



FELLOWSHIP REPORT

Summary of work activities Raquel Medialdea-Carrera Intervention Epidemiology path (EPIET) Cohort 2018

Background

The ECDC Fellowship Training Programme includes two distinct curricular pathways: Intervention Epidemiology Training (EPIET) and Public Health Microbiology Training (EUPHEM). After the two-year training EPIET and EUPHEM graduates are considered experts in applying epidemiological or microbiological methods to provide evidence to guide public health interventions for communicable disease prevention and control.

Both curriculum paths are part of the ECDC fellowship programme that provides competency based training and practical experience using the 'learning by doing' approach in acknowledged training sites across the European Union (EU) and European Economic Area (EEA) Member States.

Intervention Epidemiology path (EPIET)

Field epidemiology aims to apply epidemiologic methods in day to day public health field conditions in order to generate new knowledge and scientific evidence for public health decision making. The context is often complex and difficult to control, which challenges study design and interpretation of study results. However, often in Public Health we lack the opportunity to perform controlled trials and we are faced with the need to design observational studies as best as we can. Field epidemiologists use epidemiology as a tool to design, evaluate or improve interventions to protect the health of a population.

The European Programme for Intervention Epidemiology Training (EPIET) was created in 1995. Its purpose is to create a network of highly trained field epidemiologists in the European Union, thereby strengthening the public health epidemiology workforce at Member State and EU/EEA level. Current EPIET alumni are providing expertise in response activities and strengthening capacity for communicable disease surveillance and control inside and beyond the EU. In 2006 EPIET was integrated into the core activities of ECDC.

The objectives of the ECDC Fellowship - EPIET path are:

- To strengthen the surveillance of infectious diseases and other public health issues in Member States and at EU level;
- To develop response capacity for effective field investigation and control at national and community level to meet public health threats;

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

This portfolio does not represent a diploma. Fellows receive a certificate acknowledging the 2-year training and listing the theoretical modules attended. Additionally, if all training objectives have been met, they receive a diploma.

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- To develop a European network of public health epidemiologists who use standard methods and share common objectives;
- To contribute to the development of the community network for the surveillance and control of communicable diseases.

Fellows develop core competencies in field epidemiology mainly through project or activity work, but also partly through participation in training modules. Outputs are presented in accordance with the EPIET competency domains, as set out in the ECDC Fellowship Programme Manual.

Pre-fellowship short biography

Raquel Medialdea Carrera holds a PhD from the University of Liverpool (UK) as part of the National Institute for Health Research Health Protection Research Unit in Emerging and Zoonotic Infections (NIHR HPRU EZI). She has worked for two years in Brazil during the Zika and Chikungunya epidemics conducting public health research, clinical investigations and community engagement activities. Raquel also worked for three months in Bangalore (India) researching about an epidemic of neurologic disease. In 2015, Raquel deployed twice to work on the Ebola epidemic response in Sierra Leone with International Medical Corps (IMC) and Public Health England (PHE) where she worked in an Ebola Treatment Center in Makeni. She holds a Masters from the University of Glasgow in Translational Research and Evidence-Based Medicine and a Masters from the University of Liverpool in Infections and Global Health. Raquel is passionate about public health communication and humanitarian emergency response.

Fellowship assignment: Intervention Epidemiology path (EPIET)

On the 11th of September 2018, Dr Raquel Medialdea Carrera started her EPIET fellowship at the Infectious Disease Control and Prevention Unit (IDCU) in the Health Promotion and Disease Prevention Directorate (HPDP) of the Ministry for Health in Malta under the supervision of Dr Maria Louise Borg. This report summarizes the work performed by Raquel during the fellowship.

Fellowship portfolio

This portfolio presents a summary of all work activities (unless restricted due to confidentiality regulations) conducted by the fellow during the ECDC Fellowship, EPIET path. These activities include various projects, 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.

This portfolio also includes a reflection from the fellow on the field epidemiology competencies developed during the 2-year training, a reflection from the supervisor on the added value of engaging in the training of the fellow, as well as a reflection by the programme coordinator on the development of the fellow's competencies.

Fellowship projects

1. Surveillance

Title: The roll-out and implementation of the WHO tool Go.Data for the COVID-19 outbreak response in Malta

Investigation of chains of transmission and contact tracing are core public health interventions that play central roles in the control of COVID-19. The implementation of digital health technology for collection of data from cases, contact tracing as well as investigation of chains of transmission is key to facilitate COVID-19 epidemic response activities.

Go.Data is a tool focused on the management of data from cases, contacts and visualization of chains of transmission. Go.Data was designed for field data collection during health emergencies including information from laboratory, hospitalization and contact follow-up management. Malta decided to roll out and implement Go.Data, an outbreak response tool, as the core digital platform for data collection and management of the COVID-19 epidemic.

Malta implemented the WHO Go.Data tool for management of data from COVID-19 cases and contacts and investigation of chains of transmission. Go.Data was launched 11 days after the first COVID-19 case was confirmed in Malta. The deployment was preceded by a phase of design, pilot and training. Short video tutorials were produced

specifically for each team involved. Go.Data was fully implemented across all the COVID-19 response teams 19 days following the notification of the first case.

The COVID-19 response team in Malta focused on robust laboratory testing and surveillance systems as well as stringent contact tracing to reduce successfully case numbers and to control the COVID-19 epidemic. Go.Data was quickly rolled out, easily implemented and has proven to greatly facilitate an efficient response to rapidly control the spread of COVID-19. Go.Data is an easy-to-use tool that can help responders choose the right interventions to stop a virus such as SARS-CoV-2 from spreading.

Role and outputs:

Raquel was the principal investigator. Raquel supported the implementation, collaborated with the other teams involved in the response and supported the roll out across the 8 different teams involved in the COVID-19 response. Raquel conducted the training across all the teams involved and drafted a manuscript that is currently under review [4].

Supervisor(s): Dr Maria Louise Borg, Dr Hugo Agius-Muscat

Title: World Health Organization - Supporting the roll-out and implementation of the WHO tool Go.Data in the Americas and Europe

On 30th January 2020, the World Health Organization (WHO) declared that the newly discovered SARS-COV-2 virus, which was causing an epidemic of respiratory disease, constituted a Public Health Emergency of International Concern (PHEIC). Following this declaration, on the 12th of February 2020 WHO published operational planning guidelines to provide country-level support in preparedness and response against COVID-19.

Go.Data is a tool focused on the management of data from cases, contacts and visualization of chains of transmission. The overall objectives of the mission were supporting the roll-out and implementation of Go.Data worldwide. In particular, Raquel worked supporting training both through organized Face-to-face training and online, development of training materials and technical advice and support to organizations implementing Go.Data.

As part of her work supporting WHO, a range of training materials including facilitation guide, PowerPoint presentations, agendas and excel injects were prepared and adapted for the face to face sessions that were delivered in Central and South America and online training sessions.

In collaboration with PAHO, a total of 4 country missions were conducted delivering advance training on Go.Data in Mexico DF, Cuernavaca (Mexico), Bogotá (Colombia), Brasilia (Brazil) and Buenos Aires (Argentina). Additionally, a series of online training sessions and Webinars were delivered.

Additionally, my role within the global Go.Data team and international rollout plans included supporting the Go.Data implementation and day-to-day interactions with countries and partners in the field for country and regional-level implementation of the WHO tool. Raquel acted as focal point for a wide range of countries and partners supporting their needs in English, Spanish and Portuguese as needed.

Role and outputs:

Raquel was the principal investigator. Raquel designed a range of training materials and adapted existing documentation. Raquel designed training sessions, delivered a range of both face-to face and online training workshops and responded to queries from member States and partner institutions. Raquel designed and recorded two online courses available at OpenWHO and wrote an end of mission report [42]. Raquel supported

Supervisor(s): Armand Bejtullahu, Mr Pat Drury

Title: Enhanced surveillance of mosquitoes and vector-borne diseases in the Maltese Islands: Molecular species identification, insecticide resistance monitoring, and risk assessment for vector-borne infections

Over the last decade, the combined influence of global travel, climate change, human migration and the spread of vector-borne infections like chikungunya, dengue, West Nile Virus (WNV) and malaria in Europe and North Africa, has

made the spread of vector mosquitoes in Malta an urgent public health priority. We sought to identify competent vectors for infectious diseases in the Maltese islands, in order to inform public health response.

Entomological surveillance was conducted July 2018 to February 2019 across Gozo and Malta with larvae, pupae and adult mosquitoes collected in 23 sites. From July to November 2018, egg density was measured weekly in 32 sites using ovitraps. Species were identified via morphological and molecular analyses. Insecticide resistance mutations were analysed in a partner laboratory in Greece. We analysed national surveillance data on vector-borne infections in Malta from 1990 to 2018.

The species most frequently found were *Culiseta longiareolata* (9 sites), *Culex pipiens s.s.* (8 sites), including the hybrid *Cx. pipiens pipiens/molestus* biotype (2 sites) and *Aedes albopictus* (4 sites). Neither *Anopheles* nor *Ae. aegypti* mosquitoes were detected. Mutations relevant for pyrethroid-based insecticide resistance were detected among 53% *Culex* (n=37) and 15% *Aedes albopictus* (n=17). No Diflubenzuron-resistant mutations were recorded. From 1990-2018, 103 malaria, 7 dengue, one chikungunya and no WNV cases were reported in Malta; with the exception of one cryptic *Plasmodium falciparum* infection reported in October 2018, all other mosquito-borne infections were travel-related.

This is the first molecular species identification and insecticide resistance analysis of mosquitoes from Malta. The sustained presence of competent vectors for arboviruses prompted the implementation of vector-control strategies including community information campaigns to reduce breeding sites, controlled insecticide use by environmental authorities, and enhanced surveillance to monitor the arrival and spread of mosquito species, and the emergence of insecticide-resistant mutations.

Role and outputs:

Raquel was the Principal Investigator. She applied for funding from the INFRAVEC2 EU Consortium, conducted an extensive literature review and summarised all previous methods used for mosquito investigations and mosquito-borne diseases in the Maltese Islands. Raquel conducted the field work, carried out the analysis, coordinated with Greek partners and interpreted the results. The results presented at the 10th TEPHINET Global Scientific Conference celebrated in Atlanta from the 28th of October to the 1st of November 2019 [7]. The results were also presented at the 2nd National Public Health Symposium in November 2019 in Malta [16]. A summary report was generated to provide recommendations for further public health measures needed to be conducted in Malta to prevent the establishment of mosquito-borne disease [36].

