ID: 34250730
Infectious Diseases - Foodborne, Infectious Diseases - Host Site Description
New York City Department of Health and Mental Hygiene

Assignment Location: Queens, US-NY
New York City Department of Health and Mental Hygiene
Bureau of Communicable Disease/Division of Disease Control

Primary Mentor: Vasudha Reddy, MPH
Deputy Director of the Bureau of Communicable Disease
New York City Department of Health and Mental Hygiene

Secondary Mentor: HaeNa Waechter, MPH
Foodborne Disease Team Lead
New York City Department of Health and Mental Hygiene

Work Environment
Hybrid

Assignment Description

The CSTE fellow will be fully integrated into the Bureau of Communicable Disease at the NYC Health Department and assigned to the Enterics and Waterborne Unit. They will have their own analytic, surveillance, and educational projects to work on daily. The fellow's main assignment will be working on foodborne and waterborne disease surveillance and outbreak investigations. They will gain a detailed understanding surveillance and outbreak response, as the unit investigates an average of 150 clusters and outbreaks each year. The fellow will participate in all aspects of the investigations, with the goal of being able to manage them independently. The fellow will have the opportunity to participate in all aspects of the FoodCORE-funded activities, including attending monthly conference calls and annual InFORM meetings, participating in CDC site visits, and assisting with FoodCORE-specific surveillance initiatives and projects. The fellow will also participate in waterborne disease cluster review and response, including internal cluster review meetings and presenting surveillance reports to environmental health and laboratory colleagues.

Fellow's Anticipated Day-to-Day Activities:

- Attend weekly outbreak meetings in BCD to discuss current acute issues for all diseases that BCD tracks.
- Attend biweekly foodborne cluster and outbreak meetings with colleagues from Environmental Health and the Public Health Laboratory to discuss all active investigations.
- Attend biweekly Legionella unit meetings and cluster response meetings.
- Attend quarterly meetings with Environmental Health and the Public Health Laboratory staff to discuss shared projects.
- Assist with reviewing legionellosis reports and present summary data on cases to cluster review group.
- Assist with reviewing parasitic disease surveillance and developing reports to assist in surveillance reporting.
- Investigate hepatitis A cases and arrange post-exposure prophylaxis for close contacts.
- Work with FoodCORE-funded MPH students to help oversee foodborne disease cluster and outbreak investigations.
- Assist with semi-annual training of students from NYC schools who provide surge capacity to conduct data collection in large outbreak settings.
- Investigate clusters and outbreaks of foodborne disease, which will include interviewing patients, developing databases for data entry, data analysis, and preparing final reports. In-person visits to restaurants or stores to review food preparation practices and collect invoices with Environmental Health staff will also be part of some investigations.
- Conduct special studies, to include aspects of study design, IRB application submission (as needed), project implementation, data collection, and analysis.

- Prepare presentations and publications for meetings and conferences.

Describe Statistical and Data Analysis Support, Such as Databases, Software, and Surveillance Systems Available to the Fellow

The agency has licenses for analytic software such as SAS, SQL, and Microsoft Access. The fellow will have the opportunity to attend software training, such as SAS courses, through the SAS Institute, as well as R trainings held at other locations and within the agency. BCD uses Maven to track and manage communicable disease data, and the agency uses the Electronic Clinical Laboratory Reporting System (ECLRS) to receive electronic lab reports for all reportable diseases in NYC, including reports from the Public Health Laboratory via CERNER. BCD has a Data Unit, which offers statistical analytic support, epidemiologic methods support, review of abstracts and papers, and programming assistance. The agency also has a Bureau of Epidemiology Services, which can provide additional support, as needed.

