

FINAL REPORT

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The European Programme for Intervention Epidemiology Training (EPIET), Cohort 2021

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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 at acknowledged training sites across European Union (EU) and European Economic Area (EEA) Member States.

According to Article 9 (6), Article 5 (8) and Article 11a (1) of Regulation (EU) 2022/2370 of the European Parliament and of the Council of 23 November 2022 amending Regulation (EC) No 851/2004 establishing a European centre for disease prevention and control (the ECDC Founding Regulation):

Article 9 (6) 'The Centre shall, as appropriate, support and coordinate training programmes, in particular in relation to epidemiological surveillance, field investigations, preparedness and prevention, response to public health emergencies, public health research and risk communication. Those programmes shall take into consideration the need for training to be kept up-to-date, take into account the training needs of Member States and shall respect the principle of proportionality.'

Article 5 (8) 'By encouraging cooperation between experts and reference laboratories, the Centre shall foster the development of sufficient capacity within the Union for the diagnosis, detection, identification and characterisation of infectious agents that have the potential to pose a threat to public health. The Centre shall maintain and extend such cooperation and support the implementation of quality assurance schemes'.

Article 11a (1) 'The Centre shall establish a EU Health Task Force and ensure that there is a permanent capacity and an enhanced emergency capacity to mobilise and use it. The EU Health Task Force shall provide assistance with regard to requests for prevention, preparedness and response planning, local responses to outbreaks of communicable diseases and after-action reviews in Member States and in third countries, in cooperation with the WHO. The EU Health Task Force shall include the Centre's staff and experts from Member States, fellowship programmes and international and non-profit organisations'.

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.

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Stockholm, September 2023

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This final report describes the output of the fellow and the competencies they acquired by working on various projects, activities, theoretical fellowship training modules, other modules or trainings and international assignments or exchanges during the fellowship.

Pre-fellowship short biography

Katja van Ewijk is from the Netherlands. After completing medical school in 2016 at the Vrije Universiteit Medical Centre in Amsterdam, she gained experience as a clinical doctor in intensive care, internal medicine and psychiatry liaisons departments. Katja then decided she wanted to specialise in public health. In 2018-2019 she followed a Master in Public Health, where she focused on Health Economics and Epidemiology, at the London School of Hygiene and Tropical Medicine. After completing the Master, she started her specialisation as a public health physician for infectious disease control in the Netherlands in 2019. In addition to her specialisation, Katja started her EPIET fellowship in 2021.

Results

The objectives of these core competency domains were achieved partly through project and activity work and partly by participating 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

1.1. Outbreak investigations

COVID-19 outbreak in a long-term care facility during the booster vaccination campaign, the Netherlands

Supervisors: Susan Hahné and Mirjam Knol

Category: Vaccine-preventable diseases

The elderly populations who reside in long-term care facilities (LTCF) are at higher risk for (severe) COVID-19, yet evidence of vaccine effectiveness (VE) in this population is scarce. In November 2021 (Delta period), a COVID-19 outbreak occurred at a LTCF in the Netherlands, which continued despite measures taken and a booster vaccination campaign. We investigated the outbreak to assess VE of primary COVID-19 vaccination against SARS-CoV-2 infection and mortality, and to describe the impact of the booster vaccination.

We calculated the attack rate (AR) and case fatality (CF) per vaccination status (unvaccinated, primarily vaccinated and those vaccinated with a booster dose). We calculated VE - on average six months after vaccination - as one-risk ratio (RR) using the crude risk ratio (RR) with 95% confidence intervals (CI) for the association between vaccination status (primary vaccination versus unvaccinated) and outcomes (SARS-CoV-2 infection and mortality < 30 days after testing positive for SARS-CoV-2).

The overall AR was 67% (70/105). CF was 33% (2/6) among unvaccinated cases, 12% among primarily vaccinated (7/58) and 0% (0/5) among those who received a booster dose. The VE of primary vaccination was 17% (95% CI -28%; 46%) against SARS-CoV-2 infection and 70% (95% CI -44%; 96%) against mortality. Among residents who received a booster dose (N = 55), there were 25 cases in the first week after receiving the dose, declining to five in the second week and none in the third week.