Supervisor(s): Dr Maria Louise Borg, Dr Tanya Melillo

Title: Infectious disease screening of refugees and asylum seekers arriving to Malta (2015-2019), the shifting paradigm of a humanitarian crisis in the EU

Increased arrivals of asylum seekers to the EU has prompted the implementation of public health screening for detection of infectious diseases among newly arrived humanitarian migrants. We aimed to document demographic characteristics and prevalence of infectious diseases in asylum seekers arriving in Malta and understand the challenges faced by healthcare workers.

We described a case series including all asylum seekers arriving in Malta from January 2015 to July 2019. We conducted face-to-face interviews and examinations, offered Tuberculosis screening and provided linkage to care when needed. Qualitative semi-structured interviews were conducted to examine the challenges faced by healthcare workers conducting the screening (n=8).

A total of 9,411 asylum seekers arrived in Malta from 78 different countries of origin including 7,543 (80%) male and 1,805 (20%) minors (<18 years). At arrival, 8% of females were pregnant. Chest-X-Ray abnormalities were reported in 3.6% of arrivals with 77 (0.8%) diagnosed with active Tuberculosis. During January-July 2019, 10% of migrants presented with symptoms suggestive of infectious disease including fever, cough, vomit and/or diarrhea, 13% had scabies and 1.8% required further secondary referral such as dentistry or ophthalmology. Healthcare workers reported multiple challenges including diverse cultural and language differences, limited institutional infrastructure capacity, insufficient human resources and specialist training and contradiction between professional ethics and local policy.

The screening contributed to early detection of infectious diseases among asylum seekers. Healthcare workers involved face multiple challenges. We recommend ensuring the support of cultural mediators, providing adequate training and improving the infrastructures in migrant reception centers. This data supports the need for asylum

seekers to have access to a comprehensive post-arrival medical assessment to safeguard the health of both individual refugees and the community.

Role and outputs:

Raquel was the principal investigator of this study. Raquel conducted the design of the study, carried out the research investigations, collection of qualitative investigations, analysis of the results and interpretation of the findings and draw a series of public health recommendations. The findings of this study were presented at the 2019 ESCAIDE Conference in Stockholm in November 2020 [10].

Supervisor(s): Dr Maria Louise Borg, Dr Tanya Melillo

Competencies developed:

The different surveillance projects undertaken have allowed me to build on previous experience and apply advanced epidemiological and statistical skills to develop and evaluate surveillance systems as per international recommendations. I was able to get involved in a range of national routine surveillance activities and developed reports and manuscripts using surveillance data. During my international mission with WHO, I gained further insights into the importance of international surveillance data, the challenges of setting up surveillance systems in low-resource settings and the significance of reporting reliable surveillance data for outbreak control. Moreover, I further developed experience in managing multiple projects, coordinating with different teams and working with international partners. Overall, I developed a range of competencies through relevant hands-on experience, setting up and managing national surveillance systems, as well as exposure to new disease groups and methods which will allow me to become a better health professional and epidemiologist.

2. Outbreak investigations

Title: Investigation of a recurring Norovirus outbreak on a cruise ship, Malta, August-September 2018

Norovirus is highly contagious and often responsible for protracted outbreaks in closed settings such as cruise ships; rapid response and control measures are fundamental to stop them. In September 2018, the report of a suspected norovirus outbreak on a cruise ship prompted an investigation to control the outbreak.

Food, water and surface samples, as well as stool samples from passengers, were tested for norovirus and other enteric pathogens by RT-qPCR. Clinical information was collected by the medical service onboard. We conducted interviews with staff and reviewed and advised health and hygiene management plans.

In total, 104 cases were reported affecting three consecutive cruises (31/8-20/9/2018): 86 passengers, 18 staff (three food handlers). The attack rate among passengers was 4.3% and among staff 8.9%. Median symptom duration was 2 days (range: 1-6 days). Norovirus was detected by PCR in 9/11 stool samples. No pathogen was detected in the environmental samples (0/20). Improved sanitation and control measures were implemented such as isolation of symptomatic cases until 48h without symptoms, disinfection of public areas and cabins, and health communication with passengers and staff.

The outbreak was controlled before the fourth consecutive cruise started following the enforcement of isolation of cases. The epidemiological curve suggested person-to-person transmission with crew members possibly carrying the virus over between cruises. Adherence to existing international guidelines including the isolation of cases is needed for preventing, investigating, and controlling such outbreaks on cruise ships.

Role and outputs:

Dr Raquel Medialdea was the principal investigator. Raquel conducted the field work including the visits to the outbreak site, data analyses and interpretation of the findings. The outbreak investigation was presented at the 2019 ESCAIDE Conference in Stockholm in November 2020 [9]. The results were also presented at the 2nd National Public Health Symposium in November 2019 in Malta [12]. An outbreak report was generated [38].

Supervisor(s): Dr Maria Louise Borg

Title: The risk of malaria re-emergence in Southern Europe: cryptic *Plasmodium falciparum* malaria case in Malta in 2018

Malaria was eliminated in Europe in the 1970s; however, the rise of global travel and climate change might have increased the risk for a possible re-introduction. In October 2018, IDCU Malta was notified of a suspected malaria case and launched an investigation to identify the possible route of transmission.

Blood samples of the suspected case were assessed for the presence of malaria parasites by microscopy and PCR. We interviewed the case and conducted an environmental assessment of his residence and surrounding area. We installed two BG-sentinel mosquito traps baited with BG-lure in the household for two weeks. Additionally, we assessed travel history for all malaria cases reported in Malta from 1990 to 2018.

Plasmodium falciparum infection was confirmed. The case, a 32-year old migrant from Burkina Faso, had no history of travel outside Malta in the past 10 years and no history of blood transfusion, transplantation or other nosocomial exposures. From 1990 to 2018, 103 malaria cases were reported in Malta, with all except this one being travel-related (80% to sub-Saharan Africa). No indication of further autochthonous transmission was detected.

This cryptic case of malaria transmission suggests that *Anopheles* mosquitoes as competent *Plasmodium* vectors may be present in Malta. This event, together with the recent autochthonous malaria case in Italy (August 2018), indicates that a re-establishment of malaria in Southern Europe may be possible. This reinforced the urgent need for vector surveillance and control measures in Malta, which have now been implemented across the Maltese islands.

Role and outputs:

Dr Raquel Medialdea Carrera was a co-investigator. She conducted a literature review to ascertain the previous evidence of Malaria in Malta and other European countries. Raquel collected the data and conducted the analysis of the data. Raquel wrote an outbreak report and an article was published in Eurosurveillance [1]. The findings were presented at the 2nd National Public Health Symposium in November 2019 in Malta [15].

Supervisor(s): Dr Maria Louise Borg

Title: An outbreak of ESBL-producing *Salmonella* Kentucky linked to both humans and poultry in Malta, 2013-2020

Salmonella enterica serotype Kentucky ST198 (*S. Kentucky*) is frequently associated with human infections. The antimicrobial resistance of this serotype to multiple drugs is a growing concern worldwide. *Salmonella* Kentucky is among the most frequently isolated *S. enterica* serovars from food animals in the United States. *Salmonella* Kentucky isolates have been found both in humans and animals including poultry. In 2016/2017, an increase in the number of human ESBL-producing *S. Kentucky* infections in Malta and Europe prompted launching an investigation to determine the source of this outbreak and to design a series of public health recommendations.

A retrospective cohort study was conducted including cases from the 1st of January 2013 to the 1st of February 2020. Laboratory diagnosis was conducted by the pathology department at Mater Dei Hospital. Data on ESBL producing *S. enterica* isolates in both human and animal samples was compiled and epidemiological information was collected. Further whole genome sequencing (WGS) was conducted on the identified samples.

As of 1st January 2020, a total of 35 ESBL producing human *Salmonella* infections have been reported in Malta. Among them, 5 *S. Infantidis*, 1 *S. Tumodi* and 29 *S. Kentucky*. The first case reported in April of 2013 and the last case reported in September 2018. Additionally, from 2017, a total of 16 animal isolates of ESBL-producing *S. Kentucky* have been identified. Additionally, there have been 15 animal isolates identified. Those 16 isolates proceed from 4 different farms and one slaughterhouse. No geographical cluster was identified with cases coming from different regions of Malta and Gozo. WGS confirmed a link between the animal isolates and at least one of the human infections.

Our investigation suggests that there may be an ongoing outbreak in Malta possibly linked to animal infection. Further collaboration between veterinary and human departments within the Ministry of Health will be key to further develop a response and preparedness to this outbreak and prevent further disease in Malta.

Role and outputs:

Dr Raquel Medialdea Carrera was a co-investigator. She conducted a literature review, collected the data and conducted the analysis of the data. Raquel wrote an outbreak report, an abstract was submitted for the 2020 ESCAIDE Conference and Raquel is currently drafting a manuscript [39].

Supervisor(s): Dr Maria Louise Borg**Title:** World Health Organization response to the Ebola Virus Disease epidemic in the Democratic Republic of the Congo (DRC), 2019

As of 26 March 2019, a total of 1029 confirmed and probable EVD cases were reported, of which 642 died (case fatality ratio 62%). Of 1029 cases with reported age and sex, 57% (584) were female, and 30% (307) were children aged less than 18 years. The number of healthcare workers affected had risen to 78 (8% of total cases), including 27 deaths.

The Ministry of Health of DRC in partnership with WHO implemented an emergency management health response, which involves several pillars including Epidemiology and Surveillance, vaccination, Infection Prevention and Control, Psychosocial Support, Risk Communication and Community Engagement. The Data management analytics and products (MAP) team within the Health Emergency Information and Risk Assessment (HIM) Unit conducted surveillance and coordinated the epidemiological analyses. An "epi-cell" based in Goma was also established to conduct epidemiological analyses and further analytical investigations to guide the Ebola response.

During the 6-week deployment at WHO HQ, Raquel was involved in a range of different activities including supporting the daily routine database management activities of the Data management analytics and products (MAP) team. Other activities included supporting the routine analytical work of the MAP team producing a series of figures briefings, materials and information products to inform senior leaders of the response and Organization, partners, donors, and the wider public. Raquel was also involved in further analyses on nosocomial transmissions, healthcare workers infections and investigation of Infection Prevention and Control (IPC) data. Raquel also worked on the weekly IPC reports and developed a novel tool that included an automatic daily epidemiological update on nosocomial infection (NI) in the Ebola-affected areas in the Democratic Republic of Congo (DRC).