Projects

Surveillance Activity Title: Investigating foodborne and waterborne disease outbreaks

Surveillance Activity Description:
Because the fellow will be fully integrated into the Enterics and Waterborne Unit, they will gain a detailed understanding of foodborne and waterborne disease surveillance and outbreak response within the agency. Clusters and outbreaks in NYC are identified from a variety of sources, including reports from patients or providers, analysis of disease reports, and laboratory testing results. The NYC Health Department investigates approximately 30 foodborne outbreaks, over 100 whole genome sequencing (WGS)-identified foodborne clusters, fewer than 10 parasitic waterborne disease clusters, and several legionellosis clusters each year. The fellow will take primary responsibility for investigating some of these outbreaks and clusters, having the opportunity to oversee and become involved in all aspects of the investigations. This will include developing questionnaires, conducting outbreak interviews, analyzing outbreak data (including creating maps incorporating epidemiologic and laboratory data), and writing final reports. For multi-jurisdictional outbreaks, the fellow will participate in multistate calls with other states, CDC, the Food and Drug Administration (FDA), the U.S. Department of Agriculture (USDA), and other relevant agencies. They will have the opportunity to go on restaurant inspections and other field and site visits, conduct hazard analysis and critical control points (HACCP)-based food preparation reviews, and take the NYC food protection training that is required for restaurant operators doing business in NYC.

Surveillance Activity Objectives:
The fellow will be involved in all aspects of foodborne and waterborne disease outbreak investigations, including questionnaire development, questionnaire administration and data collection, creating databases, analyzing data, presenting findings, recommending control measures, and drafting final reports. The fellow will also learn to collaborate closely with federal and state partners, as well as other groups within the NYC Health Department on these investigations.

Surveillance Activity Impact:
The fellow will gain hands-on, shoe-leather epidemiology experience, working on investigations from beginning to end and ultimately identifying causes of illness in order to implement control measures to prevent additional illness from occurring.

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Surveillance System Evaluation Title: Evaluating foodborne disease antimicrobial resistance data reported by laboratories in NYC

Surveillance System Evaluation Description:
Antimicrobial-resistant foodborne pathogens have caused numerous recent enteric disease outbreaks in the U.S. In NYC, certain foodborne pathogens are required to be reported to the Health Department, along with any results for performed antimicrobial susceptibility testing (AST) for these pathogens. The Health Department also requires that clinical isolates for certain foodborne diseases be forwarded to the NYC Public Health Laboratory for additional testing. For this subset of clinical isolates, the NYC Health Department and/or CDC perform AST or infer antibiotic susceptibility based on whole genome sequencing. The Health Department routinely analyzes foodborne disease surveillance data; however, laboratory-reported susceptibility data from outside the Health Department and CDC have not yet been incorporated into these analyses. As increasing antimicrobial resistance is of great concern, it is critical to monitor resistance observed among patients diagnosed with foodborne pathogens. The fellow will analyze and describe laboratory testing data, including antimicrobial resistance patterns, for foodborne diseases reported to the NYC Health Department and evaluate the completeness and timeliness of foodborne disease AST reporting in NYC from laboratories.

Surveillance System Objectives:
The fellow will develop an analytical dataset with demographic and laboratory testing data, including antimicrobial resistance data reported for foodborne infections to the Health Department by outside testing facilities. Foodborne pathogens of interest for this project include (but are not limited to): Salmonella, Campylobacter, Shigella, Vibrio, and Yersinia. Of note, drug-resistant Campylobacter, Salmonella and Shigella are among the CDC's 2019 Antimicrobial Resistance Threats. The fellow will characterize resistance patterns being seen in NYC and assess the completeness and timeliness of AST data reports, by pathogen. In addition, the fellow will perform a small gap analysis with a subset of case reports and compare reported data with information collected from patient medical charts and electronic health information exchanges. Based on this evaluation, the NYC Health Department will work with testing laboratories to improve reporting. These data will also be used to help prioritize patient interviews for those with antimicrobial-resistant infections. These findings would be submitted for presentation at regional and national conferences and shared with other state and local health departments.

