Infectious Diseases-Foodborne, Infectious Diseases

Tennessee Department of Health, Communicable and Environmental Health Services and Emergency Preparedness

Nashville, Tennessee

Assignment Description

The CSTE fellow will be fully integrated into the TDH's Communicable Environmental Disease Services and Emergency Preparedness (CEDEP) program. He or she will gain a detailed understanding of TN's Foodborne Diseases Active Surveillance Network (FoodNet), Foodborne Diseases Centers for Outbreak Response Enhancement (FoodCORE) and TN's Integrated Food Safety Center of Excellence's (TN CoE) surveillance and programmatic activities. FoodNet conducts surveillance for nine foodborne disease pathogens and FoodCORE centers work collaboratively with CDC to develop new and better methods to detect, investigate, respond to and control multistate outbreaks of foodborne diseases. The TN CoE is a partnership between TDH and the University of TN as serves as a resource for local, state and federal public health professionals to respond to foodborne outbreaks. TN has been a member of FoodNet since 2000, a member of FoodCORE since 2010 and developed the TN CoE in 2012.

The fellow will be expected to participate, and have the opportunity to lead, all aspects of an outbreak investigation including questionnaire design, interview training and case/control interviews, data collection and management, data analysis, after-action reviews and report writing. Collaboration with local, regional and state health department staff, as well as agencies outside of TDH such as the Tennessee Department of Agriculture, CDC, FDA, USDA-FSIS and others will be necessary.

CEDEP staff members and fellows have been involved in numerous outbreak investigations and surveillance system projects. Our previous fellow, Jane Yackely, evaluated TDH's Shiga toxin-producing E.coli (STEC) surveillance system to better understand the system's strengths and weaknesses during a time of changing laboratory testing practices. Ms. Yackley worked on numerous foodborne outbreak investigations with frontline public health staff. She has also collaborated with state and local environmental health and epidemiology staff to create a statewide web-based foodborne illness complaint system. Ms. Yackley also collaborated with our State Epidemiologist, Dr. Jones on the development of a manuscript published in Foodborne Pathogens and Disease titled Foodborne Disease Outbreaks in the United States: A Historical Overview (https://www.liebertpub.com/doi/abs/10.1089/fpd.2017.2388).

The fellow will have the opportunity to collaborate with CDC and other regional Integrated Food Safety Centers of Excellences (CoE) in developing and delivering food safety training and educational materials to states and jurisdictions in need. In collaboration with the University of TN, the fellow will participate in Whole Genome Sequence training development and delivery. The Fellow will also work with UT to develop best practices on marketing on-line outbreak response trainings for epidemiologists, nurses, disease investigators, laboratorians and environmental health specialists. The fellow will contribute to COE's work by reviewing training competencies for Environmental Health Specialists and other disciplines being developed and piloted by UT the University of Colorado.

Our fellow will also be integrated within TDH's SSIP to assist the FDP in the implementation of the Foodborne Diarrheal Diseases Message Mapping Guide (FDD MMG). The MMG will drastically change

how TDH captures and manages foodborne disease surveillance data. The fellow will be instrumental in working with both FDP and SSIP staff in creating new enteric disease case report forms, updating pages in the National Electronic Disease Surveillance System (NEDSS) Base System (NBS), piloting data entry and evaluating the MMG.

Our fellow will also have the opportunity to participate in projects in our Vector-Borne Diseases (VBD) Program. Our VBD program is housed at the state laboratory since in addition to an epidemiology component, it has laboratory and environmental components. Tennessee reports 19 VBD conditions, including among the highest case numbers of spotted fever rickettsiosis. Tennessee led the nation in revising the SFR case definition in 2019 to provide more accurate case classification with the current laboratory testing. TDH is in the process of implementing the 510(k) Rickettsia species RT-PCR assay available through LRN for more accurate case detection. TDH will continue to improve vectorborne disease surveillance by supporting the NNDSS Modernization Initiative through the integrated surveillance system (NBS). TDH has been a leader in this area. The release of the final version of the Tickborne and Rickettsial Disease (TBRD) Message Mapping Guide (MMG) is currently planned for the fall of 2019. Once released, the Vector-borne team will collaborate with the TN Surveillance Systems and Informatics team to ensure capture and transmission of all data elements necessary for modernized surveillance. TDH will also employ Tableau to monitor vector-borne disease data quality and reporting timeliness. This effort includes interactive dashboards for Central Office to track investigations requiring attention within NBS as well as Regional dashboards to monitor disease burden and trends. The fellow will have the opportunity to be involved in these initiatives.

We anticipate the new fellow will similarly and successfully work within the context of CEDEP. The fellow will be fully supported to complete projects and take on responsibilities that will influence statewide activities. Ms. Yackley was able to complete all requirements in approximately one year.