The Ebola outbreak in Congo represents a very complex health emergency. The response to this epidemic is extremely challenging not only because of the length and high mortality of the Ebola epidemic but also because of all the socioeconomic implications that the outbreak is having in an area of DRC where more than 100 different armed groups coexist.

In addition to this, the population in DRC are also facing several other health challenges due to a debilitated and fragmented health systems such as epidemics of measles and high infant mortality. A more collaborative approach is needed to tackle this Ebola outbreak and control the spread of infectious diseases in DRC.

Role and outputs:

Raquel deployed with WHO for 6 weeks (March to May 2019) to support the Ebola response for assistance through GOARN, the Global Outbreak Alert and Response Network. An end-of-mission report was written [41]. Additionally, a brief article piece was prepared for the EPIET Alumni Newsletter on the experience of deploying to support the Ebola response with WHO.

Supervisor(s): Brett Archer and Marie Amelie**Title:** Public Health measures taken to control the spread of COVID-19 amongst the migrant population in a small EU island state

In the last 10 years, the migrant population residing in Malta has increased exponentially. The COVID-19 epidemic impacted disproportionately migrants which are often in disadvantaged positions due to the lower socioeconomic status, communication barriers and lower education levels.

During the COVID-19 epidemic, migrants were particularly affected due to multiple factors including communication barriers, restriction measures imposed, loss of employment, challenges accessing the healthcare system, travel ban and mental health issues. Ports were closed preventing disembarkation of migrant boats and asylum request applications were put on hold.

As of 16th June, a total of 30.2% (n=198) confirmed COVID-19 cases were migrants. A strategy to support migrants was designed and implemented. The COVID-19 outbreak in a migrant center resulted in all 800 residents being placed in lock-down for 41 days and a total of 50 COVID-19 cases. Migrant boats that arrived before ports were closed were placed under quarantine. Migrants reported difficulties seeking healthcare, using the helpline, and higher exposure risk due to overcrowded living conditions.

Migrants faced additional challenges due to the impact of the pandemic. The public health response measures implemented for the general population were not always feasible or accessible for the migrant population including hygiene recommendations, access to testing, isolation and quarantine and access to accurate scientific information. The mental health impact of COVID-19 among migrant populations was enhanced due to loneliness, lack of communication with their families and financial instability. Challenges accessing the healthcare system, understanding the restriction measures and the evolving public health recommendations were highlighted. Future strategies to control epidemics should always include specific plans to support migrant populations.

Role and outputs:

Dr Raquel Medialdea was the co-investigator. Raquel conducted field work data analysis and contributed to generate the public health strategy. An abstract has been accepted as an oral presentation for the 16th World Congress on Public Health 2020 [18]. An abstract has been submitted to ESCAIDE 2020 and a presentation was delivered to the European Asylum Seeker Support Office (EASO) [30].

Supervisor(s): Dr Tanya Melillo

Title: Gastrointestinal Outbreak following a staff Party Dinner in San Ġiljan, Malta

On 12th December 2018, the Infectious Disease Control Unit (IDCU) of the Ministry for Health was notified of an outbreak of gastroenteritis affecting at least 8 out of 21 staff members who attended a staff party buffet dinner at a Hotel in San Ġiljan, Malta. The dinner had taken place the previous day, the 11th December, at 8.30 pm and staff members of a particular Unit attended.

Symptoms included diarrhoea, malaise and abdominal cramps and started on the 12th December.

Environmental samples of food leftover, as well as samples from staff and a stool specimen from a case were collected and sent for laboratory testing.

An analytical cohort study was carried out with a questionnaire shared with the 21 individuals that had attended the dinner. A total of 16 individuals replied including 8 cases and 8 controls. The epidemiological investigations suggested that subjects that consumed cheesy chicken and turkey breast had a higher risk to get sick. The laboratory tests were inconclusive with no viral or bacterial pathogen identified.

Food safety and health promotion recommendations were given to the staff working at the Hotel, dinner attendees and public health workers. No further case associated with eating at the Hotel was identified in the following days.

Role and outputs:

Raquel was the principal investigator. Raquel designed the study, prepared the data collection tools and collected the data. Raquel analysed the results and drafted the outbreak report [37].

Supervisor(s): Dr Maria Louise Borg

Title: Prevention of the spread of COVID-19 in nursing homes in the Maltese islands, 2020

Nursing home residents are at high risk for infection, severe morbidity and death from COVID-19. Protecting nursing home residents poses a major challenge for disease prevention and control. Several outbreaks with high mortality have been reported worldwide in nursing homes.

Malta has an ageing population with 18.8% of its inhabitants being over 65 years and a total of 5,312 licensed beds in nursing homes (1066.7/100.000 pop). To prevent hospitalizations and deaths in this vulnerable group, a strategy was developed for long term care facilities in Malta to prevent the introduction of COVID-19 into homes.

For a 2 month period (April –May 2020), 80% of nursing homes in Malta implemented a voluntary lockdown of staff working in the homes. This innovative policy consisted of self-quarantine staff in their homes for 14 days followed by COVID-19 testing. Those with negative test results lived in the nursing home for 2 to 3 weeks with the residents, being then replaced by another group of carers. Additionally, a prospective longitudinal serosurvey was conducted among a cohort of 380 social care workers to determine the prevalence of anti-SARS-CoV-2 antibodies and the rate of seroconversion in this population group.

As of 18th June, a total of 2.3% of the COVID-19 cases detected in Malta were carers in nursing homes (n=15). Four COVID-19 deaths in Malta (4/9) were residents of nursing homes. The policy promoted enhancing infection, prevention and control measures in nursing homes, increasing surveillance and testing of symptomatic residents and forbidding visits. Staff undertook training and health communication campaigns targeting nursing homes were prepared to prevent further spread of COVID-19.

The promotion of lock-down in homes was shown to be an effective way of minimising the introduction of COVID-19 into nursing homes. Developing specific strategies targeting nursing homes to prevent the spread of COVID-19 is of paramount importance. The implementation of national monitoring systems for COVID-19 in care homes prevents the introduction of COVID-19 into the homes and the early identification of outbreaks in order to protect this fragile population.

Role and outputs:

Raquel was the co-investigator. International guidelines were revised and Raquel collaborated in the development of the testing and surveillance strategy. Raquel contributed in the design of the serosurvey targeting social care workers. Raquel collected and analysed the data, interpreted the findings and drafted the lessons learnt and key public health recommendations. Raquel wrote an abstract that was submitted and is currently under review [18].

Supervisor(s): Dr Tanya Melillo, Dr Maria Louise Borg

Title: Health policy for the COVID-19 epidemic response in Malta

Due to the emergence of the COVID-19 epidemic, the Superintendence of Public Health in Malta constituted a National Response Team. Raquel joined the team and worked on strengthening health systems and rapidly assessing scientific evidence and develop novel health policy to respond to COVID-19. Among Raquel's duties, she attended weekly meetings organized by International Health organizations including Health Security Committee, World Health Organization European Office and the ECDC.

During the COVID-19 epidemic, the National COVID-19 Response team was responsible for conducting multiple literature reviews, discuss and draft a high number of different health policies, protocols and strategies around the following topics as part of the National COVID-19 Public Health response team:

- COVID-19 Vaccination: Considerations in prioritizing access to COVID-19 vaccines and the National COVID-19 Vaccination Strategy Plan
- Development of enhanced surveillance plans for COVID-19 in Malta
- Strategy for the gradual and effective lifting of coronavirus containment measures in Malta. Development of epidemiological criteria and monitoring capacity
- Strategy to support migrants, refugees and other minority groups during the COVID-19 response
- Strategy to support the elderly and other vulnerable population groups during the COVID-19 response focusing on care homes.
- Development of a series of COVID-19 epidemiological and health criteria for opening and operating travel corridors to and from Malta. Guidance to re-opening the borders and constitution of travel corridors (safe countries)
- Development of a COVID-19 diagnostic testing strategy for the response to the epidemic in Malta

During the COVID-19 pandemic, there has been a need to expeditiously develop in health policies, strategies and guidelines that were being adapted and updated as required. Health policies and strategies were reviewed by the National Public Health Authorities and other government bodies as adequate.

Role and outputs:

Raquel was the co-investigator. Raquel conducted multiple literature reviews and contributed to discussing and drafting a wide range of health policies, protocols and health strategies for the COVID-19 response in Malta.

Supervisor(s): Dr Tanya Melillo, Dr Maria Louise Borg, Dr Kenneth Grech

Title: Data Management for the COVID-19 epidemic response in Malta

The development and implementation of efficient data management systems are critical during an epidemic response for assigning and managing case investigations, linking confirmed COVID-19 cases to their contacts, and monitoring the evolution of the spread of the epidemic.

The collection of key performance indicators (KPIs) and other epidemiological parameters is part of the core activities needed to be carried out as part of the COVID-19 epidemic response to guide the response to the epidemic and assist in the decision of the required public health measures needed to be implemented in each stage of the epidemic.

Additionally, due to the global impact of COVID-19, a series of aggregate data and key performance indicators (KPIs) have to be provided with daily, weekly or monthly frequency to the ECDC, WHO, EU Health Security Committee and other international institutions.

Among those tasks conducted by the COVID-19 data management team, it includes the development of effective COVID-19 case ascertainment form and passenger locator forms, curation of data for reporting to ECDC via The European Surveillance System (TESSy) and to the weekly data requests from the EU Health Security Committee (HSC). Additionally, epidemiological updates were used for the daily reporting of COVID-19 data updates by the National Public Health Authorities.

Role and outputs:

Raquel was the co-investigator. As part of the data management team in the COVID-19 response, Raquel developed and updated the case ascertainment form for investigation of COVID-19 cases, designed the airport form for investigation of COVID-19 suspected cases. Additionally, Raquel prepared and responded to the requests of aggregated COVID-19 data solicited by ECDC, the Health Security Committee (HSC) and other international organizations.