Surveillance System Impact:
This analysis will be of great benefit to the NYC Health Department as it will characterize what antimicrobial resistance is being seen in NYC among foodborne infections and where laboratory reporting could be improved. This will be the first time the NYC Health Department has assessed antimicrobial resistance data from laboratories other than the NYC Health Department or CDC for foodborne disease investigations and analyses, providing a more complete picture of foodborne antimicrobial resistance patterns in NYC. Findings will also help support, enhance, and prioritize future case investigations and may inform clinical prescribing guidelines.

Major Project Title: Determinants of foodborne and waterborne disease public health investigation success, 2022-2024

Major Project Description:
Interviewing patients who were diagnosed with enteric diseases is critical in identifying what may have caused their illness, especially during outbreak investigations. There are many factors that may impact whether an investigator is able to successfully interview a patient or their proxy, some of which may be related to disease surveillance activities, such as receiving disease reports rapidly, contacting patients promptly after receiving reports, or attempting to reach patients at different times of the day or days of the week. There may also be demographic or clinical factors that impact patient interview success, including patient age, socioeconomic factors, or severity of illness. The purpose of this analysis will be to assess factors associated with interview success, determine ways the Health Department can improve interview

success (e.g., implementing investigation protocol changes, improving disease reporting timeliness), or assess if there are disparities in interview success among certain populations in NYC (and explore possible barriers and interventions to improve success in reaching these populations).

Major Project Objectives:
The fellow will analyze reportable foodborne and waterborne enteric disease surveillance data (including salmonellosis, typhoid/paratyphoid fever, vibriosis, cholera infection, Shiga toxin-producing E. coli infection, hepatitis A infection, listeriosis, and cryptosporidiosis data). Information including patient age, address, and laboratory testing information are routinely reported to the Health Department. During case investigations, investigators track interview attempts that are made by phone, text messaging, and mailed letters, and collect additional demographic and clinical information. The fellow will analyze these data to assess factors associated with interview success. Findings will be presented both internally as well as at regional and national meetings in order to improve surveillance related activities both within and outside of NYC.

Major Project Impact:
Based on the project findings, the fellow will prepare recommendations for improving interview success, including possible disease investigation protocol changes and additional analyses that may be needed to assess interview barriers within specific communities/groups with low response rates. These findings will be shared internally and with local and state health departments as they will be very interested in improving interview success in their respective jurisdictions and possibly performing similar analyses.

Additional Project #1 Title: Evaluating a building-level analysis for detecting foodborne disease outbreaks
Project #1 Type: Surveillance System Evaluation

Project #1 Description:
It is critical for health departments to rapidly detect foodborne disease clusters and outbreaks, especially among patients who reside in high-risk transmission settings such as congregate residential settings, including nursing homes, assisted living facilities, shelters, and other facility types. The NYC Health Department runs a daily, automated analysis to quickly detect building-level outbreaks of 7 foodborne diseases, including salmonellosis, Shiga toxin-producing E. coli infection, campylobacteriosis, norovirus infection, shigellosis, hepatitis A infection, and listeriosis. When foodborne infections are reported to the Health Department, patient addresses are geocoded, and returned fields include a building identification number (BIN) and a Real Property Assessment Division (RPAD) building classification. The analysis uses the BIN to match cases to a master facility list, which is a geocoded list of congregate facilities, as well as to identify >1 case in the same building or facility diagnosed within a certain time period. It also uses the RPAD building classification and a keyword search to identify residents of facilities that were missed either because their BIN was missing or incorrect or because the facility was not in the master facility list. Matching cases are automatically added to a tracking spreadsheet and emailed to investigators for review and possible investigation. Similar analyses have been described for respiratory diseases, including influenza (https://pubmed.ncbi.nlm.nih.gov/25960384/) and COVID-19 (https://pubmed.ncbi.nlm.nih.gov/36943404/), but not for foodborne diseases.

Project #1 Objectives and Expected Deliverables:
The fellow will use foodborne reportable disease surveillance data, building-level analysis reports, and cluster/outbreak data to evaluate the accuracy, completeness, and timeliness of the building analysis, and the proportion of building matches that led to a public health action, such as case-patient interviews or facility notification. The fellow will summarize and present their findings at national and regional meetings and conferences.