Vaccine effectiveness of primary vaccination in residents of LTCFs was very low against SARS-CoV-2 infection and moderate against mortality. There were a few cases at two weeks after the booster dose and no deaths, despite the presence of susceptible residents. These data are consistent with the positive impact of the booster vaccination in curbing transmission. Timely booster vaccination in residents of LTCF is therefore important.

Role: Katja co-led this outbreak investigation together with a colleague from the regional Public Health Service. She was responsible for making the data-collection tool (online questionnaire) used by the LTCF, for the data-management and analysis, and interpretation of the results. Katja was first author of an outbreak report manuscript that was published in the peer-reviewed journal (Paper 1). She additionally wrote an abstract and presented the findings through a poster presentation at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE, 2022)

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>

Mpox outbreak in the Netherlands, 2022: public health response, characteristics of the first 1 000 cases and the protection of the first-generation smallpox vaccine

Supervisors: Eline Op de Coul and Eelco Franz

Category: Emerging and re-emerging diseases including vector-borne diseases.

In early May 2022, a global outbreak of mpox started among persons without travel history to regions known to be enzootic for monkeypox virus (MPXV). On 8 August 2022, the Netherlands reported its thousandth mpox case, representing a cumulative incidence of 55 per million population, one of the highest cumulative incidences worldwide. We described the characteristics of the first 1 000 mpox cases in the Netherlands, reported between 20 May and 8 August 2022, within the context of the public health response. These cases were predominantly men who have sex with men aged 31–45 years. The vast majority of infections were acquired through sexual contact with casual partners in private or recreational settings including LGBTQIA+ venues in the Netherlands. This indicated that, although some larger upsurges occurred from point-source and/or travel-related events, the outbreak was mainly characterised by sustained transmission within the Netherlands. In addition, we estimated the protective effect of first-generation smallpox vaccine against moderate/severe mpox and found a vaccine effectiveness of 58% (95% CI: 17–78%), suggesting moderate protection against moderate/severe mpox symptoms on top of any possible protection by this vaccine against MPXV infection and disease. Communication with and supporting the at-risk population in following mitigation measures remains essential.

Role: Katja participated as Public Health registrar and EPIET fellow in the Dutch national public health response for the mpox outbreak in 2022. She regularly gave epidemiological updates on the mpox outbreak during Dutch Response Team meetings. She additionally co-wrote communication material (Labinfact) to regional public health professionals and e.g. general practitioners on the case definitions, control measures and epidemiological updates. For the manuscript on the outbreak investigation, she was responsible for the data-management and data-analyses. Katja interpreted the results and wrote the manuscript that was published in a peer-reviewed journal (Paper 2). She presented the results of the protective effect of the smallpox vaccine in the Dutch response team meeting to inform policymakers.

Educational outcome

Katja was involved in two outbreak investigations. During the outbreak investigations she gained experience in making data-collection questionnaires, procuring data, analysing data, writing outbreak reports and presenting the findings at an international conference and response teams. During the mpox outbreak in the Netherlands, Katja helped develop the case definitions for case finding, and communicated frequently through direct messaging services with the Public Health Services to update on the recommended control measures. These activities have helped Katja gain experience in the 10 steps of outbreak investigation and the public health response to an outbreak.

1.2. Surveillance

Evaluation of the invasive pneumococcal disease surveillance system among adults aged 60 years and older, the Netherlands 2021–2022

Supervisors: Anneke Steens and Amina Afrian

With the implementation of the PPV23 vaccination programme for adults, the existing surveillance system for IPD was expanded as of April 2021. Diagnostic laboratories submit IPD isolates to the NRLBM for serotyping and results are shared with RIVM. The regional public health services notify RIVM about cases through the OSIRIS notification system with epidemiological data. RIVM links the two datasets for surveillance analyses. We evaluated this surveillance system ten months after implementation on (1) the completeness of the isolates sent from the diagnostic laboratories to the NRLBM, (2) the completeness of cases notified in OSIRIS compared to cases reported by the NRLBM, and (3) the completeness of epidemiological data of cases in OSIRIS.