Supervisor(s): Dr Tanya Melillo, Dr Maria Louise Borg, Dr Hugo Agius Muscat

Competencies developed:

As an EPIET Fellow in the Ministry for Health in Malta, I was able to get involved in a range of different outbreaks including vector-borne, gastrointestinal and respiratory infections. I was able to work as principal investigator which further developed my experience and skills in outbreak response and analytical capacities. The gastrointestinal outbreaks allowed me to design and conduct analytical cohort investigations, I had the opportunity to apply innovative methods in the outbreak investigation, learnt more and shed light on the challenges of finding the infectious source in foodborne investigations in European countries. My deployment with WHO to support the Ebola outbreak allowed me to gain further insights into the coordination of outbreak responses in developing countries and I learnt more advanced methods of visualising and presenting results. Working on the COVID-19 national response team represented the largest and most fascinating challenge during my fellowship. Being actively involved in various epidemiological meetings, reporting the findings, the development of protocols, strategies and constant new decisions as the COVID-19 epidemic was spreading across the whole world was extremely enriching and invigorating. Overall, by having been engaged in so many different outbreaks I was able to appreciate about the importance of early implementation of control measures to reduce the spread of the epidemic and the relevance of adequate risk communication with all the stakeholders and particularly with the general public.

3. Applied epidemiology research

Title: Trends of pulmonary and extrapulmonary tuberculosis in Malta over 29 years (1990-2018) and the impact of screening newly arrived migrants to Malta

During the last 30 years, the Maltese population has increased due to migration from EU and non-EU countries. Since 2002, new migrants arriving in Malta from high tuberculosis (TB) incidence areas are screened on entry using chest X-ray (CXR) and/or Mantoux test. We analysed TB surveillance data from Malta to inform the strategy for TB elimination.

We describe demographics, clinical characteristics and trends of pulmonary and extra-pulmonary TB in Malta from 1990 to 2018. We also analysed data from the national migrant and asylum seekers screening database from 2002 to 2018 and assessed the contribution of the migrant screening programme to case detection.

In total, 864 TB cases were reported with 71% diagnosed as active pulmonary TB and 29% as extra-pulmonary TB. The mean annual incidence rate was 7.3/100,000. The incidence peaked at 13/100,000 in 2008, continued to be high and was 11.4/100,000 in 2018. Since 2002, 26,407 asylum seekers arriving in Malta have been screened on entry. Approximately 1.2% of them were diagnosed and treated for active TB. Among all TB-positive cases diagnosed since 2010 (n=339), 11% were HIV co-infected.

TB incidence increased in Malta during the last 29 years. TB screening among migrants on entry has been effective in identifying active TB and enabling early treatment and reduced transmission. Its continuation will be crucial to control and drive towards TB elimination in the coming years. Active surveillance and diagnostic testing of TB-HIV co-infection continues to be relevant for both clinical and public health purposes.

Role and outputs:

Raquel was the principal investigator. Raquel designed the study, analysed the data and generated the public health conclusions and recommendations. The results were presented at the 2019 ESCAIDE Conference in Stockholm [8] and at the 2nd National Public Health Symposium in November 2019 in Malta [11].

Supervisor(s): Dr Maria Louise Borg and Dr Tanya Melillo

Title: Sexually transmitted infections testing, risk and needs of men who have sex with men (MSM) in Malta: results from the 2017 European MSM Internet Survey (EMIS)

In the last decade, an increase in sexual risk behaviours and sexually transmitted infections (STIs) among men who have sex with men (MSM) has been reported in Europe. We analysed behaviours that might contribute to the acquisition of STIs among MSM in Malta to improve the STI prevention strategy for this population.

In 2017, the European MSM Internet Survey collected data from MSM from 49 countries through an anonymous multilingual online questionnaire. We analysed the data from participants living in Malta (n=301) and examined the proportions of reported STIs, attitudes and risks among them.

During the previous 12 months, 141 MSM reported carrying out at least one STI test (47%) and 48 of them (16%) reported being diagnosed with at least one STI including gonorrhoea (5.7%), chlamydia (4.0%), syphilis (3.0%) and genital warts (2.4%). Twenty-three individuals reported being HIV positive (7.7%). During the previous year, respondents reported consuming alcohol (94%) and/or drugs (58%), engaging in condomless sexual intercourse (30%) and consumption of drugs to facilitate sexual activity (9.5%). Sixty per cent reported current mild to severe anxiety and/or depression and 24% reported having suicidal thoughts during the previous week.

A 3 to 6 monthly STIs testing interval should be promoted for MSM who engage in high-risk sexual behaviours. Our results emphasise the need for further research to better understand and support mental health for MSM in Malta. We recommend training for healthcare workers for counselling and/or refer MSM with mental health issues and promoting early diagnosis for the prevention of STIs.

Role and outputs:

Raquel was a co-investigator. Raquel analysed the data results, conducted the statistical analysis, generated public health recommendations and generated two national reports [35]. Results were presented to healthcare professionals

in the Ministry for Health in Malta and also at the 2nd National Public Health Symposium in November 2019 in Malta [14].

Supervisor(s): Dr Maria Louise Borg and Dr Tanya Melillo

Title: First detection of *Hyalomma rufipes* in a recently arrived migrant to Malta

Since 2008, the Infectious Disease Control Unit (IDCU) has been responsible for the public health screening of newly arrived migrants in Malta. This screening includes offering active TB testing soon after arrival and a face-to-face interview and examination for screening and linkage to care and treatment for infectious diseases. In Europe, ticks are the most important vectors of human and animal pathogens. We aimed to investigate a tick detected in a migrant at arrival in Malta.

Morphological identification of the tick followed by species identification using keys specific to North Africa was conducted by the Medical Entomology and Zoonoses Ecology group at Public Health England (PHE). Molecular testing for Crimean Congo Haemorrhagic Fever (CCHF) virus was performed.

From January 2018 to June 2019 Malta has received 38 boat arrivals with 2721 migrants with the most prevalent migrant groups being from Sudan (27.7%) and Bangladesh (17.0%). In May 2019, a *Hyalomma rufipes* tick was identified on the lower side of the chest of a 28-year-old male from Sudan that had recently travelled by boat from Libya to Malta.

We are reporting for the first time the presence of an *H. rufipes* tick, the main vector for Crimean Congo Haemorrhagic fever, on a human in Europe. This event highlights the importance of increasing awareness of the risk of tick-borne infections among recently arrived migrants in Malta. We need to consider tick screening as part of the public health screening offered to newly arrived migrants in Malta.

Role and outputs:

Raquel was the principal investigator. Raquel conducted the field investigations, interviews and data collection. Raquel drafted a literature review and analysed the findings. The results were presented at the 2nd National Public Health Symposium in November 2019 in Malta [13]. Raquel drafted a manuscript that is currently under review [3].

Supervisor(s): Dr Maria Louise Borg and Dr Tanya Melillo

Title: Investigation of the seroprevalence of SARS-CoV-2 antibodies in the Maltese Islands, May – July 2020

Serological surveys can be used to investigate the extent of COVID-19 infection in a population. As part of the public health effort in the fight against COVID-19, serological surveys in Malta were planned. This study aims to estimate the seroprevalence of antibodies against SARS-CoV-2 infection among different population groups to gain a better understanding of the spread of COVID-19 in Malta and to aid in the development of the vaccination plan.

A series of seroprevalence surveys were conducted between April and July 2020 in Malta and Gozo. The population groups targeted include blood donors, social care workers, healthcare workers, the national COVID-19 response team, hospital excess blood and a cohort of persons who inject drugs (PWIDs). Ethical approval was obtained from the National Health Ethics Committee. Participants were invited to join the study and those who accepted the invitation filled in a short questionnaire and took a blood sample to check for IgG antibodies against SARS-CoV-2 virus using the ELISA COVID-19 Abbott assay.

Preliminary findings suggest a very low prevalence rate of SARS-CoV-2 antibodies in the population ranging between 0.2 to 2%. Seroprevalence investigations proved to be essential for the investigation of the public health measures

that should be implemented in the Maltese islands. The majority of the Maltese population is seronegative to SARS-CoV-1 infection. The low prevalence rate detected in Malta suggests a low extent of infection in the Maltese islands. These findings emphasize the need for maintaining public health measures to avoid a new wave of COVID-19 in the Maltese islands.

Role and outputs:

Raquel was a co-principal investigator for two of the arms of the seroprevalence study (blood donors and excess hospital blood) and co-investigator on the other study arms. Raquel drafted the protocol, applied for ethical approval, drafted a consent form and information leaflet and coordinated with the national reference laboratory for sample transport and testing. Raquel drafted a report and a manuscript is currently being drafted.

Supervisor(s): Dr Neville Calleja

Title: Evaluation of the sensitivity and specificity of three commercial SARS-CoV-2 immunoassays, Malta, April 2020

Accurate diagnostics underpins all effective public health responses to the COVID-19 epidemic. Reliable antibody detection approaches are key for the performance of population serological studies. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was only recently discovered and several immunoassays are rapidly being developed and placed on the market while there is very limited and scarce availability of validation results using clinical specimens.

We evaluated the reproducibility, sensitivity and specificity of three commercially available serological tests to detect SARS-CoV-2 antibodies. These included two commercial enzyme-linked immunosorbent assays (ELISAs) and one point-of-care (POC) lateral flow tests. Validation was conducted using serum samples from i) SARS-CoV-2 PCR-positive patients with a known date of symptoms onset (n=32); ii) a convenient sample of archived sera obtained from individuals collected in 2018 and 2019 (before the emergence of SARS-CoV-2) (n=172).

The results showed a low positive rate is expected for specimens collected during the first two weeks post symptoms onset. IgG Sensitivity for specimens collected from day 14 post symptoms onset was 41% for the POCT and 70 and 80% for the two commercial assays. IgM Sensitivity for specimens collected from day 7 post symptoms onset was 52%. IgM specificity was 100% while the specificity of the IgG assays was 99.4, 97.1 and 100% for the POCT and the commercial assays respectively.

Our results suggest high specificity but low sensitivity. Overall, these findings have facilitated the selection of the adequate serological assays for the detection of SARS-CoV-2-specific antibodies in the seroepidemiological investigations that are currently being conducted in the Maltese Islands.

Role and outputs:

Raquel was a co-investigator. Raquel designed the study, curated the database, analysed the laboratory results, and provided the interpretations and conclusions. Raquel wrote two summary reports [40] and presented the findings to the COVID-19 response Team in Malta, April and May 2020 [25].

Supervisor(s): Dr Maria Louise Borg

Title: Skin Disease Profile of Syrian Refugees in Jordan: A Field-Mission Assessment

Since the beginning of the Syrian war in 2011, the world has faced the most severe refugee crisis in history and 5.6 million Syrians have sought asylum in neighbouring countries or Europe. According to recent estimates, more than 650 000 Syrian refugees are displaced in Jordan.