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Project #1 Impact:
Based on the project findings, the fellow will prepare recommendations to potentially improve the building-level analysis as well as response activities. Findings will be presented to other health departments who may be interested in implementing a similar system.

Additional Project #2 Title: Evaluating the effectiveness of supplemental surveillance conducted as part of waterborne disease monitoring activities
Project #2 Type: Surveillance System Evaluation

Project #2 Description:
The majority of NYC's water supply comes from the Catskill/Delaware watershed, which in agreement with the Environmental Protection Agency (EPA) does not need to be filtered; however, as part of this agreement, additional disease surveillance activities for Cryptosporidium and Giardia are required. These activities were based off of response from a large cryptosporidiosis outbreak in Wisconsin in 1993. There are three major activities: 1) Surveillance of over-the-counter anti-diarrheal medicines reported by 3 pharmacy chains in NYC. Data are reported daily and analyzed for geospatial and temporal trends, 2) A large commercial laboratory reports the number of stool specimens tested daily for bacterial culture and sensitivity, ova and parasites, and Cryptosporidium. Analyses are done to determine if testing has increased compared to baseline, and 3) the Health Department partners with eight nursing homes in the city to serve as sentinel sites for diarrhea/vomiting outbreaks. If there is an outbreak at these nursing homes, the nursing home will collect stool and send to the NYC Public Health Laboratory for testing.

Project #2 Objectives and Expected Deliverables:
The fellow will evaluate each system to understand their usefulness. For pharmacy surveillance, the fellow will compare citywide and neighborhood signals of anti-diarrheal sales with cryptosporidiosis and giardiasis cluster signals to ascertain if the pharmacy signals have predicted clusters. For the commercial laboratory test numbers, the fellow will explore other systems that could potentially provide us with stool testing numbers, such as NSSP Essence, a database of tests from a major commercial laboratory. For sentinel nursing home surveillance, the fellow will ascertain how many cryptosporidiosis and giardiasis outbreaks have been identified through this program. The fellow will also evaluate whether additional data are needed to achieve the aims of each of these three systems.

Project #2 Impact:
While these systems are required as part of an agreement with the EPA, none of them have been evaluated recently and are based on decades-old practices. An evaluation of these tools would be useful for understanding their effectiveness in comparison to other more modern systems or cluster detection methods. If the fellow finds that there is little utility in continuing these activities, we potentially could negotiate a change to the agreement, which would help streamline our processes and allow us to reallocate resources.

Additional Project #3 Title: Evaluating the impact of various foodborne disease cluster and outbreak detection methods
Project #3 Type: Surveillance System Evaluation

Project #3 Description:
The NYC Health Department has a robust foodborne disease cluster/outbreak detection system, which draws on multiple detection methods. The NYC Health Department Public Health Laboratory (PHL) performs whole-genome sequencing (WGS) on all Shiga toxin-producing E. coli, Salmonella, and Listeria clinical isolates (as well as select other pathogens), and when highly-related isolates are identified by WGS, communicates these matches to the Bureau of Communicable Disease (BCD). BCD has also implemented several advanced aberration detection methods for identifying clusters and outbreaks, such as spatio-temporal and temporal-only cluster analyses using SaTScan software, a building-

level analysis where patients' geocoded addresses are matched against other patients' addresses and the addresses of congregate settings, and a rare Salmonella serotype alert that notifies epidemiologists of two or more cases with clinical isolates subtyped with the same rare serotype, among other methods. The fellow will analyze cluster/outbreak data, by detection method, to evaluate BCD's foodborne disease cluster/outbreak detection system.