To assess the completeness of isolates received by the NRLBM, we compared the number of isolates with the number of isolates in the Infectious disease Surveillance Information System for Antibiotic Resistance (ISIS-AR). Approximately 95% of IPD isolates in ISIS-AR were submitted to the NRLBM.

There were 713 IPD cases in the NRLBM and 619 in the OSIRIS database. Of the 713 in NRLBM, 567 (80%) could be matched to OSIRIS. Reporting to Osiris was more complete for cases that were infected with a PPV23 serotype (447/547; 82%) compared to cases infected with a non-PPV23 (120/166; 72%), and for those targeted for vaccination (154/188; 82%) compared to those not yet eligible for vaccination (413/525; 78%).

Completeness of year of birth, sex, diagnosis date, and postal code, was 98–100% for the cases notified in OSIRIS (N=613). Vaccination status was reported in 89% of cases, and serotype in 81%. The NRLBM number was reported correctly only in 57% and was unknown in 40%. When stratifying by eligibility for vaccination, serotype and NRLBM number was more often reported in those eligible (140/162; 85%; 122/162, 77% respectively) than those not eligible (363/457; 79%, 226/457, 50%, respectively).

These results suggest that cases with PPV23 serotypes or in people who are eligible for vaccination, could more often be matched compared to those who are not, and that the indicators are more often completed in these individuals as well. Non-differential reporting will lead to biased results in vaccine effectiveness and impact studies.

Role: Katja was responsible for the data-management, which included data-linkage between two databases, and the data-analysis. To improve quality of surveillance, she communicated the results and its implications for public health to the regional Public Health Services during an oral presentation. Additionally, she made a factsheet of the results and the importance of IPD surveillance which was distributed to all regional Public Health Services to improve surveillance. Katja was the first author of a manuscript that was submitted to and accepted for publication in a Dutch peer-reviewed journal (Paper 3).

Educational outcome

By evaluating a surveillance system, Katja has gained experience on this specific task and has broadened her knowledge of surveillance systems. She better understands the importance of choosing the right indicators for the aim of the surveillance, and the importance of evaluating whether the aims are being met. Katja also learned the importance of communicating to the regional public health services why certain data are collected and for what purpose.

2. Applied public health research

COVID-19 vaccine effectiveness against SARS-CoV-2 infection during the Delta period, a nationwide study adjusted for chance of exposure, the Netherlands, July to December 2021

Supervisors: Mirjam Knol

When vaccines are introduced, it is important to monitor the vaccine effectiveness (VE). In general, there are several factors that can influence VE, such as age, and comorbidities. For SARS-CoV-2, people's behaviour, and consequently their chance of SARS-CoV-2 exposure, might also have an impact. Persons who adhere to non-pharmaceutical interventions might be more likely to get vaccinated, or vice versa. Differential SARS-CoV-2 exposure between vaccinated and unvaccinated individuals may confound VE estimates.

We conducted a test-negative case-control study to determine the VE against SARS-CoV-2 infection and the presence of confounding by SARS-CoV-2 exposure. We included adults tested for SARS-CoV-2 at community facilities between 4 July and 8 December 2021 (circulation period of the Delta variant). The VE against SARS-CoV-2 infection after primary vaccination with an mRNA (Comirnaty or Spikevax) or vector-based vaccine (Vaxzevria or Janssen) was calculated using logistic regression adjusting for age, sex and calendar week (Model 1). We additionally adjusted for comorbidity and education level (Model 2) and SARS-CoV-2 exposure (number of close contacts, visiting busy locations, household size, face mask wearing, contact with SARS-CoV-2 case; Model 3). We stratified by age, vaccine type and time since vaccination.