This article aims to assess the demographic characteristics and skin disease profile of Syrian displaced people residing in Al Za'atari camp and in communities in Jordan. Furthermore, the authors discuss the barriers to healthcare provision experienced during field missions.

This is a retrospective analysis of medical records collected during three medical missions in Jordan by an international dermatological team. Data on patient age, gender, country of origin and skin disease diagnoses were recorded both in Al Za'atari camp and Jordanian towns near the Syrian border.

A total of 1197 patients were assessed during the field missions, with 67.7% female and 37.1% under the age of 14 years. Dermatitis was the leading dermatological condition in both refugee camp and community healthcare clinics. Infectious diseases were the second most common; however, fungal presentations were more common in the community as opposed to viral in Al Za'atari.

High dermatitis presentations were likely secondary to the environment, living conditions and lack of access to emollients. Infectious diseases were postulated secondary to poor hygiene and sharing of overcrowded spaces. Barriers to health care included limited pharmacological formulary, difficulty in continuity of care and case referrals due to lack of specialized services. Better access to health care, improvement of living conditions and hygiene, and increased availability of medications including emollients and sunscreens are all interventions that should be carried out to reduce skin disease burden. Our findings should further urge the international community to uphold their commitments and uptake engagement in improving health care for Syrian displaced people.

Role and outputs:

Raquel was the co-investigator. Raquel conducted data cleaning, curation and statistical analyses. Raquel generated tables and figures for the manuscript and contributed to writing and revising the manuscript [2].

Supervisor(s): Dr Valeska Padovesa

Competencies developed:

During the last two years, as EPIET fellow I have been involved in a range of public health projects that have allowed to further develop my research skills and capacities while allowed me to contribute to advancing in the knowledge and supporting surveillance and outbreak control strategies. The projects on Sexually Transmitted Infections (STIs) and Tuberculosis allowed me to advance my knowledge on managing large datasets and the curation of databases as well as to advance my expertise in the use of specialised statistical software including STATA and R. The tick-borne infections project allowed me to learn further about vector control strategies, migrant health and to establish international multidisciplinary collaborations. The management of projects related to COVID-19 including seroprevalence investigations and evaluations of diagnostic assays further developed my capacities on developing rapidly adapting protocols, designing research projects, analysing and interpreting the findings to support the outbreak control strategies and support decision-making.

I was able to conduct research projects from conception through to completion as principal investigator including designing and writing the project proposal, applying for funding, management of funds and coordination of a team, developing the study and analysis of results. I was able to apply knowledge on study design, sampling techniques, training of the team and implementation of the field work.

Finally, the projects related to refugee health allowed me to further develop my epidemiological skills and knowledge on humanitarian research.

Being involved in all these research projects was a very enriching experience, truly educational and represented an exceptional opportunity to further develop my research capacities and expand my experience with health technology, infectious diseases and research methodologies to a range of different projects.

4. Communication

Publications

Publications in peer reviewed journals

1. Medialdea-Carrera R, Melillo T, Gauci C, Rocco G, Borg ML. Letter to the editor: Is malaria re-emerging in southern Europe? Cryptic *Plasmodium falciparum* malaria in Malta, October 2018. *Eurosurveillance* 23(50); 2018. DOI: 10.2807/1560-7917.ES.2018.23.50.1800650
2. Saikal SL, Ge L, Mir A, Pace J, Abdulla H, Leong KF, Benelkahla M, Olabi B, Medialdea-Carrera R, Padovese V. Skin Disease Profile of Syrian Refugees in Jordan: A Field-Mission Assessment. *J Eur Acad Dermatol Venereol.* 2020 Feb;34(2):419-425. DOI: 10.1111/jdv.15909. Epub 2019 DOI: [10.1111/jdv.15909](https://doi.org/10.1111/jdv.15909)
3. Medialdea-Carrera R, Melillo T, Micaleff C, Borg ML. Detection of *Hyalomma rufipes* in a recently arrived asylum seeker to the EU. *Journal of ticks and tick-borne infections* (2020). Currently under review.

Manuscripts submitted to peer reviewed journals (in review process)

4. Medialdea-Carrera R, Borg ML, Rocco G, Buttigieg S, Melillo T, Agius-Muscat H. The roll-out and implementation of the WHO tool Go.Data for the COVID-19 outbreak response in Malta. *Eurosurveillance* (2020). Currently under review.
5. Medialdea-Carrera R, Guicciardi X, Kostenzer J. Tackling the climate crisis: it's time for planetary health in all policies. 2020. Currently under review.
6. Medialdea-Carrera R. "Call for action": What is a priority area for EU action on health and health policy in the upcoming years? 2020. Currently under review

Conference presentations

7. Medialdea-Carrera R, Melillo T, Borg ML. Enhanced surveillance of mosquitoes and vector-borne diseases in Malta: Molecular species identification, monitoring insecticide resistance and risk assessment for vector-borne disease emergence. Poster Presentation at the 10th Global TEPHINET Scientific Conference in Atlanta 28th of October to 1st of November 2019.
8. Medialdea-Carrera R, Melillo T, Borg ML. Trends of pulmonary and extrapulmonary tuberculosis in Malta over 29 years (1990-2018) and the impact of screening newly arrived asylum seekers. Poster Presentation at the 2019 ESCAIDE Conference in Stockholm 27th to 29th of November 2019.
9. Medialdea-Carrera R, Melillo T, Borg ML. Investigation of a recurring Norovirus outbreak on a cruise ship, Malta, August-September 2018. Poster Presentation at the 2019 ESCAIDE Conference in Stockholm 27th to 29th of November 2019.
10. Medialdea-Carrera R, Melillo T, Borg ML. Infectious disease screening of refugees and asylum seekers arriving to Malta (2015-2019), the shifting paradigm of a humanitarian crisis in the EU. Poster Presentation at the 2019 ESCAIDE Conference in Stockholm 27th to 29th of November 2019.
11. Medialdea-Carrera R, Melillo T, Borg ML. Trends of pulmonary and extrapulmonary tuberculosis in Malta over 29 years (1990-2018) and the impact of screening newly arrived migrants to Malta. Oral Presentation at the 2nd National Public Health Symposium in Malta in November 2019.
12. Medialdea-Carrera R, Melillo T, Borg ML. Investigation of a recurring Norovirus outbreak on a cruise ship, Malta, August-September 2018. Oral Presentation at the 2nd National Public Health Symposium in Malta in November, 2019.
13. Medialdea-Carrera R, Melillo T, Borg ML. Should public health guidelines for migrant screening in the EU be revised? First detection of *Hyaloma Rufipes* in a recently arrived migrant to Malta. Oral Presentation at the 2nd National Public Health Symposium in Malta in November, 2019.

14. Medialdea-Carrera R, Melillo T, Borg ML. Sexually transmitted infections testing, risk and needs of men who have sex with men (MSM) in Malta: results from the 2017 European MSM Internet Survey (EMIS). Oral Presentation at the 2nd National Public Health Symposium in Malta in November, 2019.
15. Medialdea-Carrera R, Melillo T, Borg ML. The risk of malaria re-emergence in Southern Europe: cryptic Plasmodium falciparum malaria case in Malta in 2018. Oral Presentation at the 2nd National Public Health Symposium in Malta in November 2019.
16. Medialdea-Carrera R, Melillo T, Borg ML. Enhanced surveillance of mosquitoes and vector-borne diseases in the Maltese Islands: Molecular species identification, insecticide resistance monitoring, and risk assessment for vector-borne infections. Oral Presentation at the 2nd National Public Health Symposium in Malta in November 2019.
17. Medialdea-Carrera R, Cauchi D, Agius Muscat H. Contact Tracing in Malta for the COVID-19 response. Oral Presentation at the First WHO Online Consultation on Contact Tracing on the 10th of June 2020. Attended by >300 participants.
18. Medialdea-Carrera R, Melillo T. Public Health measures taken to control the spread of COVID-19 amongst the migrant population in a small EU island State. Abstract submitted for the 16th World Congress on Public Health 2020 (Virtual).
19. Medialdea-Carrera R, Melillo T. How to prevent spread of COVID-19 in nursing homes – a Maltese perspective. Abstract submitted for the 16th World Congress on Public Health 2020 (Virtual).

Other presentations

20. Public Presentation at Think Soapbox – Health Edition. Held in Valetta (Malta) on the 9th of July. Title: Importance of vaccination. Audience:40 to 50 people (general public)
21. Delivery of a Webinar for EPIET and EUPHEM Fellows. Title: Migration and Public Health. Online on the 13th of August 2019.
22. Delivery of Elevator Pitch for Young Gasteiner Scholars Session during the European HealthGastein Forum 2019 celebrated in Bad Hofgastein (Austria) on the 1st of October 2019 Title: Challenges on Migration Health in Public Health.
23. Oral Presentation at Scientific Café in Explora, Malta: Title: Coronavirus on the 13th of February to approximately an audience of 50 individuals.
24. Oral Presentation at the Exchange of Experience among Fellows on COVID-19 Surveillance. Title: The Implementation of novel technology for COVID-19 surveillance in Malta on the 6th of April, 2020.
25. Presentation at the National Public Health COVID-19 response Meeting in Msida, Malta on the 12th of April 2020. Title: COVID-19 Epidemiological Update and seroprevalence investigation in the Maltese islands
26. Presentation at the National Public Health COVID-19 response Meeting on the 30th of April 2020. Title: COVID-19 Epidemiological Update and seroprevalence investigation in the Maltese islands
27. Oral Presentation at the Weekly Global Outbreak Alert and Response Network (GOARN) OPS call. Title: The Implementation of Go.Data in Malta on the 17th of April 2020
28. COVID-19 Public Engagement: Video Presentation for the Science Department of Asturias (Spain) on the COVID-19 epidemic on the 4th of April: [Link here](#)

29. Oral Presentation at the monthly TEPHINET Directors Meeting held online on the 17th of May 2020. Title: The roll out and implementation of the WHO tool Go.Data
30. Invited speaker at the Seminar sessions of the European Asylum Support Office (EASO). Talk titled: on Covid-19: Public Health, Epidemiology, challenges in data collection and impact on migration populations on the 21st of May 2020.
31. Interview in Onda Cero Radio (in Spanish). Discussion about COVID-19 and epidemiology on the 28th of May 2020 ([link here](#))
32. Oral Presentation via Instagram Live for the Spanish Youth Organization Conseyu de la Mocedad Xixon (Spain) in collaboration with the Government of Gijón (Spain). COVID-19 – “Everything you wanted to know about COVID-19” on the 28th of May 2020 ([Link here](#))
33. Oral Presentation via Instagram Live and Twitter Live for Spanish the Youth Organization Conseyu de la Mocedad Xixon (Spain) in collaboration with the Government of Gijón (Spain). COVID-19 – “Everything you wanted to ask about COVID-19 and I didn’t have time to reply” on the 11th of June 2020 (Link to the talk on [Twitter](#) and [Instagram](#))
34. Oral Presentation at the ECDC Think Tank Session on Ethnic minorities, migrants and COVID-19 on the 6th of July 2020. Title: The impact of COVID-19 in Migrants and Refugees in Malta