Project #3 Objectives and Expected Deliverables:
Through data collection, management, and analysis, the fellow would evaluate, by first detection method, the timeliness of cluster detection given patients' diagnosis dates, how often the cause of the cluster and/or source of illness was identified, and the time between cluster detection and the NYC Health Department taking public health action. In addition, a sub-analysis focused on clusters that were identified using multiple detection methods will assess the timing of when each detection method identified the cluster and how each tool added to the investigation. Based on this evaluation, the fellow would also help to update and rework foodborne cluster detection and investigation protocols. These findings would be submitted for presentation at regional and national conferences and shared with other state and local health departments through webinars or during monthly/quarterly meetings.

Project #3 Impact:
This evaluation will not only benefit the NYC Health Department in assessing which detection methods most frequently identified clusters/outbreaks that were eventually solved, but also assist in characterizing those in which public health action could be taken quickly, which can help support, enhance, and prioritize future investigations. Moreover, other health departments may also be interested in adopting these detection methods to enhance their existing cluster/outbreak response efforts.

Please Describe the Fellow's Anticipated Role in Preparedness and Response Efforts – Include Activities and Time Allocation (Required Competency of Fellowship)

The NYC Health Department has responded to numerous citywide and national emergencies, including the initial outbreak of West Nile virus in 1999, the response to the 9/11 terrorist attacks and anthrax investigation in 2001, the outbreak of Ebola in West Africa in 2014, the outbreak of measles in NYC in 2019, the COVID-19 pandemic in 2020, the mpox response in 2022, and responding to an increase in varicella in NYC. All employees are assigned to an Emergency Response Group for purposes of planning for and responding to emergencies. The fellow will be assigned to the Surveillance and Epidemiology Group and will be expected to participate in NYC Health Department responses during emergencies, and in all drills and meetings required by the unit. Prior fellows have had the opportunity to participate in point-of-distribution (POD) clinics to disseminate hepatitis A vaccine to patrons of restaurants, participate in POD clinics to test animal shelter staff for influenza after identification of a novel strain in cats, support investigations of measles cases to ensure rapid identification of contacts at high risk for developing illness, perform COVID-19 cluster investigations, assist with COVID-19 vaccine breakthrough and reinfection studies, as well as mpox and varicella response activities.

Please Describe the Fellow's Anticipated Role in Cluster and Outbreak Investigations – Include Activities and Time Allocation (Required Competency of Fellowship)

The Enterics and Waterborne Unit routinely identifies and responds to clusters and outbreaks in NYC. The fellow will be involved in all aspects of these investigations. For outbreaks of foodborne illness identified through 311, NYC's non-emergency complaint-based system, or social media, the fellow will develop questionnaires, collect data, create databases, analyze data, recommend control measures, coordinate clinical and food testing (if applicable), attend inspections, and draft final reports. The NYC Health Department identifies clusters of foodborne and waterborne illness several different ways, including advanced aberration detection methods such as spatio-temporal and temporal-only cluster analyses using SaTScan, a building analysis where patients' geocoded addresses are matched against addresses

of congregate settings, and a rare Salmonella serotype alert that notifies epidemiologists of two or more cases with clinical isolates subtyped with the same rare serotype, among others. In addition, the NYC Health Department Public Health Laboratory performs whole-genome sequencing (WGS) on all STEC, Salmonella, and Listeria clinical isolates (as well as select other pathogens) and reports any clusters to BCD on a weekly basis. CDC reports WGS data for Cyclospora clinical isolates and informs the NYC Health Department if any clinical isolates are part of a cluster, and will notify the NYC Health Department if any salmonellosis, STEC, listeriosis, or shigellosis patients are part of multistate cluster investigations. The fellow will take the lead on these investigations, and review and summarize demographic, clinical, and exposure information for cases. If the investigations identify cases in other states and/or a specific implicated food item, the fellow will liaise with federal partners, including CDC, FDA, and USDA, as well as other state and local health departments.

The fellow will be part of the Legionella response team evaluating Legionella cases for clustering and responding to any community clusters.

The fellow will be part of a cluster investigation rotation, managing clusters as they are assigned on a weekly basis, and will respond to outbreaks as they arise.