VE against infection (Model 3) was 64% (95% CI: 50–73), only slightly lower than in Models 1 (68%; 95% CI: 58–76) and 2 (67%; 95% CI: 56–75). Estimates stratified by age group, vaccine and time since vaccination remained similar: mRNA VE (Model 3) among people ≥ 50 years decreased significantly ($p = 0.01$) from 81% (95% CI: 66–91) at < 120 days to 61% (95% CI: 22–80) at ≥ 120 days after vaccination. It decreased from 83% to 59% in Model 1 and from 81% to 56% in Model 2. In conclusion, SARS-CoV-2 exposure did not majorly confound the estimated COVID-19 VE against infection, suggesting that VE can be estimated accurately using routinely collected data without exposure information.

Role: Katja was one of the main investigators of this research project. She adjusted the existing online questionnaire to make it up-to-date to the COVID-19 control measures in place at that time. She developed an analysis plan, performed data management, and conducted the analyses. In addition, she was first author of a manuscript that was published in a peer-reviewed journal (Paper 4). She presented the findings in an oral presentation during the ESCAIDE conference 2022.

Acceptance and timeliness of post-exposure vaccination against mpox in high-risk contacts, Amsterdam, the Netherlands, May-July 2022

Supervisors: Susan Hahné and Gini van Rijckevorsel

In May 2022, several countries reported mpox outbreaks among men-who-have-sex-with-men. In the Netherlands, high-risk contacts were offered the third-generation smallpox vaccine as post-exposure prophylaxis (PEP) preferably within four but within a maximum of 14 days after exposure. We investigated their PEP acceptance, timeliness of uptake and development of mpox symptoms for the region of the Public Health Service (PHS) Amsterdam.

High-risk contacts identified during 20 May–22 July 2022 were included. Contacts were followed-up 21 days after last exposure and classified as: no patient (no mpox symptoms or orthopoxvirus PCR-negative), probable (clinically suspected mpox) or confirmed patient (orthopoxvirus PCR-positive). We calculated time intervals with interquartile range (IQR) between date of most recent exposure and a) first PHS consultation, b) PEP administration, c) mpox symptom onset.

Two-hundred-ninety contacts were at high-risk of mpox predominantly due to sexual and/or direct skin-skin contact (212/290, 73%). First PHS consultation was a median of five (IQR 3, 7) days after exposure, at which point 26/290 (9%) contacts were ineligible for PEP. 84% (223/264) of contacts eligible for PEP, received PEP within a median of six (IQR 3, 8) days after exposure. Of 282 contacts (missing outcome n=8) 38 (14%) developed mpox, a median of six (IQR 0, 10) days after exposure, of whom 50% (19/38) developed mpox before their first PHS consultation. Among contacts eligible for PEP, 2/38 (5%) PEP unvaccinated and 16/218 (7%) PEP vaccinated contact developed mpox.

PEP acceptance among high-risk contacts of mpox patients was high. However, timeliness of PEP was inadequate. Half of the contacts received PEP six or more days after exposure, and half of the contacts who developed mpox had an onset prior to their first PHS consultation. Estimating PEP vaccine effectiveness is problematic due to the timeliness of PEP and the time it takes for vaccine-induced immunity to be generated. It is important to assess how timeliness of PEP may be improved and to promote pre-exposure vaccination to control mpox outbreaks.

Role: Katja was the main investigator of this project. Together with colleagues from the Public Health Services of Amsterdam she extracted the data from the electronic database. She was in charge of the data-management and analysis. In addition, she was first author of a manuscript that was submitted to a peer-reviewed journal (Paper 7).