Day-to-Day Activities

- Attend weekly CEDEP meetings, including FoodNet / FoodCORE staff meetings, EHS Net and Environmental Health meetings and SSIP meetings;
- Work with SSIP staff to develop and/or modify enteric disease pages in NBS;
- Revise enteric disease case report forms to model pages developed in NBS;
- Participate fully in interviewing, cluster evaluation, and acute foodborne outbreak investigations;
- Become familiar with Whole Genome Sequencing (WGS) and analyzing and interpreting WGS data;
- Interview enteric disease cases using standardized surveillance interview tool;
- Serve as a consultant for local and regional health department staff on questions regarding foodborne disease outbreak investigations;
- Work with the Foodborne Outbreak Coordinator in managing and analyzing enteric outbreak data;
- Provide data analysis and report writing support to local and regional health departments;
- Attend all statewide epidemiology trainings including monthly CEDEP conference calls and face-to-face meetings;

- Conduct special studies to include aspects of study design, implementation, and analysis;
- Prepare presentations and publications, and deliver them at state and national meetings;

Potential Projects

Surveillance Activity Temporal and Spatial Surveillance of Shigella sonnei Cases in TN

Approximately every five to seven years, TN reports an increase in Shigella sonnei cases. In 2008, TN reported over 900 cases of Shigella. From 2009-2012, between 218-374 cases were reported. However, in 2013, the number of cases of Shigella rose to 815 and was over 900 in 2014. Since 2015, TN has not reported more than 310 cases of Shigella per year. We would like to better understand possible factors associated with increased reports of Shigella over time and geographic location. Our fellow will conduct a temporal and spatial analysis using SaTScan. He/she will perform geographical surveillance of Shigella cases in TN to detect spatial or space-time disease clusters and to see if they are statistically significant. They will also test whether TN's Shigella cases are randomly distributed over space, time or space and time. Finally, throughout their fellowship, he/she will perform repeated time-periodic disease surveillance for early detection of disease outbreaks and will provide the program with a protocol to continue this surveillance.

Surveillance Evaluation An Evaluation of the Foodborne Diarrheal Diseases (FDD) Message Mapping Guide

The National Notifiable Diseases Surveillance System (NNDSS) helps public health monitor, control, and prevent about 120 diseases. These diseases are important to monitor both state and nationwide and include infectious diseases such as foodborne outbreaks such as E. coli. About 3,000 state and local health departments gather and use data on these diseases to protect their communities. Through NNDSS, CDC receives and uses these data to evaluate trends and detect potential health threats.

As part of the CDC Surveillance Strategy, the NNDSS Modernization Initiative (NMI) is enhancing the system's ability to provide more comprehensive, timely, and higher quality data than ever before for public health decision making. Through this multi-year initiative, CDC is increasing the robustness of the NNDSS technological infrastructure so that it is based on interoperable, standardized data and exchange mechanisms. One objective of the NMI is to develop message mapping guides (MMGs) for Health Level 7 (HL7) case notifications.

The FDP and SSIP have been collaborating for over a year to implement the FDD MMG. Staff have reviewed the final FDD MMG and are currently finishing up a gap analysis and data system inventory to ensure all necessary data will be captured in NBS for CDC and TDH program purposes. Once the FDD MMG is implemented, FDP staff will work with SSIP to test electronic data transmission processes for case surveillance with CDC FoodNet and other appropriate programs to ensure accuracy and completeness of data submitted. We anticipate the FDD MMG will be in the testing phase by July 2020 when the Fellow would be coming on board.

Our fellow will be instrumental in finishing up the testing phase of the FDD MMG and will be tasked with evaluating data quality for Salmonella pre and post FDD MMG. Data elements under review will include

demographic (i.e., age, race, ethnicity), clinical (i.e., symptoms, illness onset, laboratory data) and exposures (i.e.; food, water, ill contacts). A comparison scheme between Salmonella data pre MMG and post MMG will be developed. Using the "Updated Guidelines for Evaluation of Public Health Surveillance Systems," our fellow will also describe the simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness and stability of the Salmonella pages pre and post MMG. Recommendations for future improvements will be described and implemented (if possible) during our fellow's tenure. We anticipate that the Fellow would have access to 6-12 months of post FDD MMG implementation Salmonella case data which should provide sufficient cases for a robust evaluation.

Major Project Reportable Conditions Needs Assessment

In TN there are almost 100 reportable diseases or conditions which vary by reporting source, reporting methods, and reporting systems. These reporting sources include individual physicians, hospitals and hospital systems, urgent care facilities, long-term care facilities, laboratories, and several others. TDH uses several systems to capture these disease reports including Electronic Laboratory Reporting, Morbidity Reports into the NEDSS Base System (NBS), SFTP for flat file reports, REDCap, National Healthcare Safety Network (NHSN), Electronic Health Records at the local health departments, the state-wide immunization registry (TenIIS), and several others. This can be a confusing process for providers, leads to underreporting, and can lead to multiple offices at TDH contacting the same providers around similar issues.

