cohort 2020) as an MS-track fellow at the National Institute for Public Health and the Environment (RIVM), Bilthoven, the Netherlands.

When she started the fellowship Elke already had experience in the field of epidemiology, especially in research, at the regional level. During the fellowship she managed to complement her knowledge by gaining experience at the national level through two outbreak investigations and several surveillance activities focusing on Hepatitis C and B. She further broadened her knowledge in surveillance through an interesting qualitative study investigating opportunities for surveillance of long-term chlamydia complications. One challenging research project on a possible association between Q-fever and COVID-19 in the Netherlands further deepened her analytical skills, as well as her skills in communication. She facilitated several case studies and supervised a Master Student successfully, making her more confident in her teaching skills as well in her own expert knowledge. Elke had a very successful fellowship, identifying and carrying out a wide range of projects to further improve her skills in all the areas addressed. She was very motivated and remained positive despite some challenges posed by the pandemic. It was great working with her, and I wish her all the best for her future career.

Supervisor's conclusions

Elke had worked for several years as an epidemiologist at the regional public health service before she started her fellowship. She already had experience in routine surveillance and the management of research activities. Through her fellowship, she wanted to broaden her scope of public health epidemiology to the national level and increase her knowledge in epidemiological methods and data analysis.

Directly from the start of her fellowship, Elke got involved in a research project on the possible association between Q-fever and COVID-19, which was a very political and sensitive topic in the Netherlands because of the large and impactful outbreak of Q-fever in 2007. In addition, it appeared to be a research question that was very difficult to study. Elke managed to collect relevant data, perform the data analysis in R and publish a peer-reviewed article. In addition, she contributed to the communication of the results to the public and the government. Elke performed two surveillance projects where she learned very different skills. In the hepatitis C project she learned to define a relevant research question with the data available and analyse routine surveillance data, acknowledging the limitations of these data. She explored the effect of the COVID-19 pandemic on hepatitis C incidence. Based on this work, she made suggestions for improving the collection of surveillance data on hepatitis C. In the chlamydia project she conducted a qualitative study from beginning to end, consulting with experts on qualitative study design and analysis. The results of her work will be used to set up a surveillance system for complications of chlamydia. Elke performed two outbreak investigations where she learned to apply the ten steps of an outbreak investigation in a systematic way. She applied different designs (case-case and case-control) and performed multivariable analysis to try to find the source of the outbreak. In both outbreaks no clear source was discovered and no further public health actions could be taken. Elke was involved in many teaching activities and also supervised a Master's student. She developed a wide range of skills through the different projects she was involved in, because of the variety in design, type of data, analysis, and communication.

Elke combined her regular work at the Municipal Health Centre with her EPIET fellowship at RIVM, which was sometimes challenging. Working from home and following most modules online made the fellowship even more so. However, she managed to find her way through this and completed her fellowship with a very good portfolio of different activities acquiring a lot of skills, which will be very useful in her future career. Elke is a pleasant person to work with, she is very organised and has good management skills. She can work independently and asks for help if needed. She is eager to learn new skills and meet new people, thereby broadening her network. I am confident that she will continue to work in public health epidemiology, where she will be able to apply the skills she acquired or improved on during her fellowship.

Personal conclusions of the fellow

Before the start of my EPIET fellowship I worked at the regional health service for over three years as an epidemiologist and felt the need to broaden my knowledge and skills in the field epidemiology. The EPIET fellowship gave me the perfect opportunity to develop my professional epidemiological skills and at the same time provided me with a large (inter)national network. The combination of the fellowship at national level and working as a regional epidemiologist in particular gave me the opportunity to learn about differences and similarities between levels. For example, the outbreak investigations strengthened my understanding of why the GGD is asked for extra information, and in return I could use my regional experience to help the process at national level. The theoretical and practical training during the modules, in addition to gaining experience through projects was a productive combination. I feel comfortable to say that in the past two years I increased and strengthened my infectious diseases epidemiological skills. The fellowship not only addressed analytical skills but also broader public health professional skills were extensively discussed. I am grateful to have been a part of this interesting fellowship and will continue to apply all the acquired knowledge and skills in my future career.

Acknowledgements of the fellow

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Last but not least, the fellows from the 2020 cohort. It has been quite the two years, but we can proudly say we made it! Thank you for the interesting conversations, the trips, the virtual coffee breaks, the help and advice you provided and the network we created. I am very happy to have met you all and truly believe we will work together in the future.