A case-control study to explore risk factors for invasive group A streptococcal infection in children 0-5 years, the Netherlands, February-May 2023

Supervisors: Brechje de Gier

In 2022, an increase of increase of invasive Group A Streptococcal infection (iGAS) cases was observed in the Netherlands, compared with the pre-COVID years 2016-2019. Among children aged 0-5 years, there was a sevenfold increase, including nine reported fatalities among 42 cases. As a consequence, all iGAS manifestations, i.e. when GAS is found in a normally sterile body location, (compared to previously only puerperal fever/sepsis, toxic shock syndrome or fasciitis necroticans) became notifiable by 2023 and post-exposure prophylaxis was indicated for household contacts. The specific cause of this increase in iGAS (in children) was unclear, although several hypotheses existed: predisposing infections, such as chickenpox or other respiratory viruses, lead to a higher susceptibility in children ('porte d'entree'); reduced immunity for GAS and respiratory viruses after physical distancing during the COVID-19 pandemic; and the increase in GAS emm-type M1UK which has shown increased toxigenicity compared to the previous M1 strain. We aimed to investigate risk factors for developing iGAS infections in children aged six months up and to five years. We conducted a prospective case-control study between February and May 2023. Whenever a case was notified, we invited parents of 10 controls who were recruited via social media. Controls were matched on sex and birthyear of the case. Both the parents of the case and controls were invited to complete an online questionnaire on exposure in the past four weeks prior. Analysis and results were still pending at time of writing the final report.

Role: Katja was one of the primary investigators setting up the study. She wrote the study protocol, participated in making the study questionnaire and writing the information and informed consent letter for the parents of cases and controls. She additionally helped writing (as second author) an abstract that was accepted for the ESCAIDE conference 2023.

Upsurge of cutaneous diphtheria among migrants in the Netherlands, 2022

Supervisors: Susan Hahné and Helma Ruijs

In October 2022, ECDC reported an upsurge of diphtheria among migrants, mostly travelling from Syria and Afghanistan in Europe. Also, the Netherlands reported more cases of diphtheria in comparison to previous years. To determine the number of *C. diphtheriae* infections among migrants who present with cutaneous wounds, the RIVM decided to set up a study in collaboration with the regional public health services and asylum centres.

Role: Katja was part of the team that set up the study. She developed the first draft of the study protocol and did a sample size calculation. She was involved in writing updates on the epidemiological situation, case definition, testing protocol and control measures regarding diphtheria that was sent to regional public health professionals, physicians, general practitioners and microbiologist.

The association between reactogenicity and innate immune response after the first COVID-19 vaccination in healthy individuals, a prospective cohort study, the Netherlands, 2021

Supervisors: Mirjam Knol, Martijn van de Garde and Alienke Wijmenga-Monsuur

Reactogenicity refers to the physical manifestation of the inflammatory response that occurs soon after vaccination. The reactogenicity that people experience after COVID-19 vaccination varies substantially from person to person, and can include injection-site pain, redness, swelling, or induration as well as systemic symptoms such as fever, myalgia and headache.

Publications have reported an association with innate immune responses, such as serum IL-6 and CRP levels and reactogenicity after hepatitis B vaccination. The innate response shapes the development of the adaptive immunity following infection or vaccination. We aimed to determine whether the intensity of reactogenicity that people experience after first COVID-19 vaccination correlates with the characteristics of the innate immune response.

This study was part of the IIVAC study (Immune responses Induced by Vaccination Against COVID-19 in Dutch healthy individuals), which was a longitudinal observational study starting in 2021 in which humoral and cellular vaccine responses after COVID-19 vaccination were measured at various timepoint with a 12-month follow-up.

For the reactogenicity and innate immune response association, participants were invited to fill in a diary on their reactogenicity symptoms within the five days after their first COVID-19 vaccination. Additionally, they provided blood by venapuncture to measure the innate response 0-2 weeks before and two days after first COVID-19 vaccination. The activation of the innate immune system before and after vaccination was tested through cellular essays on PBMCs isolated from the collected blood and by measuring immune proteins in serum. We analysed whether the severity of reactogenicity was associated with the strength of various innate immune responses. Analysis and results were still pending at time of writing this final report.

Role: Katja was part the research team, together with immunological experts from the Centre for Immunology and Vaccine (IIV) of the RIVM. She was responsible for the data-management of the reactogenicity data. The data was later combined with immunology data for analysis for which Katja was responsible.

