Infectious Diseases-Foodborne, Infectious Diseases

North Carolina Department of Health and Human Services, Division of Public Health, Epidemiology Section, Communicable Disease Branch

Raleigh, North Carolina

Assignment Description

Three mentors are listed for this CSTE Fellow. Dr Erica Wilson, a second secondary mentor, offers valuable projects and connection to the vaccine-preventable disease program.

Erica Wilson

Agency: North Carolina Division of Public Health

Title: Medical Director for Vaccine Preventable and Respiratory Diseases

Erica received her MD and MPH at the University of Alabama at Birmingham and completed Family Medicine residency at the Mountain Area Health Education Center in Asheville, NC. Erica is board certified in Family Medicine. Additionally, Erica completed a CDC Epidemic Intelligence Service (EIS) fellowship with the Wisconsin Division of Public Health in the Bureau of Environmental and Occupational Health.

NC DPH’s Epidemiology Section includes three branches: Communicable Disease, Occupational and Environmental Epidemiology, and Public Health Preparedness and Response. (Please see the attached organizational chart for the location of the Communicable Disease Branch within the Section.) Because communicable diseases can have so much impact on the population, the surveillance and control of such diseases is an important part of protecting the public's health. The Communicable Disease Branch primarily deals with infectious diseases that are reportable by law to the state health department, and other communicable diseases of public health significance, such as influenza, norovirus infection and certain healthcare-associated infections. The Communicable Disease Branch houses approximately 190 staff members, with a subset (30) sitting in the Medical Consultation Unit which is where the CDC/CSTE Applied Epidemiology Fellow will be located.

The North Carolina Communicable Disease Branch works closely with local health departments and strives to protect and improve the health of people in North Carolina through disease detection, tracking, investigation, control, education, prevention and care activities to reduce morbidity and mortality resulting from communicable diseases that are a significant threat to the public.

The Epidemiology Section of the NC Division of Public Health (DPH) is committed to providing an exceptional, well-rounded experience for a CSTE/CDC Applied Epidemiology Fellow.

The Epidemiology Section Communicable Disease Branch has a strong history of hosting CDC Epidemic Intelligence Service Officers (37 officers since 1952), UNC-Chapel Hill public health students, and student interns. This assignment will allow a Fellow to develop applied epidemiology competencies under the guidance of experienced mentors by engaging in both narrowly-focused and cross-cutting projects, with opportunities to easily gain experience in communicable disease and public health preparedness, as well as environmental and injury epidemiology as desired.
Mentors will work with the Fellow to choose projects that fit with the Fellow’s interests, fulfill the competency areas, and provide solid broad-based experience in applied epidemiology. These projects will involve the Fellow with staff across the Section, DPH, and from other states and CDC. Projects provide opportunities to present at national/state conferences and submit manuscripts to peer-reviewed journals. The Fellow will present work to internal and external partners and will be mentored in handling data/technical assistance requests (e.g., from public and media). Placement will allow the Fellow opportunities to understand the surveillance, outbreak response, and training required in a decentralized public health infrastructure with a high population.

The mentors have a combined 30+ years of experience in applied epidemiology and are committed to ensuring an exceptional experience for an Applied Epidemiology Fellow.

**Day-to-Day Activities**

Day-to-day activities will primarily depend on the nature of the project and experience of the Fellow. As this Fellow will be housed in the foodborne program, the majority of the initial time will be spent acclimating to foodborne data, our statewide surveillance system, our public health infrastructure and organization, and establishing routine activities to encourage small successes and accomplishments at the beginning of the Fellowship. All members of the foodborne team enter paper lab results on specific days and ensure data quality of events in our surveillance system before closing them and sending to CDC. Initially, daily activities will be strongly linked to one or more of the mentors. As the Fellow develops capacity, more independent oriented activities will predominate. As new projects are initiated, the mentors will work with the Fellow to get oriented and will check in to ensure progress toward reaching competencies is made. In addition to foodborne projects, as part of the Communicable Disease Branch, the Fellow will participate in outbreak investigations and other projects as they arise. Fellows will also participate in serving as the epidemiologist on call, responding to inquiries from local health departments and the general public. We hope to provide a diverse experience in accordance with branch needs and the Fellow’s interests as the mentors represent vectorborne, foodborne, and vaccine-preventable diseases.