Reports

National Reports

35. National Report European MSM Internet Survey (EMIS) 2017 in the Maltese Islands (2018)
36. National Report- Surveillance of Mosquitos and mosquito-borne diseases in the Maltese Islands 2018-2019

Outbreak Reports

37. Outbreak Report. Gastrointestinal Outbreak following a staff Party Dinner in San Ġiljan, Malta (2018/2019)
38. Outbreak Report. Norovirus Outbreak on board ship, Malta, 2018
39. Outbreak Report. An outbreak of ESBL-producing Salmonella Kentucky in Malta (2014-2020)

Other Reports

40. Evaluation of the sensitivity and specificity of three commercial SARS-CoV-2 immunoassays, Malta, April 2020

Reports from International Missions with the World Health Organization (WHO)

41. GOARN End of Mission Report. Response to COVID-19 - Go.Data Team of the World Health Organization (February to June 2020)
42. GOARN End of Mission Report. Response to the Ebola Virus Epidemic in the Democratic Republic of Congo (DRC) – Health Information Management Unit of the World Health Organization Emergency Programme (February to June 2020)

Other

Other written communications:

- Interview for the Bulletin of the Spanish Society of Microbiology (Sociedad Española de Microbiología, SEM). Micro Joven. Una salida Diferente. N131 / June 2019. P12-13. [Link here](#).

- Review, writing and design of the Guidance Document: “Health Guidelines for Migrants in Malta” (2018 – 2019)
- Contributing to 4 Quarterly Newsletters produced by the Infectious Disease Control and Prevention Unit (IDCU) of the Health Promotion and Disease Prevention Directorate (HPDP) in the Ministry for Health in Malta.
- Piece for the EAN Newsletter on my Ebola International Deployment with WHO. The piece can be accessed here: <https://epietalumni.net/daten/2019/08/EAN-newsletter-summer-2019-vfinal2.pdf>
- Article Published in THINK Magazine. Four reasons why we should not forget about Ebola. Link here: <https://www.um.edu.mt/think/four-reasons-why-we-should-not-forget-about-ebola/>
- Written an article for the European Health Gastein Forum (EHGF) blog. Title: “Nobody Left Outside” on Improving Healthcare access for marginalised people. A link to the article can be found here: <https://blog.ehfg.org/2019/10/04/nobody-left-outside>
- Written the article on Vaccine Hesitancy and Vaccine Ecosystems in Europe. It includes the interview to Dr Natasha Azzopardi, President of EUPHA as part of the European Health Gastein Forum, 2019. Link [here](#).
- Contribution to the Young Gasteiners network from the European Health Forum Gastein on COVID-19 contributions in Europe on the 21st of April. Links [here](#) and [here](#).
- Interview and video for PAHO showcasing the WHO Go.Data training delivered in the National Directorate of Epidemiology in Mexico:
 - a. Available in English here: Title: A tool to investigate outbreaks, Go.Data, is rolled out for COVID-19 in Latin America [Link here](#).
 - b. Available in Spanish here: Title: Inician en México la puesta en marcha de Go.Data en América Latina, una herramienta para investigar COVID-19 y otros brotes epidémicos. [Link here](#).
 - c. Full video interview also available here: <https://www.youtube.com/watch?v=RN7Md-Yr94U>
- Interview and video for PAHO Brazil showcasing the Go.Data training delivered in Brasília. Title: Go.Data: OPAS treina especialistas do Brasil em uso de ferramenta para investigação de epidemias de COVID-19 e outras doenças. [Link here](#).
- COVID-19 Public Engagement and contribution to the press:
 - a. Interview and article published in El Imparcial on the 29th of February 2020. The COVID-19 epidemic. [Link here](#).
 - b. Interview and article published in La Nueva España on the 7th of May 2020. The COVID-19 epidemic. [Link here](#)
 - c. Interview and article published in La Voz de Asturias (Spanish newspaper) (May 2020). The COVID-19 epidemic.: [Link here](#)
 - d. Interview and article published in El Comercio (Spanish newspaper) on the 28th of May 2020. The COVID-19 epidemic. [Link here](#).
 - e. Interview and Podcast on the Federation of Spanish Biotechnologist (FEBIOTEC). Title: UK, Malta and SARS-CoV-2, a new chapter. Published on the 6th of June 2020. Link to the podcast [here](#).

5. Teaching activities

Title: World Health Organization – Training professionals on the use and implementation of the WHO outbreak response tool Go.Data

In February 2020, as the COVID-19 epidemic started spreading from Asia to other continents, there were a large number of requests from several public health institutions, Member States and WHO regional offices to receive training in the use and implementation of the WHO tool Go.Data

Raquel provide on-site and remote training for Go.Data. she organised both Face-to-face training and online, she developed training materials and provided technical advice and support to organizations implementing Go.Data. She also provided advice for epidemiological analysis and use of Go.Data for in a country-specific contexts

In collaboration with PAHO, the national PAHO offices and the Ministries of Health of Mexico, Colombia, Brazil and Argentina, Raquel designed and delivered a total of 5 face-to-face workshops were in 4 different countries including:

- 1 day Go.Data training in the Dirección General de Epidemiología, Ministry of Health of Mexico (Mexico DF) – Around 15 participants
- 1 day Go.Data training in the National Institute of Public Health of Mexico in Cuernavaca – A total of 25 face to face participants + 77 attending via Webinar
- 3 day Go.Data advance training at the Colombian Institute of Public Health in Bogotá (Colombia). Around 20 participants.
- 2 day Go.Data advance training in PAHO Brazil, Brasilia (Brazil) in collaboration with the Ministry of Health of Brazil. Around 18 participants.
- 2 day Go.Data advance training in PAHO Argentina in Buenos Aires (Argentina) in collaboration with the Ministry of Health of Argentina. Around 20 participants.

Raquel also developed a range of training materials that were adapted for the different sessions. These materials included:

- Two OpenWHO Courses Online. Title: Introduction to Go.Data.
These two courses are some briefing packages that provide an orientation to the purpose, benefits and utilization of Go.Data. They consist of 7 modules with a narrated walkthrough of the key features of the Go.Data web-based platform and mobile application. Raquel designed and recorded all the modules in the Spanish Course and Modules 1, 4, 5, 6 and 7 of the English course. Find here below the links to both:
 - English - <https://openwho.org/courses/godata-en>
 - Spanish - <https://openwho.org/courses/godata-es>
- A range of training materials was developed and adapted for the different training sessions. These included the training presentations, preparation of the training environment, generation of specific excel injects and development of training guides adapted for each of the face-to-face training sessions.
- Translation to Spanish and Portuguese and adaptation of Go.Data overview documentation

Raquel organized and conducted a range of online training sessions and Webinars which were delivered including:

- Five Go.Data introductory Webinar Briefings of 1.30h to 2h each with 25 to 60 participants each (March to June 2020). Webinars delivered in English and Spanish for both European and Central and South American countries in collaboration with PAHO, ECDC and WHO.
- Three Go.Data Briefing sessions of 1h each in English. Sessions delivered for 1) the EPIET Coordination Team of the European Centre for Disease Control and Prevention (ECDC), 2) The Health Promotion and Disease Prevention Directorate (HPDP) in Malta and 3) The Ministry for Health of Malta
- Two Advance Go.Data Training Webinars of 1.30h each. "Go.Data –Ask the Expert" session with 30 to 50 participants each (May and June 2020). One session delivered in English and the other in Spanish.

Supervisor(s): Armand Bejtullahu, Mr Pat Drury

Title: Lecturing about Infectious Diseases and Public Health at the University of Malta

Designing teaching materials and delivering two lectures of 2 hours each to students of the course of Public Health from the University of Malta. Delivery of the following lectures:

1. Lecture Title: Infectious Diseases and International Pandemics
 - 14th of November 2018. University of Malta, 2 hours – 6 to 8 pm.
2. Lecture Title: Public Health, Vaccination and Foodborne infections
 - 9th of January 2019. The University of Malta, 2 hours – 6 to 8 pm

The learning objectives of the lectures in Infectious Disease and Public Health (4h) were:

- To describe the importance of Infectious diseases
- To outline the importance of epidemics and outbreaks
- To describe some of the key steps needed prior to conducting an outbreak investigation
- To recognise the importance of vaccination
- Understand how foodborne outbreaks caused and how to prevent them
- To explain key concepts about international outbreaks such as Ebola, flu or Zika.

The lecturing activities were evaluated using an online questionnaire form via Survey Monkey. Very positive feedback was received.

Supervisor(s): Dr Maria Louise Borg

Title: Teaching about Outbreak Investigation at the University of Malta

Designing the teaching materials and delivering two lectures of 1 hour each to students of the course of 1st, 2nd and 3rd year of Physiotherapy and Occupational Therapy from the University of Malta. Delivery of the following lectures:

1. Lecture title: Outbreak Investigation
 - 5th of November, 2018. University of Malta, 1 hour. Lecture for undergraduate students of physiotherapy and Occupational Therapy at the University of Malta
2. Lecture Title: Case Scenarios of Outbreak Investigation
 - 12th of November 2018, University of Malta, 1 hour. Lecture for undergraduate students of physiotherapy and occupational therapy at the University of Malta

The learning objectives of the Lectures in Outbreak Investigation (2h) were:

- To describe the global importance of infectious diseases
- To understand the Zika Virus and Ebola Virus Epidemics
- To describe the principles of outbreak investigation
- Explain the steps in outbreak investigation
- Describe the different types of investigation needed

A series of questions were generated for the student's final exam.

The lecture activities were evaluated using a paper questionnaire form that was collected at the end of each lecture. 81.0% of the respondents reported "the lectures to be very interesting and informative" while the other 19.0% reported "the lectures to be mostly interesting and informative". Overall, very positive comments were collected with the feedback received.