Educational outcome

During her research projects, Katja further developed her epidemiological and analytical skills. She also gained experience in making research compliant with the GDPR. She improved her skills in setting up studies and developing informed consent forms and questionnaires. By conducting analyses, she developed her analytical and R skills. Katja prepared multiple abstracts and learned how to present her findings in both oral and poster presentations at scientific conferences.

3. Teaching and pedagogy

From cell to notification: surveillance systems

Katja gave an online lecture at the Netherlands School of Public and Occupational Health on surveillance (in the Netherlands) to public health nurses. This was a two-hour course that included a lecture on surveillance systems and an interactive case study on how to set up a West Nile One Health surveillance system. Katja co-developed both the lecture and case study. The participants appreciated the content of the lecture and the group work on how to develop a surveillance system.

Surveillance systems

Katja gave a two-hour online lecture to epidemiologist who work at the regional public health services to train them on infectious disease epidemiology and surveillance systems. Katja developed the training and discussion material. The participants appreciated the theory on surveillance on they liked the practical examples. They valued the discussion on the pros and cons on different surveillances methods. The content was rated on average an 8 out of 10.

Outbreak investigation: Study design and choosing a reference group

Katja gave a 1.5-hour lecture at the Netherlands School of Public and Occupational Health, in Utrecht, to public health physicians in training on study designs and how to choose a reference group. She additionally facilitated a case study on Trichinosis in France.

Outbreak investigation: Epicurves

Katja gave a 1.5-hour lecture at the Netherlands School of Public and Occupational Health, in Utrecht, to public health physicians in training on epicurves. She additionally facilitated a case study on 'Giardia in Bergen, Sweden' at the NSPOH.

Outbreak response: Experiences from the 2022 mpox outbreak in the Netherlands

As part of the Research Minor Control of Infectious Diseases for third year (bio)medical students at the Radboud University Medical Centre, Katja gave a one-hour lecture on outbreak response and the experiences from the 2022 mpox outbreak response in the Netherlands. She developed the lecture and discussion material.

Facilitation of a case study on Giardia in Bergen, Sweden

Katja facilitated a case study on 'Giardia in Bergen, Sweden' to Public Health physicians in training at the Netherlands School of Public and Occupational Health, in Utrecht. The focus of this case study was the ten steps of an outbreak investigation, understanding the importance of a case definition, interpreting epicurves, calculating attack rates, and describing an outbreak in time place and person.

Facilitation of a case study on an outbreak of gastroenteritis in Kalundborg, Denmark

As part of the Research Minor Control of Infectious Diseases for third year (bio)medical students at the Radboud University Medical Centre, Katja facilitated an EPIET case study on an outbreak of gastroenteritis in Kalundborg in Denmark. The focus of this case study was the ten steps of an outbreak investigation and to illustrate the importance of a multi-disciplinary approach to an outbreak investigation.

Educational outcome

Katja van Ewijk was able to develop her teaching and pedagogical skills. In addition, by co-developing the teaching material she strengthened her knowledge on the content. She gained confidence in leading group discussions and transferring her knowledge, experience and skills to others.

4. Communication

4.1 Publications related to the EPIET fellowship

4.1.1 Manuscripts published in peer-reviewed journals

1. **C.E. van Ewijk** et al. COVID-19 outbreak in an elderly care home: Very low vaccine effectiveness and late impact of booster vaccination campaign. *Vaccine*. 2022 Nov 2;40(46):6664-6669. doi: 10.1016/j.vaccine.2022.09.080. Epub 2022 Oct 4. PMID: 36216647; PMCID: PMC9531647.
2. **C.E. van Ewijk** et al. Mpox outbreak in the Netherlands, 2022: public health response, characteristics of the first 1000 cases and the protection of the first-generation smallpox vaccine. *Euro Surveill*. 2023;28(12):pii=2200772. <https://doi.org/10.2807/1560-7917.ES.2023.28.12.2200772>
3. **C.E. van Ewijk** et al. Evaluatie van surveillance systeem voor invasieve pneumokokkenziekte in volwassenen van 60 jaar en ouder, 2021–2022. (Accepted by the Dutch journal *Infectieziektenbulletin*, June 2023. Awaiting publication).
4. **C.E. van Ewijk** et al. COVID-19 vaccine effectiveness against SARS-CoV-2 infection during the Delta period, a nationwide study adjusting for chance of exposure, the Netherlands, July to December 2021. *Euro Surveill*. 2022;27(45):pii=2200217. <https://doi.org/10.2807/1560-7917.ES.2022.27.45.2200217>
5. F. Miura, **C.E. van Ewijk** et al. Estimated incubation period for monkeypox cases confirmed in the Netherlands, May 2022. *Euro Surveill*. 2022;27(24):pii=2200448. <https://doi.org/10.2807/1560-7917.ES.2022.27.24.2200448>