**Potential Projects**

**Surveillance Activity**  
**Develop Surveillance Summaries for Foodborne/Waterborne Pathogens**

Our NC surveillance system is excellent at collecting information for multiple parties to view in real time but obtaining that data for analysis is a bit challenging. Surveillance is the ongoing and systematic collection of data for public health action. There are over 100+ local health department nurses who have submitted over 6,000 surveillance events to our statewide surveillance system in 2018. Analyzing surveillance data to create surveillance summaries allows decisions to be made based on the actual data rather than assumptions about the data being submitted. This is an important step to close the loop on our overall surveillance activities.
Additional surveillance activity option: Analysis of reported human cases of NC Lyme disease surveillance data

North Carolina is a state in which Lyme disease is emerging as a significant vectorborne disease threat. Under the direction of the state public health veterinarian and public health entomologist we have procured ELC funding to survey ticks, develop acarologic risk assessments and define the leading edge of Borrelia burgdorferi infected Ixodes scapularis ticks in the state. The objective of this project would be to perform a comprehensive analysis of reported clinical, risk factor and laboratory information on confirmed and probable cases in NC EDSS. The goal of this project would be to characterize case outcome, clinical presentation, and laboratory results and determine the extent to which the case data is similar to highly endemic states. Our hypothesis is that, in areas of emergence (northwest NC), the reported case data should resemble case data from highly endemic states.

Additional surveillance activity option: Risk factors for pertussis infections in North Carolina and maternal Tdap uptake.

On average, approximately 450 pertussis cases are reported each year in North Carolina. Pertussis infection can be especially dangerous in infants who are too young to be vaccinated. In 2012 ACIP recommended maternal Tdap vaccination in order to increase protection for both mothers and infants. An analysis of North Carolina pertussis surveillance data by comparing demographics, clinical data, and risk factors of infant and non-infant cases as well as the frequency of maternal Tdap among the mothers of infant cases would allow better targeting of intervention and education efforts to prevent infant pertussis infections.

Surveillance Evaluation Evaluation of North Carolina’s Electronic Disease Surveillance System (NC EDSS) As A Tool for Salmonella Surveillance Used for Cluster Investigations

As the 9th most populous state, the NC foodborne program received state and multi-state cluster (possible outbreak) notifications multiple times a day depending on the time of the year. The importance of NC’s contribution to the body of exposure information to assist with finding a cause cannot be understated. Barriers need to be identified and processes evaluated and streamlined. For example, is the length and/or content of the surveillance form a barrier? How complete are surveillance events? Is the local capacity to complete the surveillance survey a barrier? Is the value of the surveillance information misunderstood? Additionally, canned reports produced by NCEDSS do not contain exposure information. Is there a more efficient way of identifying exposure data? Assessing our system to improve outcomes will help NC identify or rule out commonalities more efficiently for NC outbreaks and multi-state outbreaks. This project would involve data analysis of denormalized SAS tables, assessing attributes of NCEDSS surveillance for Salmonella based on CDC guidelines, understanding state and national cluster investigation processes, and comparing local CD nurse needs/abilities with the needs of state and federal partners.

A separate evaluation project option includes the following:

Title: Evaluation of surveillance for Salmonella and impact of culture independent diagnostic testing
Description: Given that Salmonella is so common (>2,000 reported cases in NC/year), and the use of CIDTs is becoming more prevalent, it is proposed to perform a standard evaluation and look at the impact CIDT use may be having. This has been discussed, most recently (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6409a4.htm). This evaluation may be used to guide recommendations and public policy.

An additional surveillance evaluation project option: Evaluation of Lyme disease (LD) case investigation and reporting timeliness in NC EDSS.

A prior review of the impact of Electronic Laboratory Reporting on case processing time indicated that, with the advent of ELR, Lyme disease case processing time increased (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3743288/). Since 2013 the percentage of Lyme disease events that are created for investigation by ELR on an annual basis have increased steadily. Additionally, as Lyme disease is a condition that is emerging in NC, case reports in general have increased (in 2018 over 1400 LD events were created for investigation, over 85% were created by ELR). The goal of this project will be to characterize LD case processing time and identify areas for improved efficiencies as reported cases are expected to increase.

**Major Project  Develop an Analysis Tool to Improve Quality and Timeliness of Cluster Investigations**

As the 9th most populous state, the NC foodborne program received state and multi-state cluster (i.e. possible outbreak) notifications multiple times a day depending on the time of the year. With the current integration of whole genome sequencing, our ability to identify exposure information is even more critical given the very specific nature of sequencing results. Our existing surveillance system does not produce reports containing exposure information. The foodborne team currently reviews each surveillance report individually, document exposures from each individual in a spreadsheet, and reviews the final spreadsheet for commonalities. A far more efficient method would be to use a SAS program to mine the hundreds of SAS data tables for exposure information. A program for our foodborne pathogens does not exist. An analysis tool would do the following: 1) improve timeliness in identifying or ruling out exposures, 2) expand the depth and breadth of reviewing surveillance data, and 3) give the investigator more time to follow up on nuances identified in the data.

**Additional Project  Analysis of Diagnostic Testing Results for Specimens Submitted to the State Laboratory of Public Health for Reportable Vaccine Preventable Conditions**

While North Carolina has not had any measles cases in 2019, testing continues to be performed at the State Laboratory of Public Health (SLPH), as well as commercial laboratories, for suspect cases. At the SLPH, if measles PCR is negative, then the sample is then put into viral culture. An analysis of culture results for samples submitted for measles testing would provide valuable information on other viruses causing measles like symptoms.