Supervisor(s): Dr Maria Louise Borg

Title: Design, development and delivery of a Case Study: The Zika Virus Outbreak: Challenges of using Social Media during an international Epidemic

Raquel designed, developed, piloted and delivered a teaching case study about the use of social media in public health epidemics. The case study was facilitated 2 times in Malta and once in the Czech Republic as part of the EPIET Alumni Network (EAN) Mini Module Workshop on Social Media in August and September 2019.

The target audience for this case study was public health professionals interested in learning about the use of social media during international outbreaks. The target audience did not need to have previous experience dealing with social media for public health or with outbreak response. The case study was divided into 5 parts and lasted approximately 3 to 4 hours. This case study has now been registered under the Attribution-NonCommercial-ShareAlike v 4.0.

Raquel facilitated this case study three times:

- 1) 31st of July 2019, Infectious Disease Control Unit, Ministry of Health, 3 hours
- 2) 15th of August 2019, Health Promotion and Disease Prevention Directorate, Malta, 3 hours
- 3) 31st of August 2019 and 1st of September 2019, Public Health Institute, Prague (Czech Republic). 2 days, 6 hours

Learning objectives for this case study:

The overall aim of this case study is to illustrate the different uses of social media for public health communication during international outbreaks and the challenges of the spread of fake news. By the end of this case study, participants should be able to:

- Describe the challenges of using social media during outbreaks
- Design and construct public health messages for social media
- Recognise and tackle fake news
- Explain the different uses of social media for public health purposes during epidemics
- Learn about using social media for conducting research and interventions
- Design social media campaigns targeting different population groups
- Be aware of the importance of the use of adapted language in social media
- Learn about ways to promote your messages on social media
- Assessing the performance and impact of a social media campaign / messages

The needs of the audience were evaluated with a short questionnaire prior to the session which asked about their experience with social media, their interests and the expected learning outcomes from the session. The case study was evaluated using an online questionnaire form via Survey Monkey. Very positive feedback was received. Additionally, Raquel contributed to the facilitation of this case study delivered for the Australian FETP Fellows in August 2020 (Online).

Title: Thesis supervisor for a Master's Student in Public Health from the University of Malta

Supervised and tutored a Masters student in Public Health from the University of Malta (2019 / 2020).

Thesis title: The Knowledge, Attitude and Practices on prevention and control of mosquitoes in Malta.

Provided support on the design, analyses and write up of a Master's Thesis Masters Public Health. The student had his Master's Thesis presentation in June 2020, it was approved and the student officially completed his Masters in June 2020.

Supervisor(s): Dr Tanya Melillo

Title: Training Seminar on Mosquito-Borne Diseases for Environmental Health Inspectors

Design, development and delivery of a 3-hour training session on Mosquito Borne Diseases for Environmental Health Inspectors of the Ministry for Health in Malta.

A series of materials, leaflets and presentation slides were prepared. Additionally, leaflets with information on mosquito surveillance were generated and distributed.

The lecture was delivered on 17th of September 2019 in the Environmental Health Directorate in Santa Venera, Malta. A total 30 national professionals from both the Environmental Health Directorate as well as the Pest Control team attended the session.

Supervisor(s): Dr Tanya Melillo, Dr Maria Louise Borg

Title: Continuous Professional Development (CPD) Lecture for Healthcare Professionals in Malta: Zika Virus and Emergent Epidemics

Design, development and delivery of a lecture as part of the Continuous Professional Development (CPD) Programme for Healthcare Professionals in Malta.

A 1.30h lecture was delivered on the 22nd of January 2019 at the Directorate for Health Information & Research (DHIR) in Malta. Presentation Title: The Epidemic of Zika Virus: unravelling some of the mysteries of the outbreak in Brazil.

The lecture was well attended and very positive feedback was received.

Supervisor(s): Dr Tanya Melillo, Dr Maria Louise Borg

Title: Lecturing in Public Health at the Barts and the London School of Medicine and Dentistry

A total of 14 lectures each 1 hour in length were designed and delivered at the Barts and the London School of Medicine and Dentistry in the Gozo Campus (Malta).

A set of 9 lectures (9h) were delivered between the 9th and 11th of December 2019 for 3rd year Medical students on various topics in public health including infectious diseases, vaccination, influenza, epidemiology, randomised trials and other evidence, principles of screening, nutrition in public health and cancer epidemiology.

A 1.30h lecture was delivered on 5th February on Migration and public health for Medical University students of 1st, 2nd and 3rd year.

Additionally, another 5 lectures on public health were delivered for 1st year Medical University students in April 2020. The lectures were about public health. Due to the emergence of COVID-19, lectures had to be delivered virtually.

Title: Training the COVID-19 Response Team on the use of the outbreak response tool Go.Data

Raquel was responsible for teaching and training on the use of Go.Data across all the teams involved in the response. She designed and conducted advance training on the use of Go.Data for the COVID-19 response in Malta to the following teams:

- Contact Tracing
- Case Management
- Swabbing Team
- Data Management
- Epidemic Intelligence
- Response Management and coordination
- Follow Up team

- Primary Health Care

Structured training was prepared for all the teams. Training consisted of specific Training sessions delivered online or face to face tailor-made for each of the teams. Training sessions varied from 1 hour to 3.5 hours long depending on the needs.

In total, training was provided to over 60 specialists. Additionally, short video tutorials of 10 to 15 minutes were also designed, recorded and produced for each team showing demonstrations on the specific use of Go.Data required for their functions.

Supervisor(s): Dr Maria Louise Borg

Educational outcome:

Prior to this work, I had extensive experience of teaching and tutoring both undergraduate and postgraduate students. During the two years of my fellowship, I had the opportunity to further develop and improve my training and teaching skills.

Delivering training materials for such a wide range of different audiences was a really interesting challenge. Even though I truly enjoyed lecturing at University, it was also extremely interesting to teach healthcare professionals with a high level of knowledge and experience.

Moreover, developing a case study contributed to the development of my knowledge, skills and attitudes towards teaching public health professionals. It was very rewarding to receive such positive feedback and to be able to prepare a case study that could be delivered by other professionals worldwide and continue to transmit my experience and knowledge to many others. It was fantastic to receive positive interest from FETPs worldwide, and the Australian FETP are planning to deliver this case study as part of their teaching to Australian FETPs in August 2020.

Overall, this experience has allowed me to continue developing my teaching skills and it has reinforced that teaching is something I really enjoy as it allows me to transmit my passion and knowledge to others.

6. Other activities

International Deployments:

- Two international deployments with the Global Outbreak Alert and Response Network (GOARN) to support WHO's emergency response:
 - Ebola epidemic in the Democratic Republic of Congo (DRC): Deployed with GOARN to support with the World Health Organization working as epidemiologist in the Data management analytics and products (MAP) team at the Health Emergency Information and Risk Assessment (HIM) Unit of the WHO Health Emergencies Programme in Geneva. March 2019 to May 2019 – 6 weeks.
 - COVID-19 response: Deployed with GOARN to support the Go.Data Team in collaboration with PAHO. Deployed to Mexico, Colombia, Argentina and Brazil.

Conferences attended:

- Attended the 12th European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE) held in Malta 21st to 23rd of November 2018
- Attended the European Health Forum Gastein (EHFG) on the 2nd to the 4th of October 2019 in Bad Hofgastein, Austria
- Attended the 10th Scientific Global TEPHINET Conference in Atlanta (US), 28th of October to 1st of November 2019.
- Attended the 12th European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE) held in Malta 21st to 23rd of November 2018

- Attended the WHO Consultation on Contact Tracing for COVID-19 on the 9th to 11th of June 2020 (online)

Other meetings attended:

- Attended the European Surveys and Training to Improve MSM Community Health (ESTICOM) Dissemination Workshop meeting in June 19, 2019 hosted by Chafea, Luxembourg
- Attended the WHO Workshop on Counselling and Brief Interventions in Primary Health Care Level. Public Health Approached in Malta to Address NCD Risk Factors on the 11th to 12th of July 2019, Malta
- Attended the 2-day meeting on *Review of vector control practices and strategies against West Nile virus in the EU* organized by the European Centre for Disease Control and Prevention (ECDC) in Stockholm on the 2nd and 3rd of December 2019. Drafted the minutes of the meeting and presented the conclusions from the group discussions on the 3rd of December 2019.

Other activities:

- Finalist in Science Communication Competition: "I am a Scientist" - Epidemic Zone. Came Second in the Epidemic Zone. Shared knowledge and information about public health, epidemics and infectious diseases in Europe (November – December 2018)
- Awarded the Third price at the EPIET Alumni Network (EAN) Photo Contest in Field Epidemiology and Public Health Microbiology during the 2019 ESCAIDE Conference in Malta
- Awarded funding from InfraVec2, an EU Consortium funded by the European Commission Horizon 2020, to conduct laboratory testing for the mosquito surveillance projects.
- Awarded Scholarship to join the European Young Gastein Forum (2019). As a Young Gasteiner, moderated one conference session and supported the Young Gastein activities on social media.
- Organization of several engagement activities to support asylum seekers and refugees' Health in the migrant reception centers and refugee camps in Malta (June 2019, August 2019, September and December 2019).
- Supported the Public Health Screening of recently arrived asylum seekers and migrants in the Maltese Islands with the team of the Infectious Disease Control and Prevention Unit (IDCU) in Malta. Supported the public health activities taking place with the arrival of asylum seekers and refugees at both the port and the migrant reception center of Marsa, Malta between September 2018 and January 2020.
- Organizing and setting up Travelling Photo Exhibition. Title: "Epidemiology, infectious Diseases and Public Health". Photo Exhibition exhibited in Malta, in Mater Dei Hospital for 3 weeks from the 6th of February 2019 to the 28th of February 2019. Then, the photo exhibition was shown in Nederland (RIVM) from April to May 2019, in Dublin from May to August 2019 and in Bratislava August to November 2019. [Link here.](#)
- Member of the Organization Committee for the Career Compass that took place during the 2019 ESCAIDE Scientific Conference on the 28th of November 2019 in Stockholm.
- Support in the organization and coordination of the First WHO Consultation on Contact Tracing in the context of COVID-19 on the 9 to 11th June 2020, Online. Management of Slido and interactive platforms for audience participation.