6. Vaughan Aisling M, Cenciarelli Orlando, Colombe Soledad, Alves de Sousa Luís, Fischer Natalie, Gossner Celine M, Pires Jeff, Scardina Giuditta, Aspelund Gudrun, Avercenko Margarita, Bengtsson Sara, Blomquist Paula, Caraglia Anna, Chazelle Emilie, Cohen Orna, Diaz Asuncion, Dillon Christina, Dontsenko Irina, Kotkavaara Katja, Fafangel Mario, Ferraro Federica, Firth Richard, Fonager Jannik, Frank Christina, Carrasco Mireia G, Gkolfinopoulou Kassiani, Grenersen Marte Petrikke, Guzmán Herrador Bernardo R, Henczkó Judit, Hoornenborg Elske, Igoe Derval, Ilić Maja, Jansen Klaus, Jančá Denisa-Georgiana, Johansen Tone Bjordal, Kasradze Ana, Koch Anders, Kyncl Jan, Martins João Vieira, McAuley Andrew, Mellou Kassiani, Molnár Zsuzsanna, Mor Zohar, Mossong Joël, Novacek Alina, Orlikova Hana, Pem Novosel Iva, Rossi Maria K, Sadkowska-Todys Malgorzata, Sawyer Clare, Schmid Daniela, Sîrbu Anca, Sondén Klara, Tarantola Arnaud, Tavares Margarida, Thordardottir Marianna, Učakar Veronika, **Van Ewijk Catharina**, Varjas Jutta, Vergison Anne, Vivancos Roberto, Zakrzewska Karolina, Pebody Richard, Haussig Joana M. A large multi-country outbreak of monkeypox across 41 countries in the WHO European Region, 7 March to 23 August 2022. *Euro Surveill.* 2022;27(36):pii=2200620. <https://doi.org/10.2807/1560-7917.ES.2022.27.36.2200620>

4.1.2 Manuscripts submitted to peer-reviewed journals

7. **C.E. van Ewijk** et al. Acceptance and timeliness of post-exposure vaccination against mpox in high-risk contacts, Amsterdam, the Netherlands, May-July 2022. (Submitted, August 2023)
8. M.R. Haverkate, I.J.M. Willemstein, **C.E. van Ewijk**, P.C.G. Adam, S.J. Lanooij, P. Jonker-Jorna et al. Factors that influenced the course of the mpox outbreak in the Netherlands, 2022-2023 (Submitted, September 2023)

4.1.3 Letters to the Editor published in peer-reviewed journals

9. **C.E. van Ewijk**, S. Hahné, M.J. Knol on behalf of all co-authors of the original article. Response to Letter to the Editor: Importance of considering high-risk behaviours in COVID-19 vaccine effectiveness estimates with observational studies. *Euro Surveill.* 2023;28(4):pii=2300044. <https://doi.org/10.2807/1560-7917.ES.2023.28.4.2300044>
10. **C.E. van Ewijk**, S. Hahné. Letter to the editor: bias in the vaccine effectiveness of one-dose post-exposure prophylaxis against mpox. *Euro Surveill.* 2023;28(34):pii=2300358. <https://doi.org/10.2807/1560-7917.ES.2023.28.34.2300358>

4.2 Conference presentations

ESCAIDE, 23/11/2022 – 26/11/2022, Stockholm. [COVID-19 vaccine effectiveness against SARS-CoV-2 infection during the Delta period, a nationwide study adjusting for chance of exposure, the Netherlands, July to December 2021] Oral presentation.