**Additional Project  Mapping Surveillance Forms with Supplemental Forms Requested by CDC to Eliminate Duplicative Steps in Surveillance Interviews.**

In addition to routine surveillance information, CDC requests supplemental interview forms for five foodborne pathogens reportable in NC: Listeria, Vibrio, Typhoid/Paratyphoid, Cyclospora, and Trichinella. In our decentralized infrastructure, Local Health Departments (LHD) are responsible for a lot of tasks. Many of our LHDs have limited time for communicable disease due to multiple overlapping
responsibilities such as preparedness, working in various clinics or because there is limited communicable staff nurses at many LHDs. Efforts to minimize duplicative tasks between surveillance and supplemental forms will save hundreds of person-hours across the state among our 85 health departments/districts.

**Preparedness Role**

In addition to the fellow participating in outbreak investigations, which are common in North Carolina, within in the Communicable Disease Branch, large outbreaks may be managed with involvement of the Public Health Preparedness and Response Branch, which is also within the Epidemiology Section and colocated with the Communicable Disease Branch. If the Public Health Coordination Center is opened, requests will be made throughout DPH for volunteers to assist in response efforts.

Section epidemiologists and fellows, including EIS and CSTE fellows, have worked in the Public Health Coordination Center during hurricanes, floods, H1N1, foodborne and vaccine-preventable disease outbreaks and other public health response events. Roles, tasks, and length of detail will be negotiated with the Fellow. An EIS Fellow served as the Epidemiology and Surveillance Lead for the 2012 Democratic National Convention held in Charlotte. A previous CSTE fellow served as an integral component of our NC Ebola response, assisting to create the database used to monitor returning travelers.

An outbreak response curriculum has been developed by a colleague within the Epidemiology section; the Fellow will receive this training and will be actively engaged in outbreak response and field investigations as appropriate. In addition, the Fellow will be trained in the FEMA Incident Command System.

**Additional Activities**

Project Title:

Outbreak Investigation and Response

Project Description:

There were approximately 119 gastrointestinal outbreaks reported among NC residents in 2018. While most are routine, some require all hands-on deck. The CSTE Fellow will be trained in outbreak investigation and response with the goal of developing expertise to lead a foodborne/waterborne investigation independently, with the availability of mentors for assistance. Important tasks will be identifying necessary partners, establishing a "case definition, identifying immediate control measures, deciding if an analytic study will be needed, developing an analysis plan, survey design, database management, data analysis, interpretation of results, and reporting out results (i.e. conference calls, final reports, etc.). Outbreak investigations expand beyond the foodborne program and we would give the CSTE Fellow the opportunity to assist with outbreaks from other programs. Recent outbreak investigations included mumps, Legionella associated with hot tubs at a fair, peritonitis, vaping, and Hepatitis A.
Project Title:
Establish Standard Initial Outbreak Investigation Survey

Project Description:
The information collected at the onset of an investigation can save time or create more work if the proper information is not collected. Establishing a standard outbreak investigation survey to be used at the onset of a possible outbreak investigation that can be applied across multiple programs would be a valuable tool for local and state partners as they work together on outbreak investigations.

Project Title:
Standardize Investigation Steps and Documentation Involving Four Partners to Complete Vibrio Investigations

Project Description:
All Vibrio cases require a surveillance interview that includes clinical, exposure and laboratory information. Additionally, CDC requests a supplemental form, Cholera and Other Vibrio Illness Surveillance (COVIS). COVIS forms require information from the state foodborne program, the local health department, the local/regional environmental health specialist, and the state Seafood and Shellfish Sanitation Branch. A clear protocol needs to be established and documented to ensure all parties are aware of their role in completing the COVIS form that must be submitted to CDC for all Vibrio cases.

Project Title:
Obtain Local Health Department Experience

Project Description:
We see the value in understanding the perspective of a local health department, as all things start local. We will assess local health department need and capacity to work with the CSTE Fellow on a project to allow the Fellow to understand the challenges of a local health department, especially in a decentralized public health infrastructure, gain perspective on different levels of public health and provide valuable assistance to a local jurisdiction.
Project Title:
Develop Lab Interpretation Tool/Resource

Project Description:
There are over 70+ reportable conditions in North Carolina, most of which require a positive laboratory results to be considered a case. Understanding how to interpret a lab result is an important first step in determining if a case exists, which will determine immediate control measures and if the need to complete a surveillance interview exists. Feedback from local nurses has repeatedly included the value in understanding how to interpret lab results. Creating a tool/resource for local nurses to use when interpreting labs will save time and can be useful to multiple programs within our branch (i.e. vaccine preventable, vectorborne and foodborne diseases).

Additional activities: Participate in the NC Food Safety and Defense Task Force, consisting of government, private, academic and other partners with a stake in food safety. Present during foodborne regional and statewide trainings.

Mentors
Primary  Carl Williams DVM, DACVPM
          State Public Health Veterinarian

Secondary  Nicole Lee MPH
           Foodborne Epidemiologist