7. EPIET/EUPHEM modules attended

1. Introductory Course, Spetses, Greece, 24th September - 12th October 2018

2. EPIET Outbreak Investigation module, Berlin, 3rd - 7th December 2018
3. EPIET Multivariable Analyses module, Madrid, 25th - 29th March 2019
4. EPIET Rapid Assessment module, Zagreb, 13th - 18th May 2019
5. EPIET Project Review module, Prague, 26th August – 30th August 2019
6. EPIET Time Series Analyses module, Utrecht, 4th - 8th November 2019
7. EPIET Vaccinology module, 4 May – 24 June 2020, online.
 - Institute Pasteur, SPOC (Small Private Open Course), 4th of May to 12th of June 2020, Online.
 - National Institute for Public Health and the Environment of the Netherlands (RIVM), facilitated sessions, 22-24 June 2020, Webinar.

8. Other Training

- Introduction to R for Outbreak Investigations. Workshop delivered by the R Epidemics Consortium (RECON) in collaboration with the EPIET Alumni Network (EAN) on the 19th and 20th of November 2018 in Msida, Malta.
- Introduction to the use of R. Online Course. DataCamp, November 2018.
- Introduction: Operational Readiness (Tier 1). Online Course. OpenWHO. December 2018.
- BSAFE - Online security awareness training of the United Nations Department of Safety and Security. Online Course. January – February 2019.
- Workshop on Migration and Health for Health Professionals, law enforcement officers and social workers (8hours). Workshop delivered as part of the TRAIN4M&H project, European Commission on the 27th of February 2019 in Malta.
- The WHO Go.Data outbreak tool developed by GOARN. London, UK, June 2019. Training delivered by MSF/WHO attended online via Webinar.
- WHO Workshop on Brief Interventions for NCDs and mapping risk factors. Delivered by the World Health Organization (WHO) on the 11th and 12th of July 2019 in Sliema, Malta
- Advanced R Course for Outbreak Investigations. Workshop delivered by the R Epidemics Consortium (RECON) at the European Centre for Disease Control and Prevention (ECDC) on the 25th and 26th of November 2019, Stockholm (Sweden)
- Training as Go.Data SuperUser for surveillance and Contact Tracing – by the World Health Organization and the Global Outbreak Alert and Response Network (GOARN). February 2020, WHO, Geneva (Switzerland).
- Training on the use of Slido, platform for managing Q&A and polling during meetings, conferences and events. Online, June 2020

Supervisor's conclusions

As evidenced by her extensive portfolio, during her two-year assignment in the Infectious Disease Control and Prevention Unit (IDCU) in the Ministry for Health in Malta, Raquel was involved in numerous outbreaks, research,

surveillance, teaching, and communication projects. Through her constant hard work and dedication, she successfully met and surpassed all the EPIET objectives.

Coming from an advanced academic background with good statistical experience, Raquel used her knowledge and expertise to improve the systems and outputs of IDCU. She provided inputs for evidence-based decision-making, assisted IDCU in enhancing its surveillance systems, analyzing the datasets, and improving our reporting quality—evidenced by her work in EMIS, Tuberculosis, COVID-19 and STIs. Raquel also led the surveillance of mosquitoes and established funding for vector competency analysis with international partners.

During the COVID-19 pandemic, Raquel was pivotal in implementing Go.Data in Malta and was a member of the public health response team from the beginning of the COVID-19 epidemic. Similarly, her microbiology and laboratory expertise strengthened the communication and understanding between IDCU/public health epi and the pathology/microbiology team. This increased communication was fundamental in times of crisis during the initial and successful COVID-19 response. Through her assistance to the microbiology team, she successfully led the evaluation of the commercial COVID-19 immunoassays.

Through Raquel's keen interest in humanitarian issues and her volunteer work with local NGOs, she played an essential role in bringing asylum seekers' health to the forefront and increasing awareness of asylum seekers' health needs. Her projects contributed to improving asylum seekers' health and strengthening the surveillance and screening of infectious diseases in asylum seekers. Through her publication on asylum seekers, reports on migrants health and work on surveillance of infectious diseases among asylum seekers, she managed to increase awareness in the context of infectious diseases in asylum seekers communities.

Regarding communication and visibility of IDCU, Raquel helped connect our government work with different Maltese stakeholders involved in health-related issues including collaborating with the Environmental Health Department and the Ministry for the Environment, sustainable development and climate change. Working with local NGO's, she liaised and communicated the work that we do at IDCU with people attending vulnerable populations. Through peer-reviewed publications, presentations, reports and meetings she showcased our work in an academic environment. Lastly, internationally and through multidisciplinary collaborations, Raquel helped showcase the work done by IDCU, increasing our international visibility.

Through her motivation, enthusiasm, and pro-activeness, Dr Medialdea Carrera proved to be an exceptional fellow throughout her training. She is very passionate and motivated about public health, epidemiology and infectious diseases, which was shown through her motivation especially in the light of the COVID-19 pandemic. Raquel led multiple projects and was responsible for all aspects of leading these projects from onset to completion. Raquel worked very well under pressure and managed her time effectively, always meeting deadlines. She quickly adapted to the unit's work and became an invaluable team member, always being a great team player. Raquel also showed excellent leadership skills, especially in infectious disease surveillance and when managing infectious disease outbreaks and organizing the implementation of Go.Data in Malta, which she successfully championed. Raquel was involved in public health policy and decision making specially during the COVID-19 epidemic and her inputs and support constantly exceeded all expectations. Her knowledge and expertise in teaching, communication, data management, statistics, and microbiology were tremendous assets to our unit on a long-term plan. Her exceptional performance is evidenced by all her outputs, presentations, and publications during the EPIET fellowship. Moreover, her personal qualities, interpersonal skills and contagious enthusiasm motivated the whole team and contributed to improving the overall teamwork. I cannot commend Dr Medialdea Carrera enough.

To conclude, all of Raquel's experiences within IDCU and all her invaluable contributions to the unit further prove the importance and value of the EPIET program. This program provides the opportunity for fellows to gain proper epidemiological training and for host sites to benefit from the fellow's expertise. The fellow's knowledge is vital to small MS training sites, given our limited human resources and technical expertise. Therefore, we were fortunate to have such a highly trained fellow.

Coordinator's conclusions

Raquel started her fellowship with strong public health research background, and she had conducted work in international health in Brazil and India. She maximised use of the two fellowship years, being involved in eleven field assignments in the surveillance and research area, along with six outbreak investigations, including four projects related to the COVID-19 pandemic. Through her knowledge and experience from global health and infectious diseases, enthusiasm and high commitment, she has completed all of these, achieving all EPIET objectives and producing large amount of public health communication outputs of high quality. Her teaching of fellow-colleagues and contribution to the fellowship training material has been also highly appreciated.

Raquel's passion for public health communication and humanitarian emergency response was visible throughout the fellowship. In addition, she is highly skilled and organised, able to work independently and effectively. Supported by excellent supervision and project availability at the site and internationally, her fellowship has been highly successful. She improved her competencies working with many public health topics, also using novel methods like Go.Data tool implementation for COVID-19 outbreak investigation in Malta. I believe that Raquel has excellent professional and interpersonal skills needed in public health.

Personal conclusions of fellow

During the last two years, EPIET has been a fantastic professional and personal experience. Completing this Fellowship has given me numerous invaluable opportunities. I have been able not only to continue acquiring new skills and knowledge every single day, but also, I have been able to make a significant contribution to improve public health in Malta, Europe and also worldwide through my international missions with WHO.

Being a fellow in the Ministry for Health in Malta was an extremely interesting and unique experience as I was able to engage in projects in a wide range of public health activities and all kinds of infectious diseases. Moreover, as Malta is a small country with all public health activities centralised in the Ministry for Health, I had the opportunity to take part in numerous public health response activities at local, regional, national and international level which was immensely enriching. Additionally, being able to support refugees and asylum seekers upon arrival in Malta and working in several projects with the aim to improve migrants health was truly interesting and rewarding.

When I started this epidemiology fellowship, I would have never imagined that only a few months after, a new virus would emerge causing what has already been called as "the worst pandemic of the century". I feel fortunate for having been able to work as an epidemiologist in the COVID-19 response contributing to the public health work and research needed to control this large epidemic.

Overall, I am truly grateful for having had the opportunity to work as EPIET Fellow in Malta, joining a cohort of brilliant health professionals from all over Europe and being able to continue advancing my epidemiology expertise and becoming a better public health professional, field epidemiologist and humanitarian responder.

Acknowledgements

I would like to first and foremost thank my site supervisor Dr Maria Louise Borg who has not only been a wonderful supervisor but also a great friend over the course of the last two years. The long days and nights working together, the fascinating outbreak investigations and field work carried out together all around Malta and the continuous support and friendship were invaluable and made my experience in the Maltese Islands even more special. A special thanks goes to Dr Tanya Melillo, my second supervisor in Malta and whose drive and passion were an inspiration. It was a pleasure to be your "buddy" and to adventure with you all across Malta. I am certain one day we will write a bestseller book sharing all our incredible stories and adventures working together.

I would like to extend my warmest acknowledgement to all the team at the Infectious Disease Control and Prevention Unit (IDCU) and the Health Promotion and Disease Prevention Directorate (HPDP). In particular, I need to acknowledge Graziella, Daniel, Marika, Jackie, Glorianne, Elton, George and Robert. Thanks for being my extended family in Malta and making every day at work even more pleasurable with you all.

I would like to express my most sincere thanks to all the superb Maltese National COVID-19 Response Team. I am truly proud to be part of such a brilliant team of professionals led by Prof Charmaine Gauci and Dr Kenneth Grech who have managed to protect and control the spread of COVID-19 in Malta. I thank them both for all the opportunities provided to support Malta tackling this pandemic. I am also grateful to leads such as Dr Hugo Agius Muscat and Dr Neville Calleja for all the fascinating work conducted together. Also, thanks to the Ministry for Health of Malta for supporting and making the fellowship agreement possible.

I would like to express my most sincere thanks to GOARN and WHO for providing me with the fascinating opportunities to deploy twice with WHO to support the Ebola and the COVID-19 response. It was great being part of the Ebola response team under the supervision of Brett Archer and Marie Amelie Degail. I would like to acknowledge Armand Bejtullahu, Pat Drury, PAHO and the Go.Data team for allowing me to contribute in such an interesting way during the COVID-19 response.

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Last, but not least, I want to express my gratitude to all my fantastic EPIET, EUPHEM, PAE, FETP peers from *the thunderstorm* cohort for being so inspiring and making this fellowship such a fun and unique experience.

As Isaac Newton said, "*If I have seen further, it is by standing on the shoulders of giants*". Thanks to all of you, for being such wonderful "giants" and for making this unique professional experience extremely interesting, exceptionally enriching and specially rewarding.