ESCAIDE, 23/11/2022 – 26/11/2022, Stockholm. [COVID-19 outbreak in an elderly care home: Very low vaccine effectiveness and late impact of booster vaccination campaign] Poster presentation.

ESCAIDE, 22/11/2023 – 24/11/2023, Barcelona, [Acceptance, and timeliness of post-exposure vaccination against mpox in high-risk contacts, Amsterdam, the Netherlands, May-July 2022] Rejected.

ESCAIDE, 22/11/2023 – 24/11/2023, Barcelona [Varicella zoster as a risk factor for invasive Group A Streptococcal infection in children aged 6 months to 5 years, a prospective case control study in the Netherlands.] As second author. Accepted for oral presentation.

4.3 Other presentations

Oral presentation to the Regional Public Health Consultants (RAC) and Regional Epidemiology consultants (REC) on the results of the evaluation on surveillance system for invasive pneumococcal disease among adults aged 60 and older.

Regular presentations to the Dutch National Response Team on epidemiological situation during the mpox 2022 outbreak in the Netherlands.

4.4 Other reports

Contribution to regular updates on the epidemiological situation and control measures through direct messaging services (Labinfact) to, amongst others, regional public health professionals, physicians, general practitioners and microbiologist, during e.g. the mpox outbreak and the diphtheriae upsurge in the Netherlands in 2022.

Factsheet for the regional public health services on the results of the evaluation on the invasive pneumococcal disease surveillance system among adults aged 60 years and older.

5. EPIET/EUPHEM modules attended

1. Introductory course part 1, 20/9/2021 – 8/10/2021, virtual
2. Phylogeny inject day, 20/10/2021, virtual
3. Operational research inject day, 27/10/2021 – 28/10/2021, virtual
4. Data management inject day, 10/11/2021, virtual
5. Outbreak investigation, 6/12/2021 – 10/12/2021, virtual
6. Multivariable analysis, 14/3/2022 – 18/3/2022, virtual
7. Introductory course part 2, 20/4/2022 – 29/4/2022, Spetses, Greece
8. Rapid risk assessment and survey methods, 6/6/2022 – 10/6/2022, Stockholm, Sweden
9. Project review, 29/8/2022 – 2/9/2022, Lisbon, Portugal
10. Time series analysis, 7/11/2022 – 11/11/2022, Utrecht, the Netherlands
11. Qualitative research, 31/1/2023 – 3/2/2023, virtual
12. Vaccinology, 13/2/2023 – 17/2/2023, virtual
13. Management, leadership and communication in public health, 8/5/2023 – 12/5/2023, Stockholm, Sweden
14. Project review, 28/8/2023 – 1/9/2023, Lisbon, Portugal

6. Other training

RIVM Tidy-R course, 26/11/2021, virtual
RIVM Vis-R course, 30/11/2023, virtual
RIVM Stat-R course, 3/12/2021, virtual
European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE) 16/11/2021 – 19/11/2021, virtual
European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE) 23/11/2022 – 26/11/2022, Stockholm, Sweden

7. Other activities

Katja van Ewijk routinely attended the weekly scientific seminars organised by the epidemiology and surveillance department of the RIVM. Katja also participated in the weekly early warning meetings. In addition to her EPIET fellowship, Katja followed her specialisation to become a Public Health Physician for Infectious Disease Control. During her specialisation, she worked at the Centre for Infectious Disease Control at the RIVM where she was involved in many tasks at the national level within the LCI. She was involved in the mpox outbreak response, as well as the response to the cutaneous diphtheriae upsurge in migrants. Within her role as public health physician she also advised the local Public Health Services on a weekly basis on various questions they had regarding infections and the appropriate control measures.

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Last but not least, a big thanks and congratulations to all fellows of cohort 2021. It has been two wonderful years. I am very happy that we met, and I cannot wait to work together in the future as well. Don't be a stranger.