The purpose of this needs assessment will be to identify the efficiency of the disease and condition reporting process from multiple perspectives including: the provider/hospital, laboratory, local health department, TDH Central Office programmatic staff, and the informatics staff managing the surveillance systems. This needs assessment will be accomplished through key informant interviews with surveillance system managers, focus groups and surveys with representative reporter types, and site visits with local health departments. At the conclusion of this needs assessment process, the Fellow will work with a group of key staff to review findings, create recommendations, and develop implementation plans for gaps or areas of improvement.

Surveillance Evaluation Assessing the Feasibility of Implementing A Single Outbreak Database In CEDEP

All healthcare providers and other persons knowing of or suspecting a case, culture, or specimen of a reportable disease or event shall report that occurrence to the Department of Health. In TN, disease outbreaks (foodborne, waterborne, healthcare acquired, etc.) are required to be reported immediately by phone to public health. TDH responds to close to 150 disease outbreaks each year. Currently, aggregated outbreak information is captured in two separate databases. The Foodborne Outbreak Coordinator developed an Enteric Outbreak Database and a Non-enteric Outbreak Database in an attempt to capture all suspected and confirmed outbreaks reported to CEDEP. The databases assist in tracking information needed for grant deliverables and capture efforts conducted by frontline public health staff.

Our CSTE fellow will review both outbreak databases, interview key Central Office and field investigations staff, and document call and data workflows to assess whether or not it is feasible to create one centralized system to capture all outbreaks reported to CEDEP as well as recommend

improvements to the overall process. Using the "Updated Guidelines for Evaluation of Public Health Surveillance Systems," our fellow will describe the simplicity, flexibility, data quality, acceptability, sensitivity, representativeness, timeliness and stability of CEDEPs current outbreak reporting system. This comprehensive evaluation will be able to inform stakeholders of needed system and training improvements, as well as determining if combining both data systems would be beneficial to CEDEP in terms of improved timeliness of reporting and data quality.

Surveillance Evaluation Evaluation of WGS Implementation in TN and Other WGS Activities

Whole-genome sequencing (WGS) has replaced pulsed-field gel electrophoresis (PFGE) as the gold standard for enteric disease cluster identification. WGS provides the ability to identify distinct sub-clusters not distinguishable by PFGE. TDH's State Public Health Laboratory (SPHL) implemented WGS for Listeria in 2015 and currently sequences all Salmonella, Campylobacter, STEC and Shigella flexneri isolates. Our fellow will evaluate sequence and analysis timeliness compared to PFGE and will provide recommendations to our SPHL partners on sequencing procedures and communicating results with epidemiologists and CDC. Our fellow will also work collaboratively with the SPHL's informatics team to develop methods to integrate WGS data into NBS. The impact of culture independent diagnostic testing on WGS in TN will also be assessed by reviewing the volume of specimens vs. isolates received by the SHPL. Our fellow will also be involved with WGS sequence analysis activities and will work with TDH epidemiologists to identify and investigate enteric disease clusters.

Preparedness Role

Our fellow will participate in all ICS training and certification activities and participate in emergency response activities. These include assisting with the planning, development, and implementation of a tabletop exercise to improve the ability to detect and respond to a communicable disease outbreak. The fellow will also be incorporated into the Operations Branch of TDH's ICS for any real-world activations of the State Health Operations Center (SHOC), with a focus on activities related to just-in-time creation of data collection instruments, and analysis and visualization.

Additional Activities

Arboviral MMG evaluation:

TDH onboarded the Message Mapping Guide (MMG) for Arboviral diseases in February 2017. Throughout 2020, TDH will be working to complete a gap analysis to support onboarding of the Lyme and Tickborne Rickettsial Diseases (TBRD). The Fellow will work with the Vectorborne disease program to complete an initial evaluation of the Arboviral MMG in order to familiarize themselves with TDH reportable disease data and reporting database features. We foresee the Fellow then participating in the major project, listed previously, to evaluate the FDD MMG. Each of these prior steps would set up the Fellow to then oversee the evaluation of the TBRD guide implementation. This progression of projects would allow the Fellow to gain valuable program area knowledge in a variety of diseases and surveillance processes as well as develop progressively advanced leadership and management skills though their evolving roles across these three functional projects.

Mentors

Primary Mary-Margaret Fill MD

Medical Epidemiologist

Secondary Katie Garman MPH

Director, Enteric Disease Surveillance and Outbreak Investigations